FutureGen Project Report

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Abstract

This report summarizes the comprehensive siting, permitting, engineering, design, and costing activities completed by the FutureGen Industrial Alliance, the Department of Energy, and associated supporting subcontractors to develop a first of a kind near zero emissions integrated gasification combined cycle power plant and carbon capture and storage project (IGCC-CCS). With the goal to design, build, and reliably operate the first IGCC-CCS facility, FutureGen would have been the lowest emitting pulverized coal power plant in the world, while providing a timely and relevant basis for coal combustion power plants deploying carbon capture in the future.

The content of this report summarizes key findings and results of applicable project evaluations; modeling, design, and engineering assessments; cost estimate reports; and schedule and risk mitigation from initiation of the FutureGen project through final flow sheet analyses including capital and operating reports completed under DOE award DE-FE0000587. This project report necessarily builds upon previously completed siting, design, and development work executed under DOE award DE-FC26-06NT4207 which included the siting process; environmental permitting, compliance, and mitigation under the National Environmental Policy Act; and development of conceptual and design basis documentation for the FutureGen plant. For completeness, the report includes as attachments the siting and design basis documents, as well as the source documentation for the following:

- Site evaluation and selection process and environmental characterization
- Underground Injection Control (UIC) Permit Application including well design and subsurface modeling
- FutureGen IGCC-CCS Design Basis Document
- Process evaluations and technology selection via Illinois Clean Coal Review Board Technical Report
- Process flow diagrams and heat/material balance for slurry-fed gasifier configuration
- Process flow diagrams and heat/material balance for dry-fed gasifier configuration
- Full capital cost report and cost category analysis (CAPEX)
- Full operating cost report and assumptions (OPEX)

Comparative technology evaluations, value engineering exercises, and initial air permitting activities are also provided; the report concludes with schedule, risk, and cost mitigation activities as well as lessons learned such that the products of this report can be used to support future investments in utility scale gasification and carbon capture and sequestration.

Collectively, the FutureGen project enabled the comprehensive site specific evaluation and determination of the economic viability of IGCC-CCS. The project report is bound at that determination when DOE formally proposed the FutureGen 2.0 project which focuses on repowering a pulverized coal power plant with oxy-combustion technology including CCS.

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Attachments

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ATTACHMENT 2 - UNDERGROUND INJECTION CONTROL (UIC) PERMIT APPLICATION

ATTACHMENT 3 – DESIGN BASIS DOCUMENT

ATTACHMENT 4 – CLEAN COAL REVIEW BOARD TECHNICAL REPORT

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EXECUTIVE SUMMARY

The FutureGen Integrated Gasification/Combined Cycle (IGCC) Carbon Capture and Storage (CCS) project was a collaborative partnership of global stakeholders, both public and private, involved in the effective use of coal for electricity production. This project was focused on an IGCC/CCS configuration until 2010, when the scope was changed to an oxycombustion/CCS configuration and renamed “FutureGen 2.0.” This report summarizes the collaborative efforts of the original FutureGen project, which was exclusively an IGCC/CCS configuration, from site selection activities starting in 2005 through the conceptual design and cost estimate in 2010.

In response to a 2003 federal call to investigate and promote the development of clean coal power production, the FutureGen Industrial Alliance (the Alliance) was formed to evaluate the technical and economic feasibility of generating electricity from a first-of-a-kind (FOAK) clean coal power plant. At project initiation, the Alliance was composed of 12 major industrial companies that produce coal and generate coal-fueled power on six continents. With coal-fueled electricity generation providing nearly half of the domestic supply of power¹ and approximately 40 percent of the worldwide supply,² the FutureGen project was the first attempt in the world to site, permit, design, construct, and operate a fully integrated coal-fueled power plant with near-zero emissions, including the capture and permanent storage of the carbon dioxide (CO₂) produced by the power plant.

As originally envisioned, the Alliance, in cooperation with the U.S. Department of Energy (DOE), was responsible for all aspects of the FutureGen project design and development, including power plant and sequestration³ site selection; power plant and sequestration system design, cost estimating, construction, and operations; risk and liability management; and overall project management. As a compendium of information, analyses, and documentation from project initiation and siting through the site-specific design phase of the FutureGen IGCC/CCS project, the following project report was prepared by the Alliance to summarize the work conducted by the Alliance and its subcontractors in the development of the first comprehensive and supportable site selection and project cost estimate provided to DOE for the FutureGen IGCC/CCS project. Accordingly, the report includes substantial technical contributions from URS (Washington Division: Houston office); siting and project development support from Coles Together (Coles County, Illinois); as well as those activities completed by the Alliance and numerous others. The work contained herein was executed under the original FutureGen cooperative agreement (DE-FC26-06NT42073) and the FutureGen restart agreement (DE-FE0000587).

The FutureGen IGCC/CCS project not only produced a defensible siting process, a robust engineering and design effort, and a detailed cost estimate, it provided a comprehensive and applicable path to the development and deployment of integrated power production and carbon capture technologies. The following summarizes the activities and details considered most relevant in the execution of siting, designing, engineering, and costing the FutureGen project. Each of the following sections also includes a condensed discussion of the key lessons learned. The lessons learned are subjective and represent the opinions of the project team.

¹ U.S. Energy Information Administration, Annual Energy Outlook 2011. DOE/EIA-0383(2011), April 2011.

² U.S. Energy Information Administration, International Energy Outlook 2011. DOE/EIA-0484, September 2011.

³ The term “sequestration” has since been changed to “storage.”

This report provides a narrative of the work completed for the FutureGen project, and is a collection of the substantial amount of technical design, engineering, and development work previously completed by the Alliance, their respective subcontractors, collaborative partners, and the DOE. Further description or details are added to this report to clarify this previous work such as siting and subsurface evaluations; design basis and engineering analyses; capital and operating reports; as well as others which are included in entirety as attachments to this report. In some cases, these reports contain proprietary information that was provided to the Alliance by technology providers. In those cases, the proprietary information is redacted or provided as an amended version with the relevant details disclosed.

The Alliance completed considerable work in other important areas, such as vendor due diligence and communications, equipment and materials specifications, stakeholder support, and site-specific communications among others. These are captured in other documents outside the scope of this report.

Basis of Design

Under guidance provided by DOE's National Energy Technology Laboratory for a near-zero emissions gasification and power generation facility, the Alliance designed the FutureGen project to nominally produce 275 MW(e), while meeting the programmatic emissions targets provided in Table ES-1.

Table ES-1. DOE Clean Coal Emissions Goals

Emissions Goals ^a
Greater than 99 percent removal of sulfur
Greater than 90 percent mercury removal
Less than 0.05 pounds of nitrogen oxides (NO _x) emitted per million British thermal units (BTU)
Less than 0.005 pounds of particulate matter (PM) emitted per million BTU
Capture and sequester 90 percent of the CO ₂ produced at the plant

^a FutureGen Alliance Initial Conceptual Design Report. Rev. 2. May 2007.

The Alliance refined these targets further for project-specific design basis documents such as the environmental impact statement (EIS), surface facility engineering design data, capital cost report, and the operating cost report; the targets are offered in the following design axioms as proposed by the Alliance.

Table ES-2. FutureGen Performance and Design Goals

Performance Target		Design Axioms ^{a,b}
Facility Related	IGCC configuration, rated nominally at 275 MW(e)	Capability to fully load an F-Class combustion gas turbine on at least one coal type.
	Gasify multiple coal types and ranks	Capability to gasify a range of coal types from sub-bituminous to bituminous.
Emissions Related	Greater than 99 percent removal of sulfur	Emit at the heat recovery steam generator (HRSG) stack an amount equal to or less than 1 percent of sulfur (as SO _x) in the coal feed, or less than 15 ppmv, whichever is greater.
	Greater than 90 percent mercury removal	Remove more than 90 percent of the mercury contained in the coal fed to the gasifier.
	Less than 0.05 pounds of nitrogen oxide emitted per million BTU coal	Emit at the HRSG stack an amount of NO _x equal to or less than 0.05 pounds of NO _x per million BTU of coal gasified. ^{c,d}
	Less than 0.005 pounds of PM emitted per million BTU coal	Emit at the HRSG stack an amount of PM equal to or less than 0.005 pounds per million BTU of coal gasified.
	Capture 90 percent of the CO ₂ produced at the plant	Capture 90 percent of the carbon in the sour syngas stream from the gasifier. Sequester at least 1 million metric tons of CO ₂ per year in a deep saline geologic formation.

^a FutureGen Alliance Baseline Design Axioms. August 2007.

^b DOE/EIS-0394D: FutureGen Project Draft EIS. June 2007.

^c BTU calculated based on the higher heating value of the incoming coal.

^d Calculated as NO₂.

The final technology configuration(s) and flow sheet analyses confirmed that the design axioms could be met by the proposed design.

Observations and Lessons Learned - Performance Targets

- Gasifying multiple coal types required a non-optimized design, additional equipment resulting in higher cost, or significant turndown on the combustion turbine generator (CTG) for lower rank coals. Fuel flexibility would also affect the plant on-stream factor when transitioning between coal types. The plant heat rate and gross-to-net capacity penalty to accommodate fuel flexibility was noticeable. As described in the Value Engineering section (11.1), the Alliance evaluated the impact to capital costs by optimizing the design for a single coal (Illinois 6); the concluding recommendation was to optimize the design to a single coal, but maintain the capability to process other ranks. These value engineering exercises recommended a revised axiom:

“The FutureGen design is optimized for a single coal type, Illinois #6. While this doesn’t preclude use of other coal types, no equipment or capacity will be installed for other coal types.”

- The IGCC gross and net output varied considerably based on technology configuration and coal type. In each case, the gross output of the facility was greater than 275 MW; however, the net power output varied as much as 45 MW. The terminology used to initially define the project’s electrical output, *Nominally Rated at 275 MW*, should be amended such that future performance targets capture the objective of the gasification process (nominal syngas production), and the objectives of power production: capacity and efficiency.

- Preliminary plant permitting activities and best available control technology analysis had been initiated, requiring site-specific design details such as stack, flare, and vent locations and impacts to dispersion models based on local conditions and the current plot plan. The initial performance targets did not have provisions for “off-spec” or “off-design” operations, which were considerable given the proposed availability and capacity factors of early year operations. The performance goals should specify that targets are for commercial operation after startup periods are complete.
- The carbon capture specification was based on sour syngas from gasifier, not carbon in the coal. This was done so that carbon in the gasifier byproducts would not count against the total. This provision was felt to be appropriate considering the range of gasifier technologies available. That said, this target did not provide for startup and shut down operations such as natural gas combustion during startup, flaring, operation of auxiliary boiler, etc. This caused some difficulty in determining the accounting system and “rules” necessary to ensure that the intent of the target was met. The performance target for carbon capture should provide some detail about the intent of the target and the contributors to the carbon total. This is especially important for FOAK facilities and less important for future commercial facilities.
- The fuel flexibility performance target made it challenging to meet capital cost targets in most areas of the plant, not just the gasifier and CTG. The target had significant impacts on the acid gas removal unit and sulfur removal unit / tail gas treatment unit designs and costs, the coal yard, etc. Future performance targets for fuel flexibility should account for the significant economic impact of this feature and either 1) accept that a premium price will be paid for such a facility and that the gas treatment train may require parallel units, or 2) allow significant plant de-rating and possible non-attainment of emissions targets during processing of some fuel types.

Siting and Site Selection

The FutureGen site selection process was initiated in December 2005. The Alliance Siting Team and support staff developed and issued the draft FutureGen Alliance Request for Proposals for the FutureGen Facility Host Site in February 2006, and the final FutureGen Alliance Request for Proposals for the FutureGen Facility Host Site in March 2006,⁴ after receiving and incorporating public comments. Twelve proposals representing seven different states were received for consideration. Through a rigorous qualitative and quantitative screening process, the Alliance carried four candidate sites forward for analysis. This process included full characterization of the four candidate sites under federal National Environmental Policy Act (NEPA) requirements, as well as the evaluation of site-specific characteristics. The matrix developed for the final determination of site suitability and preferential ranking of the sites included contributions from multiple sources including original site proposals; the best and final offer submissions from site proponents; Alliance due diligence analyses of the legal and financial aspects of each site; studies related to sequestration site and reservoir, transmission, and permitting; site-specific studies on power plant construction, transmission, and operations; consideration of site preparation requirements; and evaluations of representative power markets. A copy of the final, completed matrix is included in the reference folder. Figure ES-1 provides the framework developed and executed by the Alliance during the site selection process.

⁴ FutureGen Industrial Alliance: Final Request for Proposals for the FutureGen Facility Host Site. March 7, 2006.

Figure ES-1. Site Selection and Evaluation Process⁵

With the final determination that each of the final four candidate sites could support the project, the Alliance announced in December 2007 that the Mattoon, Illinois site provided the best overall comparative value, having fully considered the environmental, cost, and risk characteristics of each site (both to cost and schedule). The record of decision (ROD) was issued by the federal government in July 2009, confirming compliance with NEPA requirements; the ROD indicated that each candidate site would be acceptable to host the FutureGen project. Section 3. provides additional information on siting and the site selection process.

Observations and Lessons Learned – Siting and Site Selection

- Develop a siting evaluation and selection plan with input from a wide range of disciplines prior to drafting requests for proposals.
- While confidentiality is necessary to maintain fair competition, the overall process should be as open and transparent as possible.
- A robust siting process wherein all pertinent information is fully disclosed is necessary to gain and keep stakeholder support.
- Clear legal title or purchase option to the property is imperative to minimizing ownership risk. This enabled the Alliance to quickly establish plant boundaries and design specifics related to site control, access points (rail and road entrance), egress, and utility connections. It also limits third party interests or claims on the property.
- Clear legal control or exercisable options for ownership of subsurface (sequestration) pore space is imperative to enabling control over the CO₂ plume boundaries.

⁵ Included in Section 1 of the FutureGen Request for Proposals for the FutureGen Facility Host Site, March 7, 2006.

- Clear understanding of CO₂ pipeline route access and ownership is important for sites where the CO₂ injection site is separated from the power plant.
- Siting in a location with meaningful CO₂ storage legislation (at the state level) has a clear advantage, addressing aspects of indemnification and storage liability.
- Siting in a location with clear state-level guidelines and processes streamlines the permitting process.
- It is advantageous to minimize off-site requirements (easements for pipeline and utility corridors) and injection well locations. Fully evaluate the risks to public, cost, and schedule.
- Access and rights to utilities such as plant make-up water, natural gas, and power are important in the siting process.
- Electrical tie-in requirements and timelines are important to plant cost and schedule. The process, cost, and schedule for the power transmission system upgrades (via the regional transmission organization) should be understood during the siting process.
- The absence of pre-existing penetrations into the primary seal (storage reservoir) is advantageous.
- Sites considering CO₂ storage vs. CO₂ utilization (e.g., enhanced oil recovery) should fully vet potential take-off agreements, impacts to financial considerations, and overall levelized cost of electricity.

Cost Estimate

The FutureGen team prepared a Class 4 cost estimate methodology based on the Association for the Advancement of Cost Engineering guidance.⁶ Developed to accommodate the first “total project cost estimate,” components of the cost estimate are aligned with four key areas and are provided in Figure ES-2: project initiation (Budget Period (BP)-0 and BP-1); total installed cost (TIC) which includes capital expenditures (CAPEX) and pre-commissioning costs; total operating expenditures (OPEX) including Alliance operations, owner costs, and permitting; and post-operations cost (POC).

Figure ES-2. Cost Estimate Components

Prefacing the formal cost estimate activities, a complete set of process flow diagrams and the corresponding heat and material balance were developed for three representative coal types and two different types of coal gasifiers, enabling the estimate team to fully characterize the technology selections, likely configurations, and equipment sizing. The ensuing reference plant proposed for the cost estimate was

⁶ AACE International Recommended Practice No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries. 2005.

With costs estimated for the reference plant design, each cost area was subjected to a Monte Carlo analysis to quantify the risks and impacts associated with the cost estimate (see Section 12.). This was a multi-step process starting with the unmitigated overnight CAPEX estimate, applying the estimate-driven risks identified by the estimating team, applying confidence limits and ranges for each island, and then incorporating event-driven risks to arrive at the additional contingency necessary to provide assurance that the project can be delivered within budget. An independent analysis of the final cost estimate indicated that, based on an assessment of project documentation and interviews with the design and estimating team, appropriate estimating methods, techniques, and procedures were utilized in preparing the estimates.

The FutureGen CAPEX was based on a facility design that was segmented into 15 process areas, distinguishable by the red lettering in Figure ES-3. Several different estimating strategies were needed to estimate the costs for each area as accurately as possible. These tools included “Similar Plant,” EPC Bid, Aspen Capital Cost Estimator (ACCE™ - formerly Kbase™ and Icarus), WINEST, and Factored Estimates. The tools were tailored and used to provide the most representative and defensible cost estimate for each area.

The CAPEX values, summarized in Table ES-3, include an estimate for a slurry-fed gasifier configuration and a dry-fed gasifier configuration, as it was not decided at the time of cost estimate report which technology would ultimately be deployed for the FutureGen project. The values provided are from the draft 2009

project cost estimate issued to DOE and January 2010 update,⁷ and are based on an estimate of costs as of the second quarter of 2009 (2Q2009).

Table ES-3. CAPEX and TIC Line Item Summary

Line	Category	2Q2009	2Q2009
		Slurry-Fed Gasifier	Dry-Fed Gasifier
1	Direct Costs	\$ 1,010,081,000	\$ 1,166,428,000
2	Indirect Costs	\$ 267,954,735	\$ 265,493,742
4	Total Field Costs	\$ 1,278,035,735	\$ 1,431,921,742
5	Home Office Engineering	\$ 109,308,385	\$ 109,727,385
6	Total Field and Home Costs	\$ 1,387,344,120	\$ 1,541,649,127
7	Insurance	\$ 13,458,558	\$ 13,477,942
8	Bonds	\$ 3,212,955	\$ 3,164,660
9	Freight	\$ 28,133,700	\$ 27,540,600
10	Cost Provisions	\$ 141,453,000	\$ 156,907,000
11	Total CAPEX	\$ 1,573,602,333	\$ 1,742,739,329
12	Fee	\$ 96,627,855	\$ 95,589,855
13	Total Contract Value	\$ 1,670,230,188	\$ 1,838,329,184
14	Alliance Operations	\$ 28,400,000	\$ 28,400,000
15	Engineering, Licensing, and Construction Management	\$ 69,326,630	\$ 75,326,630
16	Permitting	\$ 6,500,000	\$ 6,500,000
17	First Fills	\$ 16,516,452	\$ 16,342,524
18	License Fees & Prelim Eng.	(Included in Line 15)	(Included in Line 15)
19	Initial Spares	(Included in TIC)	(Included in TIC)
20	Owner Costs	\$ 120,727,442	\$ 126,553,514
21	Pre-operational Costs	\$ 13,217,302	\$ 13,217,302
22	TOTAL INSTALLED COST	\$ 1,804,174,932	\$ 1,978,100,000

The CAPEX estimate includes costs for the surface facility (IGCC), subsurface facility (including CO₂ injection wells, monitoring wells, and all related monitoring, verification, and accounting (MVA) capital requirements), and supporting infrastructure. The division between CAPEX and OPEX for the purpose of the estimate was plant commissioning; equipment check-out was contained in the CAPEX, with plant startup costs captured in the OPEX.

OPEX

The OPEX produced for the FutureGen facility was based on the same plant specifications and design provided for in the CAPEX. The baseline operating plan called for 4 years of plant operations followed by 2 years for MVA of the CO₂ sequestration site. Therefore, the OPEX estimate includes all of the operations and maintenance (O&M) costs associated with the full 48-month operating period, as well as the POCs associated with CO₂ monitoring and project closeout, although the POCs were reported separately. The estimate was relative to 2Q2009 dollars; however, where appropriate, certain costs such as labor, fuel, and consumables were escalated to determine total project cost associated with the OPEX.

⁷ FutureGen Alliance. 2009 Project Cost Estimate: Volume I, Capital Costs. January 29, 2010.

Two estimates were developed, representing the slurry-fed and dry-fed gasifier configurations. Many of the costs were similar in both configurations, drawing on the same resources independent of the technology selection. Examples of such costs include O&M labor, all subsurface O&M, and certain owner costs. The summary data provided in Table ES-4 is categorized by fixed and variable costs, determining the total non-fuel-related O&M expenditures; the fuel costs were added to capture the total O&M costs. It is noted that the OPEX estimate was based on utilization of a single coal type (Illinois 6).

Table ES-4. Summary of FutureGen Operating Costs⁸

Cost Category	Slurry Fed Total	Dry Fed Total
Fixed O&M	\$215 M	\$236 M
Variable O&M	\$53 M	\$53 M
Total Non-Fuel O&M	\$268 M	\$289 M
Fuel	\$108 M	\$101 M
Total O&M	\$376 M	\$390 M
Coal Processed (short tons)	2,445,000	2,292,000
CO ₂ Sequestered (MT)	4,393,251	4,118,336

Post-Operations Costs

The POC estimate includes 2 years of MVA for the sequestration site, the associated reporting, and project closeout costs. The POCs for the subsurface facility include the following activities: closure in place of the CO₂ pipeline; limited O&M for the injection well; plugging and abandonment of all deep wells; continuation of the comprehensive CO₂ monitoring program initiated during the CAPEX and OPEX phase; field labor, travel, and overhead expenses; project indirect costs; and home office costs.

The cost estimate specified that the plant transition after operations is a zero cost item. That is, it does not take credit for any resale revenues of the facility after the 4 years of operation, nor does it assume costs associated with a plant closure after operations. It is expected that the plant will retain capital value after the 4-year operating period. The POCs are shown in Table ES-5.

Table ES-5. Post-Operations Costs

Item	2Q2009
Subsurface	\$17,000,000
Owner Costs	\$6,345,781
Total	\$23,345,781

Observations and Lessons Learned – Cost Estimate

- Cost position can be improved by purchasing major equipment outright and assigning the license/contract to an engineering, procurement, and construction (EPC) contractor if amenable to the technology provider. This avoids fees associated with an EPC purchase of equipment (percent of capital). However, it requires more contracting and administrative infrastructure for the owner.
- The purchasing structure is different for gasification equipment compared to normal power plant equipment. Technology providers are not willing to give firm pricing (e.g., lump sum/turnkey). In a

⁸ FutureGen Alliance. Project Cost Estimate Vol. II – Operating Costs. DES-OPEX-02 Rev. 2. February 2010.

competitive environment, this will delay finalization of even the preliminary design of the balance of plant until the FEED studies are complete and the gasification system has been selected. There are a limited number of gasifier technology providers and each has a different preferred method of providing their technology. Some prefer to provide a design package and technology license while others are teamed with an EPC contractor and prepared to provide the entire gasification island.

- Pre-approval of all EPC contractors and subcontractors through a structured evaluation process is recommended to determine capabilities and expertise; this helps to avoid a bid-based evaluation only.
- Perform due diligence on vendors that will be supplying major pieces of equipment and understand nuances of that equipment when it is operating both on and off specification.
- Include senior operations staff and leadership as early as possible. This enables on-site training for personnel and construction management assistance to the project team as units and processes are turned over. Senior operations staff should also be included early in the design stage to develop operating strategies (O&M, cold startup, warm restart) that can be included or addressed in the plant design.
- Scope and invest in a complete process simulator and ensure pre-commissioning labor hours are available for engineering and operator training.
- Include insurance providers early in project development to help mitigate and reduce risk.
- Expect unplanned/forced outages and compromised availability in the first 3-6 months of commercial operation. Historical startup curves of FOAKs are relevant and should indicate a prolonged acceptance testing period after mechanical completion is declared for major equipment.
- For a commercially dispatched facility, be willing to evaluate utilization of natural gas for power production when the gasification plant is not available. This goes against the FutureGen axioms, but is relevant for other utilities or facilities involved in poly-generation.
- Consider “over the fence” terms for isolated or distinguishable services, for example, oxygen delivery, zero liquid discharge, and high purity water production.
- Recognize that the plant has two separate processes, gasification and power production, which have inherent differences, including risk/safety/health, engineering, and environmental. Management must provide support and leadership to ensure an integrated team and clear communication.

Acronyms and Abbreviations

AACE	Association for the Advancement of Cost Engineering
AGRU	acid gas removal unit
ASU	air separation unit
BACT	best available control technology
BAFO	best and final offer
BGS	below ground surface
BP	budget period
BTU	British thermal unit
CAPEX	capital expenditures
CCS	carbon capture and storage
CTG	combustion turbine generator
DEIS	draft environmental impact analysis
DOE	U.S. Department of Energy
ECM	engineering construction management
EIA	U.S. Energy Information Administration
EIS	environmental impact statement
EPC	engineering, procurement, and construction
FEED	front-end engineering design
FEIS	final environmental impact statement
FEL	front-end loading (engineering level)
FOAK	first-of-a-kind
FSCA	full scope cooperative agreement
HRSG	heat recovery steam generator
I&C	instrumentation and control
ICDR	initial conceptual design report
IEPA	Illinois Environmental Protection Agency
IGCC	Integrated Gasification/Combined Cycle
LAER	lowest achievable emission rate
LSCA	limited scope cooperative agreement
LTSA	long-term service agreement
MBTU	million British thermal units

MMT	million metric tons
MVA	monitoring, verification, and accounting
MW(e)	mega-watt electrical (power)
NETL	National Energy Technology Laboratory
NEPA	National Environmental Policy Act
O&M	operations and maintenance
OPEX	operating expenditures
PFD	process flow diagram
PM	particulate matter
POC	post-operations cost
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million, volumetric dry
PRB	Powder River Basin
RFI	request for information
RFP	request for proposal
ROD	record of decision
SCR	selective catalytic reduction
SRU	sulfur removal unit
STG	steam turbine generator
TEG	triethylene glycol
TIC	total installed cost
UIC	underground injection control (permit)
ZLD	zero liquid discharge

1. Introduction

The FutureGen Integrated Gasification/Combined Cycle (IGCC) Carbon Capture and Storage (CCS) project was conceptualized as a first-of-a-kind (FOAK) clean coal power plant that would operate as a “near-zero emissions” facility, deploying the most advanced technical controls available for emissions control and abatement. As described in the initial conceptual design report (ICDR Vol. I: Rev. 2, May 2007), the advancement, consolidation, and use of these technologies in one facility was ambitious. While research and development had significantly advanced technologies to support gasification, electricity generation, and emissions control including carbon dioxide (CO₂) capture and permanent storage, these technologies had not been demonstrated at a scale and fidelity consistent with industrial power production. Many stakeholders contributed to the FutureGen project, including but not limited to the FutureGen Industrial Alliance (Alliance) and Alliance member companies; the U.S. Department of Energy (DOE), particularly the National Energy Technology Laboratory (NETL); and various subcontractors. All stakeholders were focused on the timely delivery of a coal-fueled energy production facility that would provide a pathway to affordable, near-zero emissions electricity generation. The FutureGen project represented that full-scale demonstration, and was considered essential to proving the technical, economic, and commercial viability of generating power with full emissions control including CO₂.

1.1 Background

Under guidance promulgated in the 2001 National Energy Policy,¹ it was recommended that the DOE provide \$2 billion over a 10-year period to fund clean coal technology research and development, with the intent to align federal energy policy directly with state and federal regulations on widespread emission reductions. The energy policy development group specifically addressed the advantages of coal gasification (IGCC), enabling the continued use of the substantial domestic reserves of coal, in an environmentally preferable manner. In February 2003, President Bush announced that the United States would sponsor the FutureGen Initiative—a \$1 billion, 10-year project to build and operate the world’s first coal-based, near-zero emissions power plant that would have broad international, public, and private sector partners.²

1.2 FutureGen Industrial Alliance

In response to the call for the FutureGen Initiative, the Alliance consortium incorporated in July 2005. In structuring the company, and to capitalize on the strengths of each member company, the Alliance formed a Board of Directors composed of one voting member from each of the companies. Representing domestic and foreign commitments to the strategic development of clean coal-based resources, the Board of Directors not only provided programmatic and project oversight, they worked to ensure that the project represented the highest degree of transferability.

The Alliance also formed a Technical Committee that included an engineer or scientist from each of the participating members. Broadly, the Technical Committee was tasked with ensuring that the FutureGen project could meet the mission-specific objectives set forth by the DOE while advancing IGCC/CCS technologies toward commercial deployment. Accordingly, one of their first responsibilities was to provide

¹ National Energy Policy: Report of the National Energy Policy Development Group. May 2001.

² Clean Energy and Climate Change: George W. Bush Whitehouse Archives. Accessed at: <http://georgewbush-whitehouse.archives.gov/ceq/clean-energy.html>. 11/15/2011.

a comprehensive assessment of the current state-of-technology for IGCC and CCS systems and processes, and the likelihood of their implementation into the FutureGen plant. Complementing the technology readiness evaluation, the Technical Committee also began to formulate the criteria the Alliance would use to assess potential technology configurations, and to determine what plant operating characteristics would be required to meet the mission objectives.

Where appropriate, the Technical Committee formed subcommittees to provide more in-depth analysis of specific aspects of the project and facility design and engineering. Examples include subcommittees for subsurface characterization, subsurface design and engineering evaluations, and surface facility design and engineering. This enabled the participation of technology and location-specific expertise from the member companies and supporting contractors, and ultimately provided for the siting and design of a FutureGen plant that encompassed the broadest range of applicable knowledge in these respective areas.

1.3 FutureGen Project Development

Having secured federal financial support and scope, the Alliance, with programmatic guidance from NETL, began a rigorous feasibility and conceptual design assessment, as well as a site selection process under a limited scope cooperative agreement (LSCA) executed in December 2005. By mid-2006, the Alliance had issued and received 12 proposals from seven different states to host the FutureGen project.³ Each of the 12 proposals was assessed against project siting criteria, and utilized two evaluation teams: one to consider criteria related to the power plant, and one to consider criteria related to the geologic storage (sequestration) site. After weighting, scoring, and ranking the proposed sites, the Alliance provided four candidate sites for detailed analysis in the draft environmental impact statement (DEIS). DOE issued the three-volume DEIS in June 2007.⁴ After soliciting and incorporating public comments as appropriate, the final environmental impact statement (FEIS) was issued by DOE in November 2007 (DOE/EIS-0394).⁵ In the FEIS, DOE indicated that all four candidate sites could support the proposed action. The Alliance, in turn, would be able to select the final FutureGen site from the proposed sites once DOE issued the record of decision (ROD). Section 3. includes further discussion of both the National Environmental Policy Act (NEPA) siting analysis and the final site selection analysis.

Concurrent with the siting analysis and conceptual design, the Alliance executed a full scope cooperative agreement (FSCA) in March 2007. The agreement included finalizing the site selection process, fulfilling the NEPA requirements, and initiating the preliminary design of the plant using site-specific details (the results of which would be determined by the site selection analysis and issuance of the ROD). Subsequent phases of the project, including final design, construction, and operations, would also have been captured under the FSCA.

Citing project cost concerns, DOE allowed the FSCA to expire in June 2008, and replaced it with an LSCA that included scope to complete the preliminary design as well as a revised project cost estimate. Based on the results of these efforts, the Alliance and DOE would then decide how best to proceed to successive phases of the project. Additionally, as part of the design and costing effort, the Alliance would evaluate aspects of the project specific to operating and technology that could inherently improve reliability and availability, and

³ DOE/EIS-0394D: FutureGen Project Draft EIS. June 2007.

⁴ U.S Department of Energy. Notice of Availability of the Draft Environmental Impact Statement for the FutureGen Project. Federal Register, 72 FR 30572, June 1, 2007.

⁵ DOE/EIS-0394: FutureGen Project Final EIS. November 2007. Accessed at:
<http://www.netl.doe.gov/technologies/coalpower/futuregen/EIS/>. 11/17/2011.

reduce overall cost. Considerations included relaxing the 90 percent CO₂ capture goal in operational years one and two to accommodate unknown integration and CO₂ storage issues that might be expected from an FOAK power plant; designing and costing the combined cycle power plant to operate on natural gas for power production during construction of the gasification plant and whenever syngas was not available; and optimizing the design of the plant based on a single coal type. Where applicable, details of these assessments are included in this report as they played a significant role in the final determination of project overall cost and viability.

In August 2010, DOE announced that the FutureGen project would be re-scoped as a clean coal development project, but not necessarily IGCC. Therefore, the activities providing the basis of this report came to a natural conclusion. Though the Alliance and DOE continue to lead in the advancement of the integrated oxy-combustion/CO₂ capture and sequestration project, the following project report is bound at the terminus by that re-scoping.

1.4 FutureGen Project Objectives

Proposed as a 275 MW(e)⁶ IGCC power plant, the FutureGen project was designed to gasify pulverized coal, converting it to a hydrogen-rich syngas stream of sufficient quantity to fully load an F-Class industrial combustion turbine to generate electricity. Design specifications included the capture of at least 90 percent of the CO₂ in the syngas from the gasifier, compressing the CO₂ to a supercritical fluid, and transporting the CO₂ to an underground injection site for permanent storage in a deep saline formation. As a mission to build, operate, and standardize a first generation IGCC/CCS power plant, the FutureGen project would have produced a working industrial power generation facility and research platform that could continuously provide relevant data and information for subsequent facilities. Though “boilerplate” IGCC reference plant designs were commercially available, the FutureGen project represented a significant departure from the routine development and execution of a power plant project.

First and foremost, the FutureGen project had to be designed, permitted, and operated to ensure success in meeting the rigorous emissions goals established by DOE for a near-zero emissions gasification and power generation facility. This included greater than 99 percent sulfur removal, greater than 90 percent mercury removal, and the ambitious goal of capturing and storing a minimum of 90 percent of the CO₂ produced at the plant.⁷

Second, because the FutureGen project would be a FOAK facility, the Alliance had to develop and implement novel methodologies for the disciplined screening and assessment of potential sites that could support both the power plant and CCS activities, as well as for the alternative technology configurations. The framework(s) developed for each of these activities was independently evaluated by technical experts in the respective fields so that they could serve as reasonable structures for future deployments.

Third, as a consortium of a broad range of invested parties, the Alliance not only had to prove the viability of selected technologies in a single plant at commercial scale, they also had to provide enough flexibility to accommodate the development of globally transferable near-zero emissions technologies that could be economically dispatched into a representative power market. At the project level, this was best represented by maintaining strong international support and representation within the Alliance, as well as a high degree

⁶ Nominal, or nameplate, capacity rating.

⁷ FutureGen Alliance. ICDR, Rev. 2. May 2007.

of stakeholder involvement and communication. At the technology level, this was demonstrated by employing sound science and engineering practices, executing design and costing efforts for multiple coal types and gasifier configurations, and the routine use of the technical and economic community at the regional, national, and international level.

Finally, because of the high visibility of the FutureGen project and in consideration of building and operating a FOAK IGCC/CCS facility, the Alliance frequently and candidly conducted risk, risk mitigation, and environmental, health, and safety analyses, addressing the identifiable types of credible concerns. While not unique in application, the level of rigor applied to these efforts enabled the Alliance to understand the risks involved in building and operating the IGCC/CCS facility; and of greater consequence, how to design and operate a plant that could avoid or mitigate these risks, thereby protecting the public.

1.5 FutureGen Project Report

This report is intended to provide an inclusive accounting of project activities from inception through the issuance of full site specific cost reports. Due to the significant investment already made by the Alliance, their collaborative partners, subcontractors, and DOE, previously executed scope that resulted in the formal production of studies and reports is relied upon and referenced. When appropriate, these documents are included as attachments in entirety or as amended. Reference documentation may also be provided via a weblink, as would be the case for publicly available information. For clarity, further description or detail may accompany this previously completed work. Assessments or evaluations that have not been publicly released are included to the extent practical with the exception of information proprietary to technology providers that was provided to the Alliance or DOE under non-disclosure agreements. This is particularly true for aspects of the Air Separation Unit (ASU), gasifier, and portions of the acid gas recovery process units. Certain portions of the sulfur recovery unit, particularly final process configuration, are also under non-disclosure.

Due to the number and volume of supporting documents, references and referenced reports are provided separately as attachments. This report begins by introducing the FutureGen project, the structure of the Future Industrial Alliance (Section 1); and an overall project description for the plant and CCS systems (Section 2). The site selection process and results follow in Section 3. Relevant information compiled and disclosed in the environmental information volume, DEIS, and FEIS is referenced, as they were instrumental in the evaluations of the respective sites for both the IGCC and the CCS infrastructure. Where fitting, site-specific information is provided, clarifying the FutureGen Alliance's final determination of site suitability based on cost, risk, and benefit, as well as DOE's final determination of suitability, which culminated in the ROD. The Mattoon property description is included, as is the finalized plot plan that was used for the costing effort and initial permitting activities.

As an extension of the siting and characterization process, Section 4 includes site-specific evaluations of sequestration and carbon storage aspects for the Mattoon site. This section also includes a discussion of the underground injection control (UIC) permit application.

Section 5 provides the basis of design, design option evaluations, and the final design configuration for the FutureGen plant. This section begins with the general design basis assumptions and performance axioms for the proposed IGCC/CCS project. The section also contains a significant level of detail on the Alliance's evaluations of proposed technologies and/or technology configurations conducted for equipment selection,

configuration, and integration to the overall process design prior to the costing effort. Design of the CO₂ injection wells and supporting systems is included in Section 5 as well.

A significant level of effort was completed to evaluate both gasifier and acid gas recovery units. Though largely based on proprietary vendor supplied information, the evaluations conducted as part of the Illinois Clean Coal Review Board (CCRB) supported work enable the down-selection of major plant technologies; their incorporation into process flow diagrams and accompanying heat and material balances; and development of initial operating scenarios. The CCRB work is captured in Section 6 while the CCRB report in entirety as well as the accompanying process diagrams and material balances are included as attachments.

The cost estimate methodology and cost estimate plan is included in Section 7, noting that they were developed prior to issuance or receipt of any request for information (RFI) or request for proposal (RFP) from participating vendors. The cost estimate was based on an “island approach,” enabling the identification and assignment of physical boundaries, the infrastructure contained within those boundaries, and the key material take-offs. As proposed, the scope associated with each island would be assigned to a specific contractor through separate bid processes. However, to ensure overall project continuity, the Alliance anticipated using a single integrating contractor responsible for overall continuity between islands, as well as the balance of plant.

The cost estimate portion of the report includes estimates for capital expenditures (CAPEX, Section 8), operating expenditures (OPEX, Section 9), and post-operations costs (POC, Section 10) for the surface and subsurface portions of the project. Results of the cost estimate at the area level are included. The design basis includes the throughput and composition requirements of major streams, the design coal compositions for each coal type, and de-rating allowances. The overall process flow sheets, heat and material balance, and descriptions of each process island are provided and described with a level of detail commensurate with the stage of design at the time the project cost estimate was provided to DOE. This includes, where applicable, equipment sizes, throughputs, and capacities. Consistent with the project cost estimate reports for CAPEX and OPEX, information is provided for slurry-fed and dry-fed gasifier configurations, as the Alliance completed full flow sheet analyses of both technologies to accommodate an Association for the Advancement of Cost Engineering (AACE) Class 4 cost estimate.

With a fixed, baseline plot plan, and having completed the costing exercise, the Alliance conducted value engineering assessments on multiple aspects of the facility that, if executed, could mitigate capital and operating expenses from the plant. Included here are several studies conducted to evaluate design and engineering considerations, as well as the studies executed under State of Illinois and Southern Illinois University grant programs. Concurrently, the Alliance initiated site-specific emissions modeling and profiling in support of the New Source Review and prevention of significant air quality deterioration analysis, which require the installation and operation of the best available control technology (BACT). Descriptions of each of these are provided in Section 11.

Section 12 includes summary level information regarding internal and external reviews of the cost estimate reports, risk and contingency assessments, and the analysis of financial (pro-forma) models provided by the Alliance to the DOE.

The report concludes with a summary of major accomplishments in Section 13. These key attributes and findings frame and define the technical and non-technical aspects of the project that were not only relevant to the original FutureGen project, but would have broad applicability to the development, execution, and

operation of an FOAK power plant project regardless of location or technology selection. As the first comprehensive effort to site, design, and cost a utility sized coal fired power plant with integrated carbon capture and storage, the analyses and efforts of the original project have been instrumental to the development of the current FutureGen project, with many of the key findings being incorporated into the new plant configuration and location.

2. Project Description

Fundamentally, the FutureGen project would have been coal-fueled power plant that produced hydrogen (H_2) for use in a combustion turbine, thereby generating electricity for commercial sales. Additionally, the FutureGen project would have separated and captured CO_2 produced by the plant, which could have been delivered (via pipeline) to a wellhead for injection and permanent geologic storage.

2.1 FutureGen Plant

The simplified block flow diagram in Figure 2-1 captures the essential elements of the facility, with the three functional blocks representing the gasification portion (yellow), the gas processing portion (green), and the combined-cycle power plant (blue).

Figure 2-1. Simplified Block Flow Diagram of an IGCC Plant with CO_2 Capture

Though many of the technologies considered for the plant had already gained commercial acceptance (e.g., steam turbine generator (STG), coal handling equipment, Claus process for sulfur recovery), the FutureGen facility proposed and designed for the Mattoon, Illinois site represented the first fully integrated IGCC/CCS facility in the world. As shown in Figure 2-1, the gasification and gas processing sections of the facility have more distinct unit processes than the power generation section of the plant; this is a function of the gasification process, which retains the chemical energy found in the coal until it can be used in the combustion turbine.

The gasification of coal has significant advantages compared to conventional combustion practices; the most significant is that it can substantially reduce the overall emissions profile from a coal-fueled facility. To understand this, it's useful to consider how the energy conversion processes vary between the two. Conventional combustion releases the chemical energy found in coal through complete oxidation; this typically requires an extensive "post-combustion" clean-up process such as particulate control, mercury removal, and desulphurization for emissions management. Gasification, on the other hand, converts the coal into a gaseous fuel stream (syngas) through partial oxidation. The resulting syngas contains a very high percentage of the primary contaminants found in coal that are of concern when considering overall emissions such as sulfur and mercury, but these contaminants are removed in the "pre-combustion" gas processing steps, as outlined in Figure 2-1. Because the contaminants are removed prior to combustion, the overall size of emissions control equipment and total emissions can be considerably less when compared to conventional combustion practices.

An additional process germane to the FutureGen project enabled the production and separation of CO₂ from the syngas. Formed in the water-gas shift, the reaction of water (steam) and CO in the presence of a catalyst yields additional H₂ as well as CO₂. The CO₂ produced in the water-gas shift is then removed from the syngas in the acid gas removal unit (AGRU); the AGRU is the same technology that removes most of the sulfur in the syngas as well. Once captured and removed from the syngas, the sulfur is processed in the Claus reactor, which produces elemental sulfur, while the CO₂ is compressed to form a liquid (supercritical), supplied to a pipeline, and ultimately injected through a well into a deep geologic formation for permanent sequestration.

Finally, once through the AGRU, the resulting syngas, primarily consisting of H₂ and small amounts of other gases, is heated and supplied to the combustion turbine to generate electricity. To maximize the overall efficiency of the plant, waste heat from the combustion turbine, as well as steam harvested from the gasification and gas processing process units, is used to drive a steam turbine, which also generates electricity. Considering the extensive level of integration between the power plant and the gasification and gas processing units, the overall complexity of the facility is significant.

2.2 CO₂ Capture, Transportation, and Storage (CCS System)

The CO₂ produced at the plant would have been transported via pipeline to a well distribution system, and injected into the storage reservoir. Figure 2-2 depicts a CO₂ transportation and storage system, generically presenting key components of that system, including pipeline, injection, and monitoring wells; CO₂ injection zones; and the primary seals. Sections 4 and 5.2 provide further details of the FutureGen design of the CCS system.

Figure 2-2. Components of a Generic Sequestration System

Each component in the sequestration system design is site-specific, and the Mattoon site would have enabled the Alliance to capitalize on several aspects of the proposed CCS system. Beginning with the discharge of supercritical CO₂ from the FutureGen plant's CO₂ compressor, the pipeline segment required to transport the liquid CO₂ would have been short, never leaving the FutureGen property. The short pipeline run would not only have limited the capital expense required for construction of the pipeline, it would have eliminated the risk of pressure loss in the pipeline, which is more likely in longer pipeline segments. As such, the discharge pressure of the CO₂ compressor could be operated to closely match the wellhead conditions required for injection. Additionally, co-locating the plant, transportation, and injection systems on one contiguous piece of property would have mitigated issues of pipeline and access right-of-way, environmental health and safety, and public protection.

The CO₂ distribution and injection system of the FutureGen project was proposed to contain one primary injection well, and four monitoring wells in varying placements. The primary injection well targeted the Mt. Simon Formation, and was proposed to be at a total depth of approximately 8000 feet below surface.

The four monitoring wells consisted of:

- an “in-reservoir” monitoring well to evaluate reservoir changes in pressure and geochemical conditions as the injection of CO₂ took place;
- a primary seal monitoring well just above the caprock encompassing the storage reservoir, enabling the Alliance to continuously monitor for CO₂ migration out of the reservoir; and
- two seismic monitoring wells located within 1200 feet of the primary injection well and instrumented to continuously evaluate the seismic conditions of the reservoir as over 1 million tons of CO₂ per year was injected into the Mt. Simon Formation.

The FutureGen project planned to conduct a robust monitoring, verification, and accounting (MVA) program. Implemented over the 4-year injection period and a 2-year post-injection time frame, the MVA program addressed research objectives in several areas. These objectives included establishing the baseline conditions; tracking and characterizing the size of the plume; examining the geochemical effects caused by the interaction of CO₂ and the Mt. Simon Formation; and detecting any CO₂ leakage above the Mt. Simon caprock that could influence the drinking water aquifer or activities conducted at the surface.

3. Site Selection

Initiated by the LSCA in December 2005, the FutureGen Alliance began the initial stages of a site selection process that would culminate in the selection of a single site that offered the best overall value in terms of environmental, safety, technical, and economic factors.

3.1 Siting Methodology and NEPA

To execute a national-level search for the most appropriate site that would accommodate both the surface facility (IGCC) and the subsurface storage site (sequestration reservoir), an Alliance Siting Team was created, composed of scientists, engineers, Alliance committee member experts, and Alliance Technical Committee members for the surface and subsurface facilities. Tasked with developing criteria for evaluating each proposed alternative site, the Siting Team crafted the following three types of measurements for assessing site suitability:

- Qualifying criteria – Criteria that each site would have to meet before being considered further. Failure to meet any criterion resulted in disqualification.
- Quantifying criteria – Criteria that would allow sites to be scored and ranked based on the extent to which they possessed desirable features.
- Best value criteria – Criteria that could not be quantitatively scored, but that represented factors the Alliance would consider when choosing a site that could best fulfill the project's mission.

Prior to issuance of the FutureGen Alliance Request for Proposals (RFPs) for the FutureGen Facility Host Site, the Alliance also sought and received input from additional stakeholders such as DOE, regulatory agencies, and environmental groups. The draft RFP was issued in February 2006 for public review and comment; the final RFP was revised based on that feedback and was issued in March 2006.¹ The Alliance received 12 proposals to host the FutureGen project, representing locations in seven different states. Figure 3-1 provides the locations of the proposed sites.

¹ FutureGen Alliance. FINAL: Request for Proposals for FutureGen Facility Host Site. March 7, 2006.

Figure 3-1. Proposed Sites for the FutureGen Project

Given the inherent complexity of each aspect of the project (surface and subsurface), the Alliance formed two proposal evaluation teams: one team evaluating criteria as it applied to the surface facility, and one team evaluating the criteria as it applied to the subsurface portion of the project. Working independently, the siting teams reviewed each of the 12 proposals to assess their compliance with the qualifying criteria found in Figure 3-2.

Figure 3-2. FutureGen Qualifying Criteria

Following review of the proposals, as well as clarifying responses asked to each of the sites, the evaluation teams determined that 4 of 12 sites could not satisfy all of the qualifying criteria. These sites were eliminated from further review, while the remaining 8 sites were carried forward for the quantitative analysis using the scoring criteria found in Figure 3-3.

Figure 3-3. FutureGen Quantifying Scoring Criteria

The scores were then independently derived (each scoring team member individually scored and ranked each site) and tabulated, giving a final score for each site based on its strengths and weaknesses. The Alliance also conducted a non-numeric review of each site’s “best value criteria,” which characterized aspects of the sites that were difficult to quantify, such as known markets for power or hydrogen, land ownership and proximity to sensitive receptors, recycling and disposal paths, and other considerations. Once compiled and summarized, the final ranking of the sites was considered to be unbiased and reflective of a site’s overall suitability to host the FutureGen project by offering:

1. an acceptable location for siting, constructing, and operating the power plant;
2. at least one acceptable targeted geologic formation for sequestration; and
3. minimal risk for schedule delay and/or project failure.

Of the eight sites that were scored and ranked, four were removed from further consideration, and four were carried forward as viable candidates that would be characterized in the environmental impact statement (EIS) as part of the federal NEPA process. The final four sites were Mattoon, Illinois; Tuscola,

Illinois; Jewett, Texas; and Odessa, Texas. Additional information regarding the siting methodology and analysis can be found in the FutureGen EIS in Section 3.2.

Concurrent with issuance and review of the draft EIS, but prior to receipt of the ROD, the Alliance conducted a final round of inquiries with the remaining four sites. This activity culminated in the “best and final offer” (BAFO) that each candidate site provided to the Alliance to aid in their final deliberations on site selection. While the information contained in the BAFOs could not be publicly disclosed, the details contained therein enabled the Alliance to conduct a robust comparative assessment capturing the site-specific detail of approximately 80 separate line items, including aspects of land and right-of-way ownership, impacts to capital and operating costs, potential revenue(s) and incentives, and legal considerations. Because the site-selection process is highly competitive, and to maintain the integrity of each site’s respective offer, the final tabulations, ranking, and selection of the preferred site was done by Alliance management in a closed-door meeting.

3.2 Selection of the FutureGen Host Site

In December 2007, the Alliance announced that the Mattoon, Illinois site would be the preferred site to host the FutureGen project, pending the outcome of the review of the FEIS and corresponding ROD. The Mattoon Final Site Selection Report is included in Attachment 1 of this report. In selecting the Mattoon site, the Alliance acknowledged that each of the candidate sites was likely to be acceptable to DOE and could individually offer significant benefits. However, the Mattoon site specifically represented the best overall value to the project by offering the following²:

- The Alliance would have clear legal title to the power plant and injection site, minimizing land ownership risk and concerns.
- Power plant and injection location(s) are co-located on the same contiguous piece of property, reducing capital and operating expenses and improving public access and educational opportunities.
- The Mt. Simon Formation is regionally extensive, is considered to represent a key geologic storage reservoir in the U.S., contains multiple caprock seals, and few existing penetrations into the formation or caprock.
- The site is located near supporting infrastructure to accommodate the large, capital project (rail, road, water, and transmission).

The ROD was issued July 2009 and indicated that each of the candidate sites would be acceptable alternatives to host the FutureGen project, confirming compliance with federal NEPA guidelines. Additional information regarding the NEPA process and the siting methodology can be found in the FEIS.³

3.3 Description of the Mattoon, Illinois FutureGen Site

The selected host site for the FutureGen project was located approximately 2.5 mi. west of Mattoon, Illinois, and was composed of 419 acres of predominantly agricultural use land. As previously discussed, due to the size of the property, the Alliance was able to co-locate both the surface facility (IGCC) and the sequestration site on the same contiguous parcel, reducing both the cost and risk of the project.

² FutureGen Alliance. Final Site Selection Report. December 18, 2007. Included as Attachment 1 to this report.

³ DOE/EIS-0394: FutureGen Project Final EIS. November 2007. Accessed at:
<http://www.netl.doe.gov/technologies/coalpower/futuregen/EIS/>. 11/17/2011.

From a constructability standpoint, the Mattoon site offered several benefits. Bordered on the northeast by Highway 121 and surrounded by county roads, the site had proximity to rail (Canadian National Railroad at the northeast corner of the property), and major transportation corridors of Interstate-57 running north-south and Interstate-70 running east-west were located within. As is pertinent to any power plant project, the Mattoon site also provided clear access to, and supply of, make-up water for the plant, as well as reasonable access to local electrical transmission distribution infrastructure. Figure 3-4 highlights the general location of the site on the state map, the site itself (blue outline), and the proposed corridors for water, wastewater, and natural gas supply to the site (green). Figure 3-5 is a photo of the harvested site, and Figure 3-6 is a photo of the site as it appeared in the spring with a new crop started.

Figure 3-4. Mattoon, Illinois FutureGen Plant and Injection Site

Figure 3-5. FutureGen Site Looking North

Figure 3-6. FutureGen Site with New Crop Planted

In addition to being the best overall site from a technical standpoint, the Mattoon FutureGen site would have likely capitalized on several non-technical aspects of the location as well. For example, the project had gained substantial support at the local, regional, and state level. As mentioned previously, the site was close to several universities, colleges, and trade schools that could have served as key institutional locations for the education and advancement of IGCC/CCS technologies and personnel. Further, in alignment with project goals to develop and operate a coal-fired facility with the lowest environmental footprint, the FutureGen facility at Mattoon intended to use only municipal grey water as its primary make-up water source, thereby eliminating potential impacts to local freshwater sources. Finally, though difficult to quantify, in targeting the Mt. Simon Formation for sequestration, the FutureGen project would have had a very high degree of transferability, as the Mt. Simon Formation was not only one of the most important storage reservoirs in the U.S., it was representative of the vast majority of geologic storage reservoirs being considered for carbon sequestration globally.

4. Storage Site Evaluation and Characterization

The FutureGen project had an objective to store (sequester) 1 million tons (1 million metric tons (MMT)) of CO₂ per year into a deep saline reservoir. As previously discussed, given the degree of investigation afforded to the siting process, which included subsurface characterization, each of the target formations was determined to be a reasonable alternative by addressing key geologic criteria, including but not limited to the following:

- High storage capacity (in excess of project goals) was available.
- Formation permeability and porosity would support planned injection rates but limit migration.
- Primary seal(s) of the reservoirs were thick, expansive, and void of additional penetrations.
- There was little to no evidence of active or hydraulically transmissive faults.

4.1 Mattoon and the Mt. Simon Storage Reservoir

As a well-known formation, Mt. Simon had been thoroughly investigated prior to its consideration for the FutureGen project, with a significant body of work already completed by the Illinois State Geologic Survey, Midwest Geological Sequestration Consortium, and those involved in natural gas storage and delivery. As such, the Alliance was able to focus its subsurface characterization work on determining the site-specific potential impacts of sequestration; two examples include the reservoir-modeling simulations using the proposed CO₂ injection rates, and seismic evaluations to provide geologic insights to the Mt. Simon Formation and Eau Claire caprock.

Equipped with data and information regarding the physical properties of the targeted reservoir, the Alliance conducted several numerical simulations to predict the distribution and fate of the CO₂ injected into the Mt. Simon Formation. The model, Subsurface Transport Over Multiple Phases (STOMP), solves for and describes the migration (CO₂ plume size) and fate of CO₂ as it's injected into the Mt. Simon based on parameters such as viscosity, solubility, relative permeability, and density. Detailed descriptions of the formation characteristics can be found in the UIC Permit Application (Section 2).¹

For the EIS, two injection rates were considered that represented the reasonable bounds of CO₂ output from the plant. Though ultimately dependent on many factors such as the rank and type of coal being gasified, availability of the plant, and overall capture efficiency, the bounding injection rate investigated was 7551 tons (6850 metric tons) per day, or an annual injection rate of 2.8 million tons (2.5 MMT) per year. For the second case, the model considered a continuous injection rate of 1.1 million tons (1 MMT) per year. This corresponded to the minimum rate of sequestration that the project expected over the first 4-year operating period, and directly aligned with the FutureGen programmatic goals for sequestration. In any scenario, the upper modeling limit was held to 55 million tons (50 MMT) of CO₂ injected into the Mt. Simon Formation.

It was expected that once the project was approved for the next phase, a characterization well would have been drilled at the Mattoon site. The ensuing analytic work on the borehole and core samples would have provided much-needed corroborative evidence for the characterization of the Mt. Simon Formation at the site, as well as representative data that would be used to update the injection and plume models, formation

¹ FutureGen Alliance. Underground Injection Control Permit Application. April 19, 2010. Included as Attachment 2 in this report.

characteristics, seals, and additional subsurface data requirements. The additional analytic work would have also enabled further investigation into the pressure constraints of the Mt. Simon formation, which for the purposes of modeling was held to a single-pressure boundary acknowledging that the pressure front of the injection plume would be of a larger diameter than the proposed plume boundary, but it was not quantified. As will be discussed in Section 4.2 because the Area of Review (AOR) was conservation at 2.5 miles and initial injection models indicated a plume size of approximately 1 mile, the pressure boundary was likely to fall well within the AOR constraint though this was not specifically modeled.

The following figure is an example of a calculated 20-year (yellow radius is equivalent to 2.5 MMT for 20 years), and 50-year (red radius is equivalent to 1 MMT for 50 years) plume size at the Mattoon site based on CO₂ injection modeling conducted in 2007.²

Figure 4-1. 20-yr and 50-yr Modeled CO₂ Plume Size

In response to the original FutureGen host site RFP, the site proponent provided the Alliance with a substantial amount of descriptive information about the Mt. Simon target formation, as well as additional details addressing geologic storage criteria.³ Among the deliverables was an investigation into formation and caprock faulting and fracture zones, which, if present, could affect the injection field and integrity of caprock seal. To accommodate the analysis, the site proponent had a 2D seismic survey done, verifying at a rudimentary level that no faulting was present, at least on the single seismic line that was acquired.

Once the Mattoon site was selected as the preferred location to host the FutureGen project, the site proponent executed a second, more detailed seismic survey that was completed in June 2008. The results of that survey were used to corroborate the previous 2D findings, as well as to further describe the features of the Mt. Simon Formation and the bounding caprock layers by acquiring almost 30 linear miles of seismic data along seven different profiles that traversed the FutureGen site. Figure 4-2 illustrates the seven profiles acquired in that effort, with the blue tangents representing the three-component (3C) lines, and the red tangents as the normal 2D lines.

²FutureGen Alliance. ICDR, Rev. 2. May 2007.

³FutureGen Alliance. Request for Proposals for FutureGen Facility Host Site: Part 4.0-Geologic Storage Criteria. March 2006.

Figure 4-2. Seismic Profiles Acquired at the Mattoon FutureGen Site

The seismic data was acquired using industry standard techniques. Large, truck-mounted vibrators were strategically positioned to provide vertical compression energy, which traveled down into the earth much like a wave. With this technique, as the energy travels through the earth, varying layers of rock and material impede upon that energy wave, causing it to reflect back toward the surface of the earth. At the surface, geophones (instruments that convert ground movement to an electrical signal) can then measure the degree and intensity of that reflection as it moves back to the surface. Figure 4-3 provides a view of how the geophones are spatially oriented in the field during the seismic testing; during acquisition of a single line, multiple geophone locations are required.

Figure 4-3. Field Layout of Geophones

Data processing and interpretation of the seismic survey was completed by Fairfield Industries (renamed FairfieldNodal in 2010), a recognized worldwide leader in geophysics and seismic data processing. A first interpretation, called a “brute stack analysis,” provided a rough estimate of the quality of the data collected, indicating that once a full analysis had been conducted, the Alliance should have high-quality images of both the storage reservoir and the caprock seal. Additionally, findings supported the 2D survey done in 2006, indicating there was no evidence of faulting in either the storage reservoir or the caprock seal.

A second interpretation of the seismic data was executed in late 2008.⁴ This analysis compiled data from the vertical geophones capturing compression (P-P) waves, and included 13 miles of (3C) geophones capturing converted-shear (P-SV) images. With the addition of 3C data, interpreters can more effectively describe the type of wave and the direction of wave propagation, enabling a more thorough description of subsurface lithology as well as other features.

The following images show the depth-registered interpretation of the Mattoon seismic profile, and include both P-P images and P-SV images. In Figure 4-4 and Figure 4-5, starting from the top and working toward the bottom, the blue line represents the base of the Knox Formation; this is effectively the top of the Eau Claire caprock seal. The Eau Claire Formation is represented by the span between the blue and green lines, with the green line representing the boundary between the top of the Mt. Simon Formation and the bottom of the Eau Claire caprock. The Mt. Simon Formation is then the span between the green line and the yellow line, with the yellow line representing the boundary between the bottom of the Mt. Simon Formation and the top of the underlying Pre-Cambrian basement formation.

⁴ Data processing and interpretation provided by Bob A. Hardage. December 8, 2009.

Figure 4-4. P-P Image from Mattoon Seismic Survey, Line 5

Figure 4-5. P-SV Image from Mattoon Seismic Survey, Line 5

The seismic evaluation concluded with an interpretation of fault potential at the Mattoon site. Though discontinuities (potential faulting) did appear in the Pre-Cambrian basement formation (highlighted in red in Figure 4-4), there was no compelling evidence in any of the profiles to conclude that these extended into the Mt. Simon Formation or caprock seal.

A final note in the analysis provided a clear path for further reconciliation of the seismic work with the known geologic conditions at the Mattoon site, predicated on the drilling of a characterization well. This effort would enable calibrating the seismic data obtained through imaging, with actual physical logs and other “in-hole” activities such as vertical seismic profiling and borehole core sampling.

4.2 Underground Injection Control (UIC) Permitting

The Alliance filed the initial UIC permit application on September 30, 2009, and the revised permit application on April 19, 2010.⁵ The Draft Class I UIC permit was issued by the Illinois Environmental Protection Agency (IEPA) June 26, 2010, approving the application.⁶ In the permit application, the Alliance fully disclosed specifics related to the hydrogeologic characterization of the injection and confining zones; well construction (Section 5.3 of this report); modeling of the CO₂ reservoir (Section 4.2.2 of this report); and operations, monitoring, and reporting activities expected during the project. Due to the re-scoping of the FutureGen project, the application was ultimately withdrawn by the Alliance; however, the following appended information details the relevant aspects of the permit application and the approved draft permit issued by the IEPA.

The draft permit issued by the IEPA conditionally approved the injection of supercritical CO₂ into the Mt. Simon sandstone formation at the Mattoon site (pending approval of the final UIC permit). The permit specified the construction and operation of up to two injection wells, with a requirement to operate only one injection well at a time, enabling the Alliance reasonable flexibility in such cases where a single well might be off-line for repair, inspection, or other operational or maintenance purposes. The permit also specified an injection rate not to exceed 6312 metric tons per day, noting that the final heat and material balance calculated approximately 5900 metric tons per day, and a total injection mass of 50 MMT. In accordance with the monitoring program detailed in the application, the draft permit allowed the construction and operation of up to two injection zone monitoring wells in the Mt. Simon formation, and the construction of four shallow monitoring wells in the lowermost sections of the drinking water aquifer located at the site.

Building on the seismic evaluations, the UIC permit application also provided detailed hydrogeologic characteristics of the injection zone (Mt. Simon formation), as well as the upper and lower confining zones which would have providing 'sealing' for the CO₂ storage reservoir. Actual depths and defining formation attributes would have been confirmed or verified after drilling, geophysical logging, and hydraulic testing of the injection well. Additional details found in the UIC permit application addressed the potential sources of groundwater at the Mattoon site including both brackish water (non-potable aquifers) as well as underground sources of drinking water. The draft permit clarified the procedures and policies that would govern the injection and sequestration of CO₂, and included provisions detailed in the State of Illinois administrative codes (35 Ill. Adm. Code 702, 704, and 730), as well as federal guidelines such as the Safe Drinking Water Act and United States Environmental Protection Agency Region V guidance. Additional information can be found in the UIC permit application (Attachment 2 of this report).

4.2.1 Hydrogeologic Characterization of the Mattoon Injection and Confining Zones

The Mt. Simon sandstone is a well characterized band of medium to coarse-grained quartz sandstone ranging from approximately 7,500 to 9,000 feet below ground surface (bgs) at the Mattoon injection location. Interspersed with fine to medium-grained sandstones, the Alliance intended to target a coarse-grained arkosic interval located near the bottom of the formation based on geophysical well log data (specifically porosity data) obtained from the Weaber-Horn #1 well which is approximately 36 miles southwest of the Mattoon site.

⁵ FutureGen Alliance. Underground Injection Control Permit Application.

⁶ IEPA. July 26, 2010. Permit No. UIC-013-FIA; Log No. UIC-144.

The high porosity zone in the Weaber-Horn well is relatively thick at 125 feet, and contains an average porosity in excess of 20 percent. Extrapolated using regional correlations, this high-porosity zone can range from 20 to 400 feet in thickness, and it was concluded that finding an appropriately analogous zone at the Mattoon injection site was highly probable.

The UIC permit application also provided relevant details regarding the integrity of the sealing formation(s) and the potential for fractures to develop as a result of the high pressure injection of CO₂ into the Mt. Simon. For conservative purposes, the maximum injection pressure was conservatively set at 85 percent of the .8 pound per square inch per foot (psi/ft) gradient as required by State of Illinois regulation. With fracture stimulation commonly requiring a gradient of 1.0 psi/ft in the Illinois basin, limiting injection pressures to significantly below fracture opening and closure pressures, the risk of accidental overpressure and induced fracturing in the formation, seals, or casing cements is greatly reduced.

Once the initial well was developed at Mattoon, additional subsurface characterization work would have been completed using actual drilling results and geophysical logging including effective porosity, hydraulic conductivity, capacity, and formation flow among others.

The primary confining zone of the Mt. Simon sandstone is the immediately overlying Eau Claire formation; two additional secondary sealing formations are located above the Eau Claire. Regionally, the Eau Claire formation is used as a primary caprock seal for a number of natural gas storage fields in the Illinois Basin, consisting predominantly of thick shale deposits. Extensive study and use of the Eau Claire particularly at the Manlove and Herscher gas storage fields indicates that the shale beds are an effective seal, and capable of preventing the upward migration of natural gas from the Mt. Simon into overlying formations.

The basement formation, or lower confining zone, is Precambrian age granite. With the CO₂ being injected above the formation and the inherent buoyancy of the CO₂, aspects of formation fracturing, porosity, and permeability are minimized. Though there was no publically available literature or data addressing characteristics of the granitic basement formation in Illinois, modeling results and extrapolated research on granites indicated the physical integrity of the lower confining zone would not be compromised during injection.

4.2.2 CO₂ Plume Modeling and Simulations

CO₂ plume modeling was routinely updated throughout the FutureGen siting and design processes as new information became available, such as the geophysical log data from the nearby Weaber-Horn Well #1. Equipped with log data on the physical properties of the targeted reservoir, the Alliance conducted multiple simulations to predict the distribution and fate of the CO₂ injected into the Mt. Simon Formation at the Mattoon FutureGen site. Using the STOMP simulator, the models quantified the migration (CO₂ plume size) and fate of CO₂ injected into the Mt. Simon Formation based on parameters such as viscosity, solubility, relative permeability, and density.

The baseline modeling scenario completed for the UIC permit application, “Plant-Lifetime Injection Scenario,” was based on a continuous injection rate of approximately 1.95 MMT per year for 25.6 years, giving a total injection volume of 50 MMT of CO₂ into a highly permeable 260-ft thick arkosic interval located towards the base of the Mt. Simon Formation. Table 4-1 provides the plume radii for the modeled injection scenario at selected times.

Table 4-1. Plume Size at Modeled Injection Rate

Time (years)	Radius (feet)	Radius (miles)
5	2237	0.42
10	2831	0.54
20	3303	0.63
50	4251	0.81

Complementary to the injection simulations, were plume distribution models that considered injection over the same time constraints as indicated in the Table 4-1. As illustrated in the following Figure 4-6, after injection stops at year 25.6, the CO₂ plume relaxes under the influence of buoyancy. The models also indicate that the CO₂ is rendered relatively immobile in the injection formation of the Mt. Simon and dispersion of the plume is limited both vertically under the confining layer, and horizontally within the Mt. Simon itself.

Figure 4-6. Plume Size and Distribution

In addition to those provided in the UIC permit application, additional simulations were conducted throughout the course of the project as plant operating conditions became better defined, and as exploratory evaluations were considered such as changes to injection rates, duration of injection, and targeted intervals within the Mt. Simon. These modeling efforts also provided substantive indications that

the 2.5 mile AOR as prescribed by the State of Illinois for Class I Injection Wells was reasonably conservative and that the actual plume would be well inside of that boundary.⁷

Using the model described above to evaluate CO₂ plume size for different durations of injection (i.e., different amounts of CO₂ injected), additional scenarios evaluated injection into multiple intervals within the Mt. Simon formation to examine lateral distribution characteristics of the plume. For this simulation, three different injection durations were modeled targeting a larger 748-ft interval in the Mt. Simon. Much like the previous example, each injection period was followed by a post-injection period where the plume would relax in the formation. The corresponding plumes were calculated and plotted on the FutureGen plot plan for each of the three injection scenarios (duration and volume as provided in Figure 4-7), assuming a total of a 50-year span from the start of injection.

Figure 4-7. Injection Model Scenario: Layers 4c-6f (748-ft)

⁷ This has since been changed, and is currently administered under the State of Illinois Class VI well classification.

5. Basis of Design

The FutureGen plant was designed to facilitate the research, development, and demonstration of technologies that could progress coal-to-energy power generation toward near-zero emissions. When successfully built and operated, the FutureGen plant would have provided a basis for reliable, environmentally friendly, coal-fueled power plants that could compete economically with other carbon-based technologies, both domestically and internationally.

5.1 FutureGen Performance and Design Axioms

To enable the progression of readily transferable technologies, and to ensure that the FutureGen plant would be deploying those representing the most advanced state of the technology, the Alliance conducted several engineering and techno-economic evaluations prior to advancing any firm design or performance axioms. Essentially running in parallel, the first of those efforts was an internal technology readiness assessment in late 2006. This assessment enabled the Alliance to broadly evaluate not only those technologies deployable for commercial operation in the FutureGen plant, but also those emerging technologies that could foreseeably improve capital or operating costs of future plants and could be candidates for development testing at the FutureGen site.

The first formal evaluation report, the ICDR, was issued in May 2007. The ICDR included a detailed synopsis of criteria considered in the technology screening and ranking process conducted by the Alliance Technical Committee, Alliance support staff, DOE, and independent technical experts. Predicated on successfully meeting the non-negotiable mission requirements listed in Table 5-1, the evaluations formed the basis of the FutureGen design and performance axioms, which could be applied to any potential technology configuration.

Table 5-1. FutureGen Mission Requirements

FutureGen Mission Requirements^a
Capture 1 million metric tons of CO ₂ per year
Demonstrate technology progression toward near-zero emission coal-fueled, commercial power plants
Demonstrate economic progression toward lower cost of electricity for advanced commercial power plants
Demonstrate commercial scale power generation
Demonstrate the capability to gasify bituminous and sub-bituminous coal

^a FutureGen Alliance. ICDR, Rev. 2. May 2007.

Framed by the mission requirements, the Alliance and supporting staff developed the operational and performance goals for the FutureGen project. To do so, the Alliance used the relevant field experience of participating member companies, and conducted due diligence trips to assess existing IGCC plants located in other parts of the world. Collectively, and in consideration of objectives that would reflect the FutureGen project as well as those of maturing technologies found in an “*n*th” plant, the Alliance established the following performance and design axioms (Table 5-2).

Table 5-2. FutureGen Performance and Design Axioms

Evaluation Criteria	Performance and Design Axioms ^a
Integration	Full IGCC integrated with CCS at commercial scale
Fuel Flexible	Capability to gasify a range of coal types from sub-bituminous to bituminous
Commercial Application	Capability to fully load an F-Class combustion gas turbine on syngas (hydrogen) with at least one coal type
CO ₂ Capture and Storage	Sequester at least 1 million metric tons CO ₂ per year in a deep saline geologic formation
CO ₂ Capture Fraction	Capture 90 percent of the carbon in the sour syngas stream from the gasifier
Emissions Goals	Meet or exceed the criteria as defined in the EIS and DOE Clean Coal Emissions Goals
Cost of Electricity	Path of development to target 10 percent increase in the cost of electricity with CO ₂ capture compared to non-capture IGCC

^a FutureGen Alliance. ICDR, Rev. 2. Volume 1 and Volume 2. May 2007.

Accordingly, to be eligible for the FutureGen mission, any technology or process had to comply with these axioms. Additional criteria evaluated included aspects of risk as it pertained to the mission, budget, and schedule; vendor alignment and willingness to participate; and the number and degree of innovations incorporated.

Despite the inherent complexity of the facility, the preceding constructs positioned the Alliance to objectively evaluate approximately 30 potential IGCC technology configurations for the FutureGen facility. The first qualitative down-selection process yielded 12 candidate technology configurations. Process simulation tools were then used to model the material and energy flows for each of the remaining candidates, enabling the development of budgetary estimates for total capital cost, annualized operations and maintenance (O&M) costs, and fuel requirements. The simulations were also used to calculate the likely gross and net power outputs of each configuration, and were the basis for estimating potential electricity revenue. These quantitative steps yielded three technology configurations that were carried forward for a full conceptual design evaluation, culminating in the FutureGen Power Plant Conceptual Design Case Studies, which was offered as part of the ICDR.

It is important to note that the configurations evaluated were intended only to represent the types of technologies that could be deployed in the FutureGen project; they were not intended to offer an opinion of exclusivity or reflect a preferred vendor status. Simply, the ICDR and conceptual design studies functioned to identify and quantify the vendor specific constraints, risks, and benefits associated with each technology configuration so that when the Alliance issued a firm RFP (or request for quotation), they had reasonable assurance that the selections could be deployed and were capable of meeting the mission and performance goals of the project. The most substantive findings were then carried throughout the design and costing process. Examples include the development of a single gasifier train that could still meet the operational goals for capture and sequestration (as opposed to a two-train parallel system for improved availability); designing to a narrower range of coal types but providing scheduling flexibility for lower British thermal unit (BTU) value coal types; and using proven oxygen and CO₂ separation technologies in the backbone of the facility. The Alliance also considered advanced technologies for smaller, engineering-scale type applications.

5.2 IGCC FutureGen Design Specifications

To accommodate a uniform analysis encompassing multiple gasifier types and coal ranks, and to provide prescriptive information to potential vendors, the Alliance developed the following set of technical specifications, framing the expected design, engineering, and operational targets for the FutureGen facility.

Table 5-3. FutureGen Technical Design Specifications^a

Design Basis		Specification
Fuel Utilization	Coal Feed Rate	210,000 to 340,000 lb/hr
	Coal Analysis	Accommodate the following fuel specifications for Northern Appalachia, Illinois 6, and Powder River Basin (PRB)
	Fuel Flexible	Designed to Illinois 6; feed rates adjusted to gasifier limitations for Northern Appalachia and PRB coals
	Syngas Production	Provide 1920 million British thermal units per hour (MBTU/hr) (lower heating value) to the combustion turbine for base case coal (Illinois 6)
Equipment	Train Arrangement	Single train (air separation unit (ASU), gasifier, AGRU, CO ₂ compression)
	Generating	1 on 1 (1 combustion turbine generator (CTG) and 1 STG) gross output of at least 275 MW(e)
	Turndown	60 percent on all major equipment
	Availability	Two 28 day outages per year; or consistent with storage goal of 1 MMTPY
Product	Syngas	As delivered from the gasifier; sufficient to supply 1920 MBTU/hr to the CTG
	Carbon Dioxide	>95 mol% CO ₂ purity; <100 ppmv H ₂ S
		2200 psig at compressor discharge
		>90 percent removal from syngas on an instantaneous basis
		1 MMTPY (approximately 7000 TPD maximum delivery rate)
	Sulfur	>99.9 wt% removed or <15 ppmvd in treated syngas, whichever is greater
Environmental	Air	Envelope defined by EIS specification
	Liquid	Zero liquid discharge facility
	Slag	Classified for secondary utilization
	Noise	OSHA standard for abatement inside plant boundary
Environmental Cont.	Noise	Site design to incorporate rail and transfer location noise abatement

^a Compiled and condensed from FutureGen Alliance: FutureGen Design Data, Rev. D. January 2008.

Collectively, the preceding technical specifications provided the bounding conditions for all ensuing engineering and design activities, and were conditionally captured in the bottom-up cost estimate for the two gasifier configurations (slurry-fed and dry-fed) evaluated in the CAPEX report and OPEX report. The design bases were maintained in the Design Basis Document¹ that was updated routinely as vendor responses and process details became apparent. Note this is a draft document representative of the state of design at the conclusion of the FutureGen 1.0 project.

¹ FutureGen Alliance Design Basis Document, Rev. D. Included as Attachment 3 of this report.

5.3 Subsurface System Design

The construction and operation of the injection and monitoring wells is described extensively in Section 3 and 4 of the UIC permit application,² including the design and construction specifications for up to two injection wells; two injection zone monitoring wells; and four shallow groundwater monitoring wells.

The injection well(s) were designed to accommodate the injection of supercritical CO₂ into the Mt. Simon Formation at an approximate depth of 7353 to 8996 feet bgs. The injection well was designed to extend 100 feet below the base of the Mt. Simon Formation. Therefore, the total depth of the well was estimated to be 9096 feet (~9100 feet). The Mt. Simon Formation was quite extensive at the FutureGen site with an estimated thickness of more than 1600 feet, though the Alliance would have targeted specific injection intervals within in that after geologic characterization and analysis of drilling logs. The proposed well design included three primary casing strings of varying lengths and diameter, and the corresponding cementing used to fill the annulus between the casing strings. Final construction of the wells would have been contingent upon the findings and analysis obtained during drilling, such as evaluation of drilling logs, core samples, and injection zone testing.

The longest casing string penetrates the Mt. Simon sandstone formation, and has perforations in the lowermost section permitting the distribution of the supercritical CO₂. The tubing, or centermost pipe run, runs from the wellhead down the length of the well, and contains the supercritical CO₂. The CO₂ flows out of the tubing and into the lowermost casing string, where it is distributed into the formation through the perforations. A sealbore packer prevents the supercritical CO₂ fluid from migrating up into the casing string. Additionally, the annulus between the tubing and casing string is filled with a fluid such as potassium chloride or sodium chloride, and pressurized so that the annular pressure is greater than the injection zone pressure, thereby preventing fluid flow back up the well casing.

The UIC permit application provided a full description of the casing program anticipated for the FutureGen project. Two injection well construction diagrams were offered in the permit application, as the final configuration was contingent on the findings obtained during drilling of the well. Figure 5-1 provides a diagram of the one of the primary injection well casing plans, which includes depth, cementing, and casing descriptions for each of the casing lengths; Table 5-4 includes the estimates for casing depth and diameter.

² FutureGen Alliance. Underground Injection Control Permit Application.

Figure 5-1. Injection Well Schematic

Table 5-4. Borehole Depths and Diameters

Casing String	Casing Depth (ft)	Borehole Diameter (inches)	Casing Outside Diameter (inches)
Conductor	100	38	30
Surface	500	26	20
Intermediate	5000 to 7000	17.5	13.375
Long String	9096	12.25	9.625
Tubing	8000	NA	5.5

As part of the routine operation of the storage site, the Alliance would have implemented a rigorous monitoring program. Section 6 of the UIC permit application details the monitoring, integrity testing, and contingency programs that the Alliance would have been responsible for during operation of the storage site.

5.4 Comparative Technology Assessments

Framed by the performance and design specifications, the Alliance conducted multiple technology assessments examining the potential trade-offs and impacts of technology or configuration options that could be deployed in the FutureGen facility. The analyses were not conducted to down-select potential vendors. Rather, the intent was to recognize strengths and weaknesses associated with potential equipment selections; understand what should be represented in the FutureGen facility; and survey a range of operational flexibility prior to generating the process flow diagrams (PFDs) and heat and material balances that would inform the project cost estimate activities. The individual evaluations contain proprietary information received from vendors or technology providers such that they cannot be included or attached to this document, however, an appended version of each of the studies is included in the following narrative.

CO₂ Compressor Evaluation: The CO₂ compressor evaluation directly addressed responses received from vendors during the RFI process. The main focus of the review was to determine aspects of risk, reliability, and basic mechanical attributes of different compressor types that would be considered for the project. Responses were received by three candidate technologies; all three were found to be technically acceptable for the project pending further review and clarification.

CO₂ Dehydration Report: The analysis investigated relaxing the CO₂ product dryness specification as offered in the ICDR (from 100 ppmv to 1250 – 2100 ppmv) without compromising the operation or integrity of downstream CO₂ pipeline. The analysis also considered the impact of integrating water removal with CO₂ compression. The potential to eliminate a separate triethylene glycol (TEG) dehydration unit between the compressor and pipeline was determined to be feasible using a fourth-stage CO₂ recycle stream, with approximately a 1 percent increase in compression horsepower. Ultimately, it was decided to leave the dryness specification at 100 ppmv, and include a TEG unit for water removal.

ASU Integration Study: Integrating the air separation unit (ASU) with the extraction air from the combustion turbine generator (CTG) has been demonstrated to reduce the power demand of the ASU and increasing overall IGCC plant efficiency. The analysis considered the impact of varying integration rates (0 percent, 25 percent, and 50 percent) on power output, heat rate, fuel gas consumption, and potential impacts to

reliability of the industrial gas turbines. The analysis also considered aspects of intercooling which would be required before introducing the CTG extraction air to the ASU's booster air compressor, heat recovery, and impact to heat rate. The study concluded that integration of the ASU and CTG was not preferred because of startup and operability risks, but that recovery of bleed air energy by other means should be considered depending on the technology selection.

Steam Drive/Steam Cycle Report: The impact of using steam drives (vs. electric motor drives) was analyzed in this report, focusing primarily on the large compressors in the FutureGen plant: the 34 MW main air compressor on the ASU, and the 22 MW CO₂ compressor. Steam turbine performance and economics were evaluated for six different configurations and two steam cycle configurations (reheat vs. non-reheat steam cycle), and concluded with a comparative assessment with standard motor driven machines. It was decided to retain electrical motors for the large drivers because utilizing steam drives resulted in higher CAPEX, no efficiency gain, and some operational issues.

SRU Range Evaluation: This study examined sulfur removal unit (SRU) performance due to variations in feedstock compositions from the AGRU and sour water stripper/ammonia stripper, and to determine if a single unit design could accommodate the entire range of likely fuels. The analysis included predicted performance of the SRU unit bound by Illinois 6 coal (highest mean sulfur composition), and PRB (highest nitrogen/sulfur ratio and highest turndown percentage). An ancillary sulfur/ammonia burner simulation evaluated low syngas H₂S feed concentrations and the potential for supplemental hydrocarbon fuel use (to maintain temperature), supplemental sulfur additions, or operational changes to the Claus reactors in the formation of elemental sulfur. Processing Illinois No.6 coal at full rate presented no operational problems. The acid gas and ammonia streams can be fed to the burner without bypass. At a temperature in excess of 2400°F, ammonia destruction is ensured and a sulfur recovery of >96% was predicted. Processing PRB coal, particularly at reduced throughput, would require operational and design adjustments in the SRU and increase the cost of the SRU system and operations.

CTG Turbine Inlet Cooling: This analysis examined the impacts to CTG output, and gross CTG heat rate by using inlet air cooling at the FutureGen candidate host sites to improve warm weather performance. CTG performance was modeled both with and without evaporative inlet air cooling in 10 degree increments above 50-60 °F, capturing annualized generation (CTG only), incremental fuel consumption, and potential impacts to revenue and cost of operations. Depending on the site location and the plant capacity factor, the simple payback of installing evaporative cooling ranged from 1.1 to 3.8 years. Based on this, inclusion of turbine inlet coolers was recommended for consideration after finalizing the site location and the operating projections.

CTG-NO_x and SCR Evaluation: The evaluation examined the potential capital and operational impacts of the CTG when tuned for varying levels of NO_x in the turbine exhaust (15, 25, and 50 ppm). Strategies for NO_x control included use of an ammonia-based SCR, increased diluent flow at the CTG (nitrogen and water vapor), or a combination of both. Based on a proposed stack limit of 15 ppm and variations in CTG tuning, NO_x limits were found to be achievable under a relatively wide range of hydrogen firing conditions using diluent only which would inherently increase the duty on the air separation unit as diluent flow increased, and the increase in steam demand would also contribute to a slightly higher net heat rate. The study also enumerated the potential tradeoffs in maintaining compressor surge margin, maximum firing temperature, and the likelihood of requisite CTG compressor air extraction based on the variations in tuning conditions based on CTG operational philosophy.

Tail Gas Treatment: Two options for tail gas treatment system were evaluated to determine whether they could meet the 99 percent sulfur recovery requirement, and the 90 percent carbon capture requirement. The first configuration recycled the tail gas back to the front end of the AGRU allowing the gaseous stream to be reprocessed. The second configuration included tail gas treatment, and incineration of the remaining gas stream. In each configuration, three different syngas compositions were considered with varying methane and CO conversion levels. For the non-recycle configuration, incinerator emission calculations were performed based on the three potential coal fuel types, and compared with and without the tail gas treatment unit. The study concluded that recycling of the tail gas from the Claus unit was the most effective way to meet the emissions objectives of the FutureGen project.

5.5 Architectural Design

Architectural designs were developed for the visitor center and the control room building with the intention of providing a showcase facility for tours and education. A rendering of the visitor center is shown in Figure 5-2 and the control room building is shown in Figure 5-3 and Figure 5-4.

Figure 5-2. Artist rendering of FutureGen visitor center

Figure 5-3. FutureGen control room building – 3D rendering

Figure 5-4. FutureGen control room building - architectural plan, first floor

6. Process Evaluations, Configuration, and Heat & Material Balance Development

To accommodate development of the PFDs and accompanying heat and material balances (HMBs), the Alliance conducted evaluations of gasifier technologies including variations to fuel feed (slurry-fed and dry-fed), as well as variations to syngas cooling (quench or syngas cooling). Additional evaluations were conducted on potential variations of syngas conditioning such as sulfur and CO₂ removal, as well as preliminary evaluations of plant and environmental control strategies based on the fixed plot plan and process configuration.

6.1 Clean Coal Review Board Report

Activities discussed in the preceding are found in the technology and process evaluations completed as part of the State of Illinois Clean Coal Review Board (CCRB) Report issued June 16, 2009.¹ That report, as redacted, can be found in Attachment 4. The individual tasks executed as part of the CCRB report are provided in the following abbreviated synopsis:

- Task 1: To engineer and develop the process configuration and perform technical evaluations on the FutureGen IGCC power plant gasifying Illinois 6 coal. Subtasks included evaluation of gasifier technologies, acid gas removal assessments, development of PFDs, and plant HMBs. Secondary activities included evaluation of overall plant efficiency, integration of subsystems, and overall operations and optimization based on the Mattoon site.
- Task 2: Building on defined PFDs and HMBs, the approach to Task 2 was to identify and quantify key environmental considerations. The subtasks included optimizing site-specific water and wastewater use; production, characterization, and disposal of solids, solid wastes, and byproducts; and integrated trace metals distribution and critical control point analysis.
- Task 3: These activities included the analysis of site and plant-specific variables as well as plant control mechanisms to initiate the evaluation and determination of key criteria for BACT (best available control technology), PSD (prevention of significant deterioration) requirements, and AQRV (air quality related value) including attainment status and regulatory applicability. Completion of the objectives in Task 3 required use of established plot plan configurations, identification of all plant and balance of plant interface, and development of an operations plan.

There were numerous iterations of the PFDs and HMBs throughout the project. Once developed, the PFDs and HMBs continued to be refined as the process configuration and operational scenarios were better defined or substantiated with vendor-supplied information. For clarity, only the final PFDs and HMBs that were utilized to frame the CAPEX and OPEX are included in this report. The PFD and HMB for the slurry-fed gasifier configuration are contained in Attachment 5 of this report. The PFD and the HMB for the dry-fed gasifier configuration are contained in Attachment 6 of this report. Note that the PFDs and HMBs contain redacted portions that are proprietary to technology providers, including the gasifier and certain aspects of syngas treatment. Additional information on process descriptions can be found in Section 8.2

Table 6-1 includes selected streams from the respective material balances developed for each of the gasifier configurations.

¹ FutureGen Alliance. Clean Coal Review Board Report. June 19, 2009. Included as Attachment 4 in this report.

Table 6-1. Material Balance and Flow Rate at Design

Plant Configuration	Fuel Feed Rate (lb/hr)	Oxygen Feed Rate (lb/hr)	CO ₂ to Injection Well (lb/hr)	Net Station Power (MW)
Slurry-Fed Gasifier	268,933 ²	218,557	538,051	244
Dry-Fed Gasifier	252,105 ³	188,345	500,120	199

The difference in net power output between the two designs is primarily due to different outputs of the steam turbine generator. Both designs result in a fully-loaded combustion turbine generator at 232 MW. The different STG output is from the generation and utilization of high-pressure steam for power production from the syngas cooler in the slurry fed configuration.⁴ While the slurry-fed design produces more net power, it also consumes more fuel / coal. The dry-fed configuration can produce the required level of syngas (LHV) to fully load the combustion turbine using less coal and oxygen, but due to the full quench the dry-fed configuration recovers less process heat and therefore has lower steam turbine output as designed.

It is also noted that given the level of design, neither the slurry-fed nor dry-fed gasifier configuration were fully optimized. The achievable performance would have been expected to be improved as the design was refined, particularly in terms of reducing the demands of parasitic loads. Further refinement of each configuration based on a single coal type would yield improvements to the gross and net power outputs, as well as station heat rate.

Additionally, because the Alliance had originally intended to run all three representative coal types in the facility including Illinois, Pittsburgh, and PRB, HMBs were also developed for two other coal ranks in the slurry-fed configuration for comparative purposes, and to enable an evaluation of operational impacts. Table 6-2 contains selected streams from the respective material balances developed for the varying coal types.

Table 6-2. Material Balance and Flow Rate for Alternate Coal Ranks

Plant Configuration	Fuel Type	Fuel Feed Rate (lb/hr)	Oxygen Feed Rate (lb/hr)	CO ₂ to Injection Well (lb/hr)	Net Station Power (MW)
Slurry-Fed Gasifier	Pittsburg 8	217,334	200,350	517,716	226
	Powder River Basin	311,295	222,828	526,988	211

Noting that due to modification of the cooperative agreement, work completed in support of the cost estimate such as the process evaluations were ultimately bound to a single coal type for the two gasifier configurations. Therefore, heat and material balances for the alternate coal ranks were not completed for the dry-fed configuration. Similar impacts could be expected however in the dry-fed configuration respective of the energy properties of the alternative coal ranks.

² FutureGen Alliance Heat and Material Balance. Rev C. Document No: 29207-000-21-ENG-05-200-0001. December 18, 2009. Included in Attachment 5 of this report.

³ FutureGen Alliance Heat and Material Balance. Rev. D. Document: 29207-000-21-ENG-05-200-004. December 3, 2009. Included in Attachment 6 of this report.

⁴ FutureGen Alliance. Clean Coal Review Board Report: Gasification Technology Evaluation Summary. June 16, 2009.

7. Project Life Cycle Cost Estimate Methodology and Overview

Based on the preceding, the Alliance produced a preliminary design report and factored cost estimate capturing the design and costing elements of total installed cost for capital expenditures (CAPEX), operating cost (OPEX), and post-operations cost (POC) for slurry-fed and dry-fed gasifier configurations. Where appropriate, aspects that would influence the project life cycle cost were also incorporated, such as owner's costs and contingencies for estimate-driven and event-driven risks. The cost estimate methodologies are presented in this section. The results of the CAPEX cost estimate also are summarized in Section 8. , with the details provided in Attachment 7. The results of the OPEX cost estimate are summarized in Section 9. , with the details provided in Attachment 8. The results of the POC estimate are summarized in Section 10. .

7.1 Level of Detail and Estimate Overview

The following details constitute the first cost estimate developed for the FutureGen facility based on a robust FEL-2 facility design for the two gasifier technologies at the Mattoon site. The budget estimate was proposed as a Class 4 factored cost estimate using the AACE guidance, which can have a range of estimate accuracies. The level of estimate chosen for this activity was -15 percent to +30 percent, and was consistent with most aspects of the FEL-2 level of design. The AACE classification guidance for a Class 4 cost estimate is provided in Table 7-1.

Table 7-1. Class 4 Cost Estimate Description¹

Class 4 Cost Estimate	
ANSI Standard Reference Z94.2-1989 Name: Budget estimate (typically -15% to + 30%). Alternate Estimate Names, Terms, Expressions, Synonyms: Screening, top-down, feasibility, authorization, factored, pre-design, pre-study. Description: Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineered process and utility equipment lists. Level of Project Definition Required: 1% to 15% of full project definition. Effort to Prepare (for US\$20MM project): Typically, as little as 20 hours or less to perhaps more than 300 hours, depending on the project and the estimating methodology used.	End Usage: Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval or approval to proceed to next stage. Estimating Methods Used: Class 4 estimates virtually always use stochastic estimating methods such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit costs/ratios, and other parametric and modeling techniques. Expected Accuracy Range: Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.

¹ AACE International Recommended Practice No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries. 2005.

7.2 Technical Requirements and Enabling Assumptions

To reflect the total estimated life cycle costs for the project, the Alliance framed the estimates with the following provisions:

- BP-0 included costs associated with project definition, NEPA/siting activities, the initial conceptual design, and program management.
- The CAPEX included costs for the surface facility, the subsurface facility, and all supporting infrastructure required for operations prior to commissioning.
- The total installed cost (TIC) reflects the sum of the CAPEX and the owner's costs prior to the start of operations.
- The OPEX included costs for the commissioning and operation of the plant for 4 years.
- Post-operations costs cover the 2 years of MVA operations, and project closeout costs.

The FutureGen facility would have had significant value at the end of the 4 years of operation as a commercial power plant and integrated CCS facility; however, the facility's final disposition was neither known nor proposed when the estimate was developed. Therefore, costs, revenues, and residual values associated with the facility were not included in the cost estimate, and transition to a new operator was considered a reasonable assumption.

The CAPEX, OPEX, and POC estimates were bound by enabling assumptions found in Table 7-2 (CAPEX) and Table 7-3 (OPEX), noting that the POC assumptions are collectively captured in the CAPEX and OPEX as well. The final plot plan proposed for the CAPEX estimate is included in Figure 7-1. For clarity, the basis of each assumption is provided when the supporting detail is considered material.

Figure 7-1. Mattoon FutureGen Plot Plan

Table 7-2. FutureGen CAPEX Enabling Assumptions

CAPEX	No.	Assumption	Basis
	1	Axioms will be fully implemented into the design.	Governance for the engineering and design basis.
	2	SCR (selective catalytic reduction) equipment will be installed in the HRSG (heat recovery steam generator) stack to reduce NO _x emissions to 5 ppm.	For optimum performance of the combustion gas turbine, an SCR is required to meet the targeted NO _x emissions as defined by the EIS and ROD.
	3	The CAPEX estimate will be segregated at mechanical completion and at turnover. This break allows for a clear understanding of the cost of commissioning and startup of the plant from the traditional elements that define the completion of construction.	Construction traditionally is completed at mechanical completion. At this point, specialist personnel trained in the commissioning and startup of process and power facilities are introduced into the project with the goal of turnover of a complete facility.
	4	Major islands (gasification, ASU, and power block) will be purchased under separate engineering, procurement, and construction (EPC) contracts. The engineering construction management (ECM) company will provide site prep, integration engineering, and balance of plant engineering. The ECM will serve as the main automation contractor for the project and will work with process-control system suppliers to provide the distributed control system, safety instrumented system, and data warehouse.	Due to the unique contracting nature of the gasification, ASU, and power island, each was treated as a separate EPC contract. Proposals were solicited from the gasification and ASU suppliers to provide EPC quotes. The power island was estimated by the URS Corporation (URS) power engineering group.
	5	Contracts will be awarded by the FutureGen Alliance.	Reduces contractor fees
	6	FutureGen will hold the labor agreement for the site.	Minimizes competition for resources among the construction contractors
	7	CAPEX owner costs will include the first full charge of all feed stocks and consumables required to initiate operations at the site.	Basis of Estimate
	8	Contingency was agreed upon by the Alliance consistent with industry practice and based on the degree of design uncertainty of each area or island contract.	Basis of Estimate
	9	A data warehouse will be purchased and will store historical data to be retrieved by others. It will not be a central storage for all unit operations functions for the life of the project. The data warehouse will retain a defined period of operations, typically a month of operations of the total surface and subsurface facilities.	Basis of Estimate
	10	The plant will be designed to process the base case throughput for Illinois 6 coal and an allowable turndown to 70 percent for PRB coal.	This is the optional case from the coal parametric study and gasifier RFP. The lower turndown for the PRB coal was chosen because of the dramatic impact to the capital cost of the ASU (~\$10 M from going from 87 percent to 70 percent for PRB) and the gasification island (TBD).
	11	The plant will be operated for 4 years following turnover.	The 4-year period is based on 1 year of shake down and commissioning and running multiple coal types to demonstrate the operability and meet sequestration targets.
	12	The cost of the subscale research and development facility was not included in the estimate. The plot plan will have room for subscale testing areas near the applicable processing islands. Future installation of the following subscale systems was assumed: ion-transport membrane oxygen system near the ASU, fuel cells near the power island, and Ramgen compressors near the CO ₂ compression facility.	Basis of Estimate
	13	The post-operations scenario is uncertain at this time. The plant is assumed to have no value or burden at the end of the fourth year of operations, although in reality it will.	Basis of Estimate
	14	Labor rates for construction craft, union operators, maintenance staff, and non-union engineers were based on labor surveys conducted by URS and are valid for the estimate.	Basis of Estimate

Table 7-3. FutureGen OPEX Enabling Assumptions

	No.	Assumption	Basis
OPEX	1	The “break” between the CAPEX and OPEX costs is at mechanical completion. CAPEX includes all costs before and during activities associated with mechanical completion. OPEX includes all costs after mechanical completion.	
	2	Cost estimate was based on Illinois 6 only coal feed assumptions for slurry fed and dry fed gasifier options.	Agreement with Technical Committee and in response to RFIs issued to gasification vendors.
	3	The plant was designed to process the base case throughput for Illinois 6 coal.	This is the optional case from the coal parametric study and gasifier RFP.
	5	Plant availability was determined from the fuel processing schedule: 2285 for Year 1; 4435 for Year 2; 5174 for Year 3; and 6300 for Year 4.	Modified based on surveys of other plants and technology provider information such as planned maintenance outages.
	6	No credit or debit was assumed for the subscale system loads.	In general, installed subscale equipment will be power neutral, or be capable of operating without significantly impacting station heat rate.
	7	Coal prices acquired from the U.S. Energy Information Administration (EIA) for the operating period will be used as recommended by the Alliance Technical Committee.	EIA coal price data was chosen for this level of the estimate as it represents a suitable and publicly available reference.
	8	Fixed maintenance costs (labor and materials) are estimated as a percentage of direct field cost. EPRI (TAG) terminology is used to determine the split between labor and materials (40:60) based on guidance from the Alliance Technical Committee, vendor input, and historical information from operating IGCCs.	Fixed maintenance costs include all materials and labor that is not part of the maintenance labor retained by the plant. Plant supplied labor depends on the complexity and maturity of the technology.
	9	Long-term service agreements (combustion turbine) are included as part of the variable maintenance costs associated with surface maintenance.	Listed in services subcontracts line item; provided on a per fired hour basis.
	10	Plant availability was evaluated among representative peers and through vendor responses to RFPs. The plant is intended to operate with high capacity factors when available. Startups will be taken into account based on the outage time. That is, hot restarts, warm restarts, and cold restarts will require increasing amounts of time and resources to complete.	The plant is not anticipated to have reserve shut down hours, which would reduce the capacity factor.
	11	Labor rates: union operators and maintenance staff. Non-union engineers. Labor rates received from the State of Illinois will be used. URS labor rates for construction have also been received.	
	12	The mean coal compositions in the design basis will be used for processing calculations	Recommendation of Technical Committee
	13	The plant will be allowed to run and dispatch power whenever it is available. That is, it will not have to sit idle due to an over-supply of power in the area.	

7.3 Estimate Methodology and Development

The cost estimate provided to DOE was all-inclusive from a project standpoint, such that it accounted for itemized costs in the following four areas: project initiation costs including all design and engineering costs, TIC, OPEX, and POC. The logic used to arrive at each area estimate was varied, but relative to the process design maturity and amount of available information for each area.

7.3.1 Total Installed Cost Estimate

The cost estimate was based on a reference FutureGen plant configuration using the FEL-2 design and engineering effort, as well as technical input received from potential suppliers of the major islands and equipment for the facility. Due to the overall complexity of the plant, the estimate required the use of

several different estimating resources, including Aspen's ACCE™ software² (formerly Kbase™), WinEst®,³ Similar Plant (a proprietary factored approach methodology), and factored estimating tools to develop the TIC. The application of each of these tools depended on the area, as each tool has its strengths. Tools were selected to maximize the accuracy of the estimate for a given area. Budgetary quotes were received for major equipment as well as some complete areas or contract elements. Where supplier quotations were unattainable, cost estimates were developed by extrapolating historical information. Table 7-4 provides the estimating tool and approach used for each area estimate.

Table 7-4. Area Estimating Approach

Area Number	Area	Estimate Tool	Estimate Approach
100	Coal Handling Island	Similar Plant	Priced Equipment
200	Air Separation Unit Island	EPC Bid	Vendor Quote
300	Gasification Island	EPC Bid	Vendor Quote
400	Shift Reaction	ACCE	Priced Equipment
500	Mercury Removal	ACCE	Priced Equipment
510	Acid Gas Removal	ACCE	Priced Equipment
520	Sulfur Removal	ACCE	Priced Equipment
530	Tail Gas Treatment Unit	ACCE	Priced Equipment
600A	Power Island	Similar Plant	Priced Equipment
600B	Grid Interface	Similar Plant	Priced Equipment
700	Project Integration	WinEst	Priced Material
800A	Balance of Plant	ACCE	Priced Equipment
800B	Process Water Treatment Island	ACCE	Priced Equipment
900A	CO ₂ Compression Island	ACCE	Priced Equipment
900B	Sequestration	Factored	Priced Equipment

The TIC estimate was completed for two different process technologies: one for slurry-fed gasification and one for a dry-fed gasification configuration, as the gasifier technology had not been selected at the time the estimates were completed. Initial estimates were completed as overnight 1Q2008\$. To clarify the potential impacts of the various technologies, the costs for the aforementioned technologies were estimated separately. The steps for the TIC estimate are as follows:

1. Separate cost estimates were completed for each plant area as well as the subsurface activities, BP-0, and BP-1 costs. Figure 7-2 shows how area costs were binned depending on the methodology.

² Aspen ACCE™ is the former Aspen Kbase™ software. It is designed for use throughout the estimating life cycle to generate both conceptual and detailed estimates. Equipment, with associated plant bulks, is represented by design-based installation models.

³ WinEst Pro® Construction Estimating Software

Figure 7-2. Example of Area Estimate Bid Logic

2. The individual area estimates were summed to arrive at the unmitigated CAPEX (CAPEX before any risk contingency costs have been added).
3. The owner's costs were added to the CAPEX to arrive at the unmitigated TIC.
4. Estimate-driven risks were quantified to evaluate the uncertainty of the estimate. This was reported internally as a bracketed range of costs (+/- estimate), and comparatively assessed against the proposed accuracy of the estimate.
5. Event-driven risks such as inflation, abnormal escalation, design changes, and delays were quantified to evaluate additional uncertainties in the estimate. Similar to the estimate-driven risk analysis, the initial event-driven risk analysis was initially reported as a bracketed range of costs (+/- estimate).
6. Depending on the availability of risk information, a probability model was used to develop a cost estimate with a given probability (P85 cost estimate), and reported as the as-spent TIC estimate.

The logic to arrive at the CAPEX and TIC is provided in Figure 7-3.

Figure 7-3. CAPEX and Total Install Cost Estimate Logic

7.3.2 Operating Cost Estimate

The estimates for the total operating cost and the POC were developed using the same methodology as the TIC estimate, and were based on the reference design activities. The OPEX estimate provides costs for a full 4 years (48 months) of O&M. Due to the overlap of CAPEX and OPEX related costs during the start-up and commissioning period, costs related to plant personnel labor prior to the mechanical completion of the plant are contained within the CAPEX estimate. Specifically, this captures the costs related to hiring, training, and development of plant management, engineering, operations, and maintenance staff in the year(s) prior to mechanical completion of the plant. This is further characterized in Section 8. of this estimate.

The steps of the OPEX and total operating cost estimate are as follows:

1. A schedule was developed for the staff training, commissioning, and plant operations. As previously indicated, the schedule overlapped with the CAPEX schedule because on-site plant personnel training started prior to mechanical completion of the plant.
 - A separate staffing plan was developed for plant startup and check-out, which is contained in the CAPEX.
 - A staffing plan was developed for base operations; this included labor costs associated with on-site maintenance staff in addition to operators.
2. Fully burdened labor costs for each job category were gathered from both internal sources and State of Illinois labor reports.

3. Fuel, consumables, and utility (natural gas, water, electricity, etc.) needs were obtained from the heat and material balance for the respective configuration and fuel type. These contained both fixed and variable costs.
4. Availability and electricity generation was determined using historical start-up curves and allowances for full commissioning, and incorporating two planned outages each year during the spring and fall when the demand for power is traditionally lower.
5. Factored maintenance labor and material costs were gathered from a variety of sources as described later in this document.
6. Contractual service agreements such as the CTG long-term service agreement (LTSA) were calculated based on fired hours. Other service contracts were estimated based on the level of labor and materials that would be required for non-routine systems outside of costs captured in the factored maintenance estimate (e.g., AGRU solvent performance evaluation).
7. Subsurface O&M estimates were developed based on routine inspections, well testing/workovers, and MVA activities for the sequestration facilities.
8. Owner's costs were added to the OPEX to arrive at the unmitigated total operating cost.
9. Similar to the CAPEX estimate, risk analyses were completed for two separate groups of risks, estimate-driven risks and event-driven risks, to arrive at the total operating cost estimate.

The logic used to arrive at the total operating cost estimate is provided in Figure 7-4.

Figure 7-4. OPEX and Total Operating Cost Estimate Logic

7.3.3 Post-Operations Cost Estimate

The POC estimate included the costs for 2 years of MVA activities for the sequestration site, the associated reporting, and project closeout costs. The POC for the subsurface facility included the following major activities: closure in place of the CO₂ pipeline; limited O&M for the injection well; plugging and abandonment of all deep wells; continuation of the comprehensive CO₂ monitoring program initiated during the CAPEX and OPEX phase; field labor, travel and overhead expenses; and project indirects and home office costs.

As indicated in Section 7.2 , the cost estimate assumes that the transition of the plant operations is a zero cost item; it does not take credit for any residual value of the facility after the 4 years of operation, nor does it assume costs associated with a plant closure after operations. This is a conservative assumption because the plant will retain significant book value after the 4-year operating period. The POCs are shown in Figure 7-5. Owner's costs are included and represent activities and costs incurred by the Alliance after full-scale operation of the FutureGen plant is completed.

Figure 7-5. POC Estimate Logic

7.3.4 Value Engineering and Final Review

For completeness, each area estimate underwent several reviews, both internal and external, prior to issuance. The review team was made up of senior managers from the participants and external consultants. Value engineering studies and Technical Committee reviews were completed in parallel with the management review. The final consolidated life cycle cost estimate was compared with previous order-of-magnitude estimates for continuity, and released to Alliance management and the Alliance Board for final review. With consolidated findings from the value engineering and management reviews, the final CAPEX, OPEX, and combined total project cost estimate was provided in 2Q2009 dollars. The estimate review process is provided in Figure 7-6.

Figure 7-6. Cost Estimate Review Process

8. Capital Expenditure (CAPEX) Cost Estimate

The following provides summary level details of the CAPEX developed for the FutureGen project at the Mattoon, Illinois site. The complete CAPEX report is provided in Attachment 7 of this report. As discussed previously, the FutureGen plant was designed to produce electrical power with near-zero emissions by gasification of coal with oxygen to produce a syngas consisting primarily of hydrogen, carbon monoxide, carbon dioxide, water vapor, and hydrogen sulfide.

The carbon monoxide is converted to hydrogen and carbon dioxide by the water-gas shift reaction, and then systematically cooled and treated to separate the carbon dioxide and hydrogen sulfide from the syngas. The carbon dioxide, having been removed from the syngas, is compressed and sequestered in a saline aquifer; the hydrogen sulfide is converted into elemental sulfur in a Claus unit.

The remaining fuel stream consisting primarily of hydrogen, is mixed with a diluent (nitrogen), and fed to the CTG to generate electrical power. Hot combustion gases from the CTG discharge to the HRSG, which transfers the heat of combustion into water to produce steam. Steam from the HRSG is combined with other steam sources from the gasification and syngas cooling processes, and is fed to the STG which generates additional electrical power.

8.1 CAPEX Summary

The cost estimate was completed for two different process technologies: one for slurry-fed gasification and one for a dry-fed gasification configuration. To clarify the potential impacts of the various technologies, the costs for each configuration were estimated separately. Table 8-1 provides the roll-up summary CAPEX estimate for the two configurations by Area.¹

¹ FutureGen Alliance. 2009 Project Cost Estimate: Volume I, Capital Costs. January 29, 2010. Included in Attachment 7 of this report.

Table 8-1. CAPEX for Slurry-Fed and Dry-Fed Configurations

Area Number	Area	2Q2009 Slurry-Fed Gasifier	2Q2009 Dry-Fed Gasifier
100	Coal Handling Island	\$128,564,646	\$128,503,030
200	Air Separation Unit Island	Note A	Note A
300	Gasification Island	Note A	Note A
400	Shift Reaction	\$66,363,000	\$70,129,000
500	Mercury Removal	\$4,079,000	\$3,578,000
510	Acid Gas Removal	\$158,692,000	\$152,441,000
520	Sulfur Removal	\$26,436,000	\$26,976,000
530	Tail Gas Treatment Unit	\$15,308,000	\$16,360,000
600A	Power Island	\$354,457,000	\$340,871,000
600B	Grid Interface	\$37,362,000	\$37,355,000
700	Project Integration	\$320,008,000	\$319,481,000
800A	Balance of Plant	\$23,854,000	\$21,775,000
800B	Process Water Treatment Island	\$8,004,000	\$9,343,000
900A	CO ₂ Compression Island	\$43,569,000	\$43,304,000
900B	Sequestration	\$68,795,000	\$68,795,000

Table Note A: Packaged TIC cost information for the ASU and Gasifier Islands (Area 200 and 300) are redacted due to proprietary information.

All plant areas were affected by the gasifier technology selection with the exception of the coal handling and sequestration areas (Areas 100 and 900B), as summarized in Table 8-1. The gasifier selection (slurry-fed or dry-fed gasifier) resulted in different heat and material balances, which in turn affected the flow sheets and accompanying equipment sizing. Nevertheless, the designs are very similar, and the same approach for determining CAPEX costs was used for both process configurations.

8.2 Area Summaries

The following sections present a summary explanation of each area, and the significant items within each area that contributed to the CAPEX estimate.

100 Area - Coal Handling and Storage

The coal-handling and storage area includes the enclosed coal-unloading building, coal-unloading conveyor, fully enclosed coal storage, coal reclaim system, coal-crushing system, transfer towers, crushed coal silos, and storage hoppers. A detailed vendor cost estimate for the coal-handling system was received, which included most of the items necessary to be considered a “package unit.”

Significant cost savings were experienced in the coal-handling area because of a refined design that incorporated value-engineering modifications, such as reducing the on-site coal storage from 30 days to 15 days, and maintaining a 3-day reserve fuel pile. This was considered reasonable given the proximity to fuel resources. An additional modification to the design was the option to eliminate the thaw shed, which would have been most relevant for high-moisture coal, but not necessarily a requirement.

200 Area - Air Separation Unit

The ASU was one of the islands that had a supplier-provided TIC estimate. The estimate was validated against other industrial ASU quotations on a “per ton of O₂ produced” basis. Primary pieces of equipment include the main air compressor, cold box, heat exchange and condensing equipment, and distillation columns. Additional pumping and compression is also required for oxygen and nitrogen.

The bid received was all-inclusive with the exception of the process cooling system, for which labor and material were estimated separately. Because the estimate was for a package-unit, the home engineering costs were lowered to 1 percent, and the insurance, bonds, and fee were excluded in the EPC contract. It is noted that a value engineering study considered an “over the fence” contract for oxygen and nitrogen supply; the costs associated with that moved the CAPEX cost to an OPEX fixed cost, which did not appreciably influence the overall project costs.

300 Area - Gasification

The gasification area estimates were based on TIC bids from the slurry-fed and dry-fed licensors/EPC contractors, respectively. The primary piece of equipment in this area was the gasifier, and where applicable the quench system (dry-fed configuration only). Secondary systems included the syngas scrubber and the slag and black water handling systems. Additional equipment packages such as the vent blower, vent knock-out drum, and vent stack were added during the estimate design.

Similar to the gasification area, the estimates were for packaged units, which reduced the home engineering costs to 1 percent, and the insurance, bonds, and fee were excluded in the EPC contract.

400, 500, 510, 520, and 530 Areas - Syngas Processing

The 400 Area syngas conditioning process begins with the syngas cooler (slurry-fed option), followed by syngas scrubber and shift reactors. The area also contains the process zero liquid discharge (ZLD) system associated with the shift reactors, and the sour water treatment system. The 500 Area includes the mercury removal system (Area 500); the acid gas removal unit (Area 510), which separates hydrogen and sulfur from the syngas; the sulfur recovery unit (Area 520), which converts hydrogen sulfide to elemental sulfur; and the tail gas treatment unit (Area 530), which returns any remaining sulfur back to the acid gas removal unit (Area 510). The platform for developing the estimate for these areas was ACCE™; the templates were augmented by direct equipment quotes as available.

600A Area - Power Island

Area 600A includes the CTG, HRSG, SCR system, STG, cooling towers that supply the surface condenser, and the ZLD water treatment system. With the exception of the ZLD system, the 600A area estimate was based a common configuration (1 CTG and 1 STG) for analogous natural gas-fired combined-cycle power plants. The CTG was an industrial Frame 7B type design, modified for hydrogen service. The HRSG was a single reheat design that contained the SCR system and supplied 1800 psig/1000°F steam to the STG. The STG proposed was a three section, axial exhaust machine that exhausted steam to the water-cooled surface condenser. The area also contained the generator step-up transformers, deaerator, large boiler feed water pumps, and a hot oil loop that was used for syngas and diluent heat exchange systems.

Specifications for most of the equipment were provided via vendor quotations, and were included as part of the similar plant estimate.

600B Area - Switchyard, Substation, and Grid Interface

The primary cost for this area was developed during a system impact study conducted by the regional power marketer, and addressed the appropriate strategies to tie into the existing 138 kV power system. Supplemental equipment required for the interface with the grid was estimated via Similar Plant methodology. The cost of the interface to the 138 kV power transmission line, including “dead-end tower” structures and metal tangent line poles (with foundations), are part of the power marketer’s estimate supplied during the system impact study.

700 Area - Project Integration

Area 700 was defined as the integration or interface area. The 700 Area contains all activities and systems that interface and all functional activities that integrate the discrete process units and areas. This includes civil work (cut, grade, piles, caps, foundations, etc.); area lighting; grounding; pipe rack and primary pipe runs; security and cable systems (both electrical and instrumentation); underground piping such as electrical, instrumentation and control (I&C), water, natural gas and CO₂ pipelines; all above ground piping for utilities (cooling, process, high purity, and fire water); and the remaining electrical distribution interfaces. Also included in this area are buildings and support structures such as fencing and roads. The platform for developing this estimate was WinEst.

800A and 800B Area - Balance of Plant and Water Treatment

The 800 Area is not a contiguous area, as it includes structures, piping, and equipment associated with remaining utilities and most of the water production and treatment aspects of the facility. Included here are storage buildings for water treatment and lube oil; two prefabricated substations; and equipment/materials for process, cooling, and high purity water production. The bulk of the equipment was priced based on vendor quotes, with piping, with the mechanical, electrical, and I&C quantified using ACCE™.

900A - CO₂ Compression

This area includes the CO₂ compression and drying equipment, and the ancillary support structures such as buildings and instrument enclosures. This area also includes the high-pressure CO₂ pipeline that delivers the supercritical fluid to the 900B Area. The CO₂ compressor was priced based on quotation, with piping, mechanical, electrical, and I&C quantified using ACCE™.

900B - Sequestration

The primary method used to develop the cost estimate was vendor quotes. Where vendor quotations were unattainable, cost estimates were developed based on extrapolation of historical invoices, quotations for similar work previously performed, and professional judgment. Primary components of the 900B Area include the primary CO₂ injection well, four monitoring wells (injection reservoir, primary seal monitoring, and two seismic monitoring wells), well characterization and bore testing, and baseline MVA activities.

Summary

The FutureGen CAPEX was found to be within the parameters of similar facilities recently estimated, nearing conclusion, or completed by the Alliance members. The featured estimate was presented to the Alliance Board of Directors and was found to align with the aforementioned results. The accuracy of the estimate was well within the parameters of Class 4 estimates as defined by AACE and, in certain aspects, exceeded the requirements by obtaining vendor quotations for pricing the major pieces of equipment in the facility.

Finally, the CAPEX and supporting documentation were subject to independent third-party review and comment regarding the estimate, level of supporting documentation, and processes and procedures executed in the development of the CAPEX report. The analysis concluded that, based on the evaluation of the estimate and supporting documentation, the CAPEX could be considered an advanced Class 4 estimate, or a less advanced Class 3 estimate. Further, the reviewers concluded that the project team had used an appropriate basis for establishing project scope and activities, and had used the appropriate estimating methods, techniques, and procedures in preparing the CAPEX estimate.

9. IGCC and CCS Operations and Maintenance (OPEX) Cost Estimate

The OPEX for the FutureGen facility was generated based on the plant specifications and design described in the CAPEX. The complete OPEX report is included in Attachment 8 of this report. The OPEX also contains the POCs associated with CO₂ monitoring as well as costs required for project closeout. The OPEX cost estimate presented is the overnight cost in 2Q2009 dollars.¹

9.1 OPEX Summary

The baseline FutureGen plan calls for a full 4 years of plant operations, followed by 2 years for MVA of the CO₂ sequestration site. The 2 years of monitoring is considered to be POC, and the estimate for this activity is reported separately from the OPEX. Two estimates were developed, representing both slurry-fed and dry-fed gasifier configurations. In both configurations, many of the costs are similar as they draw on the same resources independent of the technology selection. Examples of such costs include O&M labor, all subsurface O&M, and certain owner costs. For comparison, summary tables for both slurry-fed and dry-fed configurations are provided regardless of the variance.

The O&M costs include operating labor costs; maintenance costs; costs for fuel, consumables, and byproduct disposition; and owner costs. The O&M costs are categorized by fixed and variable costs to determine total non-fuel-related O&M expenditures; and then fuel costs are provided to capture the total O&M costs. Table 9-1 provides the specific line items as they were categorized in the OPEX, and Table 9-2 provides the cost roll-up for each respective cost category (fixed or variable).

¹ FutureGen Alliance. 2009 Project Cost Estimate: Vol. II, Operating Costs. January 29, 2010. Included in Attachment 8 of this report.

Table 9-1. OPEX Cost Categories

ID	Activity	Cost Type
01	Surface Operations Labor	Fixed O&M
0101	Operations Labor	Fixed O&M
0102	Administrative & Support Labor	Fixed O&M
02	Surface Maintenance	(Itemized below)
0201	On-site Maintenance Labor	Fixed O&M
0202	Services Subcontracts	Variable O&M
0203	External Maintenance Labor	Fixed O&M
0204	Maintenance Materials (Excluding GT/Well)	Fixed O&M
03	Subsurface Operations & Maintenance	Fixed O&M
0321	CO ₂ Pipeline (Labor Subcontract & Materials)	Fixed O&M
0324	Subsurface Maintenance (Injection Well Workover)	Fixed O&M
0325	Subsurface Maintenance (Monitoring Well Workover)	Fixed O&M
0351	Subsurface MMV	Fixed O&M
0331	Field Labor OH&D & Expenses	Fixed O&M
0361	Indirects & Home Office Costs–Sequestration	Fixed O&M
04	Consumables	Variable O&M
05	Byproduct Disposition	Variable O&M
06	Fuel (Coal) Purchases	Fuel
07	Owner Costs	Fixed O&M

Table 9-2. OPEX Summary

Cost Category	Slurry Fed Total	Dry Fed Total
Fixed O&M	\$215 M	\$236 M
Variable O&M	\$53 M	\$53 M
Total Non-Fuel O&M	\$268 M	\$289 M
Fuel	\$108 M	\$101 M
Total O&M	\$376 M	\$390 M

9.2 Operating Schedule and Processing

As the OPEX cost categories were entirely dependent on a declaration of plant availability, the first activity was to complete the commissioning, start-up, and operating schedules for the plant. In consultation with member companies, and based on a review of historical information, the estimate assumed a full 1-year checkout and commissioning period following mechanical completion. The first half (6 months) of the commissioning period would represent equipment checkout and commissioning with an estimated availability of 10 percent. The second half of the first year would be integrated testing, where several shutdowns and restarts were assumed with an estimated availability of 50 percent. Accordingly, the estimate assumed a first year average availability of 30 percent. The estimate assumed that commissioning will be done using Illinois 6 coal. This was followed by 3 years of full operations after the 1-year commissioning and integrated testing period. The estimate assumed that Illinois 6 coal will be used during the 3 years of operation as well. Additional coal(s) may have been consumed or trialed during the 4-year operating time period, but it was not accounted for in the estimate.

The planned maintenance outages are driven primarily by the gasification island maintenance requirements, and in certain years by the combustion turbine. As planned, semi-annual maintenance outages would have occurred during the “shoulder” months in the spring and fall. Initially, these outages were expected to be approximately 28 days long. Depending on factored hours and starts, it was anticipated that combustion inspections and/or hot-gas-path inspections (if needed) would coincide with planned outages. The initial outage period was planned to occur at the end of the commissioning period (i.e., at the end of Year 1, Q4). Subsequent outages were planned on a semi-annual basis, with a goal of moving to one planned outage each year from 2-3 weeks. The future planned outage schedules would be predicated on the technologies ultimately selected for the plant, and the maintenance requirements. The operating schedule developed for the cost estimate is shown in Table 9-3.

Table 9-3. Processing and Availability Schedule

	Start Up/ Commissioning		Integrated Testing		Year 2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Run Weeks	13	13	13	9	13	9	13	9
Scheduled Outage (weeks)				4		4		4
Coal Type	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6
Availability (100% equivalent)	10%	10%	50%	50%	60%	60%	60%	60%
Available Hours (100% equivalent)	218	218	1092	756	1310	907	1310	907
Yearly Operations (hours)				2285				435
Scheduled Outages (hours)				672		672		672
Cumulative Run Time (hours)	218	437	1529	2285	3595	4502	5813	6720

	Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Run Weeks	13	9	13	9	13	11	13	13
Scheduled Outage (weeks)		4		4		2		
Coal Type	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6	Illinois 6
Availability (100% equivalent)	70%	70%	70%	70%	75%	75%	75%	75%
Available Hours (100% equivalent)	1529	1058	1529	1058	1638	1386	1638	1638
Yearly Operations (hours)				5174				6300
Scheduled Outages (hours)		672		672		336		
Cumulative Run Time (hours)	8249	9307	10,836	11,894	13,532	14,918	16,556	18,194

Plant availability shown in the tables is based on several factors. Data was gathered from gasification vendors, and commercial plant operating data was reviewed. The maximum plant average availability selected was 75 percent, and planned outages were reduced to one in the final year of operation. While information from gasification and turbine vendors indicated that higher availability was likely, particularly as the plant matures, considering the complexity of the facility it was determined that 75 percent availability represented an achievable target and reflected what would be commercially acceptable.

9.3 Line Item Summaries

The following provides the summary-level detail for each of the line item costs found in the OPEX. Where appropriate, the distinctions between the technology selections that led to a significant difference in operating costs are described.

Surface Operations Labor

The FutureGen plant staff estimate was developed based on input from IGCC operators. The organization was divided into Operations (shift workers); Administration; Environmental, Safety, Health, and Quality (ESH&Q); Maintenance (found in Surface Maintenance); and Technical Services (engineering). Total plant staffing considered in the estimate was 90. Complete shift coverage requires slightly more than four shifts. This was achieved by having four shifts and making up the balance with premium (overtime) hours for the shift workers.

It was expected that the dedicated, on-site maintenance staff would conduct the routine maintenance activities. Subcontractors would perform specialized activities, such as turbine maintenance and gasifier rebuilds. The costs for the subcontractor maintenance are included elsewhere in the OPEX estimate (a subsection of Surface Maintenance).

Since most of the operations staff would be hired prior to plant commissioning, a staff hiring and training schedule was developed to allow full capture of the staffing costs in the time leading up to commissioning. All of the costs related to staffing, training, and development prior to commercial operations were captured in the CAPEX cost estimate as a pre-operational cost.

Surface Maintenance

The maintenance labor and material costs were handled separately for the surface and subsurface (sequestration) facilities. Surface facility maintenance costs included on-site maintenance labor costs, services subcontracts, external maintenance labor via subcontracts, and maintenance materials.

The core maintenance staff consisted of 13 full-time staff; this did not include the Instrument and Control technicians and pipefitters who were included as part of the surface operations labor.

Several service contracts would be set up to maintain various parts of the surface facility, with the largest subcontract estimated to be for the LTSA with the CTG vendor. The LTSA was based on fired hours on the CTG such that the total costs increased as the plant availability increased.

The balance of maintenance costs for the surface facility was estimated using a factored estimate for slurry-fed and dry-fed gasifier configurations. Maintenance factors were developed for each island and adjusted using information from subject matter experts, as well as peer-reviewed information from operating IGCC personnel. The overall maintenance cost was estimated as a percentage of the capital cost (direct field cost) based on inputs from internal and external subject matter experts. As the dry-fed configuration carried a higher direct field cost, it was slightly more expensive to maintain. In both cases, the split of total maintenance costs was set at 40 percent labor and 60 percent materials based on the EPRI TAG,² noting that in areas of less complexity or well established technical maturity, much of the planned maintenance is expected to be performed by the on-site maintenance staff, with the balance to be completed by subcontractors.

² Electric Power Research Institute. Technical Assessment Guide, Electricity Supply–1993, Nonutility/Nonmember Edition, EPRI TR-102276-V1R7, June 1993.

Subsurface Operations and Maintenance

The operations costs for the subsurface facility included the following major activities: CO₂ pipeline inspections; O&M for the injection well; O&M for the monitoring wells; implementation of a comprehensive CO₂ monitoring program; field labor, travel, and overhead expenses; project indirects; and home office costs.

The CO₂ pipeline from the surface facility compressors to the injection well required annual corrosion inspections; the cost category captured the costs of performing annual corrosion inspection of exposed section(s) of the pipeline (i.e., near wellhead and manhole access points) using ultrasonic mapping.

Injection well cost categories included annual well testing, annual well workovers, annual equipment replacement, field offices and utilities, and system maintenance. The field office and utility costs for the sequestration site were captured in this cost category and are not included in the others.

Similar to the injection well, this cost category covered activities for the four deep monitoring wells (one injection reservoir monitoring well, a primary seal monitoring well, and the two seismic monitoring wells), and included annual well testing, annual well workovers, and annual equipment replacement.

The remaining cost category addresses the MVA implemented during operations to accomplish the following objectives: track the migration of the CO₂ plume over time; determine geochemical effects caused by the interaction of CO₂ and the Mt. Simon Formation; and detect CO₂ leakage above the caprock, in the drinking water aquifer, and at the ground surface.

Consumables

Consumables were defined as non-maintenance items consumed as part of plant operations. There were three minor differences in consumable costs when evaluating the slurry-fed and dry-fed configurations. These were due to a variance in the estimated total make-up water flow requirement for each technology, and a distinction in the parasitic load, which affects the need for purchased electricity during start-ups. Costs for consumables were gathered for the following categories: process and potable water, water treatment chemicals, catalysts and sorbents, purchased electricity, diesel (for firewater pumps), and natural gas for the package boiler and CTG.

Byproduct Disposition

This category captures costs related to the characterization and disposal of three solid byproduct streams produced during normal operations: 1) ZLD solids from the cooling tower water system, 2) ZLD solids from the process water system, 3) and other miscellaneous solid wastes (maintenance wastes, etc.).

Cost estimates were received for non-hazardous special wastes such as the ZLD solids as well as waste char and ash at \$30 per ton; hazardous wastes such as activated or impregnated carbon from filtering process at \$300 per ton; and non-hazardous wastes that required analyses at \$100 per ton. Disposal costs were based on the rate of production from the heat and material balances, and included transportation where appropriate. Solid wastes would be disposed of in landfills consistent or compliant with the waste classification.

The cost estimate also considered that additional solids such as slag may be utilized by others for road building, aggregate, or other approved end uses, as well as recovered elemental sulfur which could be utilized in the fertilizer industry. Neither credit for sales of product nor disposal cost was assumed for the estimate.

Fuel (Coal) Purchases

The coal costs consisted of the base coal costs and the shipping costs of the coal types. While the shipping costs vary significantly among the coal types due to the distance from the mine mouth to the FutureGen plant in Illinois, for the purposes of the estimate only the costs associated with Illinois 6 coal pricing were developed. The coal purchase prices were evaluated using EIA estimates for the operating period, by recommendation of the Technical Committee to levelize what have been widely varying prices observed over the past several years coinciding with the development of the cost reports. The annual EIA estimated prices over the 4-year operating period (2015 to 2018) were gathered and used to determine the delivered price of Eastern Interior high sulfur bituminous coal.³ Due to differences in fuel throughput between the two gasifiers, the slurry-fed gasifier configuration was expected to have slightly higher fuel costs.

Owner Costs

The owner costs consisted of labor; insurance; bonds, taxes, and fees; permits; legal fees; and stakeholder support costs. The owner costs prior to plant startup were included in the CAPEX estimate. The OPEX estimate includes owner costs for the 4 years of plant operations.

Owner labor costs consisted of salaries, travel, and subsistence for the FutureGen CEO, administrative assistants, financial staff, chief operating officer, chief technology officer, and external affairs staff.

The plant insurance costs were on an “All Risks” basis and were estimated to be approximately 1 percent of the direct field cost. This included all property, boiler and machinery, liability (including directors and officers), and a pro-rated deductible. Business interruption insurance was not included in the estimate, nor was it considered to be required.

There were no OPEX costs for bonds, taxes, or fees. This assumption was based on the following: 1) the bonding costs were assumed to be part of the insurance costs; 2) FutureGen Industrial Alliance, Inc. was a tax-exempt non-profit corporation under 501(c) (3) of the Internal Revenue Code such that it would not have local, state, or federal taxes; and 3) the fees associated with technology licenses were assumed to be up-front fees and are included in the CAPEX costs.

The substantial permitting costs are included in the CAPEX (construction, wastewater, etc.). Emissions taxes would be imposed as part of the air permit; these would be fixed rates per mass of pollutant emitted. Air permitting information was combined with the mass flows and operating hours for each coal type to arrive at the total emissions costs per year. The emissions rates were calculated conservatively, and based on the design axioms for NO_x, SO_x, and mercury emissions.

Legal support to the FutureGen Alliance was required during operations for contract support, council for facility operation, insurance coverage, etc.

³ <http://www.eia.doe.gov/oiaf/aeo/supplement/index.html>.

Remaining costs reflected office rental costs, subcontracts for public relations and communications, and miscellaneous supplies and overheads.

10. Post-Operations and Project Closeout

The FutureGen project would have concluded with 2 years of post-operational activities, primarily focused on continuing the MVA program and on administrative details such as project reporting and execution of project closeout requirements. Additional aspects of project closeout were considered from a cost perspective, acknowledging that it was unknown what commercial value could be realized in the remaining FutureGen plant and sequestration system once the project concluded, or if portions of the project would remain commercially available and utilized. Therefore, to provide a conservative estimate, the project assumed that the following activities could take place: closure in place of the CO₂ pipeline, routine but limited maintenance for the injection well(s), plugging and abandonment of all deep reservoir monitoring wells, and the associated labor and expenses incurred in the completion of these activities. Table 10-1 provides the estimated POCs for the 2-year time frame.

Table 10-1. Post Operations Costs

Item	2Q2009
Sub-surface	\$17,000,000
Owner Costs	\$6,345,781
Total	\$23,345,781

Of the subsurface POCs, the MVA program was estimated to be slightly over half of the remaining costs. The program and schedule for implementation was consistent with the MVA program that was conducted during the operations (injection) period and included surface CO₂ emissions monitoring, drinking water aquifer monitoring well assessment, primary seal and injection reservoir well monitoring, geophysical logging, and seismic profiling. Once these activities had been completed, well closure would have commenced in accordance with the Class I UIC permit.

The post-operations owner's costs were limited to funding the Alliance executive staff, insurance for staff and remaining activities, and professional services subcontracts such as legal, financial, and accounting support.

11. Engineering and Operational Assessments

With a firm plot plan, complete heat and material balances, and an initial cost estimate based on 1Q2008 dollars, the Alliance scoped and performed several trade-off analyses focused on site-specific approaches that could improve the cost position of the plant from modifications to plant design, construction, and operations if implemented. Concurrently, the Alliance began developing operating strategies and protocols to maximize the thermal and electrical efficiencies of the plant, and identify and quantify sources and quantity of emissions from the plant. This included evaluations of planned start-up and shut-down procedures, identification and classification of transient operations, and dispersion modeling in support of IEPA permitting requirements. The following sections describe relevant activities included in these efforts.

11.1 Value Engineering

The Alliance staff, working with the Technical Committee and subcontractors, identified 21 cost-saving opportunities. For parity, all options were considered regardless of plausibility or likelihood of implementation. Evaluated quantitatively to determine overall impact to cost, and qualitatively to assess technical and political risk, the opportunities were then ranked and prioritized based on the resulting impact to the project. After vetting, the list was reduced to 14 potential actions that could be deployed to reduce the overall cost of the project. Table 11-1 provides an abridged version of all 21 opportunities assessed and monetary impacts to the project estimates, and indicates whether they were recommended for further investigation or incorporation into the final design.

Table 11-1. Value Engineering and Trade-off Evaluations

Item	Description	Impact to CAPEX	Impact to OPEX	Recommendation to Implement
1	Alternative acid gas scrubbing technologies	None	\$7M per year savings	No
2	Reduce the 90% carbon capture mandate	\$1.6M	7.6 MW reduction	No
3	Oxygen and nitrogen over the fence	Eliminate capital for Area 200	\$3.2M per month increase	No
4	Relax the ZLD mandate (treat process water only)	\$24.9M	\$1.5M over 4 years	Yes
5	Eliminate Thaw Shed	\$11M	Eliminate intermittent power consumption	Yes
6	Optimize plant for Illinois 6 coal	Slurry Fed: \$19.8M Dry Fed: \$40.9M	Eliminate coal drying penalty for dry fed and Simplifies operation of SRU with low sulfur coal.	Yes
7	Over the fence water supply and treatment	\$31.8M	\$17M increase over 4 years	Yes
8	Sparing philosophy of recycle compressors	\$11.6 MM	-	Yes
9	Natural gas to the turbine/duct burner to increase availability	\$1M increase to CAPEX	\$21M additional revenue over 4 years	Yes
10	Increase design life from 25 to 30 years	\$2M	-	Yes
11	Combine the H ₂ S flash gas and tail-gas compressors	\$2.1 MM	\$15K per year increase	Yes
12	Reduce coal storage	\$12.4 MM	-	Yes
13	Revisit relevant design codes and standards	\$1.2 MM	-	Yes
14	Use CO ₂ as a refrigerant	\$6M	\$2.4M per year increase	No
15	Use integral gear CO ₂ compressors	\$10.5 MM	Parasitic power reduction	Yes
16	Nitrogen as stripping gas in concentrator	\$4M, offset by increase in nitrogen purity requirement	-	No
17	Review entire Area 700	\$51.8 MM	-	Yes
18	Craft retention package	\$19 MM	-	Yes
19	Reduce rail system for smaller unit train	\$1.8M	-	No
20	Purchase pre-owned equipment (auxiliary instrument air skid, package boiler, emergency generators, etc.)	\$1.5 MM	-	Yes
21	Design for, but do not include, carbon capture in the CAPEX during startup. Include as a cost when plant is stabilized and operating then implement sequestration.	Evaluated but against axioms	Evaluated but against axioms	No

The 2009 CAPEX and OPEX incorporated several of the above findings, and assumed that had the project continued to the next phase, additional findings from the evaluations would likely have been considered as the project was better defined. While aspects of the remaining analyses demonstrated that the cost position of the project could be improved significantly, their risk profiles were considered too high to

warrant further investigation, or they were simply indefensible from an axiom standpoint, as described in Table 5-2.

11.2 Facility Design and Operations Evaluations

At various times during the project, the Alliance conducted assessments to better understand equipment nuances, potential cost impacts of operations (both on-specification and off-specification), and for comparative purposes. Many of these are described previously in Section 5.4 (Comparative Technology Evaluations), Section 6.1 (CCRB Report), and Section 11.1 (Value Engineering). Numerous others fell outside of that scope, but were conducted to address specific aspects of design, capital, and operating conditions. The following includes narrative of the assessments, and relevant findings or impacts to the plant.

Start-Up and Trip Assessment: The power-block start-up assessment was conducted to quantify what would happen in the event of a trip and restart under various conditions (hot, warm, or cold), and the impact to the OPEX portion of the cost estimate. Using historically relevant material (IGCC availabilities), the Alliance made assumptions about causes of plant trips and availability by unit process, which rolled up into the year-over-year OPEX estimate. Secondly, the assessment helped to quantify aspects of consumables such as total fuel consumed in restarts, potential revenue streams from NGCC operations (megawatt-hours), and cost implications of reserving firm pipeline capacity.

Oxygen and Diluent Storage: Consistent with the effort to improve plant availability, particularly in the first years of commissioning and operations, the Alliance evaluated optimizing the storage capacity of oxygen and diluent in the event of an ASU trip. The findings also helped to strategize CTG operations, and aspects of flaring that would be required during a forced outage depending on the source of the outage and expected duration. Consistent with the findings addressed in the Start-Up and Trip Assessment, preliminary estimates suggested maintaining on-site storage of liquid oxygen and liquid nitrogen for up to 8 hours of minimum firing rate consumption for the gasifier and CTG.

Supercritical CO₂ and Corrosion Potential: The corrosion study was initiated to investigate the behaviors of mild steel in supercritical CO₂/H₂O solutions. Addressing wellbore and pipeline design, relaxing the H₂O could potentially have eliminated the dehydration system proposed for the FutureGen plant, reducing the CAPEX and OPEX cost estimates. Preliminary results indicated that a water content of approximately 780 ppmw did not demonstrate surface corrosion, while the coupon at 1300 ppmw did. Continuing studies would have addressed varying the water content between 800-1300 ppmw, as well as secondary evaluation regarding the impacts due to the inclusion of H₂S.

Fuel Feed Rate and Gross Power Output by Coal Type: The heat rate evaluation addressed observations of the Technical Committee, which identified a possible discrepancy in the calculated heat rate(s) of the FutureGen plant respective of the coal type. To address the observations, the material balances of all three coal cases were re-checked against their design bases. Additionally, the parasitic loads for the three cases, originally taken to be approximately equal, were differentiated to account for differing loads of the ASU and CO₂ compressors. In summary, it was determined that the bituminous coal(s) HMBs were prepared representing the most conservative conditions (hottest ambient temperatures), while the PRB case had been prepared using a conventional average day design due to known firing limitations of the CTG when gasifying PRB coal. The findings closely resembled those found in Table 6-1, with the exception of the Illinois 6 case, which under further refinement was able to show an approximate 1 percent improvement. Final heat and material balances produced used average day design limitations.

11.3 Emissions Modeling and Permitting Activities

Several studies were initiated as part of the site characterization and permitting process to quantify and establish appropriate controls for emissions from the FutureGen plant at Mattoon. Emissions characterization required making basic plant configuration and alignment assumptions, as well as operational scenarios. In consideration of the facility design used for the CAPEX and OPEX which included the facility plan from Figure 7-1, and the block flow diagram following in Figure 11-1, 32 distinct locations were initially modeled as emission sources and used to evaluate potential sources and distance to receptors. Numerous emission sources were located outside of the physical plant boundary limit as well including coal receiving and transfer locations, cooling towers (drift), the emergency diesel generator, and others. Compiled results were used to begin drafting of the air permitting and BACT analysis, as well as provide baseline data for comparative determinations against other previously permitted CTGs and IGCC plants.

Building on vendor-supplied information in conjunction with technology-specific studies and the CCRB report as described in Section 6.1, the Alliance began drafting and evaluating operational scenarios that would assist with the overall emissions characterization work such as the preliminary plant start-up and controlled shut-down emissions evaluation. One of the start-up sequences evaluated was the cold start-up of the plant, which is included in Figure 11-2. For each of the steps in the start-up protocol, both the duration of the event and the valve alignment were considered enabling determinations of volumetric and molar flow of syngas as well as the anticipated level of gas conditioning completed prior flaring or oxidation. The report quantified usage rates of consumables such as natural gas, syngas, and nitrogen used in start-up and shut-down procedures, as well as help to identify appropriate control strategies that could be deployed to minimize flaring and release of criteria pollutants associated with bringing the plant up to stable operations. Findings also helped to appropriately size the auxiliary steam supply system which could be used to preheat lower pressure steam systems, shift reactors (via nitrogen heating), and for nitrogen oxide control as the combustion turbine began operation.

Figure 11-1. FutureGen Plant Alignment and Sources

FutureGen Cold Startup Timeline

Rev. A

List of abbreviations / notations

NG: Natural Gas
DMDS: Dimethyl Disulfide

- ◆ Indicates that the system is ready at the end of corresponding hour
- color bar Indicates continuous operation on actions stated
- hatched bar Indicates transition operation switching from NG to coal
- solid black bar Indicates continuous stable operation on coal feed

Note: All system is cleaned, purged with nitrogen, air and moisture free.
ASU, utility systems, and steam system (using auxiliary boiler) are ready at time 0

Natural Gas → Coal Feed → Stop Using Caustic Scrubber

Figure 11-2. Cold Plant Start-Up Sequence of Operations

The Alliance also initiated a BACT review. Though neither the gasifier nor CTG technology had been selected at the time the review was commissioned, the Alliance assumed that the emission units (processes) would essentially be the same regardless of the final configuration. To complement the BACT review, the Alliance performed baseline emission calculations on both a slurry-fed and dry-fed gasifier configurations, and on each of the representative Frame 7 CTGs when combusting hydrogen and when combusting natural gas. The draft BACT analysis addressed the proposed controls for the following unit processes:

- combined cycle combustion turbines with HRSGs;
- gasifier process flare;
- acid gas removal unit flare;
- sulfur recovery unit thermal oxidizer;
- material handling systems including coal receiving, handling and storage, slag handling, storage and disposal;
- cooling tower;
- auxiliary boiler;
- diesel-fired fire pump; and
- diesel-fired emergency generator.

When evaluating air pollution control technologies, the U.S. Environmental Protection Agency recommends a “top-down” approach. This approach to BACT involves determining the most stringent control technique available, lowest achievable emission rate (LAER), for a similar or identical emission source. If it can be shown that the LAER is technically, environmentally, or economically impractical on a case-by-case basis for the particular source, then the next most stringent level of control is determined and similarly evaluated. The process continues until a control technology and associated emission level is determined which cannot be eliminated by any technical, environmental, or economic objections. Each of the pollutants subject to the BACT determination, defined as those exceeding the prevention of significant deterioration major source threshold level, were subject to the evaluation including oxides of nitrogen (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), particulate matter (PM), particulate matter smaller than 10 micrometer (µm) and 2.5 µm in diameter (PM₁₀ / PM_{2.5}).

12. Cost and Risk Evaluations

Several activities were conducted to assess the potential impacts of estimate and event-driven risks to the FutureGen project; these included in-house identification and valuation of project risks via the FutureGen Project Risk Register, Consequence Based Risk Ranking Study,¹ and a probability based evaluation of the FutureGen 2009 cost estimate. Table 12-1 includes the cost information and ranges for the probability evaluation completed by the Alliance.

Table 12-1. FutureGen Alliance Inputs and Summary for Monte Carlo Analysis

Area	Description	Contingency in Base Cost Estimate	Confidence Level of Estimate	Lower Range	Likeliest Value (w/ Contingency)	Upper Range
100	Coal Handling	15%	70%	\$ 115,708,181	\$ 128,564,646	\$ 147,031,433
200	ASU	5%	70%	Note A	Note A	Note A
300	Gasification	10%	50%	Note A	Note A	Note A
400	Shift	5%	65%	\$ 65,035,740	\$ 66,363,000	\$ 73,629,513
500	Mercury	5%	70%	\$ 3,956,630	\$ 4,079,000	\$ 4,523,088
510	AGRU	12%	60%	\$ 138,692,000	\$ 158,692,000	\$ 217,371,153
520	SRU	12%	65%	\$ 24,936,000	\$ 26,436,000	\$ 31,847,233
530	Tail Gas Treatment Unit	12%	65%	\$ 13,777,200	\$ 15,308,000	\$ 19,206,822
600A	Power Island	5%	70%	\$ 319,011,300	\$ 354,457,000	\$ 414,385,894
600B	Switchyard	5%	70%	\$ 33,625,800	\$ 37,362,000	\$ 91,273,495
700	Integration	15%	60%	\$ 288,007,200	\$ 320,008,000	\$ 374,501,816
800	Utilities	5%	70%	\$ 21,468,600	\$ 23,854,000	\$ 27,544,018
800B	Process Water	5%	70%	\$ 7,203,600	\$ 8,004,000	\$ 9,242,153
900A	CO ₂ Compression	8%	70%	\$ 27,200,000	\$ 43,569,000	\$ 61,882,867
900B	Sequestration	16%	70%	\$ 61,915,500	\$ 68,795,000	\$ 96,037,023
Comm	Comm/Startup	20%	50%	\$ 31,428,000	\$ 34,920,000	\$ 64,289,838
Owner	Owner Costs	0%	55%	\$ 114,665,000	\$ 120,700,000	\$ 175,441,301
Pre	Precommissioning	0%	50%	\$ 11,895,572	\$ 13,217,302	\$ 39,261,910
Sched	Schedule Delays	0%	20%	\$ (500,000)	\$ -	\$ 90,000,000
Esc	Escalation	0%	50%	\$ (85,000,000)	\$ -	\$ 85,000,000
Total				\$ 1,548,015,965	\$ 1,804,148,603	\$ 2,523,242,583
Relative Change from Likeliest Value				-17%		40%
Absolute Change from Likeliest value				(\$256,132,638)		\$719,093,980

Table Note A: Cost information for the ASU and Gasifier Islands (Area 200 and 300) are redacted due to proprietary information.

Note that the risk analysis was completed as an 'area-by-area' evaluation prior to finalizing the cost estimates as captured in the final CAPEX and OPEX reports. As a result, the \$1.8 billion used as the value for the highest likelihood reference case in the risk assessment, is slightly different than the final CAPEX value

¹ Consequence Based Risk Ranking Study for the Proposed FutureGen Project Configurations. Oct. 23, 2006. Quest Consultants, Inc. Norman, OK. Found in DOE/EIS-0394D: FutureGen Project Draft EIS. June 2007.

due to a minor difference in owner costs, as well as rounding. The final CAPEX cost estimate of \$1.8 billion overnight capital includes estimate-driven contingency.

Among the more relevant findings, the Alliance considered the single largest impact to the estimate (lowest level of confidence) to be associated with the combined impacts of scheduling delays and escalation associated with that.

13. Summary of Major Accomplishments

The following summarizes the major accomplishments achieved by the Alliance, their respective subcontractors, and DOE in executing programmatic and project goals defined by the FutureGen IGCC/CCS project. With regard to the project timeline, it's useful to recognize that the majority of the activities were executed between 2006 and 2008. This is significant considering that the Alliance effort began in mid-2005, with no known site or facility design, but culminated with an approved ROD in full compliance with NEPA; a draft UIC permit for CO₂ injection; a comprehensive FEL-2 design and Class 4 cost estimate; control and ownership of both surface and subsurface rights; and broad stakeholder approval at the local, state, and federal level.

The level of rigor and objectivity applied to the site selection process was matched only by the degree of timeliness. The period from the issuance of the original siting RFP to the selection and characterization of the four candidate sites via the DEIS was 18 months. With the FEIS following 5 months later, the Alliance, in full compliance with NEPA guidelines, was not only able to select four sites capable of supporting the FutureGen project mission, but to comprehensively evaluate and determine that the Mattoon site provided the best overall value to the project. As indicated previously, the Alliance received an ROD approving the findings disclosed in the FEIS.

Complementing the ROD, the Alliance also received a draft UIC permit from IEPA for injection of CO₂ into the Mt. Simon Formation at the Mattoon site. Issuance of the draft UIC permit was based on the comprehensive Class I UIC permit application submitted by the Alliance which detailed the design, construction, and operation of the carbon capture storage site system including the rigorous monitoring and reporting protocols that would have been implemented. The IEPA Class I UIC permitting process and administrative requirements preceded the EPA's transition to Class VI UIC permits in December 2010 which specifically addressed carbon dioxide injection and geologic sequestration. Had the Alliance continued with the project, they would have been required to fulfill the obligations of the newly developed Class VI UIC well permit.

The Alliance produced the first comprehensive design and cost estimate for a fully integrated IGCC power plant with a dedicated CCS system, including valuations of capital requirements (CAPEX), as well as operating and maintenance requirements (OPEX) for the project lifecycle. At the time the estimates were being developed, the Alliance had not made a formal technology selection with regard to the gasifier. Accordingly, the CAPEX and OPEX estimates assessed both slurry-fed and dry-fed configurations, with each configuration supported by a complete heat and material balance, and the corresponding process flow sheets reflective of utilizing a single coal rank (Illinois 6). In advancing one of the design axioms, the Alliance also completed preliminary heat and material balances for comparative purposes utilizing two additional coal ranks that could be used in the plant including Pittsburgh 8 and PRB.

Strengthening the validity of the CAPEX estimate, more than 85 percent of the costs associated with major pieces of equipment were based on actual priced equipment and vendor supplied quotes. Similar plant or factored estimate practices were limited to those areas where significant in-house costing efforts had been previously completed, and were restricted to routine processes such as coal handling, grid interface, and portions of the power island. Additionally, the third party assessment completed by Deloitte indicated that based on the level of design, the CAPEX and OPEX were reasonable estimates within the proposed range of uncertainty, and that an appropriate basis had been used in the estimation process.

The Alliance moved from a conceptual study (ICDR) to a defensible, all-in capital, operating, and post-operations cost estimate containing the relevant details that enabled the development of pro-forma models. The financial modeling for the project included sensitivity analysis around carbon pricing both with and without federal legislation, debt structure and servicing, escalation rates, load-weighted energy market analysis specific to the two electricity hubs that the FutureGen plant could service, levelized cost of electricity, as well as others. If the project had proceeded, these analyses would have contributed directly to the structuring of eventual commercial financing, and a likely power purchase agreement.

The Alliance put significant effort into valuating “below the line” aspects of the cost estimate, as the application of standard contingency factors did not adequately capture and quantify risk in terms of the potential cost impact. With the intent to provide a cost probability distribution beyond the inherent range offered as part of the Class 4 estimate, the Alliance conducted assessments at each area level, adjusting contingency based on the level of understanding, complexity, and confidence. These findings were independently evaluated by third party who determined the key indicators of uncertainty were primarily related to schedule slip, escalation, and overall plant integration (Area 700).

The Alliance advanced the design and engineering of the FutureGen IGCC/CCS project well beyond the HMBs, and a paper study of steady-state operations. Executing multiple operability assessments, the Alliance quantified aspects of plant start-up, shut down, and transient operations including evaluations of equipment and process modifications, abatement strategies, and operating plans (e.g., vent vs. flare). The final design as offered for the cost estimate and preliminary permitting activities represented the most efficient configuration in an alignment that could control emissions production and release within the bounds of the expected goals of the project.

As a clean coal project, FutureGen maintained broad support at the local, state, and federal levels throughout the project timeline. The commitment to stakeholder engagement and involvement manifested itself in several aspects of the project. As a living laboratory, the plant and CCS systems were designed to support public accessibility and education and included a site visitor center, observation locations for both the power plant and sequestration locations at the site, and a locally sited educational facility. From a siting perspective, the DEIS moved expediently through the public comment period, ultimately obtaining an ROD that approved all four candidate sites, and the technologies that could be developed there.

Project support was also apparent by the willingness of local landowners, Coles Together, and the State of Illinois to ensure that the Alliance was able to secure both property and storage rights for the FutureGen plant and CCS systems. Finally, though the FutureGen plant was a coal burning power plant, the project was widely considered as a fundamental and necessary step toward the advancement of fossil based power production with as few societal impacts as the state of the technology would allow.

ATTACHMENT 1

SITE SELECTION REPORT

Final Site Selection Report

December 18, 2007

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Final Site Selection Report

December 18, 2007

Submitted by:

FutureGen Industrial Alliance, Inc.

SUMMARY

FutureGen is a government-industry cost-shared project to design, build, and operate a first-of-a-kind coal-fueled, near-zero emission power plant. The FutureGen power plant will produce electricity and hydrogen from coal while capturing and permanently storing carbon dioxide (CO₂) in a deep geologic formation. On December 2, 2005, the U.S. Department of Energy (DOE) entered into a cooperative agreement with the FutureGen Industrial Alliance, Inc. (Alliance) to begin the FutureGen host site selection process and prepare a conceptual design for the facility.

The Alliance implemented a thoughtfully structured, openly competitive siting process to identify the site that could best meet the goals of the FutureGen project. This process involved the issuance of a Request for Proposals from potential site hosts, a rigorous evaluation of the 12 proposals received, and the identification of four candidate sites for full consideration by the Alliance and DOE. The four sites under consideration to host the FutureGen facility are located in Mattoon, Illinois; Tuscola, Illinois; Jewett, Texas (also referred to as Heart of Brazos); and Odessa, Texas.

In accordance with the National Environmental Policy Act, DOE prepared a Draft and a Final environmental impact statement (EIS) to evaluate the potential environmental impacts of constructing and operating the FutureGen project at each of the four sites. In the Final EIS, DOE stated that its preferred alternative is to provide financial assistance to the FutureGen project and tentatively found that all four sites were acceptable. The Alliance expects that, in the near future, DOE will issue a Record of Decision that states that it will implement its preferred alternative and confirms that each of the four sites is acceptable. The Alliance will implement mitigation measures specified in the DOE Record of Decision.

After extensive review and evaluation of the advantages and disadvantages of the four candidate sites both individually and in comparison to one another, the Alliance voted to select **Mattoon** as the host site for the FutureGen facility, pending the outcome of DOE's Record of Decision. While the Alliance believes that all of the candidate sites are acceptable and offer significant benefits to the FutureGen project, the Alliance believes the Mattoon site provides many advantages, among which are the following:

- The Mattoon site proponent can provide clear legal title to the power plant site, including the injection site, which results in minimal land ownership risk.
- Onsite CO₂ injection eliminates the need for an extended length, offsite CO₂ pipeline, which reduces capital and operating costs while still providing an excellent test of the integration of the power plant with CO₂ injection and sequestration. This site will provide both operating- and construction-related integration efficiencies that will reduce costs and staffing requirements.
- With both power production and injection on the same site, public access and educational opportunities will be exceptional.
- The Mt. Simon geologic injection formation is regionally extensive and is widely considered to be one of the most important geologic storage reservoirs for anthropogenic CO₂ in the U.S.
- The thick geologic injection formation, multiple thick overlying and low permeability formations which provide multiple seals, and lack of penetrations into both the primary or secondary seals substantially decrease geologic risk.

- There is a secure water source from two wastewater treatment facilities, which when combined with the construction and operation of an onsite reservoir, will ensure an adequate water supply to the plant.
- The site is near interstate highways which connect to major waterways to provide an opportunity for modular construction of the facility.
- There is very strong community support for the FutureGen project in Mattoon and surrounding communities.
- Enhanced, site-specific environmental mitigation measures will be implemented to reduce, to the fullest extent practicable, potential impacts from light, noise, and odors and to increase the compatibility of the plant with the surrounding area.
- There is a good potential for self-sufficient post-project operation of the plant because of the power plant's projected revenue potential and the projected low operating cost of the FutureGen plant at this site.

Balancing overall cost and associated financial risks, and other risks and benefits such as legal issues, water issues, geologic conditions, sequestration opportunities, construction issues, and environmental issues, Mattoon would best serve the overall project mission.

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ACRONYMS AND ABBREVIATIONS

BAFO	Best and Final Offer
CO ₂	carbon dioxide
DOE	U.S. Department of Energy
EIS	environmental impact statement
MMT	million metric tons
MMV	monitoring, mitigation, and verification
MW	megawatt
NEPA	National Environmental Policy Act
TDCJ	Texas Department of Criminal Justice

1.0 INTRODUCTION

FutureGen is a government-industry cost-shared project to design, build, and operate a first-of-a-kind coal-fueled, near-zero emission power plant. The FutureGen power plant will produce electricity and hydrogen from coal while capturing and permanently storing carbon dioxide (CO₂) in a deep geologic formation. The nominally rated 275-megawatt (MW) prototype power plant will operate as a production plant, generating commercially significant levels of electric power. It will also provide a large-scale engineering laboratory for testing new and clean power generation, CO₂ capture, and coal-to-hydrogen technologies, as well as including syngas slip-stream access for testing and developing new technologies. The FutureGen program intends to build and operate the cleanest coal-fueled power plant in the world.

The project is being jointly funded by the U.S. Department of Energy (DOE) and the FutureGen Industrial Alliance, Inc. (Alliance). There were four candidate sites under consideration to host the FutureGen facility. The sites are located in Mattoon, Illinois; Tuscola, Illinois; Jewett, Texas (also referred to as Heart of Brazos); and Odessa, Texas.

The Alliance engaged in a detailed discussion of the strengths and weaknesses of each site individually and performed a side-by-side comparison of the sites looking specifically at costs (including uncertainties), risks to cost and schedule, and other benefits. After this extensive review and evaluation of the advantages and disadvantages of the four candidate sites both individually and in comparison to one another, the Alliance Board of Directors voted to select **Mattoon** as the host site for the FutureGen facility, pending the outcome of future DOE decisionmaking.

This report summarizes the siting process that was used to identify candidate sites and, ultimately, to select one of those sites as the host site. In addition, the report provides an overview of the costs, revenues, and incentives; risks to cost and schedule; and other benefits associated with constructing and operating FutureGen at each of the candidate sites. With that background, the report then provides the rationale for selecting Mattoon as the host site. DOE reviewed and approved the final site selection process.

2.0 FUTUREGEN FACILITY SITING PROCESS

The Alliance implemented a thoughtfully structured, openly competitive siting process to identify the site that could best meet the goals of the FutureGen project. The process used is summarized below.

Request for Proposals

On December 2, 2005, DOE entered into a cooperative agreement with the Alliance to begin the FutureGen host site selection process and prepare a conceptual design for the facility. As a result, the Alliance created a process to identify candidate sites for the proposed FutureGen facility. This process involved developing over 75 different siting criteria, issuing a Request for Proposals, and evaluating the proposals received using a scoring system, including a visit to each proposed site.

Candidate Site List

In July 2006, the Alliance identified four candidate sites to host the FutureGen facility, out of 12 sites for which proposals were submitted. The candidate sites were selected after completion of a rigorous proposal evaluation process, which was independently audited by DOE. The Candidate Site List, and supporting rationale, was submitted to DOE for inclusion into the agency's National Environmental Policy Act (NEPA) compliance process. The Alliance's *Report to the U.S. Department of Energy on the Results of Site Offeror Proposal Evaluation*, dated July 21, 2006, provides additional detail.

Environmental Impact Statement

In accordance with its NEPA regulations, DOE analyzed the potential environmental impacts of siting and constructing the FutureGen facility at each of the four candidate sites and documented these analyses in the *FutureGen Draft Environmental Impact Statement* (DOE/EIS-0394D, May 2007) (Draft EIS). The Draft EIS was the subject of public hearings at the four sites. DOE considered the public comments received on the Draft EIS and issued the *FutureGen Final Environmental Impact Statement* (DOE/EIS-0394F, November 2007) (Final EIS). A Notice of Availability of the Final EIS was published by the U.S. Environmental Protection Agency on November 16, 2007 (72 Fed. Reg. 64618, 64619 [November 16, 2007]), beginning the minimum 30-day waiting period required by NEPA regulations.

Record of Decision

In the Final EIS, DOE stated that its preferred alternative is to provide financial assistance to the FutureGen project and tentatively found that all four sites were acceptable. The Alliance expects that, in the near future, DOE will issue a Record of Decision that states that it will implement its preferred alternative and confirms that each of the four sites is acceptable. The Alliance will implement mitigation measures specified in the DOE Record of Decision.

Data Analysis

The Alliance considered the costs, risks, and benefits associated with the construction and operation of the FutureGen facility at each of the four candidate sites. All phases (construction, operation, post-operation, and long-term monitoring) and significant components (power plant, utility requirements, and sequestration) of the plant were evaluated – over 120 different factors. The data for this analysis was derived from several sources including, but not limited to:

- Best and Final Offer (BAFO) submissions from the proponents of the candidate sites;¹
- Original site proposals; and
- Alliance due diligence efforts, including legal and financial analyses.

¹ BAFO Directions were provided to the site proponents in draft on May 30, 2007. These directions were modified after consideration of comments received from the site proponents, and final directions were sent to the site proponents on June 15, 2007. The BAFO directions describe the general factors the Alliance intends to consider in its final siting decision. BAFOs were submitted by the site proponents on August 1, 2007.

3.0 CAPITAL AND OPERATING COSTS, EXPECTED REVENUES, AND INCENTIVES

For each of the candidate sites, the Alliance considered the expected capital and operating costs, potential revenues, and potential incentives offered by the site proponents. Capital costs are those that will need to be expended over a 44-month construction period for (1) purchasing or leasing land for the power plant and/or injection site, required rights-of-way for utilities and a CO₂ pipeline, and subsurface rights needed for CO₂ sequestration; (2) preparing the power plant site for construction (e.g., road access, grading, natural gas pipeline work); (3) constructing the power plant (e.g., cost of construction labor and weather-driven costs); (4) sequestration design and construction (e.g., site characterization, building the CO₂ pipeline system and infrastructure, and monitoring infrastructure); and (5) environmental mitigation (e.g., noise attenuation barriers and odor controls). Operating costs are those that will need to be expended for the 4-year operations period of the power plant (e.g., coal and other consumables), the 4-year operations period of the sequestration system (e.g., CO₂ pipeline operations and maintenance and monitoring, mitigation, and verification (MMV)), and the 2-year post-operation period (e.g., continued MMV, injection well closure, and CO₂ pipeline closure).

The operation of the FutureGen facility is expected to generate revenue from the sale of electricity and of co-products such as elemental sulfur and slag. In addition, CO₂ sales would be possible if the plant were located at one candidate site – Odessa.

The site proponents offered various economic incentives in their best and final offers. In particular, both Illinois and Texas offered several million dollars in contributions and grants. Some of the grants require applications to be filed and/or certain conditions to be met.

The site proponents in both states also offered in-kind contributions. These include MMV services valued at least \$1 million annually. Other in-kind contributions offered include equipment, research, and services.

The following addresses the expected costs, revenue, and incentives for each site.

Mattoon

- Capital costs are comparatively high and are driven by construction labor, grid upgrades, and weather-driven requirements.
- Operating costs are comparatively low and are driven by coal delivered costs, CO₂ pipeline operations and maintenance, and operations labor.
- Total revenue is expected to be \$216 million over 4 years, of which \$215 million is expected to come from electricity sales.
- The value of incentive contributions and grants is \$21 million.

Tuscola

- Capital costs are comparatively high and are driven by construction labor, grid upgrades, weather-driven requirements, and the potential future need for a process water treatment facility.
- Operating costs are comparatively low and are driven by coal delivered costs, water, and operations labor.
- Total revenue is expected to be \$216 million over 4 years, of which \$215 million is expected to come from electricity sales.
- The value of incentive contributions and grants is \$21 million.

Jewett

- Capital costs are comparatively high and are driven by the need for a process water treatment facility and a CO₂ pipeline system.
- Operating costs are comparatively high and are driven by coal delivered costs, water treatment costs, and sequestration requirements.
- Total revenue is expected to be \$231 million over 4 years, of which \$230 million is expected to come from electricity sales.
- The value of incentive contributions and grants is \$20 million.
- Texas offered the Alliance franchise tax credits (based on electricity sales), subject to a cap. Although the Alliance is not subject to the franchise tax, the Alliance extensively analyzed the ability to sell the credits to entities that are subject to the tax in order to realize value from the credits. However, the value of any such credits to the Alliance is highly uncertain because of the unique nature of the credits, the lack of tried and tested state regulations implementing the credits, the unknown extent of the available market for the credits, and the uncertainty of electricity sales during the initial part of the facility's operating period. In addition, there is a risk that entities that are eligible for a franchise tax credit may not be eligible for the offered school district tax abatements.

Odessa

- Capital costs are comparatively low and are driven by process water treatment facility requirements, weather-driven requirements, and sequestration design and construction.
- Operating costs are comparatively high and are driven by coal delivered costs, water and water treatment requirements, and sequestration requirements.

- Total revenue is expected to be \$201 million over 4 years, of which \$190 million is expected to come from electricity sales and \$10 million is expected to come from CO₂ sales.
- The value of incentive contributions and grants is \$25 million.
- Texas offered the Alliance franchise tax credits (based on electricity sales), subject to a cap. Although the Alliance is not subject to the franchise tax, the Alliance extensively analyzed the ability to sell the credits to entities that are subject to the tax in order to realize value from the credits. However, the value of any such credits to the Alliance is highly uncertain because of the unique nature of the credits, the lack of tried and tested state regulations implementing the credits, the unknown extent of the available market for the credits, and the uncertainty of electricity sales during the initial part of the facility's operating period. In addition, there is a risk that entities that are eligible for a franchise tax credit may not be eligible for the offered school district tax abatements.

With respect to cost and cost components, there is no one site that clearly stands out as the best. For this reason, the other differentiating factors included in the overall siting analysis magnify in importance.

4.0 RISKS TO COST AND SCHEDULE

In considering risks to cost and schedule, the Alliance considered legal issues, water issues, geologic conditions and sequestration, construction capability, and environmental issues at each site.

Legal issues refer to the ability to obtain clear, unencumbered title to the proposed power plant site and the ability to obtain the necessary easements or other rights for utility corridors, the CO₂ pipeline, the installation of monitoring equipment as required over the 6-year plume, and the use of geologic reservoirs for the permanent storage of injected CO₂.

Water issues refer to the volume of water that is available, the ability to access the water when needed, and the quality of the water.

Geologic conditions and sequestration refer to the general characteristics of the target formation to store CO₂, including permeability, thickness and other factors that might impact design of the sequestration and monitoring systems, the number and thickness of caprock seals, and scientific research opportunities.

Construction capability refers to the availability of construction labor and opportunities to maximize construction efficiencies to avoid schedule delays.

Environmental issues refer to the land use of the surrounding area and the presence or absence of any sensitive receptors or resources in the area.

The following addresses these factors for each site.

Mattoon

- *Legal issues:* The Alliance would generally be able to acquire marketable title (or equivalent site control) to the proposed 419-acre power plant site, which includes the injection site. The site proponent is or will be in control of all necessary utility and transportation corridors; no CO₂ corridor is required. Modeling results suggest that the 6-year CO₂ plume would remain on the proposed site or within adjacent acreage controlled by the site proponent. As a charitable organization, the Alliance is highly likely to be eligible for a property tax exemption.
- *Water issues:* Process water would be supplied from effluent from city wastewater treatment plants in Mattoon and Charleston, Illinois. With the construction of a 7- to 10-acre reservoir on the site, process water would be available in sufficient quantities even in dry conditions. The quality of the water is good, although it will need additional treatment.
- *Geologic conditions and sequestration:* The geologic features of the injection reservoir and seals combine to produce a sequestration setting that is chemically, physically, and structurally robust. The target formation is the regionally extensive Mt. Simon sandstone formation. The Mt. Simon at the Mattoon site is the deepest reservoir as compared to the other sites. The reservoir caprock is the thick Eau Claire shale that serves as a competent caprock for natural gas storage reservoirs elsewhere in Illinois. Multiple secondary seals also exist at the site to provide backup to the main seal. The tectonic setting is stable and in a compressive regional stress regime, which further increases the likelihood that any undetected fracture zones at the site would be sealing. A recent seismic survey near the site shows no obvious faults within the sequestration area. No existing wellbores penetrate the primary seal within the 50-million metric ton (MMT) plume footprint, eliminating a potential leakage risk and well remediation expenses. Reservoir simulations conducted using reservoir property data supplied by the site proponent show that a single well would support a design basis injection rate of 2.5 MMT annually. However, because the reservoir property data used in the simulations were obtained from a well located over 50 miles away, there is uncertainty in achieving the modeled injectivity rate of 2.5 MMT annually in a single well under actual reservoir permeability conditions at the site. Additional simulations were conducted assuming the use of as little as one-third of the total reservoir thickness and still resulted in the ability to inject at a 2.5-MMT annual rate. Further, low injectivity could be mitigated by the installation of a second injection well or by installing a horizontal well at additional cost. Considering all of these factors, this site has a low probability of encountering geologic conditions that would make it impracticable to engineer a sequestration system to achieve the required CO₂ injection rate.
- *Construction capability:* Having the power plant and injection infrastructure located on the same site would allow for construction and operation integration efficiencies by being able to use the same team for surface and subsurface activities. In addition, the site is located near interstate highways which connect to major waterways to provide an opportunity for modular construction of the facility. Labor rates are higher in Illinois than in Texas, and the Illinois sites could experience weather-related construction delays. Because the Mattoon site is located near residences, the ability to work around the clock may also be limited. The nearest transmission line is a 138-kV line, and the lower voltage increases the potential for system congestion. A 345-kV

line is located approximately 16 miles away; a tie-in to that line could require 4 to 5 years for permitting and construction, adversely affecting the FutureGen schedule.

- *Environmental issues:* The current land use is agricultural. The surrounding area is rural with a low population density. Two residences are located adjacent to the site. An elementary school is located approximately 2 miles southeast of the proposed site. Enhanced, site-specific environmental mitigation measures would be implemented to reduce potential light, noise, and odor impacts to the local community to the fullest extent practicable. In addition, as required by DOE in its Record of Decision, the Alliance would consider other environmental mitigation measures such as (but not limited to) enclosing or shielding some components of the plant and landscaping around the perimeter of the plant site to partially screen the plant from nearby residences.

Tuscola

- *Legal issues:* The Alliance would have clear title to the proposed 349-acre power plant site. Some existing easements (e.g., natural gas lines) would affect the placement of the power plant on the site, or would require that the easements be modified. The Alliance would also have clear title to the 10-acre injection site located approximately 11 miles south of the power plant site. With one exception, all property owners above the 6-year plume have signed options for storage deeds for the area between 3,500 and 8,000 feet below the surface and have also agreed to surface access for MMV, including drilling monitoring wells. The 6-year plume could come within 600 feet or less of an existing shallow gas storage field, requiring extra diligence during drilling to ensure the integrity of the gas storage field; indemnification of the owner of the gas storage field may also be required. The site proponent does not have complete control over the rights-of-way needed for utilities, transportation corridors, and the CO₂ pipeline; use of eminent domain to obtain the required rights is likely. As a charitable organization, the Alliance is highly likely to be eligible for a property tax exemption.
- *Water issues:* Process water would be supplied from the Kaskaskia River through a pipeline controlled by the Lyondell-Equistar Company. A sufficient volume is available and the water quality is good. Lyondell-Equistar is in the process of being sold to another company and the Alliance has been unable to reach an agreement regarding the future availability of river access. Should the pipeline and existing water treatment plant become unavailable, the Alliance would need to find another access route to the Kaskaskia River water.
- *Geologic conditions and sequestration:* Similar to Mattoon, the target formation would be the regionally extensive Mt. Simon formation with geologic features and seals combining to produce a sequestration setting that is chemically, physically, and structurally robust. The reservoir caprock is the thick Eau Claire shale that serves as a competent caprock for natural gas storage reservoirs elsewhere in Illinois. Multiple secondary seals also exist at the site to provide backup to the main seal. The tectonic setting is stable and in a compressive regional stress regime, which further increases the likelihood that any undetected fracture zones at the site would be sealing. A recent seismic survey near the site shows no obvious faults within the sequestration area. The principal difference from the Mattoon site is a shallow (<2 degree) dip of the reservoir to the

southeast. This would cause an asymmetrical distribution of the CO₂, extending the plume farther to the northwest and expanding the acreage beyond the estimates made with a simple, radially symmetric reservoir model. The Tuscola site is also surrounded by mature and abandoned petroleum exploration and production wells, one of which penetrates the New Albany secondary seal above the 50-MMT plume footprint. However, none of the known wells penetrates the primary seal. Similar to the Mattoon site, there is uncertainty in achieving the modeled injectivity rate of 2.5 MMT annually in a single well because of uncertainty in reservoir permeability in this deep reservoir. Because of the limited acreage offered for the sequestration site, installation of a second injection well would not be a mitigation option due to pressure interference over short inter-well distances. Installing a horizontal well at additional cost would be the only corrective option for low injectivity at the Tuscola site.

- *Construction capability:* The site is located near interstate highways which connect to major waterways to provide an opportunity for modular construction of the facility. Labor rates are higher in Illinois than in Texas, and the Illinois sites could experience weather-related construction delays. There is a large natural gas mainline located on the property that would need to be moved prior to construction. The nearest transmission line is a 138-kV line, and the lower voltage increases the potential for system congestion. A 345-kV line is located approximately 17 miles away; a tie-in to that line could require 4 to 5 years for permitting and construction, adversely affecting the FutureGen schedule.
- *Environmental issues:* The current land use is agricultural. The site is located adjacent to an existing industrial area. Three residences, which would be purchased, are located adjacent to the site; 7 other residences are located within 0.5 miles of the site. As required by DOE in its Record of Decision, the Alliance would consider other environmental mitigation measures such as (but not limited to) enclosing or shielding some components of the plant and landscaping around the perimeter of the plant site to partially screen the plant from nearby residences.

Jewett

- *Legal issues:* The Alliance would have clear title to the proposed 400-acre power plant site. However, existing encumbrances (e.g., oil and gas leases) may affect use of the site, and the Alliance would need to negotiate with leaseholders to restrict the leaseholders' activities so as not to interfere with construction or operation of the FutureGen plant. The injection site would be located approximately 50 miles away on 800 acres of land owned by and leased from the Texas Department of Criminal Justice (TDCJ).² The TDCJ owns only 1/8th of the mineral interests in the subsurface area. However, Texas case law has been interpreted to require permission from only the surface owner (not the mineral owner) for right to inject and store CO₂ in a subsurface formation that is not productive of oil and gas. The possibility exists that an affected mineral owner could seek a storage fee or damages, if provable. Modeling results show that the 6-year CO₂ plume (encompassing approximately 1,650 acres) may not remain on the 800-acre site. Rights-of-way would not be required for utility or transportation corridors. The Alliance would construct and operate the 59-mile CO₂ pipeline. Rights-of-way have not been obtained, but

² Use of the TDCJ property as the injection site for Jewett is the reference case. Use of property owned by the Hill Family as the injection site raised concerns regarding faulting in the area, concerns that are not present on the TDCJ property.

common practice in Texas indicates that such rights would be granted. If the use of eminent domain were required, the Alliance would need to become or work with a common carrier.

- *Water issues:* Process water is proposed to be provided from a combination of onsite and offsite groundwater wells and blowdown water. Mine water is also available. Sufficient volume is available from a variety of sources, although the quality of blowdown and mine water is poor and other sources were not quantified by the site offeror. In all cases, the Alliance would need to reach agreement with NRG regarding the use of the water from their offered and/or identified sources.
- *Geologic conditions and sequestration:* The primary target formation is the highly porous and permeable Woodbine sandstone that provides high capacity for CO₂ injection. Although highly permeable, the Woodbine is also the thinnest of the proposed reservoirs (600 feet total) and so generates the largest plume footprint of the sites. The site also has the heterogeneous Travis Peak sandstones that provide opportunities for research on low permeability, very deep (>10,000 feet) reservoirs. The primary seal is the thick Eagle Ford shale that is immediately overlain by another thick secondary seal, the Austin chalk. The injection site is in an area of active oil and gas exploration and production. There are numerous wells in the area, although none would intersect the 6-year plume. Several existing wells would require remediation should plant operations continue. The closest seismic line, located less than 0.1 mile from the proposed TDCJ injection site, shows no clearly identifiable faults. However, the Jewett site is in a regional stress regime that is extensional in nature. Although the likelihood is low, should presently undetected faults and fracture zones exist at the site, these structures would be at somewhat higher risk of opening under stresses and frictional changes induced from CO₂ injection.
- *Construction capability:* The site is located near interstate highways which connect to major waterways to provide an opportunity for modular construction of the facility. NRG, which operates the adjacent Limestone coal-fired power plant, is building a third unit, which is expected to be completed in 2012. This could put a strain on the availability of construction labor for the FutureGen plant. The proximity of the NRG Limestone plant could also provide synergies with FutureGen that have not been identified or valued. A 345-kV transmission line is located adjacent to the proposed power plant site, reducing the potential for congestion.
- *Environmental issues:* The proposed plant site is located adjacent to an operating lignite mine and an operating coal-fired power plant. There are no residences near the proposed power plant site. The proposed injection site is located on property which also houses several thousand state prisoners. According to Census data, approximately 100 people reside above the modeled 6-year plume; 7,000 currently reside above the modeled 50-MMT plume.

Odessa

- *Legal issues:* The proposed plant site is currently subject to oil and gas leases, pipelines, and other encumbrances, and the Alliance would need to negotiate with leaseholders to restrict their activities so as not to interfere with construction or operation of the FutureGen plant. The proposed injection site would be located approximately 80 miles away on land owned by and

leased from the University of Texas System; four well sites would be leased for a total of 648 acres. Modeling results show that the 6-year CO₂ plume would remain within the 648 leased acres. The site proponent obtained a letter of commitment from the affected landowner for a transmission line easement; no other utility or transportation rights-of-way would be required. To the extent that new CO₂ pipelines are required, they would be sited, constructed, and operated by third parties which, as common carriers, may be able to use eminent domain to obtain the necessary easements if necessary.

- *Water issues:* Process water would be supplied by the City of Odessa through a new water pipeline to the proposed site. There is adequate volume available, although the quality of the water is poor.
- *Geologic conditions and sequestration:* The targeted injection zone is the Delaware Mountain Group sandstones. This porous sandstone interval is overlain by dominantly non-porous and impermeable carbonates of the Goat Seep Limestone. The primary seal is a very thick (700 feet) anhydrite mixed with minor amounts of carbonate and halite followed by another thick anhydrite (500 feet) of the Salado Formation. The Odessa injection reservoir is the shallowest of the sites and is also of the lowest overall permeability, based on data provided by the site proponent. Hence, achieving the targeted 1-MMT annual injection rate would require multiple vertical wells and/or a horizontal well. The low permeability and the option to mix horizontal and vertical wells to meet injectivity requirements offer significant scientific research opportunities unique to the Odessa site. Based on available seismic data, there is no evidence of faults cutting the primary caprock seal or any of the overlying formations. There are numerous caprock penetrations in the general area due to oil and gas exploration, but there is sufficient acreage to allow the required number of vertical and/or horizontal wells to be positioned to avoid plume contact with existing wells. The CO₂ produced at the FutureGen plant would be co-mingled with CO₂ produced elsewhere before injection. The sequestration system design basis was established at 1 MMT of CO₂ to be injected annually and any additional produced CO₂ would be sold. The costs of a dedicated CO₂ pipeline to eliminate co-mingling and the additional wells needed to allow the sequestration of more than 1 MMT of CO₂ annually have not been estimated but would be high because of the large distance (>50 miles) between the plant and sequestration site.
- *Construction capability:* This site poses the least risk of construction labor shortages and allows for the most predictable construction schedule. The plant would tie into a double-circuit 138-kV transmission line. Being located in a relatively unpopulated area, the West Texas transmission system has limited capacity and is not highly networked. This increases the potential for congestion with new generation. Based on information from the Texas BAFO, 4,500 MW of commercial windpower is being developed in the region. However, the region has been designated as a Certified Renewable Energy Zone, which allows grid upgrades in the area to be given priority. In addition, a utility joint venture has been formed specifically to increase the transmission capacity in Certified Renewable Energy Zones, including West Texas. Although the potential for congestion exists at this site, the situation could improve substantially by the time the FutureGen plant is online. Due to the absence of a major waterway in the vicinity, this site offers the least opportunity for modular construction as compared to the other three sites.

- *Environmental issues:* The proposed power plant site is in a rural area and is currently partially used for natural gas activities. The area surrounding the site to the east, west, and north is dominated by ranching and oil and gas activities. Industrial facilities and the largely abandoned town of Penwell are located adjacent to the site, to the south. There are 4 residences (which may be abandoned) located within 0.5 miles of the proposed power plant site.

All sites pose advantages and disadvantages with respect to risks to cost and schedule. Overall, the Alliance believes that selection of the Mattoon site will pose the least risk because of certainties in obtaining legal control of the site and necessary easements, the availability of process water for the facility, and the soundness of the geologic target formation.

5.0 BENEFITS

- All sites enjoy strong stakeholder support for the FutureGen plant.
- The use of eminent domain is available in both states, although it is likely that the states would decline to use that power except as a last resort. In Texas, the use of a general eminent domain (e.g., to resolve title issues) requires that the necessary funds be authorized and appropriated by the Texas legislature.
- All sites offer opportunities for co-product sales such as elemental sulfur and slag; Odessa offers the opportunity for CO₂ sales.
- All sites provide important scientific research opportunities and transferability of geologic sequestration results.
- All sites offer a high potential for university involvement for both the power plant and geologic sequestration components of the project.
- By virtue of specially enacted state legislation, both states would take “all rights, title, and interest” in the CO₂ injected into the target formation and both states offer liability protection to the Alliance. The Illinois statute states that Illinois will take ownership of “all sequestered gases” and that the state will “indemnify, hold harmless, defend, and release the Alliance and member companies from any public liability for damages arising once the gas is injected into the wellhead.” Legal counsel believes that the Texas statute will be interpreted to include other gases that are included within the CO₂ stream.

All sites offer significant benefits to the Alliance and the FutureGen project, with no one site having a particular advantage over the others with respect to the benefits.

6.0 DECISION

The Alliance selects **Mattoon** as the host site for the FutureGen facility. Although, as discussed above, all candidate sites are acceptable and offer significant benefits to the FutureGen project, the Alliance believes the Mattoon site provides many clear advantages and minimal disadvantages.

Legal Issues

- The Mattoon site proponent can provide clear legal title to the power plant site, including the injection site, which results in minimal land ownership risk.

Water

- There is a secure water source from two city wastewater treatment facilities, which when combined with the construction and operation of an onsite reservoir, will ensure an adequate water supply to the plant.

Geologic Conditions and Sequestration

- Onsite injection eliminates the need for an extended length, offsite CO₂ pipeline, which reduces capital and operating costs while providing an excellent test of the integration of the power plant with CO₂ injection and sequestration. In addition, onsite injection configures the FutureGen plant in a manner that appears to be a high-probability design (onsite or near-onsite injection) for future near-zero emission power plants.
- With both power production and injection on the same site, public access and educational opportunities will be exceptional.
- The Mt. Simon geologic injection formation is regionally extensive and is widely considered to be one of the most important geologic storage reservoirs for anthropogenic CO₂ in the U.S. In addition, the Mt. Simon formation is representative of the majority of U.S. and world geologic storage capacity and provides a favorable geologic setting for groundbreaking research.
- The thick geologic injection formation, multiple thick overlying and low permeability formations which provide multiple seals, and lack of penetrations to both the primary or secondary seals substantially decrease geologic risk.
- The Mattoon site would have the smallest CO₂ plume footprint of all the candidate sites.
- The Mattoon site provides unfettered access to conduct a world-class monitoring program.
- This site presents the fewest issues for continuing operations because there are no wells that penetrate the caprock seals within the modeled 50-year CO₂ plume and there are no reservoir capacity issues. The site proponent controls a significant portion of the land area above the 50-year plume.

Construction Capability

- There is a highly skilled construction labor force available in the region.
- Onsite injection offers both construction and operational efficiencies by being able to use the same team for surface and subsurface activities.

- The site is near interstate highways which connect to major waterways to provide an opportunity for modular construction of the facility.
- All necessary utilities – rail, transmission, and natural gas – are adjacent or close by the site.

Environmental Issues

- The potential for environmental impacts is low. The power plant/injection site is cropland that has been farmed extensively, reducing the potential for undiscovered cultural, historic, or natural resources. Utility corridors will be located primarily along existing rights-of-way which also reduces the potential for undiscovered resources.
- Enhanced environmental mitigation measures will be implemented to reduce, to the fullest extent practicable, potential impacts from light, noise, and odors and to increase the compatibility of the plant with the surrounding area. In addition, as required by DOE in its Record of Decision, the Alliance will consider other environmental mitigation measures such as (but not limited to) enclosing or shielding some components of the plant and landscaping around the perimeter of the plant site to partially screen the plant from nearby residences.

Cost

- The Mattoon site offers significant coal transportation cost advantages, including the opportunity to transport all coal types economically.
- There is a good potential for self-sufficient post-project operation of the plant because of the power plant's projected revenue potential and projected low operating cost of the FutureGen plant at this site.
- The incentives provided by Illinois and the local community are significant and certain.

Other Considerations

- Illinois has enacted meaningful CO₂ storage legislation to benefit the Alliance, including a level of liability protection.
- The Mattoon site is located in a business enterprise zone which creates a favorable tax environment.
- The Illinois Geologic Survey is strongly supportive of the project and has offered to provide valuable MMV services during and after the project period.
- The state has enacted legislation to provide a streamlined environmental permitting process for the FutureGen project.
- There is ready access to world-class universities and research institutions that focus on coal and carbon sequestration.

- There is very strong community support for the FutureGen project in Mattoon and surrounding communities.

7.0 CONCLUSION

As described above, the Alliance has undertaken a rigorous, open site selection process that has been approved by DOE. After careful consideration of the advantages and disadvantages offered at each of the four candidate sites, the Alliance believes that the Mattoon site can best meet the goals of the FutureGen project within the current schedule and budget.

ATTACHMENT 2

UIC Permit Application

Clean Energy for a Secure Future

**Underground Injection Control (UIC)
Permit Application
for the
FutureGen Electric Power and Hydrogen
Generating Plant
in
Coles County, Illinois**

April 19, 2010

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EXECUTIVE SUMMARY

The FutureGen Project was conceived to support the initiatives and recommendations of the National Energy Policy (NEP) to foster technology for future low carbon emission power plants over the next decade, and to provide breakthroughs that would greatly reduce greenhouse gas emissions over the longer term. The lead organization for the project is the National Energy Technology Laboratory (NETL), a multi-purpose laboratory operated by the U.S. Department of Energy's (DOE's) Office of Fossil Energy. NETL has a mission to solve the environmental, supply, and reliability constraints of producing and using fossil energy resources to promote a stronger economy and a more secure future for America. The DOE goal for this project is to prove the technical feasibility and potential economic viability of co-production of electricity and hydrogen fuel from coal while capturing and sequestering carbon dioxide (CO₂) and greatly reducing other air emissions. The FutureGen Alliance, Inc., formed to partner with DOE on the FutureGen Project, is a non-profit consortium of some of the largest coal producers and electricity generators in the world. Member companies include Alpha Natural Resources, Anglo American Services Limited, BHP Billiton Energy Coal Inc., China Huaneng Group, CONSOL Energy, E.ON U.S. LLC, Peabody Energy Corporation, Rio Tinto Energy America Services, and Xstrata Coal. Collectively, these member companies have global operations serving customers across several continents, including Asia, Australia, Canada, Continental Europe, the People's Republic of China, South Africa, South America, and the United States.

This document seeks to obtain an Underground Injection Control (UIC) permit from the Illinois Environmental Protection Agency (IEPA) to authorize deep well injection of CO₂ captured from the planned FutureGen Electric and Hydrogen Generating Plant (FutureGen facility), to be located in Coles County, Illinois. The Mattoon Site was initially considered for the FutureGen project after being proposed by a group consisting of the State of Illinois (through the Illinois Department of Commerce and Economic Opportunity), the City of Mattoon, Coles County, and Coles Together (an economic development organization). The proposed FutureGen facility is a prototype electric power and hydrogen generating plant that would employ coal gasification technology integrated with combined-cycle electricity generation to produce approximately 275 megawatts (MW) of electrical output. Low carbon emissions would be achieved by injecting the CO₂ captured from the plant into deep wells for permanent geologic storage (sequestration), resulting in one of the cleanest coal-fueled power system in the world. The FutureGen Site consists of approximately 444 acres (180 hectares) of farmland located approximately 1 mile (1.6 kilometers) northwest of the City of Mattoon, in Coles County, Illinois. The proposed power plant and sequestration site would be located on the same parcel of land. The proposed site is bordered to the northeast by State Route 121, to the north by E. County Rd. 900N, to the west by N. County Rd. 130 E, to the south by E. County Rd. 800N, and to the east by N. County Rd. 200E (Dole Road). A location map is shown in Figure ES-1.

The concept of geologic sequestration is illustrated in Figure ES-2. CO₂ emissions would be separated at the plant, compressed into a (supercritical) liquid state, and delivered to a deep injection well via an underground pipeline. CO₂ would be separated during the second stage of the syngas cleanup process (Section 4.2 of this application document provides more details about the operational areas of the power plant and their functions). The injection well would

Figure ES-1. Location of the FutureGen Site, Coles County, Illinois

deliver the CO₂ stream deep underground to a porous and permeable geologic formation containing only saltwater where it would be permanently stored. To ensure that the CO₂ remains permanently in place, the storage layer is immediately overlain by a low permeability confining layer, or caprock, that prevents upward migration of the CO₂ out of the storage reservoir. The storage reservoir underlying the FutureGen site is the approximately 1,600 ft thick Mt. Simon Sandstone. Overlying the Mt. Simon Formation is the approximately 500 to 700 ft thick low-permeability Eau Claire Formation, consisting primarily of shale and siltstone. Further protection against upward migration is provided by additional low-permeability formations, referred to as secondary seals, which occur above the Eau Claire caprock; these include the Ordovician-age Maquoketa Formation and the Devonian-age New Albany Formation. Low permeability granite rock underlies the Mt. Simon Formation, which will further help contain the injected CO₂ within the Mt. Simon Sandstone. Both the Mt. Simon Formation and the Eau Claire Formation extend over much of the Midwestern United States. Based on data from the Illinois Geological Survey (ISGS), the Mt. Simon is estimated to occur between depths of 7,353 and 8,996 ft (1.39 to 1.7 miles) below ground surface (bgs) at the planned FutureGen site in Coles County. The Eau Claire Formation is estimated to occur between depths of 6,705 and 7,353 ft bgs (1.27 to 1.39 miles). The actual depth interval for the Mt. Simon Formation, as well as the actual depths for the injection interval(s) within the Mt. Simon, will be identified after drilling, geophysical logging, and hydraulic testing are completed on the injection well and/or characterization wells. Section 3.9 of this permit application describes examples of

Figure ES-2. Illustration of Geologic Sequestration

characterization activities (geophysical logging, coring, testing) that may be conducted during drilling. The Mt. Simon Formation does not contain useable (potable) water and thus is not an underground source of drinking water (USDW). In general, useable groundwater in the vicinity of the site is normally obtained from sand and gravel deposits that are contained within the unconsolidated Quaternary-age sands and gravels above bedrock. In the vicinity of the planned site, these materials range in depth from about 25 to 125 ft bgs (see Section 2.7.2). As part of this permit application, a well search was conducted for a 2.5 mile area surrounding the site (i.e., the area extending 2.5 miles in all directions from the site) to identify all water wells near the site; results of this search confirmed that groundwater in the county is normally obtained from sand and gravel aquifers that are contained in unconsolidated material above bedrock (see Section 5).

Two seismic surveys have already been conducted at the FutureGen site to help characterize the geology beneath the site and to evaluate its suitability for injecting and storing CO₂. Most recently in 2008, 29.6 miles of two-dimensional (2D) seismic data were acquired, including 16.6 miles with standard geophones and 13.0 miles using three-component (3C) geophones. The 3C geophones allowed for enhanced analysis because they record reflected shear wave (P-SV) images as well as the compressional wave (P-P) images recorded using the standard geophones. Interpretations of both the P-P and P-SV data provide no evidence that faults are present that cut the Mt. Simon interval and breach its top seal (see Section 2). This is an important finding because it suggests that faults that could act as natural leakage pathways and allow CO₂ to migrate out of the storage reservoir are not present. These findings are consistent with an earlier, less extensive 2D seismic survey that was conducted by the ISGS. Further

interpretation of the 2D seismic data will be possible once the well is drilled and a specific type of geophysical log is run to provide velocity data for the subsurface layers.

In addition to an absence of faults in the vicinity of the site, the well search that was conducted for this application determined that there are no unplugged wells within the 2 ½ mile Area of Review (AOR) that penetrate the injection zone (Mt. Simon Formation) or the Primary Seal (Eau Claire Formation) (Section 5.5.2). The deepest unplugged well located in the AOR is a gas well that has a depth of 3,254 ft, and is located approximately 2.8 miles from the center of the FutureGen site. The deepest plugged well is a dry and abandoned well that is 3,585 ft deep, and approximately 0.7 miles from the injection site. Thus, no wells are present in the vicinity of the site that could be potential pathways for CO₂ migration out of the storage reservoir.

Approximately 1.95 million metric tons [MMT] of CO₂ per year would be sequestered at this site over a 4-year period. This estimate is based on a peak daily production rate of 6,312 metric tons per day (the actual CO₂ production rate may be less depending on coal type and gasifier technology that is employed) and assumes two 28-day plant shutdowns per year. A rate of 6,312 metric tons per day corresponds to an estimated volumetric flow rate of 394,949 ft³/day; the volumetric flow rate is an estimate because the actual density of the product is uncertain (Section 7.3). Reservoir modeling and well design analyses indicate that the CO₂ output from the plant can be injected into a single deep well in the Mt. Simon Formation (Section 3); however, a second (backup) well is planned in the event that a single well cannot accommodate 100% of the plant output of CO₂ or if the primary well needs to be taken out of service for an extended period of time. Preliminary locations for the primary and alternate injection wells have been identified on the plant property; however, these may need to be adjusted to accommodate changes to the plot plan for the power plant. Consequently, an area UIC permit is being requested so that the well can be placed anywhere on the plant property. The injection well will inject CO₂ through tubing (i.e., pipe) that extends to the injection interval(s) within the Mt. Simon Formation. The tubing string will include a packer, positioned near the bottom of the string but above the injection interval, to ensure CO₂ exits the well only at the injection interval(s). Above the packer, the tubing string will be surrounded by annular fluid to help reduce differential pressure across the packer and tubing and to allow a means for monitoring for leaks in the tubing and/or packer. The injection tubing will be 5-1/2 inch outer diameter (O.D.) inside of a 9-5/8 inch O.D. long-string casing that extends to the bottom of the Mt. Simon Formation and is cemented to surface. Both the primary injection well and the alternate well will be located on the FutureGen site property. The expected area of the Mt. Simon Formation containing CO₂ after 4 years of injection at this rate is approximately 306 acres; this is equivalent to a circular area with a radius of 0.39 miles.

Monitoring will be a major component of the geologic sequestration program at the FutureGen site. Numerous types of monitoring will be undertaken, including methods to measure the amount of CO₂ injected, methods to image and track the location of CO₂ within the storage reservoir, methods to detect the potential for CO₂ leakage at the land surface, and methods to monitor for impacts to USDWs. Most types of monitoring will begin before CO₂ injection starts to establish baseline conditions that can be used as a reference for comparison to monitoring data collected after injection begins. In accordance with the UIC permit application instructions, this document describes specific aspects of the monitoring program, including: regular sampling and analysis of the injection fluid (Section 6.1), the program for monitoring the injection process (i.e., injection rate, pressure, temperature) (Section 6.2.1), and the planned USDW monitoring

program (Section 6.2.2 and 6.2.3). It also includes the planned program for monitoring the integrity of the injection wells to ensure that they continue to operate properly and do not leak CO₂ into the zones outside the storage reservoir (Section 6.3) and a plan to monitor the potential for corrosion of key well components such as casing and tubing (Section 6.5). A comprehensive monitoring program is currently being developed that will determine other types of monitoring that will be conducted in addition to the types required by this UIC permit application. Some types of monitoring may require wells to be installed in the Mt. Simon storage reservoir; therefore, a design for injection reservoir monitoring wells has been included in this document (Section 4) in accordance with the IEPA instructions for preparing a UIC permit application. These wells would be similar in depth to the injection wells but would be used to support monitoring rather than for injection.

DOE-sponsored activities under the FutureGen Project would include 4 years of plant operation and CO₂ injection plus 2 years of additional monitoring of the sequestered CO₂ afterwards. After the DOE-sponsored research activities (see Section 2.2) conclude, it is generally expected that the plant would continue to operate for at least 20 to 30 years and possibly up to 50 years. The FutureGen Alliance and DOE will develop a disposition plan that addresses the future management and operation of the power plant after their involvement ends.

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- 5-1. Well Locations (provided in plastic sleeve)

ABBREVIATIONS AND ACRONYMS

Σ	sigma
°C	degree Celsius
°F	degree Fahrenheit
μm	micrometers
13Cr	13% chromium stainless steel tubing
13Cr95	
1D	one-dimensional
2D	two-dimensional
3D	three-dimensional
3C	three-component
AAL	Atlantic Analytical Laboratory
ADM	Archers Daniel Midland
AOR	area of review
APT	annular pressure test
Ar	argon
B	body
B	buttress
Ba	barium
bbl	barrel
Bc	Bearden unit of slurry consistency
bgs	below ground surface
BHCT	bottomhole circulating temperature
BNST	bottomhole static temperature
Br ⁻	bromine
BTC	buttress thread casing and coupling
BTU	British thermal unit
C	carbon
c.u.	capture units
Ca	calcium
CaCl ₂	calcium chloride
CBL	cement bond log
CH ₄	methane
Cl	chlorine
CO	carbon monoxide
CO ₂	carbon dioxide
COS	carbonyl sulfide
cp	centipoises
C _p	specific heat capacity at constant pressure
C _v	specific heat capacity at constant volume

Cp/Cv	specific heat capacity ratio
Cr	Chromium
Cr13%	13% chromium material
Cs	Cesium
CUSUM	combined Shewart-cumulative sum
C _v	specific heat capacity at constant volume
DCS	Distributed Control System
DOE	U.S. Department of Energy
DSI	dipole sonic shear imager
ECS	elemental capture spectroscopy
ESH&Q	Environmental Safety Health & Quality
F ⁻	fluorine
Fe	Iron
FIPS	Federal Information Processing Standards
ft	feet
FutureGen facility	FutureGen Electric and Hydrogen Generating Plant
gal	gallon
Gd	Gadolinium
GFLOW	Groundwater Flow Analytic Element Model
gpd	gallons per day
gpd/ft	gallon per day per foot
gpm	gallon per minute
H	hydrogen
H ₂	hydrogen
H ₂ O	water
H ₂ S	hydrogen sulfide
HCO ₃ ⁻	bicarbonate
HDPE	high density polyethylene
He	helium
HMI	Human Machine Interface
HNBR	hydrogenated nitrile butadiene rubber
HNO ₃	nitric acid
HP	high pressure
I.D.	inner diameter
IEPA	Illinois Environmental Protection Agency
IL DCEO	Illinois Department of Commerce and Economic Development
ILL	Illinois
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey

J	joint
J-55	General purpose pipe manufactured to API specification 5CT minimum yield strength of 55,000
JFE	premium tubing connection, exceeds API class 1 requirements for compression and torque, bending and external pressure resistance
K	hydraulic conductivity
k	intrinsic permeability
K	potassium
K-55	General purpose pipe manufactured to API specification 5CT. Typically used in casing applications.
KCl	potassium chloride
KDHE	Kansas Department of Health & Environment
kg	kilograms
km	kilometer
kPa	kilopascal
kPa/m	kilopascal per meter
ksi	kilopound per square inch
k-s-P	relative permeability-saturation-capillary pressure function
L-80	Pipe manufactured to API specification 5CT. It is a controlled yield strength material with a hardness testing requirement typically used in wells with sour (H ₂ S) environments.
lb	pound
lbf	pound-foot
lb/ft ³	pound per cubic foot
lbm	pound-mass
lbmole	pound-mole
LP	low pressure
LT-4	Annular Fluid Storage Tank Level Transmitter
LT-7	Accumulator Fluid Level Transmitter
LTC	long, round thread casing and coupling
LV-7	Accumulator Tank Fluid Level Control Valve
m	meter
mA	milliampere
MAC	Multi-Arm Caliper
MCr13%	modified Cr13%
MCRWD	Moultrie County Rural Water District
mD	milliDarcies
MDT	Schlumberger's Modular Reservoir Dynamics Tester
Mg	magnesium
mg/L	milligrams per liter
MIJ	metal-to-metal seal integral-joint connector
min	minute
mmBTU	one million British Thermal Units

MMT	million metric ton
Mn	manganese
Mo	molybdenum
MPa	mega Pascal
ms	milliseconds
m/s	meters per second
ms/ft	milliseconds/ft
MSDS	Material Safety Data Sheet
MSL	mean sea level
MT	metric ton
MW	megawatt
N ₂	nitrogen
N-80	General purpose pipe manufactured to API specification 5CT, 80,000 psi minimum yield strength
NACE	National Association of Corrosion Engineers
NaCl	sodium chloride
NE	northeast
NEP	National Energy Policy
NETL	National Energy Technology Laboratory
Ni	nickel
No.	number
NPT	National pipe thread fitting
NW	northwest
O.D.	outer diameter
O ₂	oxygen
ORP	oxidation/reduction potential
P	phosphorus
P&ID	Process and Instrumentation Diagram
Pa	Pascal
PAL-1	Nitrogen Bank 1 Low Pressure Switch
PAL-2	Nitrogen Bank 2 Low Pressure Switch.
Paleosol	ancient topsoil/organic layer
PEF	photoelectric factor
PFD	Process Flow Diagram
pH	
PIC-3	Annular Fluid Pressure Controller
PLC	Programmable Logic Controller
PNC	pulsed neutron capture
PNNL	Pacific Northwest National Laboratory
Poz	Pozzolan
P-P	compressional wave
ppg	pound per gallon
ppm	parts per million

psi	pounds per square inch
P-SV	reflected shear wave
PT-13	Annular Pressure Injection Well
PT-14	CO ₂ Injection Pressure
PT-3	Annular Fluid Expansion Tank Pressure
PT-9	Annular Supply Pressure
PV	plastic viscosity
PVC	polyvinyl chloride
QC	quality control
R	Rankine
RAT	radioactive tracer
Re	Reynolds number
RTDB	real time database
RTU	remote terminal unit
s	second
S	sulfur
SCr13%	super Cr13%
SE	southeast
SEM/EDS	scanning electron microscopy/energy dispersive spectrometer
SFL	spherically focused resistivity
Si	silicon
sks	sacks
SO ₄	sulfate
SOI	silicon on insulator
SR	State Route
STOMP	Subsurface Transport Over Multiple Phases
TBD	to be determined
TD/PBTD	total depth or plugged-back depth
TDAS	Tubular Design and Analysis System
TDS	total dissolved solids
TEG	triethylene glycol
Th	thorium
Ti	titanium
TIC	turbulence inducer
TT-5	Annular Fluid Storage Tank Temperature
TT-8	Annular Fluid Tank Temperature
T _y	point yield point
U	uranium
U.S. EPA	United States Environmental Protection Agency
UCA	Ultrasonic Cement Analyzer
UCI	Ultrasonic Casing Imager

UIC	Underground Injection Control
UNIT	Unit Drilling Company
USDW	underground source of drinking water
USI	Ultrasonic Imager
WMMS	Well Maintenance and Monitoring System
XRD	x-ray diffraction
yr	year
Z	compressibility factor
ZLD	Zero Liquid Discharge

1. GENERAL INFORMATION

This document is organized according to Illinois Environmental Protection Agency's (IEPA's) instructions for preparing an underground injection control (UIC) application. The instructions are contained in a number of forms that, taken together, describe the information required in the UIC permit application. To facilitate regulatory review of the permit application, this document has been divided into sections corresponding to each of the forms, as shown in Table 1-1.

Table 1-1. Organization of this Document Compared to IEPA Instructions for UIC Permit Applications

Section in this Document	IEPA Instructions (Form Number)	Contents
1	Forms 1 and 4	General Information
2	Form 4a	Hydrogeologic Information
3	Form 4b	Injection Well Design, Construction Tests, and Logs
4	Form 4c	Operation Program and Surface Facilities
5	Form 4d	Area of Review
6	Form 4e	Monitoring, Integrity Testing, and Contingency Plan
7	Form 4f	Characteristics, Compatibility, and Pre-Injection Treatment of Injection Fluid
8	Form 4g	Plugging and Abandonment Procedure

Note: The UIC Permit Application also requires a Well Completion Report (Form 4h), which will be prepared and submitted to the IEPA following completion of the drilling of the injection well.

Forms 1 (General Information) and 4 (General UIC Program Requirements) provide general information about the project and are included in this section of the document. Forms 1 and 4 are standalone and, as completed, satisfy the General Information requirements of the UIC application. Unlike Forms 1 and 4, Forms 4a through 4g do not contain information about the project but rather provide a cross-walk between specific information requirements on each form and section numbers in this report where the information can be found. These forms have been included at the front of each section of this document to further facilitate review of the document. (It should be noted that Forms 4a through 4g contain a signature line that has not been completed per direction from the IEPA; instead, the signatures have been provided on Forms 1 and 4 where required.)

X I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (Form 5)
Based on preliminary estimates of maximum air emissions that would be expected from the facility, emissions of one or more criteria pollutants are projected to exceed 100 tons per year during startup operations or during steady-state operations following startup. An air permit will be obtained from the Illinois EPA for this facility.

 X J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (Form 5)

III. NAME OF FACILITY FUTUREGEN Electric Power and Hydrogen Generating Plant

IV. FACILITY INFORMATION

CONTACT (Name and Title) John David Brown, Contracting Officer

PHONE (202) 280-6019 (Carole Plowfield)

MAILING ADDRESS 101 Pennsylvania Avenue N.W.
Suite 600, 6th Floor
Washington, D.C. 20004

LOCATION The FutureGen Site consists of approximately 444 acres (180 hectares) of farmland located approximately 1 mile (1.6 kilometers) northwest of the City of Mattoon, in Coles County, Illinois. The power plant and sequestration site would be located on the same parcel of land. The proposed site is bordered to the northeast by State Route (SR) 121 and a Canadian National Railroad.

COUNTY Coles County

SIC CODES (First) 4911
(Second) _____
(Third) _____
(Fourth) _____

OPERATOR (Name) FutureGen Industrial Alliance, Inc.

Is the operator also the owner? Yes X No _____

STATUS OF OPERATOR

 Federal Public (Specify)
 State X Other (Specify) Private

The FutureGen Alliance, Inc. is structured as a non-profit 501 (c)(3) organization.

OPERATOR PHONE same as above (City/Town) same as above
STREET or PO BOX same as above (State & Zip Code) same as above

V. EXISTING ENVIRONMENTAL PERMITS (There are no existing permits for this facility.)

NPDES N/A
UIC This application requests a UIC Permit
RCRA N/A
OTHER (Specify) N/A
OTHER (Specify) N/A

VI. MAP (Location) A topographic map extending 2.5 miles beyond the property boundary is provided as Figure 1-1. Also an oversized version of this map is provided as an attachment to this document.

VII. NATURE OF BUSINESS (Location) The proposed FutureGen facility is a prototype electric power and hydrogen (H₂) generating plant that would employ coal gasification technology integrated with combined-cycle electricity generation and sequester carbon dioxide (CO₂) emissions. The project would also include an ongoing research program, which would be the principal feature of the prototype plant. The power plant would be a 275-megawatt (MW) output Integrated Gasification Combined-Cycle (IGCC) system. CO₂ capture and geologic storage would occur at a rate of at least 1.1 million tons (1 million metric tons [MMT]) of CO₂ per year.

CERTIFICATION (see instructions)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME & OFFICAL TITLE John David Brown, Contracting Officer PHONE (281) 552-2146

SIGNATURE DATE 10/20/2009

FACILITY OWNER* same as operator PHONE same as operator

SIGNATURE* same as operator DATE same as operator

*required if owner is different than operator

Mattoon, IL – Area of Review

**Figure 1-1. Area of Review Map for the FutureGen Site
(Also attached as an oversized map)**

DRAFT UIC PERMIT FORMS

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION
GENERAL UIC PROGRAM REQUIREMENTS
FORM 4

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGen-INJ-2

I. Well Status
Operating _____ Modification/Conversion _____ Proposed X

II. Type of Permit
Individual:
New X Renewal _____ Emergency _____
Permit Number _____

Area: _____ Number of Wells 2 Name of Field _____
New X Renewal _____ Emergency _____
Permit Number _____

III. Class 1 Non Hazardous

IV. Location of Well (if area permit is requested, give approximate center of area)
A. Township-Range-Section system of the Bureau of Land Management of the US
Government (specify distance, direction and number; circle pertinent direction where
applicable)

4 feet south and 500 feet west of the NE corner of the NW quarter
of the SE quarter of Section 8, Township 12 north, Range 7
east of the 3rd Principal Meridian, Coles County, Illinois.

B. Latitude 39°29'52.46" C. Longitude 88°26'28.60"
(deg. mins. secs.) (deg. mins. secs.)

Closest Municipality Mattoon, Illinois
(Name & County) Coles County

Note: location description corresponds to approximate center of site

V. Land Ownership
(Enter name of the site landowner if not the applicant or operator)

A. Name and Title

B. Phone Number

C. Street, PO Box or Route

D. City or Town

E. State

F. County

G. Zip Code

H. Lease is to terminate on (month, day, year)

VI. Attachments (see instruction sheet)

A. Application Forms (enter form numbers) 1, 4, 4a, 4b, 4c, 4d, 4e, 4f, 4g

- B. Are five (5) copies of the Feasibility Report attached? Yes X No (explain)
- C. Are five (5) copies of the Well Completion Report attached?
Yes No X (explain) *The Well Completion Report is not provided at this time since the injection wells have not yet been drilled. The Well Completion Report will be provided after the wells have been drilled.*
- D. Has the applicant applied to proper local government unit(s) to secure siting approval? Yes No X (explain) *There is no official siting approval required for the injection wells by Coles County or the City of Mattoon. Furthermore, The FutureGen Alliance will secure subsurface storage rights for properties that overlie the portion of the Mt. Simon Formation that will store injected carbon dioxide. Therefore, any injected waste (i.e., carbon dioxide) will be stored in areas controlled by the FutureGen Alliance and as such a formal siting approval is not required per Illinois Environmental Protection Act.*
- E. Are two (2) copies of siting approval attached? Yes No X (explain)
Is a certification of financial responsibility to close, plug and abandon the well(s) attached? Yes No X (explain) *Per the Illinois EPA, certification of financial responsibility will be submitted after the IEPA reviews and approves the well plugging and abandonment cost estimate provided in this UIC permit application.*
- F. If the land is leased, is a copy of the lease agreement attached?
Yes No (explain) *Not applicable; land is owned by applicant.*

VII. Illinois State Legislative Requirements (see instruction sheet)

(Applicable to hazardous waste disposal sites except those publicly-owned sewage works or the disposal or utilization of sludge from publicly-owned sewage works.)

This application is for a non-hazardous UIC permit, therefore, this section does not apply.

- A. Is the proposed or existing hazardous waste disposal site located:
1. Above an active or inactive shaft or tunneled mine or within 2 miles of an active fault in the earth's crust or active quarry doing blasting?
Yes No *Not applicable*
 2. In a county populated with less than 225,000:
 - a. Within 1 1/2 miles of the corporate limits as defined on June 30, 1978 of any municipality?
Yes No *Not applicable*
If "yes", has approval been given by the governing body of the municipality in an official action?
Yes No *Not applicable*
 - b. Within 1000 feet of an existing private well or the existing source of a public water supply measured from the boundary of the actual active permitted site and excluding existing private wells on the property of the permit applicant?
Yes No *Not applicable*

- B. Is the proposed or existing well a pollution control facility? Yes No *Not applicable*
Have the requirements of SB172 been met? Yes No *Not applicable*
Attach a dated copy of the approval by the county board or city council

VIII. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN DAVID BROWN, Contracting Officer (281) 552-2146
Name & Official Title Phone Number
10/20/2009
Signature Date Signed

DRAFT UIC PERMIT FORMS

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION**

FORM 4a - HYDROGEOLOGIC INFORMATION

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

- 2.1 I. Elevation of Land Surface at Well Location
- 2.2 II. Faults, know or suspected within the area of review.
- 2.3 III. Maps and cross sections as required by Section 730.114(a) or 730.134(a).
- 2.4 IV. Injection Zone
 - 2.4.1 A. Geologic name(s) of injection zone.
 - 2.4.2 B. Depth interval of injection zone beneath land surface.
 - 2.4.3 C. Characteristics of injection zone.
 - 2.4.3.1 1. Lithologic description
 - 2.4.3.2 2. Injection zone thickness available to accept waste.
 - 2.4.3.3 3. Fracture pressure at top of injection zone, include source
 - 2.4.3.4 4. Effective porosity, include source
 - 2.4.3.5 5. Intrinsic permeability, include source
 - 2.4.3.6 6. Hydraulic conductivity or permeability, include source
 - 2.4.3.7 7. Storage coefficient, include source
 - 2.4.3.8 8. Seepage velocity (ft/yr) and flow direction of formation water, include source.
 - 2.4.4 D. Characteristics of injection zone formation water.
 - 2.4.4.1 1. Temperature, include source
 - 2.4.4.2 2. Pressure, include source
 - 2.4.4.3 3. Density, include source
 - 2.4.4.4 4. Viscosity, include source
 - 2.4.4.5 5. Total Dissolved Solids, include source
 - 2.4.4.6 6. Potentiometric surface, include source
 - 2.4.5 E. Additional or alternative zones considered for injection
- 2.5 V. Upper Confining Zone
 - 2.5.1 A. Geologic name(s) of confining zone
 - 2.5.2 B. Depth interval of upper confining zone beneath land surface.
 - 2.5.3 C. Characteristics of confining zone
 - 2.5.3.1 1. Lithologic description
 - 2.5.3.2 2. Fracture pressure at depth, include source
 - 2.5.3.3 3. Intrinsic permeability, include source
 - 2.5.3.4 4. Hydraulic conductivity, include source
 - 2.5.3.5 5. Alternative confining zones proposed, include explanation

and depth interval(s)

- 2.6 VI. Lower Confining Zone
 - 2.6.1 A. Geologic name(s) of confining zone
 - 2.6.2 B. Depth interval of lower confining zone beneath land surface
 - 2.6.3 C. Characteristics of confining zone
 - 2.6.3.1 1. Lithologic description
 - 2.6.3.2 2. Fracture pressure at depth, include source
 - 2.6.3.3 3. Intrinsic permeability, include source
 - 2.6.3.4 4. Hydraulic conductivity, include source
 - 2.6.3.5 5. Alternative confining zones proposed, include explanation and depth interval(s)

- 2.7 VII. Overlying Sources of Groundwater at the Site
 - 2.7.1 A. Characteristics of the aquifer immediately overlying the confining zone
 - 2.7.1.1 1. Elevation at top of aquifer, include source
 - 2.7.1.2 2. Potentiometric surface, include source
 - 2.7.1.3 3. Total Dissolved Solids, include source
 - 2.7.1.4 4. Lithology, include source
 - 2.7.1.5 5. Aquifer thickness
 - 2.7.1.6 6. Specific gravity, include source
 - 2.7.2 B. Underground Sources of Drinking Water (USDW)
 - 2.7.2.1 1. Maps and cross sections required by 730.114(a)(4) or 730.134(a)(4)
 - 2.7.2.2 2. Lowest depth of USDW
 - 2.7.2.3 3. Elevation of potentiometric surface of lowest USDW referenced to mean sea level
 - 2.7.2.4 4. Distance to nearest water supply well
 - 2.7.2.5 5. Distance to nearest down gradient water supply well

- 2.8 VIII. Minerals and Hydrocarbons
 - 2.8.1 A. Mineral or natural resources beneath or within 5 miles of the site, include types and depth intervals

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

2. HYDROGEOLOGIC INFORMATION (Form 4a)

2.1 Elevation of Land Surface at Well Location

The elevation of the land surface at the proposed location of the carbon sequestration site is approximately 698 feet (ft) above mean sea level (MSL).

2.2 Faults, Known or Suspected Within the Area of Review

In order to examine the potential for faulting within the area of review (AOR), 29.6 miles of two-dimensional (2D) seismic data were recently acquired and interpreted. Of that survey, 16.6 miles were recorded with standard geophones, while 13.0 miles were recorded using three-component geophones that allowed for recording reflected shear wave (P-SV) images as well as the compressional wave (P-P) images recorded using the standard geophones (Figure 2-1).

The P-SV data are used to confirm the acoustic variability of the Mt. Simon Sandstone and provide an indication of the internal heterogeneity of the sequestration target beyond that provided by P-P data.

Interpretations of both the P-P and P-SV data provide no evidence that faults traverse the Mt. Simon interval and breach its top seal. The P-P images provide the best resolution of the structural configuration of the Eau Claire, Mt. Simon, and Precambrian basement, and are presented here. Figure 2-2, Figure 2-3, and Figure 2-4 depict P-P images for lines 1, 2, and 5, which are located east, south, and north of the FutureGen site, respectively. The figures show that faults have been interpreted in the Precambrian basement beneath the Mt. Simon reservoir, but that the faults do not appear to penetrate the Mt. Simon or the Eau Claire sealing unit.

2.3 Maps and Cross Sections as Required by Section 730.114(a) or 730.134(a)

A location map and two perpendicular cross-sections are presented in Figure 2-5, Figure 2-6, and Figure 2-7. The cross-sections include available log control, geologic units, and lithology from the surface to the lower confining bed below the injection zone. Note that there is no deep well control in the Mattoon area, so no well locations are displayed on the cross-sections. Structure maps of the deeper horizons were provided as digital grids by the Illinois State Geological Survey (ISGS) (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, Sections 1_1_6_struc_resvr, 1_3_2_struc_seal, and 1_3_3_isopach_seal). The structure grids were based on regional mapping performed by the ISGS. The structure grids were incorporated into a solid earth model using the EarthVision® software package, and then used to estimate the tops and thicknesses of the stratigraphy beneath the Mattoon Site, as well as to produce the required maps and cross-sections.

2.4 Injection Zone

The injection zone will be in the Mt. Simon Formation. The Mt. Simon is Upper Cambrian in age, deposited on Precambrian basement rocks and overlain by a thick, impermeable shale referred to as the Eau Claire Formation. The Mt. Simon is regionally extensive in Illinois,

Figure 2-1. Seismic Program Implemented at Mattoon Shown on an Aerial Photograph of the Area
Only vertical geophones were deployed along the four red profiles. Three-component geophones were deployed along the three blue profiles so that P-SV (converted shear wave) images could be made along these lines in addition to the P-P (compressional wave) images provided by vertical-geophone data. The FutureGen site, including the proposed injection site, is located west of Line 1 and between Lines 5 and 2.

Figure 2-2. Line 1. (a) No interpretation. (b) With interpretation. Intra-basement faults are shown in red. Blue horizon = Base of Knox. Green horizon = Top of Mt. Simon. Yellow horizon = Top of Precambrian.

Figure 2-3. Line 2. (a) No interpretation. (b) With interpretation. Intra-basement faults are shown in red. Blue horizon = Base of Knox. Green horizon = Top of Mt. Simon. Yellow horizon = Top of Precambrian.

Figure 2-4. Line 5. (a) No interpretation. (b) With interpretation. Intra-basement faults are shown in red. Blue horizon = Base of Knox. Green horizon = Top of Mt. Simon. Yellow horizon = Top of Precambrian.

varying in thickness from less than 150 meters (m) (500 ft) to more than 780 m (2,600 ft) thick (Morse and Leetaru, 2005). Where present on anticlinal structures, the Mt. Simon Sandstone has been used for numerous gas storage projects in the State of Illinois, with the overlying Eau Claire shale providing an effective seal (Morse and Leetaru, 2005).

Deposition of the Mt. Simon is normally ascribed to tidal environments in shallow marine settings (e.g., Driese et al., 1981; Sargent and Lasemi, 1993). Detailed study of core samples from Manlove Field, a gas storage field, by geologists from the ISGS supported a shallow subtidal depositional environment for the Mt. Simon in east-central Illinois (Morse and Leetaru, 2005).

Figure 2-5. Index Map Showing Location of Perpendicular Cross-Sections in Figures 2-6 and 2-7 that Illustrate the Structural Dips and the Stratigraphic Thickness of Units at the Mattoon Site

2.4.1 Geologic Name(s) of Injection Zone

The injection zone for the sequestration of CO₂ is the Cambrian Mt. Simon Sandstone.

2.4.2 Depth Interval of Injection Zone Beneath Land Surface

The sequestration zone for the Mattoon Site is the Mt. Simon Sandstone, in the interval between 7,353 and 8,996 ft below ground surface (bgs) (Table 2-1). Structure maps of the deeper horizons were provided as ArcGIS digital grids by the ISGS (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, Sections 1_1_6_struc_resvr, 1_3_2_struc_seal, and 1_3_3_isopach_seal). The structure grids were based on regional

Figure 2-6. West-East Structural Cross-Section through the Mattoon Site

Figure 2-7. North-South Structural Cross-Section through the Mattoon Site

Table 2-1. Projected Stratigraphy for the Mattoon Site

Geologic Unit	Elevation (ft)	Depth (ft)	Thickness (ft)	Comment
Quaternary	698	0	100	
Pennsylvanian	598	100	1,792	
Mississippian	-1,194	1,892	1,370	
New Albany Shale	-2,564	3,262	110	Seal
Devonian Silurian	-2,674	3,372	554	
Maquoketa	-3,228	3,926	203	Seal
Trenton	-3,431	4,129	652	
St Peter	-4,083	4,781	77	
Undifferentiated Knox	-4,160	4,858	1,847	
Eau Claire	-6,007	6,705	648	Seal
Mt. Simon	-6,655	7,353	1,643	Reservoir
Precambrian	-8,298	8,996		

mapping performed by the ISGS. The structure grids were incorporated into a solid earth model using the EarthVision® software package, and then used to estimate the tops and thicknesses of the stratigraphy beneath the Mattoon Site.

The primary zone for sequestration will not be the entire thickness of the Mt. Simon, but a relatively coarse-grained arkosic interval that is usually present in the lower portion of the Mt. Simon (Leetaru et al., 2005). Estimated depths for that interval at the Mattoon Site are from 8,698 to 8,958 ft. The actual depth interval for injection will be identified after drilling, geophysical logging, and hydraulic testing of the injection well.

2.4.3 Characteristics of the Injection Zone

2.4.3.1 Lithologic Description

The Mt. Simon Sandstone is primarily a medium- to coarse-grained quartz sandstone with some conglomeratic beds (Leetaru et al., 2005). Zones of fine- to medium-grained feldspathic sandstone are also present. The coarser-grained beds tend to have better sorting and higher porosity, with lower concentrations of feldspar. Cementation in the Mt. Simon Sandstone consists primarily of euhedral quartz overgrowths (Morse and Leetaru, 2005), with euhedral feldspar overgrowths present in the more feldspathic intervals. Diagenetic clay minerals are rare; scanning electron microscope imagery indicated that most of the clay is illite (Morse and Leetaru, 2005).

2.4.3.2 Injection Zone Thickness Available to Accept Waste

Regional mapping of the Mt. Simon Sandstone by the ISGS suggests that the total thickness of the Mt. Simon in the Mattoon area is approximately 1,400 to 1,700 ft (Leetaru et al., 2005, Figure 3-14), although there is no nearby control that has penetrated the Mt. Simon. Estimated thickness of the Mt. Simon based on the structure grids provided by the ISGS (Figure 2-8) is 1,643 ft.

Data from the Weaber-Horn #1 well, the closest well that fully penetrates the Mt. Simon with geophysical porosity logs, indicates that there is a thick high-porosity zone near the base of the formation that would be the primary injection target. The Weaber-Horn #1 well is located approximately 36 miles southwest of the Mattoon Site, in Loudon Oil Field, Fayette County, Illinois. The high-porosity zone in the Weaber-Horn well is approximately 125 ft thick, with average porosity in excess of 20%. Based on regional correlations, Leetaru et al. (2005) described the basal arkose-rich interval that forms this high-porosity zone as varying from 20 to 400 ft in thickness.

Encountering porous zones with significant thickness is highly probable based on the thickness and porosity of high-porosity zones in the Weaber-Horn #1 well, and in Mt. Simon gas storage fields in the Illinois Basin (Morse and Leetaru, 2005).

Because of the lack of nearby well control, detailed hydrologic testing and geophysical well log analysis will be required to identify the thickness and porosity of intervals within the Mt. Simon after drilling the injection well at the Mattoon Site.

2.4.3.3 Fracture Pressure at Top of Injection Zone

Because the actual pressures that would cause new or existing fractures to open are not known, the maximum injection pressure is conservatively set at 85% of the 0.8 pound per square inch per foot (psi/ft) gradient that is required by Illinois regulation. Leetaru et al. (2005, p. 312) stated that fracture stimulation companies commonly use a fracture gradient of 1.0 psi/ft in stimulating wells in the Illinois Basin.

Once the initial Mt. Simon well is drilled at the Mattoon Site, additional subsurface characterization would be conducted. Fracture opening/closure pressures will be determined and would be used in refining the safe injection pressure. Requiring injection pressures to be substantially below the fracture opening and fracture closure pressures greatly lowers the risk of accidental overpressure and induced fracturing of the formation, seal, or cements in wellbores, as well as lowering the risk of opening existing fractures.

2.4.3.4 Effective Porosity

Estimation of porosity for the Mt. Simon at the Mattoon Site is based on analogy with the closest well with geophysical logs through the Mt. Simon, the Humble Oil Weaber-Horn #1 well. There is a sonic porosity log available for that well, but no core or effective porosity measurements. The use of the Weaber-Horn #1 well as an analog appears to be very appropriate as the depth of the top of the Mt. Simon in the Weaber-Horn #1 well is at 7,010 ft bgs, which is similar to the expected depth of the Mt. Simon at the Mattoon Site (7,353 ft).

Porosity data were estimated by the ISGS from the Weaber-Horn #1 sonic log using an assumed matrix velocity of 52.6 milliseconds per foot (ms/ft), corresponding to a consolidated sandstone matrix. The median of the estimated porosities (0.121) indicates that about half of the Mt. Simon porosity is in excess of 12%. The median permeability corresponds to an estimated permeability of approximately 14.5 milliDarcies (mD) using the regression equation described in Section 2.4.3.5. The estimated values of the porosity and permeability of the Mt. Simon suggest that it should be very suitable for injection of CO₂. Figure 2-9 provides a histogram of the porosity calculated from the Weaber-Horn #1 sonic log.

Figure 2-8. Thickness Map of Mt. Simon Sandstone for the Mattoon Area

Analysis of the Hinton No. 7 well, a deep well in the Manlove Gas Storage Field in Champaign County, Illinois, indicates that the porosity did not change substantially with depth in the reservoir (Leetaru et al., 2005). The median porosity found for the upper, middle, and lower zones in the Mt. Simon in that well varied from 9.3 to 10% (Leetaru et al., 2005), similar to that found for the Mt. Simon in the Weaber-Horn #1 well.

After drilling of the injection well at the Mattoon Site, a full suite of geophysical logs (including neutron, density, and sonic logs) will be run through the injection interval. Together with detailed laboratory core analysis, this will allow quantitative evaluation of the porosity of the injection interval in the Mt. Simon.

2.4.3.5 Intrinsic Permeability

There are no direct measurements of intrinsic permeability for the Mt. Simon near the Mattoon Site. In order to estimate the Mt. Simon permeability for the analog well used in Section 2.4.3.4 (Weaber-Horn #1, Loudon Field, Fayette County, Illinois), the ISGS used a regression equation developed from a porosity-permeability database that includes data from throughout the Illinois Basin (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_2_7_perm_resvr_mattoon.doc). The regression equation used a reduced major axis

Figure 2-9. Porosity Estimated from the Sonic Log for the Humble Weaber-Horn #1

algorithm that is appropriate when both variables are subject to error and it is not clear which variable should be considered the dependent variable (Davis, 2002). The equation relates the log of permeability to the porosity, yielding the following equation:

$$\log(k) = 0.268 \text{ porosity } (\phi) - 2.08$$

where permeability (k) is measured in mD and porosity is measured in percent. In order to avoid extrapolation beyond the range of the core permeability data, the maximum permeability retained from the regression equation was set to 2,600 mD. This regression equation was used to transform porosity values from the Mt. Simon in the Weaber-Horn #1 well to estimates of permeability.

Analysis of the estimated permeability for the Mt. Simon in the Weaber-Horn #1 well indicated an average permeability of 384 mD and a median permeability of 14.5 mD. The large magnitude of the average relative to the median permeability shows that the permeability estimates are positively skewed, which is usually the case for permeability data (Davis, 2002). There were approximately 592 ft of Mt. Simon in the Weaber-Horn #1 well with permeability exceeding a cutoff of 20 mD; average and median permeabilities were 839 and 232 mD, respectively, for those high permeability intervals.

As mentioned above, a full suite of geophysical logs (including neutron, density, and sonic logs) will be run through the injection interval. These log data, together with detailed laboratory core analyses and petrophysical analyses, will allow quantitative evaluation of the intrinsic permeability of the injection interval in the Mt. Simon at the Mattoon Site.

2.4.3.6 Hydraulic Conductivity or Permeability

There are no direct measurements of hydraulic conductivity for the Mt. Simon near the Mattoon Site. The hydraulic conductivity was estimated using the intrinsic permeability (k) values

estimated in Section 2.4.3.5, and the following equation for hydraulic conductivity (K) taken from Freeze and Cherry (1979):

$$K = \rho g / \mu$$

where ρ = fluid density, g = gravitational acceleration, and μ = dynamic viscosity.

The fluid density and dynamic viscosity are discussed in Sections 2.4.4.3 and 2.4.4.4, respectively. The gravitational acceleration constant is 9.81 meter per second squared (m/s^2). For the median permeability of the Mt. Simon in the Weaber-Horn #1 well of 14.5 mD, the estimated hydraulic conductivity equals 2.6×10^{-7} meter per second (m/s). For the average permeability of 384 mD, the estimated hydraulic conductivity is 6.9×10^{-6} m/s . For the 592 ft of rock in the Mt. Simon in the Weaber-Horn well with an estimated intrinsic permeability greater than a cutoff of 20 mD (Section 2.4.3.5), the median permeability of 232 mD would correspond to an estimated hydraulic conductivity of 4.2×10^{-6} m/s , while the average permeability of 839 mD would correspond to an estimated hydraulic conductivity of 1.5×10^{-5} m/s .

2.4.3.7 Storage Coefficient

There are no direct measurements of storativity for the Mt. Simon near the Mattoon Site. The storativity was estimated using the following equation for storativity taken from Freeze and Cherry (1979):

$$S = \rho g b (\alpha + n\beta)$$

where ρ = fluid density, g = gravitational acceleration, b = formation thickness, α = rock compressibility, n = porosity and β = fluid compressibility.

The fluid density is discussed in Section 2.4.4.3, the gravitational acceleration constant is 9.81 m/s^2 , and b was set at the estimated thickness of the Mt. Simon in Table 2-1 (1,643 ft). The estimated values of α and β assume a temperature (61.5°C) and pore pressure (24.4 MPa) corresponding to those expected at the center of the Mt. Simon, estimated to be about 8,175 ft bgs. The estimated rock compressibility at that depth, based on linear interpolation from Table 3 of Huang and Rudnicki (2006), is 1.7×10^{-10} Pascal (Pa)⁻¹. The estimated brine compressibility for that same temperature and pressure, based on linear interpolation from Table 6 of Huang and Rudnicki (2006), is equal to 2.1×10^{-9} Pa^{-1} . Calculation of storativity using those input parameters and the equation above yielded an estimate of 0.0023 (dimensionless value).

2.4.3.8 Seepage Velocity (ft/yr) and Flow Direction of Formation Water

The groundwater flow directions and velocity in the Mt. Simon are poorly understood in the Mattoon area due to a lack of deep well control. Bond (1972) suggested that flow in the Mt. Simon in southern Illinois was generally to the south, with a possible discharge area in the Rough Creek Fault Zone in the deeper part of the basin. Estimated flow rates in the Mt. Simon were very slow, on the order of inches per year (Bond, 1972). Bond (1972) indicated that conclusions about flow in the Mt. Simon in the deeper portions of the Illinois Basin were questionable due to the sparseness of the data and the sensitivity of the calculations to interpretations of drill-stem test results.

Gupta and Bair (1997) evaluated flow directions in the Mt. Simon using a three-dimensional (3D) steady state, variable density finite difference flow model for midcontinent basins, including

the eastern portion of the Illinois Basin. Their conceptual flow model (Figure 2-10) suggested that flow in the Mt. Simon was directed away from structural arches and towards the deeper portions of structural basins. Specifically, they suggested that flow directions in eastern Illinois would be towards the deeper portions of the Illinois Basin (Figure 2-10). Velocity vectors provided by numerical modeling that they conducted for the study supported the conceptual flow model, with flow patterns in the Illinois Basin directed westward from the uplifted Cincinnati Arch region towards the center of the Illinois Basin. The results of Gupta and Bair (1997), taken together with the structural map of the Mt. Simon Formation in the Illinois Basin produced by the ISGS (Figure 2-11), generally agree with the conclusions of Bond (1972), suggesting that flow in the Mt. Simon in the Mattoon area should be generally to the south, towards the center of the Illinois Basin.

Figure 2-10. Conceptual Flow Model for the Midcontinent Basins and Arches (from Gupta and Bair, 1997)

Evidence for vertical flow in the Mt. Simon in the northeastern Illinois Basin was presented by Gupta and Bair (1997) (Figure 2-12). A drill stem test in that area suggested upward flow from the Mt. Simon and vertical flow vectors calculated from their numerical modeling supported that conclusion (Gupta and Bair, 1997). Leetaru et al. (2005) suggested that this vertical movement from the Mt. Simon into the Eau Claire would support a hypothesis proposed by Bredehoeft et al. (1963) to explain the high brine concentrations found in many deep basins, including the Illinois Basin. That hypothesis suggests that confining layers like the Eau Claire function as osmotic barriers, allowing water to move upward from the permeable units, but leaving behind the salt. Leetaru et al. (2005) point out that this would be a very slow process, taking place over hundreds of thousands of years.

This summary provides the best information currently available for the expected flow in the Mt. Simon, however, none of it is local and most of it is based on data and modeling from the surrounding region. Extensive hydraulic testing of the Mattoon injection well and monitoring of

Figure 2-11. Regional Structure Map for the Mt. Simon Formation in the Illinois Basin (from Leetaru et al., 2005)

Figure 2-12. Evidence for Vertical Flow in the Mid-continent Basins and Arches (from Gupta and Bair, 1997)

The carbon dioxide (CO₂) plume will be used to provide more quantitative and local information on flow directions and velocity in the Mt. Simon at the Mattoon Site.

2.4.4 Characteristics of Injection Zone Formation Water

2.4.4.1 Temperature

Based on the expected depth interval for the Mt. Simon (Table 2-1), the formation temperature in the Mt. Simon should vary from 57 degrees Celsius (°C) (134 degrees Fahrenheit [°F]) at the top of the formation to 63°C (145 °F) at the base. The estimated temperatures are based on the assumption of a geothermal gradient of 1°F/100 ft from a near-surface datum of 16.7 °C (62°F) at 100 ft (Leetaru et al., 2005, p. 310). These temperatures are well above the threshold required to maintain the injected CO₂ in a supercritical state 31.1°C (87.9°F).

2.4.4.2 Pressure

Pressures within the Mt. Simon Formation should vary from 3,184 psi at the top to 3,895 psi near the base. This assumes a freshwater pressure gradient of 0.433 psi/ft, based on Leetaru et al. (2005) and the estimated elevations of the top and base of the Mt. Simon given in Table 2-1.

2.4.4.3 Density

No nearby data are available for the density of the interstitial water in the Mt. Simon at the Mattoon Site, so the density was estimated using a correlation between relative density and total dissolved solids (TDS) established for the Illinois Basin (Bond, 1972). The estimation of the TDS value for the Mattoon Site is provided in Section 2.4.4.5, where it is estimated to be approximately 130,000 parts per million (ppm), or its equivalent unit, microgram per liter (mg/L) (Figure 2-13). Using the correlation provided in Bond (1972, Figure 9) and a TDS value of 130,000 mg/L, the relative density of the interstitial water in the Mt. Simon is estimated to be 1.09, which corresponds to a density of approximately 1,090 kg/m³.

2.4.4.4 Viscosity

Viscosity data are not available for the formation fluid in the Mt. Simon Sandstone in the area of the Mattoon Site. Assuming that sodium chloride is the dominant salt present in the brine, the viscosity of the formation fluid was estimated using tables published in Kestin et al. (1981). The tables in that publication provide estimates of the viscosity based on the expected salinity, temperature, and pressure of the solution. Based on the temperature, pressure, and salinity estimates provided in Sections 2.4.4.1, 2.4.4.2, and 2.4.4.5, respectively, the estimated viscosity ranges from 5.48×10^{-4} to 6.23×10^{-4} Pa s (5.48×10^{-1} to 6.23×10^{-1} centipoises [cp]). The average of that range, 5.85×10^{-4} Pa s (5.85×10^{-1} centipoises), was used in the calculation of the hydraulic conductivity of the Mt. Simon (Section 2.4.3.6) and the Eau Claire formations (Section 2.5.3.4).

2.4.4.5 Total Dissolved Solids

Salinity data from the Mt. Simon Sandstone are sparse in the Illinois Basin, with the few measurements available confined to natural gas storage fields in which the Mt. Simon is the storage reservoir (Leetaru et al., 2005).

The salinity of the Mt. Simon at the Mattoon Site was estimated from a regional Mt. Simon map published by the ISGS (Leetaru et al., 2005). Based on the location of the Mattoon Site on the

Figure 2-13. Total Dissolved Solids Map for the Mt. Simon Sandstone
 (from Leetaru et al., 2005, Figure 3-32)

map (Figure 2-13), the salinity was estimated to be between 100,000 and 140,000 ppm. A salinity value of 130,000 ppm (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_1_3_ReservoirGeology_Mattoon.doc) was used in modeling the injection and transport of CO₂ at the site (see Section 5.4), and in calculations of the density and viscosity of the injection zone formation water (Sections 2.4.4.3 and 2.4.4.4, respectively).

2.4.4.6 Potentiometric Surface

No penetrations of the Mt. Simon exist in the Mattoon area, so the elevation of the potentiometric surface is not accurately known. A drillstem test from the Weaber-Horn #1 well had a pressure gradient essentially equivalent to a freshwater gradient of 0.433 psi/ft (9.79 kilo-Pascal [kPa]/m) (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_2_3_pressure_resvr_mattoon.doc). Assumption of a freshwater gradient for the Mt. Simon Sandstone at the Mattoon location suggests that the potentiometric surface should be equal to the ground surface.

Hydraulic testing of the initial well at the Mattoon Site will be used to quantify the potentiometric surface of the Mt. Simon.

2.4.5 Additional or Alternative Zones Considered for Injection

No other injection zones are being considered for this project.

2.5 Upper Confining Zone

At least three sealing units should overlie the Mt. Simon Formation at the Mattoon Site. The most important of these is the Cambrian-age Eau Claire Formation, which directly overlies the Mt. Simon and is discussed in detail below. The Ordovician-age Maquoketa Formation and the Devonian-age New Albany Formation provide important secondary seals for the Mt. Simon and are briefly discussed in Section 2.5.3.5.

The Eau Claire Formation provides the primary seal for a large number of gas storage fields in the Illinois Basin (Morse and Leetaru, 2005). It is a regionally extensive unit, and a regional cross-section shows that the Eau Claire should consist of a thick section of shale in the central Illinois basin (e.g., Leetaru et al., 2005, Figure 3-9). The Eau Claire has been extensively studied at Manlove and Herscher gas storage fields, where it provides an effective seal for gas storage in the Mt. Simon (Morse and Leetaru, 2005). The middle section of the Eau Claire, in particular, has been shown to consist of shale beds that provide an effective seal, preventing the upward migration of gas from the Mt. Simon into overlying formations (Morse and Leetaru, 2005).

2.5.1 Geologic Name(s) of Confining Zone

The main confining zone will be the Cambrian-age Eau Claire Formation. An isopach map based on projection of regional well control by the ISGS indicates that the Eau Claire should be approximately 648 ft thick at the Mattoon Site (Figure 2-14).

2.5.2 Depth Interval of Upper Confining Zone Beneath Land Surface

The estimated depth to the top of the Eau Claire Formation is approximately 6,705 ft (Table 2-1), with the base expected at 7,353 ft.

Figure 2-14. Thickness Isopach Map for Eau Claire Shale, the Upper Confining Zone for the Mt. Simon Sandstone at the Mattoon Site

2.5.3 Characteristics of Confining Zone

2.5.3.1 Lithologic Description

The Eau Claire Formation consists of siltstone or shale in the central part of the Illinois basin, and a mixture of dolomite and limestone interbedded with fine-grained clastic rocks in the southern portion of the basin (Leetaru et al., 2005). A cross-section of the Cambrian System in the Illinois basin suggests that the Eau Claire is a thick, regionally extensive shale unit in the central Illinois Basin (Leetaru et al., 2005, Figure 3-9). Shales in the middle portion of the Eau Claire are known to provide an effective seal for many Mt. Simon gas storage fields in Illinois (Morse and Leetaru, 2005).

2.5.3.2 Fracture Pressure at Depth

Because the actual pressures that would cause new or existing fractures to open in the Eau Claire are not known, the maximum injection pressure will be set conservatively, at 85% of the

0.8 psi/ft gradient that is required by Illinois regulation. Leetaru et al. (2005, p. 312) reported that fracture stimulation companies commonly use a fracture gradient of 1.0 psi/ft when stimulating wells in the Illinois Basin.

Once the initial Mt. Simon well is drilled at the Mattoon Site, additional subsurface characterization will be conducted. Fracture opening/closure pressures would be determined and would be used in refining the safe injection pressure. Limiting injection pressures to substantially below the fracture opening and fracture closure pressures greatly lowers the risk of accidental overpressure and induced fracturing of the formation, the seal, or cements in wellbores, as well as lowering the risk of opening existing fractures.

2.5.3.3 Intrinsic Permeability

The permeability of the seal is the main control on slow permeation that can ultimately result in seal failure. The thick primary seal in the Eau Claire is a mix of low permeability lithologies that serves as a competent caprock in 38 natural gas storage reservoirs in Illinois (FutureGen Alliance, 2006). According to the ISGS in material provided to support the Mattoon Environmental Information Volume (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_3_4 Seal_Geolog_Mattoon.doc), the primary Eau Claire seal was studied in detail by Peoples Gas Light and Coke before they installed the Manlove Gas Storage Field, 93.3 km (58 miles) north of the Mattoon site. The Eau Claire at the Manlove field has porosities ranging from less than 1% to as much as 10%, with corresponding vertical permeabilities that range from less than 0.00001 to 0.0005 mD (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_3_4 Seal_Geolog_Mattoon.doc). Extensive pressure testing of the Mt. Simon Formation at Manlove Gas Storage Field indicated that the Eau Claire Formation provided an effective seal for the Mt. Simon (Morse and Leetaru, 2005) and the field has received extensive use as a gas storage facility.

2.5.3.4 Hydraulic Conductivity

There are no direct measurements of hydraulic conductivity for the Eau Claire near the Mattoon Site. The hydraulic conductivity was estimated using the intrinsic permeability (k) values estimated in Section 2.5.3.3, and the equation for hydraulic conductivity in Section 2.4.3.6 of the Eau Claire would be estimated to range from $<1.8 \times 10^{-13}$ to 9.0×10^{-12} m/s.

The fluid density and dynamic viscosity are discussed in Sections 2.4.4.3 and 2.4.4.4, respectively. The gravitational acceleration constant is 9.81 m/s^2 . For the range of intrinsic permeability given in Section 2.5.3.3 (<0.00001 to 0.0005 mD), the hydraulic conductivity of the Eau Claire would be estimated to range from $<1.8 \times 10^{-13}$ to 9.0×10^{-12} m/s.

After drilling of the injection well at the Mattoon Site, a full suite of geophysical logs including neutron, density, and sonic logs will be run through the injection interval. Together with detailed laboratory core analysis and petrophysical analysis, as well as the analysis of drill stem test results, this will allow quantitative evaluation of the porosity, intrinsic permeability, and hydraulic conductivity of the Eau Claire.

2.5.3.5 Alternative Confining Zones Proposed, Include Explanation and Depth Interval(s)

Two secondary shale seals above the Eau Claire provide backup to the main seal (Table 2-1) (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey,

1_3_6 Seal Porosity and Diagenesis_Mattoon.doc). The Devonian-Mississippian-age New Albany Shale at an expected depth of 3,262 ft and the Ordovician-age Maquoketa Shale at an expected depth of 3,926 ft are both dominantly marine shales with vertical permeabilities to water of 0.001 mD or less. The New Albany shale, in particular, is characterized by thick black, organic-rich shale (Leetaru et al., 2005), with vertical permeabilities of less than 0.0001 mD, and is a regional seal to hydrocarbon accumulations (FutureGen Alliance, 2006) as well as several gas storage facilities in Illinois (Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_3_6 Seal Porosity and Diagenesis_Mattoon.doc). The thickness of the New Albany is expected to be about 110 ft at the Mattoon Site, and the thickness of the Maquoketa is expected to be about 200 ft (Table 2-1).

2.6 Lower Confining Zone

The lower confining zone is the Precambrian-age granite basement. Figure 2-15 depicts a structural elevation map for the top of the basement. The CO₂ injection interval will be above the lower confining zone and, due to the buoyancy of the injected CO₂, the fracture pressure, porosity, and permeability of the granite will not impact injection or fluid migration. Modeling results that illustrate the buoyant nature of the CO₂ within the Mt. Simon can be seen in Section 5.4, and indicate that the physical integrity of the lower confining zone should not be an issue during injection of CO₂ at the Mattoon Site.

2.6.1 Geologic Name(s) of Confining Zone

The lower confining zone is the Precambrian-age granite basement.

2.6.2 Depth Interval of Lower Confining Zone Beneath Land Surface

There is no nearby well control to determine the depth of the granite basement. Given the estimate of the top and thickness of the Mt. Simon, the granite basement is expected to be encountered at a depth of approximately 8,996 ft (Table 2-1). The Precambrian-age basement will constitute the base of sediment at the Mattoon Site, so there is no thickness given for the lower confining zone.

2.6.3 Characteristics of Confining Zone

2.6.3.1 Lithologic Description

The Precambrian basement in the Illinois Basin consists of rhyolitic and dacitic volcanic deposits and chemically similar shallow granitic plutons that formed between 1.42 and 1.5 billion years ago (Bickford et al., 1986).

2.6.3.2 Fracture Pressure at Depth

The authors know of no data on the fracture pressure of granites in Illinois. Given the buoyant nature of the CO₂ plume, the fracture pressure of the granite should not have any effect on migration of the CO₂.

2.6.3.3 Intrinsic Permeability

The authors know of no data on the intrinsic permeability of granites in Illinois. Although granites generally have very low effective porosity and permeability (Domenico and Schwartz, 1990), the porosity and permeability will vary depending on the grain size, mineralogy, and degree of weathering and fracturing of the granite. No data are available for those

Figure 2-15. Structural Contour Map for the Elevation of the Top of the Precambrian-Age Granitic Basement, Relative to Mean Sea Level

characteristics of the Precambrian basement in the Mattoon area, so the intrinsic permeability of the lower confining unit could not be estimated.

2.6.3.4 Hydraulic Conductivity

The authors know of no data on the hydraulic conductivity of granites in Illinois. Granites generally have extremely low hydraulic conductivity, varying from 3×10^{-14} m/s for unfractured igneous rocks to 3×10^{-4} m/s for fractured igneous rocks (Domenico and Schwartz, 1990, Table 3-2, p. 65). The hydraulic conductivity will depend on the permeability of the granite. As noted in Section 2.6.3.3, the intrinsic permeability will vary depending on the grain size, mineralogy, and degree of fracturing in the granite (Domenico and Schwartz, 1990). No data

are available for those characteristics of the Precambrian basement in the Mattoon area, so the hydraulic conductivity of the lower confining unit could not be estimated.

2.6.3.5 Alternative Confining Zones Proposed

There are no alternative confining zones expected below the Precambrian-age granitic basement. Given the silica-rich nature of the basement in the eastern granite-rhyolite province, Bickford et al. (1986) suggest that the granitic rocks are sitting atop older Proterozoic crust that would also be expected to have a granitic composition.

2.7 Overlying Sources of Groundwater at the Site

2.7.1 Characteristics of the Aquifer Immediately Overlying the Confining Zone

At the Mattoon site, the confining zone immediately above the Mt. Simon Sandstone is the Eau Claire shale. Throughout the northern half of Illinois, the geologic unit overlying the Eau Claire shale is the Ironton and Galesville sandstone. However, based on a published IEPA isopach map (Figure 2-16), the Ironton/Galesville is most likely absent in the Mattoon area (Student et al., 1981). In the absence of the Ironton/Galesville, the geologic unit immediately overlying the Eau Claire shale at the Mattoon site would be the Cambrian-age Franconia formation, which underlies all of Illinois and is estimated to be 300 ft thick at the site. The Franconia formation generally consists of glauconitic argillaceous shaly-sandstone and dolomite, and is a water-bearing formation. An isopach map of the estimated thickness of the Franconia formation in Illinois is included and shown in Figure 2-17 (Student et al., 1981). This map also illustrates the trend in TDS that typically occurs in the Franconia formation. In the southern half of the state (including Mattoon), the TDS is typically >10,000 mg/L.

2.7.1.1 Elevation at Top of Aquifer

The top of the Franconia Formation has an estimated elevation of 5,707 ft below MSL at the Mattoon site location. This estimated elevation is based on a set of formation structure contour maps that were provided by the ISGS, and input by Battelle into the EarthVision® software model. The output data from the model were used to estimate the elevations of various stratigraphic units, referenced from a point at the center of the site. The elevation of the top of the Franconia Formation was then estimated as shown in Table 2-2 (based on the EarthVision® output data and the thickness map in Figure 2-17).

Table 2-2. Estimated Elevation and Thickness – Franconia Formation

Estimated Thickness (ft)	Estimated Bottom Elevation (ft below MSL)	Estimated Top Elevation (ft below MSL)
300	6,007	5,707

2.7.1.2 Potentiometric Surface

Insufficient data are available regarding the potentiometric surface of the Franconia Formation, as there are very few wells that penetrate this formation in the region around the site. An estimate of the potentiometric surface of the Midwest Bedrock Aquigroup (which includes the water-bearing units immediately above the Eau Claire shale) is contained in the ISGS report “Geology, Hydrology, and Water Quality of the Cambrian and Ordovician Systems in Northern

**Figure 2-16. Thickness Map of the Ironton/Galesville formation in Illinois
(Student et al., 1981)**

Illinois” (ISGS, 1985, pg 68, Figure 26). This publication includes limited data for the central portion of Illinois, but does include an estimated potentiometric surface level of 500 ft MSL for the Midwest Bedrock Aquigroup in northwestern Coles County.

2.7.1.3 Total Dissolved Solids

Limited information is available regarding the TDS concentrations in the groundwater in the Franconia Formation at the Mattoon site. The closest data on TDS in the Franconia comes from a well in Douglas County to the north of the site. This well was installed into the Franconia Formation to a depth of 3,095 ft and included a brine analysis with TDS listed as 27,000 ppm (Student et al., 1981).

2.7.1.4 Lithology

The Franconia Formation generally consists of glauconitic, argillaceous sandstone and dolomite. From north to south in Illinois, the lower part of the formation becomes increasingly shaly and the upper part grades to silty and sandy dolomite. In central and southern Illinois, the glauconitic sandstone is absent, and the silty, shaly sandstone is overlain directly by relatively pure dolomite (Willman et al., 1975).

2.7.1.5 Aquifer Thickness

The Franconia Formation is approximately 300 ft thick underneath the site (Willman et al., 1975). The Franconia Formation occurs at a depth of approximately 6,405 to 6,705 ft bgs, and an elevation of approximately -5707 to -6007 ft MSL (refer to Table 2-1, using an estimated grade elevation for the center of the Mattoon site of 698 ft MSL).

2.7.1.6 Specific Gravity

The authors know of no information regarding the specific gravity of the Franconia Formation.

2.7.2 Underground Sources of Drinking Water

Groundwater resources in the area immediately surrounding and including the proposed power plant site are available in limited quantities based on information obtained from the ISGS’s Water Well Database, and referenced in Section 6 of the “Mattoon Site Environmental Volume” (FutureGen Alliance, Inc., 2006). In general, groundwater in the vicinity of Mattoon is normally obtained from sand and gravel deposits that are contained within the unconsolidated Quaternary-age material above bedrock. The sand and gravel deposits for the vicinity of the proposed power plant site range in depth from about 25 to 125 ft bgs. The sand and gravel deposits are sufficient groundwater sources when small or large diameter drilled wells are constructed for domestic and farm uses. Bedrock is indicated by a boring on the southwest border of the site to be approximately 90 ft below the surface.

According to Allen Wehrmann, Senior Hydrologist and Director for the Center for Groundwater Science of the Illinois State Water Survey (ISWS) in 2006, there is no identified major shallow aquifer present at the proposed site. The shallow groundwater at the site exists in sporadic sand and gravel lenses, or discontinuous layers of sand. There were no specific data available on the recharge capacity and transmissivity of the sand and gravel deposits located in the vicinity of the proposed power plant site. Mr. Wehrmann stated that the only transmissivity data the ISWS had available for the area was for three public wells located in Cooks Mills, Illinois and one public well located in Mattoon, Illinois. Cooks Mills is located approximately 5 miles north of

the proposed power plant site, and in, 1979, transmissivity values were obtained for each well. The transmissivity values of the three wells were 7,920 gallons per day per foot (gpd/ft), 13,200 gpd/ft, and 12,160 gpd/ft with well depths of 33 ft, 30 ft, and 28 ft, respectively. The public well in Mattoon was located approximately four miles southeast of the proposed power plant site, and in 1939 the transmissivity was obtained. The transmissivity of the well was 10,000 gpd/ft, with a total well depth of 56 ft. Recharge capacity information for the proposed power plant site and local vicinity was unavailable. However, based on a potential yield of 50,000 gallons (gals) per day per square mile, Mr. Wehrmann estimated that the vicinity of the proposed power plant site might exhibit a recharge capacity equal to or less than approximately one inch per year. According to Bill Wallace of the Moultrie County Rural Water District, public water supply is provided to the proposed site area by Moultrie County Rural Water District (MCRWD). The water service extends to County Road 200E by means of a 4 inch water main. MCRWD obtains its water supply from wells that are owned by the City of Sullivan, Illinois, which is located approximately 12 miles northwest of the proposed plant site. The area in the vicinity of the proposed power plant site does not consume significant quantities of water from MCRWD.

2.7.2.1 Maps and Cross Sections Required by 730.114(a)(4) or 730.134(a)(4)

Refer to Figure 2-6 and Figure 2-7, which include the deep stratigraphy that separates the upper Quaternary deposits from the deeper injection zone, and to Figure 2-18 and Figure 2-19 depicting cross-sections through the unconsolidated deposits which constitute the lowest underground source of drinking water (USDW).

2.7.2.2 Lowest Depth of Underground Source of Drinking Water

Public water supplies in Coles County are generally obtained from surface water, with a small amount obtained from groundwater. Groundwater in the county is normally obtained from sand and gravel aquifers that are contained in unconsolidated material above bedrock. The sand and gravel deposits in the vicinity of the proposed power plant site range in depth from approximately 25 to 125 ft bgs (ISGS Water Well Database).

The FutureGen Alliance Environmental Impact Statement states that potable water is not likely to be found below 175 ft at the site. Water well data from private wells in the vicinity of the site, provided by the ISGS, confirms that any water tested below 175 ft was found to be too mineralized for potable use. Therefore, the lowest USDW is considered to be the unconsolidated deposits of sand and gravel above bedrock. The ISGS water well database for a well located approximately 3 miles to the northeast of the site (well log # 1202 9017 3200, drilled in 1962) indicated a depth to bedrock of 105 ft bgs at that location.

2.7.2.3 Elevation of Potentiometric Surface of Lowest USDW Referenced to Mean Sea Level

The review of available ISGS water well log data within the AOR indicates that the well data are highly variable and the manner of logging field data was inconsistent. Many of the well logs for the wells screened in the lowest USDW did not list a static water level. The water level data that were obtained from the well logs was highly variable when comparing wells screened within the same approximate range of depth. For those wells screening groundwater between 100 to 175 ft bgs, reported static water levels in the lowest USDW ranged from 16 to 35 ft bgs from five wells (approximate elevation 682 to 663 ft MSL). For those wells screening groundwater at less

than 100 ft bgs, reported static water levels in the lowest USDW ranged from approximately 9 to 26 ft bgs from seven wells (approximate elevation 689 to 672 ft MSL).

Observations from a review of three ISGS water-well database logs, for wells located adjacent to the south and east of the site, indicated the following:

- Well 1 adjacent to the south of the site (database # 1202 9226 3500):
 - Total depth: 89 ft below grade;
 - Best determination of stratigraphy from driller log: clay till down to 65 ft; sand and gravel 65 to 89+ ft; water-bearing sand and gravel from 79 to 89 ft. Static water level 19 ft below casing top (this indicates a confined sand layer, with a usable quantity of water available in the unit). Well was pumped for 3 hr at 6 gallons per minute (gpm) - pumping level 32 ft.
- Well 2 is adjacent to the east/north of the site (database # 1202 9011 0700):
 - Total depth: 85 ft below grade;
 - Best determination of stratigraphy from driller log: clay till down to 77 ft; water-bearing sand 77 to 85+ ft. Static water level is 26 ft below casing top (this indicates a confined sand layer). Could have potential for a usable quantity of water - well was pumped down to a pumping level of 60 ft, but no pumping rate or duration of pumping was noted.
- Well 3 is adjacent to the east/south of the site (database # 1202 9224 7500):
 - Total depth: 38 ft below grade;
 - Best determination of stratigraphy from driller log: various thin stringers of sand and clay; water-bearing gray sand from 19 to 20 ft.

The ISGS and Patrick Engineering, Inc., performed seven shallow test soil borings within and bordering the site in September and November of 2006. These borings were designated B1M, B2M, B3M, B4M, B5M, B6M, and B7M. The depth of the borings ranged from 30 to 90 ft bgs, and the depth to first saturated soil samples ranged from approximately 8.0 to 14.6 ft bgs. No wells were installed in these borings and no direct groundwater level information was available on these logs. Bedrock was encountered (at 83.6 ft) only in boring B1M, which extended to a total depth of 90 ft bgs.

The ISGS well logs for nearby wells appear to support what was observed in on-site borings B2M and B5M – that there is a relatively deep layer of confined water-bearing sand within the glacial deposits which lie above the bedrock surface. However, this layer may not be continuous throughout the entire site (as noted absent at the same elevation in ISGS log for B1M). It was also observed that there is a deep layer of thin organic topsoil noted in the on-site boring logs at an approximate elevation of 640 ft MSL. It occurs at approximately the same elevation in all three of the deepest on-site borings – B1M, B2M, and B5M. This is a paleosol (ancient topsoil/organic layer) that can be used as a reference marker bed. In some locations on site, there is water-bearing sand deposited directly on top of the paleosol (B2M, B5M), and in other locations there is till deposited directly on top of the paleosol (B1M - the ISGS descriptive log for B1M appears to indicate a till deposit on top of the paleosol). These observations confirm the inconsistent nature of glacial deposits at the site, and the lack of a continuous deep

aquifer layer throughout the entire site. Also, the shallower water-bearing sands that do occur appear to be discontinuous (pinching-out) in some places (B6M). The long distance between available boring data makes it difficult to confirm continuity in the layers within the site. Refer to shallow cross sections A-A' and B-B' (Figure 2-18 and Figure 2-19, respectively). These cross-sections illustrate the available on-site boring data in the form of boring diagrams located at various locations and elevations within the site. As indicated, the borings were widely spaced.

The variability of data prohibits development of a potentiometric surface map for groundwater within the USDW. However, an estimated regional groundwater table contour map was previously prepared (by E. Mehnert, Sr. Geohydrologist with the ISGS for the Mattoon EIV submittal) for both the Tuscola and Mattoon injection well candidate sites, using Groundwater Flow Analytic Element Model (GFLOW) modeling software (Haitjema Software, Bloomington, IN). The input data were adopted from a calibrated model for a watershed in northern Champaign County (Mehnert et al., 2006), which is approximately 30 miles (48 km) north of Mattoon. The contour map of the water table was estimated with the following inputs:

- Hydraulic conductivity = 37.5 ft/day (11.4 m/day)
- Aquifer thickness = 50 ft (15.2 m)
- Recharge = 0.00091 foot/day (2.8×10^{-4} m/day)

Figure 2-21 shows the estimated contours for the GFLOW water table map. This contour map indicates that shallow groundwater beneath the Mattoon site flows north-northwest toward Whitley Creek. The GFLOW water table map is a regional estimate of shallow groundwater flow direction. As previously indicated, direct field data are not available to develop a localized contour map of the shallow groundwater at the Mattoon site.

2.7.2.4 Distance to Nearest Water Supply Well

Based on the ISGS water well database, there is a water supply well on the proposed site of the FutureGen power plant. It is a private well listed as a water supply well and has a depth of 113 ft (ISGS database well #1202 9236 5300). This well will be properly abandoned since the occupant will be relocated. Figure 2-21 shows three additional wells on site. These are not water wells but represent the three geotechnical borings conducted by ISGS and Patrick Engineering in September 2006. Based on a potable water survey of residences within a one mile radius of the site, the closest active water supply well to the site is located approximately one mile to the west of the site, servicing the Wetzel residence. The property is shown on Figure 2-21 as are all the residences within a one mile radius from the site. With the exception of the Wetzel residence, potable water is supplied to these residences by the City of Mattoon or by the MCRPWD.

2.7.2.5 Distance to Nearest Downgradient Water Supply Well

Since a hydrogeological study has not been performed at the site, the local groundwater gradient is not yet known with accuracy. However, the regional GFLOW water table map shown in Figure 2-21 indicates shallow groundwater flow to the northwest. The nearest downgradient water supply well is approximately 2.4 miles northwest of the site boundary, located within Township 13N, Range 5E, Section 31 (ISGS database well #1202 9016 1100). This well was drilled to a depth of 150 ft bgs, and encountered bedrock at a depth of 90 ft bgs. Other wells

Figure 2-18. Mattoon Cross Section A-A'

Figure 2-19. Mattoon Cross Section B-B'

Figure 2-20. GFLOW Contour Map of the Estimated Water Table Beneath the Mattoon Injection Site (Dashed blue lines represent the water table, 10-foot, [3.05 m] contour interval.)

located downgradient from the site, but closer than well #1202 9016 1100, include well #1202 9239 3200, #1202 9239 3300 and seven other wells. These wells are all engineering test holes or dry holes.

2.8 Minerals and Hydrocarbons

2.8.1 Mineral or Natural Resources Beneath or Within 5 miles of the Site

2.8.1.1 Stone, Sand, Clay and Gravel

Limestone beds, 15 to 25 ft (4.6 to 7.6 m) thick, are sporadically present in the rocks of the Pennsylvanian System in central Illinois. In Coles County, the highest potential for shallow limestone aggregates occurs in the southeastern part of the county. The nearest quarry to the proposed plant site is more than 15 miles (24.1 km) to the east, about 2.5 miles (4.0 km) northeast of Charleston. Elsewhere, especially in the Mattoon area and around the proposed plant site, limestone is either absent or too thin or deep to be economically minable. Some areas, starting about 5 miles (8.0 km) to the south of the plant site, have a higher potential for sand and gravel aggregate resources. This mostly includes T11N-R7E and some in townships to the east and west. An active sand and gravel pit (as of 2004) about 8 miles (12.9 km) south of the proposed plant site has been extracting sand and gravel aggregate in Section 19, 11N, 7E. Other areas with potential shallow sand and gravel resources lie in some areas in T13N, R7E and T13N and R8E. These resources have not been evaluated and their thickness and distribution are not known. To be economical, sand and gravel deposits need to be at least 10 ft (3.0 m) thick with a ratio of deposit to overburden thickness of about 2:1. Movable deposits should also be at least 20 acres (0.08 km²) in area. These restrictions limit most areas for exploration. Clay-rich materials that are useful for pond liners, landfill liners and covers, and

similarly engineered barriers and berms can be obtained from some of the Quaternary units that are near the surface. This same clay and bedrock shale could be used to make ceramic products; however, the Quaternary materials are generally not the materials of choice in Illinois, and new ventures of this type require an additional source of profitability, such as a low-cost source of natural gas.

2.8.1.2 Coal

Although coal is present throughout the area, relatively small areas of Springfield and Herrin Coal are considered available for mining in the local area. “Available” coal means coal that is not known to have geological, technological, or land-use restrictions that would negatively impact the economics or safety of mining. The resources are not necessarily economically minable at the present time, but they are expected to have mining conditions comparable with those currently being mined in the state. The Springfield, Herrin, and Danville Coals, where available for mining, average approximately 3.5 to 5.5 ft (1.07 to 1.68 m) thick in this area (Treworgy et al., 1999, 2000; Korose et al., 2002). Overall, the thickness of the coals is quite variable in this area, and the coals are thin (less than 2.5 ft [0.76 m] thick) and/or eroded outside the areas classified as available for mining. The Herrin and Springfield Coals average 1,000 to 1,100 ft (305 to 335 m) deep near the Mattoon site, and the Danville Coal averages 900 to 1,000 ft (274 to 305 m) deep.

The nearest active coal mining is approximately 50 miles (80.5 km) to the northeast, in Vermilion County, Illinois, where the Black Beauty Coal Company operates the Riola and Vermilion Grove Mines. These mines are in the Herrin Coal, at an average depth of 250 ft (76 m) and seam thickness of 5 to 6 ft (1.52 to 1.83 m). Production for each mine was approximately one million short tons in 2004 (Illinois Department of Commerce and Economic Development [IL DCEO], 2004).

The nearest historical coal mining on record at the ISGS was a single shaft in the center of the City of Mattoon, about 3 miles (4.8 km) to the southeast. This mine was operated by the Mattoon Mining Co., from 1882 to 1888, and was reportedly 904 ft (276 m) deep. In 1883, it had reportedly mined 1 acre (0.004 km²) of coal, 3.5 ft (1.067 m) thick, likely in the Danville Coal. Based on the total production of the mine listed as 198,923 short tons, it is estimated that an area of approximately 35 acres (0.14 km²) has been undermined at this location.

There is a cluster of drift and slope mine shafts approximately 10 miles (16.1 km) south-southwest of the Mattoon site, in Shelby County. Not much is known about these local mines, other than the majority of them pre-date the 1940s.

2.8.1.3 Oil and Gas

Located east of the proposed Mattoon Plant/Injection site is the Mattoon Field, a mature, 22.7 million barrel oil field with minor gas production. Primary reservoirs are Mississippian sandstones that range in depth from 1,750 to 2,950 ft (533 to 899 m) along the compound anticlinal structure. Scattered minor gas production from Devonian sandstones at a depth of less than 3,200 ft (975 m) has been established. The western-most producing wells were located approximately 1.5 miles (2.4 km) to the east of the plant site although most of the wells throughout the field have been plugged and abandoned. Scattered active wells and associated production facilities remain within the 12 square mile, north-south trending field.

The next petroleum production in proximity to the Mattoon plant/injection site is Gays Field. The field is 4.5 miles (7.2 km) to the west-southwest and is 200 acres (0.81 km²) in size. Production has been established from Mississippian and Devonian sandstones at depths ranging from 1,970 to 3,200 ft (975 m). Records show that five wells are still active and about 154,000 barrels of oil have been produced from the field.

2.9 Attachments

Map of mineral resources: Mattoon_Geology.pdf

2.10 References

Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, Sections 1_1_6_struc_resvr, 1_3_2_struc_seal, and 1_3_3_isopach_seal.

Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_2_7_perm_resvr_mattoon.doc.

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

FORM 4b - INJECTION WELL DESIGN, CONSTRUCTION TESTS and LOGS

USEPA ID NUMBER _not applicable

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Location in Application

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- ## Certification

Phone Number

Date Signed _____

19 April 2010

3. INJECTION WELL DESIGN, CONSTRUCTION TESTS, AND LOGS (Form 4b)

3.1 Well Depth

The injection well(s) have been designed to inject CO₂ into the Mt. Simon Formation. As discussed in Section 2, the depth of the Mt. Simon Formation at the Mattoon site is estimated to be between 7,353 and 8,996 ft bgs (1,643 ft thick). CO₂ will likely be injected into only a portion of the estimated 1,643-ft thick section of Mt. Simon present at this site. A relatively coarse-grained arkosic interval that is usually present in the lower portion of the Mt. Simon (Leetaru et al., 2005) is a potentially attractive interval from an injectivity standpoint. At the Mattoon site, the arkosic interval is estimated to extend from 8,698 ft bgs to 8,958 ft bgs (260 ft thick). The exact injection interval(s) will be determined after the well is drilled and characterized (i.e., geophysical logging, core analysis, hydraulic testing).

For the purpose of designing the CO₂ injection well(s), it was assumed that the Mt. Simon Formation is present between depths of 7,353 and 8,996 ft bgs and the injection well(s) extend 100 ft below the base of the Mt. Simon. Therefore, the depth of the well(s) is estimated to be 9,096 ft bgs. The exact depth of the well(s) may differ from this estimate as it will depend on the results of the geologic characterization data obtained during drilling.

3.2 Anticipated Fracturing Pressure

As presented in Section 2.4.3.3, the actual fracture pressures in the Mt. Simon Formation that would cause new or existing fractures to open are not known with certainty. Leetaru et al. (2005, p. 312) stated that fracture stimulation companies commonly use a fracture gradient of 1.0 psi/ft in stimulating wells in the Illinois Basin. Fracture pressure gradients range from 0.8 to 0.95 psi/ft for reservoirs between 3,000 and 10,000 ft bgs (Howard and Fast, 1970).

Once the initial Mt. Simon well is drilled at the Mattoon Site, additional subsurface characterization activities will be conducted, including hydraulic testing (e.g., step-rate test) to determine the fracture pressure of the injection interval. The fracture opening/closure pressures determined from site-specific testing will be used to establish the safe injection pressure (i.e., maximum injection pressure).

3.3 Static Water Level and Type of Fluid

As discussed in Section 2.4.4, fluids in the Mt. Simon Formation have a salinity (TDS) range between 100,000 and 140,000 ppm, although salinity data from the Mt. Simon Sandstone are sparse in the Illinois Basin, with the few measurements available confined to natural gas storage fields in which the Mt. Simon is the storage reservoir (Leetaru et al., 2005). The stated salinity values were estimated from a regional Mt. Simon map published by the ISGS (Leetaru et al., 2005). A TDS value of 130,000 ppm was used to model the injection and transport of CO₂ at the site. Using the correlation provided in Bond (1972, Figure 9) and a TDS value of 130,000 mg/L, the relative density (specific gravity) of the interstitial fluid in the Mt. Simon is estimated to be 1.09; this corresponds to a density of approximately 68.02 pound per cubic foot (lb/ft³) (1,090 kg/m³). Based on the expected depth interval for the Mt. Simon (Table 2-1), the formation temperature in the Mt. Simon should vary from 134°F (57°C) at the top of the formation to 145°F

(63°C) at the base. The estimated temperatures are based on the assumption of a geothermal gradient of 1°F/100 ft from a near-surface datum of 62°F at 100 ft (Leetaru et al., 2005, p. 310). These temperatures are well above the threshold temperature (87.9°F, 31.1°C) required to maintain the injected CO₂ in a supercritical state.

No penetrations of the Mt. Simon exist in the Mattoon area, so the elevation of the potentiometric surface is not accurately known. A drillstem test (of the Mt. Simon Formation) from the Weaber-Horn #1 well had a pressure gradient essentially equivalent to a freshwater gradient of 0.433 psi/ft (9.79 kilopascal per meter [kPa/m]) (Appendix, Mattoon Subsurface Data package submitted by ISGS, 1_2_3_pressure_resvr_mattoon.doc). At this gradient, the fluid pressure at the top of the Mt. Simon Formation (estimated depth 7,353 ft bgs) would be 3,184 psi. Under these conditions, the static fluid level would occur at/near ground surface ft bgs (i.e., a pressure of 0.433 psi is sufficient to lift a column of freshwater [density = 62.4 lb/ft³] a distance of 1 ft). For fluids such as those in the Mt. Simon Formation with a density greater than freshwater, the static water level will be lower than the freshwater head assuming the same formation pressure. For example, assuming a reservoir pressure of 3,184 psi at the top of the Mt. Simon Formation (depth 7,353 ft bgs) and a fluid with specific gravity of 1.09 (68.02 lb/ft³), the static water level would be approximately 615 ft bgs. Hydraulic testing of the initial well at the Mattoon Site will be used to verify the site-specific potentiometric surface of the Mt. Simon.

3.4 Expected Service Life of Well

The planned duration of the FutureGen demonstration phase is 4 years after regular CO₂ injection begins. The injection well(s) have been designed to have a life expectancy that exceeds this period; however, the exact life expectancy is not known. The use of corrosion resistant alloy materials for selected well components (e.g., casing, packer, wellhead, cement) will likely result in a life expectancy for the injection well(s) that is far in excess of 4 years. Sections 7.5.4.1 through 7.5.4.7 discuss the compatibility of well materials (injection tubing, casing, cement, packer, wellhead) and the CO₂ injectate, including estimates of corrosion rates for well tubulars composed of different types of steel. These analyses suggest that carbon steel well tubulars (e.g., casing, tubing) will be sufficient for the expected lifetime of the project. However, corrosion resistant alloys will provide significantly longer service, depending on the alloy. It should be noted that selected well components, such as injection tubing, packers, and wellheads, can be replaced to extend the service life of the well. The use of CO₂ resistant cement across the injection reservoir will also help extend the service life of the well by ensuring that cement corrosion is significantly retarded. Cement corrosion can lead to the formation of channels adjacent to the wellbore that could allow leakage of the injected CO₂ out of the target injection interval.

Another factor affecting the service life of the well is the pressure buildup in the injection reservoir. After a period of time, it may no longer be possible to continue injection if reservoir pressure increases to the point where the injection pressures are required to exceed the maximum allowable injection pressure. CO₂ fate and transport modeling performed for this permit application (see Section 5.4) suggests that CO₂ injection can continue for at least 27 years at the design injection rate of ~1.95 million metric ton (MMT)/yr (this rate is based on an instantaneous injection rate of 0.006312 MMT/day with two 28-day plant shutdowns per year); therefore, pressure buildup is not likely to limit the service life of the well. Nevertheless,

pressure fall-off tests will be conducted periodically during the active injection phase to monitor pressure buildup in the injection reservoir.

3.5 Injection Well Completion

The injection well(s) will be fully cased across the Mt. Simon Formation (i.e., not an open-hole completion) and the casing will be cemented to ground surface with appropriate types of cement, including CO₂ resistant cement extending, at minimum, across the Mt. Simon Formation. The casing will be perforated across selected intervals in the Mt. Simon Formation having properties that are conducive for injection.

3.6 Schematic or Other Appropriate Drawing of the Surface and Subsurface Construction Details of the Well

The injection well(s) will include the following casing strings: a 30-inch diameter conductor string set a depth of approximately 100 ft bgs; a 20-inch diameter surface string set a depth of approximately 250 to 500 ft bgs; a 13-3/8 inch diameter intermediate string set a depth of approximately 5,000 to 7,000 ft bgs; and a 9-5/8 inch diameter deep (injection) string set an approximate depth of 9,100 ft bgs. All casing strings will be cemented to surface. The purpose of the conductor string is to provide a stable borehole across the near-surface, unconsolidated glacial deposits before drilling the remaining deeper casing strings and to help protect the USDW. As discussed in Section 2.7.2, groundwater in the vicinity of the Mattoon site is normally obtained from sand and gravel deposits that are contained within the unconsolidated Quaternary-age material above bedrock. The sand and gravel deposits for the vicinity of the proposed site range in depth from about 25 to 125 ft bgs. Bedrock is indicated by a boring on the southwest border of the site to be approximately 90 ft below the surface. The surface string will extend across the uppermost bedrock layers (Pennsylvanian age) and will help to further isolate and protect the USDWs. The intermediate casing string will extend across and isolate deeper potentially unstable layers or layers where there is potential for lost circulation to ensure that the well can be drilled to total depth. The deepest casing string will extend to approximately 100 ft below the base of the Mt. Simon Formation, into the underlying Precambrian-age granite bedrock.

A diagram of the injection well casing plan is provided in Figure 3-1 and Figure 3-2. Two versions of the well diagram are provided because the depth of the intermediate casing is uncertain at this time. In Figure 3-1, the intermediate casing is set just below the St. Peter Sandstone in the Upper Knox at a depth of approximately 5,000 ft bgs. In Figure 3-2, the intermediate casing is set in the Eau Claire Formation at an approximate depth of 7,000 ft bgs. The design with the deeper casing would be implemented if there is an indication that hole stability below 5,000 ft is an issue and thus would warrant extending the depth of this casing string to isolate problem ones. The deeper intermediate casing string would be preferable if the borehole across the Mt. Simon is left open to allow extended open-hole testing, as this would minimize the amount of openhole susceptible to caving during testing. Also, the difference in depth necessitates minor changes in the weight and grades of materials used for the intermediate casing string. The depth of the intermediate casing string may not be finalized until drilling is underway.

Figure 3-1. Injection Well Schematic (5,000 ft Intermediate Casing String)

Figure 3-2. Injection Well Schematic (7,000 ft Intermediate Casing String)

3.7 Well Design and Construction

The injection well was designed using the program Tubular Design and Analysis System (TDAS), version 6.16 (Schlumberger, 2006). The primary output produced by TDAS is a well casing plan, which includes the weight, grades and material for each casing string. The number of casing strings and their depth are specified by the user, but the casing specifications are determined based on a series of load scenarios that are programmed into the TDAS program. The user also specifies a pore pressure gradient and a fracture pressure gradient. Load cases are defined by a temperature profile, an internal pressure profile (i.e., inside the casing), and an external pressure profile (i.e., outside the casing). Default load scenarios included in the TDAS program are listed in Table 3-1. For each casing string, five design factors are computed by TDAS, including burst, collapse, tension, compression, and triaxial loading (i.e., Von Mises). The TDAS program includes three different rule sets that can be chosen by the user, each with different minimum acceptable design factors, but these can be altered by the user. The minimum acceptable design factors used to design the CO₂ injection well are as follows: burst (1.1), collapse (1.1), tension (1.5), compression (1.3), and triaxial loading (1.25). All casing strings included in the well design equal or exceed these design factors for the load scenarios that were evaluated. By evaluating multiple load scenarios, a more rigorous well design is possible. This approach is advantageous compared to the common technique of defining a single worst case burst scenario and a single worst case collapse scenario.

3.7.1 Well Hole Diameters and Corresponding Depth Intervals

The borehole diameters for the various casing strings are as follows: 30-inch diameter casing string – 38 inches; 20-inch diameter surface casing – 26 inches; 13-3/8 inch diameter intermediate casing string – 17.5 inches; 9-5/8-inch diameter deep (injection) casing string – 12-1/4 inches. These borehole diameters are considered conventional sizes for the sizes of casing that will be used and should allow ample clearance between the outside of the casing and the borehole wall to ensure that a continuous cement sheath can be emplaced along the entire length of the casing string. Table 3-2 summarizes information about the borehole diameter and depth for each casing string.

3.7.2 Casing

As discussed in Section 3.6, the injection well will include the following casing strings: a 30-inch diameter conductor string set a depth of approximately 100 ft bgs; a 20-inch diameter surface string set a depth of approximately 250 to 500 ft bgs; a 13-3/8 inch diameter intermediate string set at a depth of approximately 5,000 to 7,000 ft bgs; and a 9-5/8 inch diameter deep (injection) string set an approximate depth of 9,100 ft bgs. All casing strings will be cemented to surface. Table 3-3 and Table 3-4 summarize the casing program for the injection well. Table 3-3 describes the casing program for a 5,000 ft deep intermediate casing string, whereas Table 3-4 describes the casing program for the scenario in which the intermediate casing string is 7,000 ft deep. Note that except for the intermediate casing string, the two well designs are identical. Table 3-5 summarizes properties of each casing material.

Table 3-1. Load Scenarios Evaluated

Load Name	Description	Casing String
Installed Load	Casing is filled with mud with weight it was run in with, cement outside casing, static temperature profile.	All
1/3 Evacuation	Casing is evacuated to a depth equal to 1/3 the depth of the next casing point (below this, mud is present with weight used to drill subsequent section), mud with weight casing string was run in with is present outside casing, static temperature profile. Note that this results in complete evacuation of the casing if the depth of the subsequent casing point is > 3x the depth of the casing string evaluated.	C, S, I
Full Evacuation	Casing is completely evacuated, mud with weight casing string was run in with is present outside casing, static temperature profile.	P
Pressure Test	Casing is filled with mud with weight casing was run in with and surface pressure is applied that produces a pressure at the shoe equal to the fracture pressure plus a margin of safety (0.2 pound per gallon [ppg]), natural pore pressure gradient outside the casing, static temperature profile.	C, S, I,
50 bbl kick	Simulates gas kick of specified volume; internal pressure profile depends on size of gas bubble, natural pore pressure gradient outside the casing, temperature profile is based on correlation by Kutasov and Taighi (see TDAS manual).	S, I
1/3 gas replacement	Casing is filled with 0.0 psi/ft gas to a depth equal to 1/3 the depth of the next casing point (below this, mud is present with weight used to drill subsequent section), natural pore pressure gradient outside the casing, static and circulating temperature profiles are both considered.	S, I
Surface tubing leak	Internal pressure profile is defined by wellhead shut in pressure acting on the packer fluid, natural pore pressure gradient outside the casing, static and flowing temperature profiles. The shut-in pressure is calculated internally by TDAS using the gas pressure prediction model.	P

Note: C (conductor casing), S (Surface casing), I (intermediate casing), P (production or long-string casing)

Table 3-2. Borehole Diameters and Depths for Casing Strings for the CO₂ Injection Well

Casing String	Casing Depth (ft bgs)	Borehole Diameter (inches)	Casing Outside Diameter (inches)
Conductor	100	38	30
Surface	500	26	20
Intermediate	5,000 to 7,000	17.5	13.375
Long String	9,096	12.25	9.625
Tubing	8,000	NA	5.5

3.7.2.1 Conductive Casing

As shown in Table 3-3 and Table 3-4, the conductor casing will be 30 inch diameter 157.53 lb/ft (0.5 inch wall thickness) carbon steel or similar. Table 3-6 summarizes the load scenarios that were evaluated in the TDAS well design program to determine the conductor casing specification. Minimum design factors for this casing string are provided on Table 3-7.

**Table 3-3. Casing Program for the CO₂ Injection Well
(5,000 ft Intermediate Casing String)**

Casing String	Casing Depth (ft bgs)	Borehole Diameter (inches)	Casing Outside Diameter (inches)	Casing Material (weight/grade/connection)	Coupling O.D. (inches)
Conductor	100	38	30	157.53 lb/ft, B, MIJ	33.525
Surface	500	26	20	133 lb/ft, J-55, BTC	21.000
Intermediate	0–1,750	17.5	13.375	54.5 lb/ft, K-55, BTC ^(a)	14.375
	1,750–5,000		13.375	68 lb/ft, N-80, BTC	14.375
Long String	0–4,500	12.25	9.625	40 lb/ft, N-80, LTC	10.625
	4,500–7,000		9.625	47 lb/ft, N-80, LTC	10.625
	7,000–9,096		9.625	53.5 lb/ft, N-80, LTC ^(b)	10.625

(a) This section may be upgraded with 68 lb/ft K-55 or N-80.

(b) These sections may be replaced with corrosion resistant alloy material, such as 13% chromium (Cr) stainless steel or similar.

**Table 3-4. Casing Program for the CO₂ Injection Well
(7,000 ft Intermediate Casing String)**

Casing String	Casing Depth (ft bgs)	Borehole Diameter (inches)	Casing Outside Diameter (inches)	Casing Material (weight/grade/connection)	Coupling O.D. (inches)
Conductor	100	38	30	157.53 lb/ft, B, MIJ	33.525
Surface	500	26	20	133 lb/ft, J-55, BTC	21.000
Intermediate	0–1,700	17.5	13.375	54.5 lb/ft, K-55, BTC ^(a)	14.375
	1,700–7,000		13.375	68 lb/ft, N-80, BTC	14.375
Long String	0–4,500	12.25	9.625	40 lb/ft, N-80, LTC	10.625
	4,500–7,000		9.625	47 lb/ft, N-80, LTC	10.625
	7,000–9,096		9.625	53.5 lb/ft, N-80, LTC ^(b)	10.625

(a) This section may be upgraded with 68 lb/ft K-55 or N-80.

(b) These sections may be replaced with corrosion resistant alloy material, such as 13% Cr stainless steel or similar.

ksi – kilopound per square inch

3.7.2.2 Surface Casing

As shown in Table 3-3 and Table 3-4, the surface casing is 20 inch diameter 133 lb/ft J-55 pipe (0.635 inch wall thickness) with buttress thread casing and coupling (BTC) connections. The metallurgy of this casing string is carbon steel. Table 3-8 summarizes the load scenarios that were evaluated in TDAS to determine the surface casing specification. Minimum design factors for this casing string are provided on Table 3-9.

Table 3-5. Properties of Well Casing Materials

Casing String	Casing Material (weight/grade/connection)	Casing Outside/Inside/Drift Diameter (inches)	Yield (ksi)	Tensile (ksi)	Burst (psi) Plain End	Collapse (psi)	Tension (1,000 lb) Joint (J) and Body (B)	Compression (1,000 lb)
Conductor	157.53 lb/ft, B, MIJ	30/29/28.813 (0.5 in wall)	35	60	1020	220	1622	1622
Surface	133 lb/ft, J-55, BTC	20/18.73/18.543 (0.635 in wall)	55	75	3060	1500	2012 (J) 2125 (B)	1476
Intermediate	54.5 lb/ft, K-55, BTC	13.375/12.615/12.459 (0.380 in wall)	55	95	2730	1130	1038 (J) 853 (B)	601
	68 lb/ft, N-80, BTC	13.375/12.415/12.259 (0.480 in wall)	80	100	5020	2270	1585 (J) 1556 (B)	1268
Long String	40 lb/ft, N-80, LTC	9.625/8.835/8.750 (0.395 in wall)	80	100	5750	3090	737 (J) 916 (B)	708
	47 lb/ft, N-80, LTC	9.625/8.681/8.525 (0.472 in wall)	80	100	6870	4760	905 1086 (B)	869
	53.5 lb/ft, N-80, LTC	9.625/8.535/8.500 (0.545 in wall)	80	100	7930	6620	1062 (J) 1244 (B)	1019
Alternate Long String	53.5 lb/ft 13Cr95	9.625/8.535/8.500 (0.545 in wall)	95	120	10900	7950	1062 (J) 1244 (B)	1019
Tubing	20 lb/ft, N-80, LTC	5.5/4.778/4.653 (0.361 in wall)	80	100	9190	8830	427.9	350.6

Table 3-6. Conductor Casing Load Scenarios

Casing String/ Load Scenario	Load Scenario Name ^(a)	Internal Pressure Profile ^(a)	External Pressure Profile ^(a)	Temperature Profile ^(a)	Other/Comments ^(b)
Conductor (30 inch, 100 ft)					
A	Installed Load	8.5 ppg mud	Mud/cement-str 1	Static Temperature	Cement weight 16.2 ppg (0-100 ft)
B	1/3 Evacuation-500' str 1	1/3 Evacuation-500'	8.5 ppg mud	Static Temperature	Casing fully evacuated
C	Pressure Test-100' str 1	Press test-str 1	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 38 psi; Pore pressure 0.43 psi/ft (8.3 ppg)

(a) Names of load scenarios and temperature and pressure profiles correspond to those used in the TDAS program.

(b) Wall loss (4%) and temperature derating considered in all scenarios.

**Table 3-7. Minimum Design Factors and Corresponding Scenarios
for Conductor Casing String**

Casing String	Burst	Collapse	Tension	Compression	Von Mises
Conductor (30 inch, 100 ft)	25.95 (C)	4.53 (B)	>100 (C)	50.75 (B)	25.14 (B)

Note: Letters in parenthesis correspond to load scenario with minimum design factor.

Table 3-8. Surface Casing Load Scenarios

Casing String/Load Scenario	Load Scenario Name ^(a)	Internal Pressure Profile ^(a)	External Pressure Profile ^(a)	Temperature Profile ^(a)	Other/Comments ^(b)
Surface (20 inch, 500 ft)					
A	Installed Load	9.2 ppg mud	Mud/cement-str 2	Static Temperature	Cement weight 16.2 ppg (0-500 ft)
B	1/3 Evacuation-5,000' str 2	1/3 Evacuation-5,000'	9.2 ppg mud	Static Temperature	Casing fully evacuated
C	Pressure Test-500' str 2	Press test-str 2	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 166 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
D	50.0 bbl Kick-5,000' str 2	50.0 bbl Kick-5,000'	Natural Pore Pressure	50.0 bbl Kick-5,000'	Internal pressure at surface = 592 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
E	1/3 Replc-5,000' str 2 C,W	1/3 Replc-5,000'	Natural Pore Pressure	Circulating 5,000'	Internal pressure at surface = 823 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
F	1/3 Replc-5,000' str 2 S,W	1/3 Replc-5,000'	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 823 psi; Pore pressure 0.43 psi/ft (8.3 ppg)

(a) Names of load scenarios and temperature and pressure profiles correspond to those used in the TDAS program.

(b) Wall loss (4%) and temperature derating considered in all scenarios.

bbl - barrel

ppg - pound per gallon

**Table 3-9. Minimum Design Factors and Corresponding Scenarios
for Surface Casing String**

Casing String	Burst	Collapse	Tension	Compression	Von Mises
Surface (20 inch, 500 ft) w/5,000 ft intermediate	3.57 (E)	5.73 (B)	14.28 (F)	9.86 (D)	3.61 (E)
Surface (20 inch, 500 ft) w/7,000 ft intermediate	2.43 (E)	5.73 (B)	70.36 (C)	12.08 (D)	2.43 (E)

Note: Letters in parenthesis correspond to load scenario with minimum design factor.

3.7.2.3 Intermediate Casing(s)

As shown in Table 3-3 and Table 3-4, two intermediate casing string designs are being considered: one that is approximately 5,000 ft long and the other that is approximately 7,000 ft in length. In both cases, the intermediate string will be composed of two materials: an upper section (approximately 1,700 ft in length) of 54.5 lb/ft K-55 pipe with BTC connections, and a lower section of 68 lb/ft N-80 pipe with BTC connections. The metallurgy of both materials is carbon steel. Table 3-10 summarizes the load scenarios that were evaluated in TDAS to determine the intermediate casing specification. Minimum design factors for this casing string are provided in Table 3-11.

Table 3-10. Intermediate Casing Load Scenarios

Casing String/ Load Scenario	Load Scenario Name ^(a)	Internal Pressure Profile ^(a)	External Pressure Profile ^(a)	Temperature Profile ^(a)	Other/Comments ^(b)
Intermediate (13.375 inch, 5,000 ft)					
A	Installed Load	10 ppg mud	Mud/cement-str 3	Static Temperature	Cement weight 12.7 ppg (0-4,000 ft), 15.6 ppg (4,000-5,000 ft) ^(c) ; Cement weight 12.7 ppg (0-4,500 ft), 15.6 ppg (4,500-6,000 ft); 16.2 ppg (6,000-7,000 ft) ^(d)
B	1/3 Evacuation—9096' str 3	1/3 Evacuation—9096'	9.5 ppg mud	Static Temperature	Casing fully evacuated to 3,032 ft bgs
C	Pressure Test—5,000' str 3 ^(c) ; Pressure Test—7,000' str 3 ^(d)	Press test—str 3	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 1,584 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
D	50.0 bbl Kick—9,096' str 3	50.0 bbl Kick—9,096'	Natural Pore Pressure	50.0 bbl Kick—9,096'	Internal pressure at surface = 1,293 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
E	1/3 Replc—9,096' str 2 C,W	1/3 Replc—9,096'	Natural Pore Pressure	Circulating 9,096'	Internal pressure at surface = 1,733 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
F	1/3 Replc—9,096' str 2 S,W	1/3 Replc—9,096'	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 1,733 psi; Pore pressure 0.43 psi/ft (8.3 ppg)

(a) Names of load scenarios and temperature and pressure profiles correspond to those used in the TDAS program.

(b) Wall loss (4%) and temperature derating considered in all scenarios.

(c) for 5,000 ft casing string

(d) for 7,000 ft casing string

Table 3-11. Minimum Design Factors and Corresponding Scenarios for Intermediate Casing String

Casing String	Burst	Collapse	Tension	Compression	Von Mises
Intermediate(13.375 inch, 5000 ft)	1.51 (E)	1.18 (B)	3.8 (F)	6.02 (B)	1.67 (E)
Intermediate (13.375 inch, 7000 ft)	1.25 (C)	1.16 (B)	3.02 (C)	4.67 (A)	1.39 (C)

Note: Letters in parenthesis correspond to load scenario with Minimum Design Factor.

3.7.2.4 Long-String Casing

As shown in Table 3-3 and Table 3-4, the long-string casing is 9-5/8 inch diameter pipe composed of three sections, each with a different material. The uppermost section (approximately 4,500 ft) will be N-80 40 lb/ft pipe (0.395 inch wall thickness) with long thread coupling (LTC) connections; the middle section (4,500 to 7,000 ft) will be N-80 or 47 lb/ft pipe (0.472 inch wall thickness) with LTC connections; and the lower section (7,000 ft to 9,096 ft) will be N-80 or L-80 53.5 lb/ft pipe (0.545 inch wall thickness) with LTC connections. The metallurgy of the upper and middle sections is carbon steel. The metallurgy of the lower section may be carbon steel or it may be upgraded to a corrosion resistant alloy, such as 13% Cr stainless steel. Table 3-12 summarizes the load scenarios that were evaluated in TDAS to determine the long casing specification. Minimum design factors for this casing string are provided in Table 3-13.

Table 3-12. Long String Casing Load Scenarios

Casing String/ Load Scenario	Load Scenario Name ^(a)	Internal Pressure Profile ^(a)	External Pressure Profile ^(a)	Temperature Profile ^(a)	Other/Comments ^(b)
Deep (9.625 inch, 9,096 ft)					
A	Installed Load	11 ppg mud	Mud/cement–str 4	Static Temperature	Cement weight 12.5 ppg (0-5,700 ft), 15.8 ppg (5,700-9,096 ft)
B	Full evacuation–str 4	Complete evacuation	11 ppg mud	Static Temperature	Casing fully evacuated
C	Srf Tbg Leak–Static str 4	Surf tbg leak–static	Natural Pore Pressure	Static Temperature	Internal pressure at surface = 4160 psi; Pore pressure 0.43 psi/ft (8.3 ppg)
D	Srf Tbg Leak–Hot str 4	Surf tbg leak–hot	Natural Pore Pressure	Flowing	Internal pressure at surface = 4213 psi; Pore pressure 0.43 psi/ft (8.3 ppg)

(a) Names of load scenarios and temperature and pressure profiles correspond to those used in the TDAS program.

(b) Wall loss (4%) and temperature derating considered in all scenarios.

3.7.2.5 Other Casing

The injection well will not have any casing strings other than those discussed in Sections 3.7.2.1 through 3.7.2.4.

**Table 3-13. Minimum Design Factors and Corresponding Scenarios
for Long String Casing**

Casing String	Burst	Collapse	Tension	Compression	Von Mises
Deep (9.625 inch, 9,096 ft)	1.3 (D)	1.08 (B) ^a	2.11 (C)	3.2 (B)	1.43 (C)

Note: Letters in parenthesis correspond to load scenario with Minimum Design Factor.

(a) Although this value slightly exceeds the minimum design factor of 1.1, it was considered acceptable because it is based on a fully-evacuated scenario, which is not possible for the long-string casing.

The value was also calculated using 53.5 lb/ft N-80 casing. 13Cr95 casing is anticipated to be used in the bottom portion of the long string, which has greater strength properties.

3.7.3 Injection Tubing

The injection tubing will be 5-1/2 inch outer diameter (O.D.) pipe. This size tubing is required to accommodate the planned CO₂ injection rates.

A thermohydraulic analysis was conducted to determine the proper tubing size for the proposed injection scenario. The injection well at the Mattoon site is designed to have a maximum instantaneous injection rate of 578,568 lb/hr (this equates to an annual injection rate of approximately 1.95 MMT/yr as the plant is designed to be shut down for two 28-day periods per year). To achieve this flow rate, the injection pressure must be greater than the minimum bottomhole pressure required to drive the CO₂ into the reservoir formation but less than the maximum safe pressure to avoid fracturing. The minimum bottomhole pressure to provide the required flow rate into the Mt. Simon Formation was determined by subsurface reservoir modeling (see Section 5.4). The maximum safe bottomhole pressure is specified as 85% of the pressure developed assuming 0.8 psi/ft of depth to the top of the reservoir. These limiting conditions are summarized in Table 3-14. Two scenarios were evaluated. In the first scenario, CO₂ is injected across the entire Mt. Simon Formation (7,353 to 8,996 ft bgs), in the second scenario, CO₂ is injected only across a 260 ft thick portion of the Mt. Simon Formation (8,698 to 8,958 ft bgs). Each of these scenarios requires a different bottomhole pressure to inject the CO₂ into the formation, and thus a different surface injection pressure.

Table 3-14. Flow Rates and Limiting Pressures for Hydraulic Calculations

Parameter	Scenario #1 ^(a)	Scenario #2 ^(a)
Depth to top of injection horizon (ft)	7,353	8,698
Flow rate/well (lb/hr)	578,568 (6,312 metric tons/day)	578,568 (6,312 metric tons/day)
Max. bottomhole injection pressure (psi) (depth × 0.85 × 0.8 + 14.7)	5,015	5,929
Required injection pressure at top of injection zone (based on reservoir modeling) (psi)	3,411	3,959

(a) The first scenario assumes CO₂ is injected across the entire Mt. Simon Formation (7,353 to 8,996 ft bgs); the second scenario assumes CO₂ is injected only across a 260 ft thick portion of the Mt. Simon Formation (8,698 to 8,958 ft bgs).

A steady state, one-dimensional flow model was used to calculate the pressure drop along a series of segments of the pipeline or well. Pressure changes from frictional loss, gravity head, and acceleration of the flow are included in the model. The CO₂ density is calculated from the pressure and internal energy from the carbon dioxide state equation of Span and Wagner

(1996). The carbon dioxide is assumed to be a liquid or supercritical fluid and the calculation stops if two-phase conditions occur. The internal energy at the end of a pipe length segment was calculated from the energy equation accounting for the heat transfer from or into the carbon dioxide stream from the surrounding soil or rock, change in potential energy due to pressure, and kinetic energy of the flow. For the well, the ultimate heat sink is the rock far away from the well so steady-state heat transfer cannot be assumed. Instead, an equivalent heat conductance was defined at a given elapsed time after injection starts based on the heat flux calculated with a one-dimensional transient finite difference conduction model.

In the energy equation, the pressure, kinetic energy and gravity terms are relatively small and roughly balance out for moderate friction pressure drops. Depending upon the ambient rock temperature profile and the CO₂ temperature at the wellhead, net heat transfer may be from the fluid to the rock or from the rock to the fluid. Changes in internal energy and temperature of the CO₂ with depth cause gradual changes in density, which in turn change the velocity and pressure drop. If the friction pressure drop is large (e.g., high velocity flow through small injection tubing), fluid expansion is significant as it moves down the pressure gradient. The resulting cooling effect can potentially have a greater impact on the CO₂ temperature than heat transfer to the surroundings.

The combined effect of major phenomena influencing fluid pressure is illustrated in Figure 3-3. If the injection pressure is too high, a higher wellhead temperature, lower wellhead pressure and higher friction pressure drop (higher flow, smaller tubing) are beneficial to achieving stable operating conditions. If the injection pressure is too low, a lower wellhead temperature, higher wellhead pressure, and lower friction pressure drop (lower flow rate, larger tubing, smoother tubing surface) are beneficial.

Figure 3-3. Influences on CO₂ Pressure versus Depth from Delivery to the Wellhead to Injection at Depth of Target Formation

Calculations using the thermohydraulic model show that a tubing string with 5-1/2 inch O.D. and 4.778 inch inside diameter (I.D.) will accommodate the peak mass flow rate assuming a CO₂ temperature of 95°F or lower at the surface and an injection pressure of approximately 2,100 psi. A higher injection pressure would be required if the temperature of the CO₂ is 120°F. The higher temperature results in lower density, leading to less hydrostatic head in the fluid column and higher frictional losses because of higher fluid velocities. This is true for both scenarios that were evaluated – i.e., when CO₂ is injected across the entire Mt. Simon Formation (top of injection interval is at a depth of 7,353 ft bgs) and when CO₂ is injected only across a 260 ft thick portion of the Mt. Simon Formation (top of injection interval at 8,698 ft bgs). A summary of the results is provided in Table 3-15. A tubing string with an inside diameter smaller than 4.778 inches (e.g., 26.8 lb/ft tubing has an inside diameter of 4.5 inches) would require higher surface pressures to achieve the required bottomhole pressure due to increased frictional losses in the tubing. However, 20 lb/ft tubing (inside diameter of 4.778 inches) is sufficient for this application based on the mechanical strength properties of the tubing,

Table 3-15. Summary Results of Thermohydraulic Evaluation

Parameter	Scenario #1 ^(a)		Scenario #2 ^(a)	
Tubing I.D. (in.)	4.778 ^(b)	4.778 ^(b)	4.778 ^(b)	4.778 ^(b)
Wellhead temperature (°F)	95	120	95	120
Required bottomhole pressure (psi)	3,411	3,411	3,959	3,959
Predicted bottomhole pressure (psi)	3,425	3,411	3,973	3,961
Predicted bottomhole temperature (°F) adiabatic	125	150	129	156
Predicted wellhead pressure (psi)	1,918 ^(c)	2,242 ^(c)	2,086 ^(c)	2,427 ^(c)

- (a) The first scenario assumes CO₂ is injected across the entire Mt. Simon Formation (7,353 to 8,996 ft bgs); the second scenario assumes CO₂ is injected only across a 260 ft thick portion of the Mt. Simon Formation (8,698 to 8958 ft bgs).
 (b) Tubing string used in calculation is 5.5 inch O.D., 20 lb/ft N-80. Roughness factor of 4.6×10^{-5} m for tubing string.
 (c) This is the value that is required to produce the predicted bottomhole pressure.

3.7.3.1 Maximum Allowable Suspended Weight Based on Joint Strength of Injection Tubing

The joint strength of the coupling defines the maximum allowable suspended weight. For 20 lb/ft N-80 API pipe with LTC couplings, the yield strength is 428,000 lb. Table 3-16 describes the properties of the tubing. Based on this, 5-1/2 inch 20 lb/ft N-80 tubing with LTC couplings can support a string weight of 428,000 lb. The pipe body has a yield strength of 466,000 lb.

Table 3-16. Properties of Tubing Material

Material (weight/grade/ connection)	Casing Outside/Inside/Drift Diameter (inches)	Yield (ksi)	Tensile (ksi)	Burst (psi)	Collapse (psi)	Tension (1000 lb) Joint (J) and Body (B)	Compression (1000 lb)
20 lb/ft, N-80, LTC	5.5/4.778/4.653 (0.361 in wall)	80	100	9,190	8,830	427.9 (J) 466 (B)	350.6

3.7.3.2 Weight of Injection Tubing String (Axial Load) in Air

The total weight of the tubing string suspended in air is equal to its length in feet multiplied by the weight per foot of the tubing material. The material will be 20 lb/ft N-80. The exact length of the tubing string will be determined after the well is drilled and characterized (geophysical logging, core analyses, etc.). For the sake of this application, it was assumed that the length of the injection tubing will be 8,000 ft, which would position the bottom of the tubing string in the middle to lower half of the Mt. Simon Formation. Based on a length of 8,000 ft, the tubing would weigh 160,000 lb.

3.7.4 Cement

All casing strings will be cemented to surface. A cement program was designed for the injection well by a company specializing in well cementing services (Schlumberger) and is summarized in Table 3-17. The table describes, for each casing string, type of cement, amount of material (in sacks [sks]) including excess if applicable, weight of the mixture in ppg, and yield in ft³/sack. The table also identifies if a cement column includes more than one stage and/or multiple sections (e.g., lead, tail) and the approximate depth interval of each section. Schlumberger used its CEMCADE program to aid in designing the cement program for the injection well. Details of the CEMCADE analyses are provided in Appendix 3-1. It should be noted that the cement design developed by Schlumberger was based on a preliminary well design; therefore, some of the casing weights used by Schlumberger do not match exactly those described in Section 3.7.2. However, the depths of the casing strings and the borehole diameters used by Schlumberger do match those presented in Section 3.7.2; therefore, the proposed cement design is considered to be very close to a final design. A final cement design that incorporates the final casing details will be prepared prior to drilling the well.

3.7.4.1 Conductive Casing

The cement for the conductive casing will be Type A cement.

3.7.4.2 Surface Casing

The cement for the surface casing will be Type A cement. Approximately 300 sks will be required, including 75% excess. The mixture will have a weight of approximately 15.6 ppg.

3.7.4.3 Intermediate Casing

The cement design for the intermediate casing is different for the two well designs. For the well design with a 5,000 ft intermediate casing string, the intermediate casing will be terminated in the dolomite below the St. Peter sandstone. The cement column will include a lead (upper) section and a tail (lower) section. The lead section, which will extend from ground surface to an approximate depth of 4,000 ft bgs, will be a 35:65 mixture of Type A cement and Pozzolan (Poz) material. A total of approximately 1,950 sks of this mixture will be required. The mixture will have an approximate weight of 12.7 ppg. The tail section, which will extend from a depth of approximately 4,000 to 5,000 ft bgs, will be Class A cement and will have a weight of approximately 15.6 ppg. Approximately 900 sks will be required, including 50% excess.

For the well design with a 7,000 ft intermediate casing string, cement will be emplaced in two stages. Both stages will include a lead and tail section, the intermediate casing will be terminated in the Eau Claire Formation above the Mt. Simon Formation. The lower (1st) stage, which will extend from approximately 5,000 to 7,000 ft bgs, will include a lead section (5,000 to

Table 3-17. Cement Program for the CO₂ Injection Well

Casing String	Casing Depth (ft bgs)	Cement Description ^(a)
Conductor	100	Class A
Surface	500	Class A, 15.6 ppg; 300 sks, 1.2 ft ³ /sk, 75% excess
Intermediate (5,000 ft)	0–5,000	Lead (0–4,000 ft): 35:65 Class A:Poz, 12.7 ppg, 1950 sks, 2.15 ft ³ /sk Tail: (4,000–5,000 ft): Class A, 15.6 ppg; 900 sks; 1.19 ft ³ /sk, 50% excess
Intermediate (7,000 ft)	0–7,000	Stage #2 Lead (0–4,500 ft): 35:65 Class A:Poz, 12.7 ppg, 2200 sks, 2.15 ft ³ /sk Stage #2 Tail: (4,500–5,000 ft): Class A, 15.6 ppg; 450 sks; 1.19 ft ³ /sk, 50% excess Stage #1 Lead (5,000–6,000 ft): Class H, 15.6 ppg, 880 sks, 1.18 ft ³ /sk Stage #1 Tail: (6,000–7,000 ft): Class H, 16.2 ppg; 950 sks; 1.09 ft ³ /sk, 50% excess
Deep (with 5,000 ft or 7,000 ft intermediate casing)	0–9,096	Lead (0–5,700 ft): 35:65 Class A:Poz, 12.5 ppg, 1100 sks, 2.01 ft ³ /sk Tail: (~5,700–9,096 ft): EverCRETE CO ₂ resistant cement (or similar), 15.8 ppg; 1200 sks; 1.09 ft ³ /sk, 35% excess

Actual volumes and depth intervals will depend on true thickness of formations encountered in the well, actual hole size/volume, and other variables that cannot be predicted with complete certainty. Thermal conductivities of cements range from 0.5–0.6 BTU/ft•hr•°F for the lead systems to 0.75 BTU/ft•hr•°F for the tail systems including the EverCRETE material (or similar).

6,000 ft bgs) and a tail section (6,000 to 7,000 ft bgs). The lead section will be Class H cement (approximately 880 sks) with a weight of 15.6 ppg. The tail section will be Class H cement (approximately 950 sks, including 50% excess) with a weight of 16.2 ppg. The upper (2nd) stage will extend from ground surface to approximately 5,000 ft bgs and will also have a lead section (0 to 4,500 ft bgs) and a tail section (4,500 to 5,000 ft bgs). The lead section will be a 35:65 mixture of Type A cement and Pozzolan material. A total of 2,200 sks of this mixture will be required. The mixture will have an approximate weight of 12.7 ppg. The tail section will be Class A cement and will have a weight of approximately 15.6 ppg. Approximately 450 sks will be required, including 50% excess.

3.7.4.4 Long-String Casing

The cement for the long-string casing will be installed in a single stage but will include a lead section (ground surface to approximately 5,700 ft bgs) and a tail section (approximately 5,700 to 9,096 ft bgs). The lead section will be a 35:65 mixture of Type A cement and Pozzolan material. A total of approximately 1,100 sks of this mixture will be required. The mixture will have an approximate weight of 12.5 ppg. The tail section will be a CO₂ resistant cement that is designed to cover at least 1,000 ft above the top of the Eau Claire shale section (for the 5,000 ft intermediate casing scenario) or 1,000 ft inside the intermediate casing (for the 7,000 ft

intermediate casing scenario). The current cement design includes EverCRETE cement. This mixture will have a weight of approximately 15.8 ppg. Approximately 1,200 sks will be required, including 35% excess.

A description of the EverCRETE CO₂ resistant cement, provided by Schlumberger, is provided below. Also, specific properties of the cement are described in Table 3-18.

The EverCRETE CO₂ resistant cement has been engineered to be more resistant to degradation by wet CO₂ and carbonic acid than traditional portland cement based well cement. The cement mix has been engineered in three different ways to reduce its reactivity:

- the engineering of the mix reduced the amount of portland cement, the reactive component in the mix, by the addition of non-reactive microspheres. The microspheres take up space that would otherwise be taken up by portland cement which lowers the amount of portland cement in the mix.
- it reduced the reactivity of the portland cement in the mix by eliminating calcium hydroxide, the most reactive component of portland cement. Calcium hydroxide is typically up to 20% of the reaction products formed when portland cement hydrates and it is much more reactive than calcium-silicahydrate, the other major reaction product.
- it reduces the permeability of the entire mix by optimizing the particle size distribution to reduce the permeability of the set cement. By optimizing the sizes of the particles that make up the mix, spaces that would otherwise act as open pores in the set cement are closed which reduces the permeability of the cement.

Table 3-18. Properties of the EverCRETE Cement System

Bottomhole circulating temperature (BHCT)		40°C [104°F]
Bottomhole static temperature (BHST)		50°C [125°F]
Specific gravity, lbm/gal		15.8 ppg
Rheological properties determined with API R after mixing	Plastic Viscosity (PV), cp	208
	Yield Point (T _v), lbf/100ft ²	9
Rheological properties determined with API R1B5 after conditioning at BHCT	PV, cp	207
	T _v , lbf/100ft ²	15
	10 second gel strength, lbf/100ft ²	7
	10 minute gel strength, lbf/100ft ²	32
	Then 1 minute stirring gel strength, lbf/100ft ²	14
	Stability	OK
	API fluid loss at BHCT	54
Thickening Time	30 Bc	3 hr, 54 min
	70 Bc (unpumpable)	4 hr, 31 min
Ultrasonic Cement Analyzer (UCA) cell compressive strengths	50 psi	6 hr, 16 min
	500 psi	8 hr, 04 min
	24 hour compressive strength psi	2,982

Note: This table shows typical data, actual test data will be provided. Source: Schlumberger
API: American Petroleum Institute; psi (pounds per square inch); Bc (Bearden unit of slurry consistency)
lbf – pound-foot

3.7.4.5 Other Casing

Not applicable.

3.7.4.6 Cementing Techniques, Equipment Positions, and Staging Depths

Cement will be emplaced in a single stage for all casing strings except the intermediate casing string that is 7,000 ft in length (if applicable). For the 7,000 ft intermediate casing string (if applicable), the stage collar would be placed at an approximate depth of 5,000 ft, which is just below the St. Peter Formation. Actual placement of the stage collar will be dependent upon hole conditions encountered while drilling. In addition to the stage collar, additional cementing equipment (hardware) is listed in Table 3-19.

Cementing of all casing strings will require two pump trucks. In addition, a batch mixer will be used for a weighted spacer for the intermediate and injection strings because cement emplacement for the intermediate and injection strings will be preceded with 50 bbls of chemical wash (CW100) and 50 bbls of Mud Push Spacer. An additional (second) batch mixer will be used on the injection string for the EverCRETE.

Table 3-19. Additional Cementing Equipment Required for Each Casing String

Casing String	Equipment^(a)
20-inch Surface Casing (500 ft)	Float shoe Guide shoe ~10 centralizers 1 cement basket 2 stop rings
13 3/8-inch intermediate casing (5,000 ft or 7,000 ft)	Float shoe Float collar ~20 centralizers (more for 7,000 ft intermediate casing scenario) 2 stop rings Stage collar (for 7,000 ft intermediate casing scenario) Cement Basket if stage collar is used
9 5/8-inch long casing string (9,096 ft)	Float shoe (with JFE Bear connection if lower part of casing string is comprised of 13Cr95 material) Float collar JFE Bear Connection (with JFE Bear connection if lower part of casing string is 13Cr95 material) ~35 centralizers ~4 stop rings 2 LTC X Bear cross-over connections (if lower part of casing string is 13Cr95 material) *Stage collar (not anticipated, but possible)

All quantities are approximate.

3.7.4.7 Perforation Depths

As previously discussed, CO₂ will be injected into the Mt. Simon Formation, which is currently estimated to occur between depths of 7,353 to 8,996 ft bgs (thickness of 1,643 ft). The exact perforation interval will be determined after the well is drilled and characterized with geophysical logging, core analyses, and hydraulic testing. It is possible that multiple intervals with varying length will be perforated rather than a single long perforation interval. Modeling will be used, incorporating the results of the site-specific testing activities, to aid in determining the total length of the perforated intervals as well as to optimize the placement and density of the perforations. Results of the characterization activities along with the proposed perforation interval(s) will be described in the Well Completion Report (i.e., Section 9 [Form 4h] of the UIC

Permit Application) which will be submitted to the IEPA following completion of the drilling and characterization activities.

3.7.5 Annulus Protection System

The purpose of the annulus protection system is to maintain the annular fluid at a prescribed pressure. An automated annulus protection system has been designed for this purpose that is part of the comprehensive well maintenance and monitoring system [WMMS]). The WMMS includes piping, instrumentation valves, controls, and other equipment to accomplish several functions, including:

- Maintaining a prescribed pressure on the annular fluid in the well;
- Automatically delivering annular fluid to the well when the fluid volume in the well decreases due to temperature and/or pressure changes or leaks in the well;
- Automatically removing annular fluid from the wells when the fluid volume in the well increases due to temperature and/or pressure changes;
- Continuously monitoring injection well parameters including annular pressure, wellhead pressure and temperature, and bottomhole pressure and temperature and relay measured parameters to a remote terminal unit (RTU) located in the WMMS building, which are in turn connected to a programmable logic controller (PLC) located near the well;
- Monitoring parameters (e.g., pressure, temperature, fluid levels, nitrogen pressure) associated with the skid-mounted pressure-maintenance system; and,
- Automatically ceasing CO₂ injection to the wells when injection pressure or annulus pressure fall outside of prescribed limits.

This section is primarily focused on describing the components of the WMMS that will regulate the annular fluid pressure. The WMMS will maintain the pressure of the annular fluid between the tubing and the long string of casing at pre-determined levels as specified in the permit. The system can maintain the annular pressure at a specified level either above or below the pressure of the CO₂ in the injection tubing. For example, the pressure within the annular space, over the interval above the packer to the confining layer, can be maintained at a pressure that is greater than the pressure of the injection zone formation at all times. The annular fluid pressure will be continuously monitored so that CO₂ injection can be halted when the annular fluid pressure falls outside the pre-determined range for a period of time that exceeds allowable limits.

The major mechanical components of the WMMS that regulate annular fluid pressure are described below and shown on Figure 3-4. Other components of the WMMS (including instrumentation, controls, and alarms) shown on Figure 3-4 are described in Section 6.4, which describes how the system will detect and respond to out of range conditions that necessitate well shutdown.

- Three vessels (labeled V-1002-A, B, and C) together provide storage for annular fluid and a means for maintaining the pressure on the annular fluid. Because of the high pressure requirements for the annular fluid, a pre-fabricated hydraulic system will be used as the main component of the pressure maintenance system. Vessel V-1002-A

is the accumulator (storage) tank for the annular fluid system that will supply the well when necessary. This vessel will be partially filled with the same annular fluid that is in the well; the remainder of the vessel will contain pressurized nitrogen. The nitrogen and annular fluid liquid will be separated by a movable piston, the location of which will be monitored to indicate the annular fluid volume in the accumulator tank. Vessels V-1002-B and V1002-C are pressurized nitrogen bottles that provide additional vapor space for the accumulator. This extra volume allows for minimal venting during daily temperature fluctuations.

- A ½ inch diameter stainless steel line connects the accumulator (V-1002-A) to the injection well and allows annular fluid to move from the accumulator to the well's annular space or vice versa.
- Nitrogen Cylinders – Six (6) high pressure (approximately 6,000 psig) nitrogen cylinders, divided into two banks of three (3) cylinders each, supply the “blanketing” pressure for the annular fluid in the accumulator. During normal operation, one bank will supply nitrogen to the annular fluid system. A nitrogen manifold with automatic switchover (AS-1000) provides a means for automatically switching from one bank of nitrogen cylinders to another when the pressure in the operating bank drops to a pre-determined level. Operators will then replace the “empty” bank with full cylinders.
- Vessel T-1000 is the annular fluid reservoir. This tank will be partially filled with a reserve of annular fluid that can be pumped into the accumulator when the volume in the accumulator isn't adequate to meet the needs of the well. It can also serve as storage capacity for annular fluid bleed off (from the accumulator) during thermal expansion of the annular fluid when CO₂ injection is initiated and terminated.
- Annular Fluid Pumps (P-1001, P1002) are high pressure hydraulic pumps that will pump reserve annular fluid from the annular fluid reservoir (T-1000) into the accumulator (V-1002) when the level in the accumulator reaches a low set point. The system is designed so that the pumps alternate operation to ensure that both pumps are operational when needed.
- Control valves PV-3A and PV-3B will provide a controlled gas charge on the accumulator containing the annular fluid. The low pressure control valve, PV-3A, will add nitrogen to increase the charge pressure when necessary; the high pressure control valve, PV-3B, will vent nitrogen to the atmosphere to reduce the charge pressure when necessary.
- Control valve LV-7 will open or close as needed to allow annular fluid to move from the well directly into the annular fluid reservoir (T-1000), rather than into the accumulator, if the fluid level in the accumulator is above a pre-set level.

The nitrogen system will be designed to minimize venting, but small amounts of nitrogen may be vented in response to daily and seasonal temperature changes (warming) or changes in the temperature of the injection fluid. The largest variance in annular fluid volume is expected to occur during the initial injection and subsequent shut-downs and start-ups. The annular fluid will be pumped into the system in small increments to maintain system liquid volume and minimize nitrogen usage. Using a liquid pump and a reserve tank reduces the size of the high-pressure

Figure 3-4. Process Flow Diagram for CO₂ Injection Well Maintenance and Monitoring System

DESIGNED BY	BAI	Battelle
DRAWN BY	LC	CO ₂ Injection Well Annular Field System
CHECKED BY	LC	Process Flow Diagram
DATE	04/02/10	04/02/10

accumulator, and also allows for some operational time if the system has a small annular fluid leak.

The annular fluid system will be monitored through a PLC, with important parameter data logged for documentation and review, and alarms to warn of impending noncompliance or out of operating parameter excursions. Section 6.4 describes alarms and controls included in the WMMS to detect and respond to out of range conditions that necessitate well shutdown.

3.7.5.1 Annular Space(s)

The annular space is the area inside the 9-5/8 inch long-string casing and the outside of the 5-1/2 inch injection tubing, above the packer. Assuming that the packer is placed at a depth of 8,000 ft, the volume of the annular space is approximately 15,108 gallons (360 bbls). This is based on the casing design presented in Section 3.7.2. The capacity of the well below the packer is approximately 3,267 gallons (78 bbls) and the capacity of the tubing is approximately 7,477 gallons (177 bbls).

3.7.5.2 Type of Annular Fluid(s)

The annular fluid will be a dilute salt solution such as potassium chloride (KCl), sodium chloride (NaCl), calcium chloride (CaCl₂), or similar. The fluid will be mixed on site from dry salt and good quality (clean) fresh water or it will be acquired pre-mixed. The fluid will also be filtered to ensure that solids do not interfere with the packer or other components of the annular protection system. Final choice of the type of fluid will depend on availability.

3.7.5.3 Specific Gravity of Annular Fluid(s)

The specific gravity of the annular fluid will be approximately 8.5 to 9.0 ppg or similar. These weights will be sufficient to maintain tubular and casing integrity and minimize differential pressure across the packer. A fluid with a higher specific gravity would be needed to prevent freezing near ground surface, if heat tracing isn't applied to the wellhead. A 8.5 ppg KCl (3.2%) fluid contains approximately 11.6 lb of dry KCl per bbl of fluid; a 9 ppg KCl (12.7%) fluid contains approximately 47.9 lb of dry KCl per bbl of fluid.

3.7.5.4 Type of Additive(s) and Inhibitor(s)

The annulus fluid will contain additives and inhibitors including: a corrosion inhibitor, biocide (prevent growth of harmful bacteria), and an oxygen scavenger. Example additives and inhibitors are listed below along with approximate mix rates:

- TETRAHib Plus (corrosion inhibitor for carbon steel tubulars) – 10 gal per 100 bbls packer fluid
- CORSAF™ SF (corrosion inhibitor for use with 13Cr stainless steel tubulars or a combination of stainless steel and carbon steel tubulars) – 20 gal per 100 bbls packer fluid
- Spec-cide 50 (biocide) – 1 gal per 100 bbls packer fluid
- Oxban-HB (non sulfite oxygen scavenger) – 10 gal per 100 bbls packer fluid

These products were recommended by and are provided by Tetra Technologies, Inc., of Houston, Texas. Material Safety Data Sheets (MSDSs) for each of these products is provided in Appendix 3-2. Actual products may vary from those described above.

3.7.5.5 Expansion Coefficient of Annular Fluid(s)

The expansion coefficient for the annular fluid is similar to that of water. Injection stream temperatures are expected to be within the range of 105 to 120°F and bottomhole temperature in the Mt. Simon formation is anticipated to be 135 to 145°F, which would be the maximum temperatures the fluid would be exposed to. For a range of temperature from 105 to 145°F, the expansion coefficient of water ranges from 0.000214 to 0.000290 °F⁻¹ (Engineering Toolbox, 2010). In comparison, the expansion coefficient of a NaCl solution with a concentration range of 8.5 to 9.0 ppg, ranges from 0.000228 to 0.000289 °F⁻¹ (CRC, 2009).

3.7.5.6 Packer or Fluid Seal

See Sections 3.7.5.2 through 3.7.5.4 for a description of the annular (packer) fluid that will be used in the injection well.

3.7.5.6.1 Packer(s)

The choice of packer will depend on whether transmitters/gauges are placed above the packer or below the packer to monitor bottomhole injection pressure and temperature. An example of a packer for both types of monitoring is described below. Manufacturer's information for each of these packers is provided in Appendix 3-3.

Below packer monitoring – The Weatherford HellCat-2 9.625 inch × 5-1/2 inch packer (or similar) is suitable for this purpose. It has 5-1/2 inch tubing connections and a minimum inside diameter of 4.60 inches. This packer can accommodate up to eight 1/4 inch lines (i.e., pass through) to allow pressure and temperature gauges/transmitters to be mounted below the packer. The packer is hydraulically set and retrievable. It is retrieved by running a shifting tool inside of the tubing on wireline or slick line (shift to release). After the packer is released, the shifting tool is pulled from the well and the tubing is retrieved. The tubing cannot be disconnected from this packer and therefore cannot be used as a casing bridge plug.

Above packer monitoring – The Weatherford BlackCat 9.625 inch × 6 inch Retrievable Seal Bore Packer has a smooth polished bore and seals connected to tubing that are stung into the bore. The bore of the packer is 6 inches and the inside diameter of the seals is 4.875 inches. The packer is set on an electric line; the seals are simply set down in the packer and rotation is not required to install or remove the packer. Extra polished bore extensions can be added below the packer to allow for long seal lengths to accommodate a large amount of tubing movement. Tailpipe can be run below the packer with a landing nipple. A plug can be set in the nipple and the seals can be retrieved, thus converting the packer to a bridge plug. This allows the tubing to be retrieved for inspection and/or repairs without removing the packer. This packer is retrievable via a separate trip on tubing with a special retrieving tool. It cannot be accidentally retrieved with the seal.

3.7.5.6.2 Fluid Spotting Procedure, Frequency, and Quantity

Fluid will not be spotted below the packer and left in the wellbore during the final completion activities. Filtered annular (packer) fluid is pumped into the annular space, above the packer, and is the only fluid that will be spotted in the well.

3.8 Information on Well Drilling Company Used During Construction

A drilling company has not yet been put under contract to drill the injection wells. The wells will be drilled by a traditional mud rotary rig. Drilling will begin as soon as possible after the final UIC permit is issued. Either the injection well or the Mt. Simon monitoring well will be drilled first. Approximately three months will be required to drill and characterize each well. The wells may be drilled sequentially or there may be a time lag between drilling events. A survey of drilling companies in the Illinois Basin and surrounding regions was conducted and a drilling company with the equipment required for this project was identified. The drilling company is Unit Drilling Company (UNIT) of Oklahoma City, Oklahoma. UNIT would use its Rig #305 (or similar) to drill the injection wells. Rig #305 has a working depth of 16,000 ft and a static hook capacity of 750,000 lb, which will comfortably handle the FutureGen injection well having a depth of approximately 9,100 ft and a maximum string weight of approximately 450,000 lb (7,000 ft, 13-3/8 inch intermediate casing). No drilling companies in the Illinois Basin with the capabilities required for this size well were identified. A list of standard equipment included with Rig #305 is provided in Table 3-20.

Unit Drilling Company 7101 S. W. 29th St. Oklahoma City, OK 73179

Contact: James L. W. Greer Vice President Marketing

Office 405-745-4948 Fax 405-745-2136 Cell 405-831-7464
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Other drillers may be used to install or assist in installing the smaller diameter (7 inch) monitoring wells. One such drilling company is Les Wilson, Inc., of Carmi, Illinois (205 Industrial Avenue, Carmi, Illinois, 62821; Tel. 618-382-4666; Contact: Bob Wilson). Les Wilson Inc. recently drilled a pilot CO₂ injection well at the Archers Daniel Midland (ADM) plant in Decatur, Illinois, that is very similar in design to the proposed FutureGen injection well.

3.9 Tests and Logs

Logging, coring and testing activities will be conducted during and after drilling to characterize the geology of the site and to demonstrate the integrity of the well to prevent upward migration of fluids from the injection reservoir. After drilling, additional injection tests may be conducted on selected intervals in the Mt. Simon Formation to aid in evaluating injection capacity prior to injecting CO₂. Also, if necessary, the well may be stimulated to enhance injectivity of the formation near the wellbore. Initially, acidization and swabbing of the perforated zone will be performed on the well to remove particulate matter from the perforations and the injection reservoir. However, during characterization and testing activities, it may be determined that the injection reservoir needs to be fractured with a propping material in order to achieve the desired CO₂ injection rates.

Table 3-20. Description of Unit Drilling Company Rig 305

UNIT DRILLING COMPANY		RIG 305
		WORKING DEPTH: 16,000'
DRAWWORKS	Continental Emsco D-3 1,000 HP Powered By: 2-Gulf Electroquip 752 1,000 HP traction motors Auxiliary brake: Elmagco	
SCR HOUSE	Ross Hill Model 1400 SCR with 3-SCR cubicles and 3-generator control cubicles	
POWER	3-Caterpillar 3512B 1476 HP diesel engines 3-Kato 1204 kW generators	
#1 PUMP	Gardner Denver PZ-10 1,300 HP triplex Powered by: GE 752 1,000 HP traction motor	
#2 PUMP	Gardner Denver PZ-10 1,300 HP triplex Powered by: GE 752 1,000 HP traction motor	
MAST	142' Dreco 750,000# static hook load on 12 lines	
SUBSTRUCTURE	22' Jack Ross box on box, 18' to underside of rotary beams	
TRAVELING EQUIPMENT	Block: Gardner Denver 400 ton traveling block Hook: BJ 4300, 350 ton hook Swivel: LB 400, 400 ton swivel	
ROTARY TABLE	Continental Emsco 27 1/2" rotary	
BOP EQUIPMENT	Ram Preventor: 11" 5,000 psi Shaffer LWS Double Ram 11" 5,000 psi Shaffer LWS Single Ram Annular Preventor: 11" 3,000 psi HydriL GK Closing Unit: Valvcon five station closing unit Quality 4 1/16" x 2 1/16" 10,000 psi choke manifold	
DRILL PIPE	4 1/2" 16.60 #/ft NC-46	
DRILL COLLARS	Varies sizes available	
MUD SYSTEM	Working Pits: 1-500 bbl process tank with 3-10 HP mud agitators 1-500 bbl suction tank with 4-10 HP mud agitators Premix Pit: Mud mixing pump: 1-5x6x11 50 HP desander pump 1-5x6x11 50 HP desilter pump 2-5x6x13 50 HP mixing pumps Trip Tank:	
SOLIDS CONTROL EQUIPMENT	Shale Shaker: 2-Derrick FLC 503 linear motion shakers Prime movers: 1-National Oilwell 2-cone 1,000 GPM Desander: 1-National Oilwell 12-cone 1,000 GPM Desilter: 1-Drilco See-Flo Degasser:	
AUXILIARY EQUIPMENT	Water tank: 2 - 500 bbl Fuel tank: 15,000 gal Mud house: Penetration recorder: EDR Survey Instrument: 7 degree with wireline unit Kelly Spinner: International AGC Pipe Spinner: Grayspin Mark 10	

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3.9.1 During Drilling

Activities during drilling will include geophysical logging, coring, fluid sampling, and formation pressure tests. At minimum, the logging and testing activities meet the logging and testing requirements for the UIC permit application. A preliminary logging and testing program is outlined in Table 3-21.

Table 3-21. Preliminary Logging and Testing Program

Depth Interval	Log or Test	Purpose/Comments
Surface Casing Interval (Below conductor casing to 500 ft bgs)	- Basic log suite (gamma ray, formation density, neutron porosity, resistivity ^(a) , spontaneous potential ^(a) , photoelectric factor, caliper ^(a))	- Characterize basic geology (lithology, mineralogy, porosity) - Evaluate borehole condition prior to cementing
	- Dipole sonic shear (DSI) log ^(b)	- Provide sonic data to calibrate surface seismic and other purposes
	- Cement bond log ^(c)	- Evaluate cement integrity
Intermediate Interval (500 to 5,000 ft bgs to 7,000 bgs)	- Basic log suite (gamma ray, formation density, neutron porosity, resistivity ^(a) , spontaneous potential ^(a) , photoelectric factor, caliper ^(a))	- Characterize basic geology (lithology, mineralogy, porosity) - Evaluate borehole condition prior to cementing
	- Enhanced log suite (dipole sonic shear log, resistivity-based microimage log, nuclear magnetic resonance log, elemental capture spectroscopy log) ^(b)	- Enhanced characterization of geologic properties that control injectivity and seal integrity. Focused on formations in this interval that are potential seals.
	- Formation fluid samples ^(b) - Reservoir pressure ^(b)	- Focused on formations or zones in this section of the well that have sufficient porosity and permeability to host monitoring wells (e.g., St. Peter Sandstone, Franconia) - Characterize baseline geochemistry of formation fluids and determine pre-injection reservoir pressure
	- Whole cores and/or sidewall cores ^(b)	- Focused on formations in this interval that are potential seals.
	- Cement bond log	- Evaluate cement integrity
Long String Casing Interval (5,000 to 7,000 ft bgs to 9,100 ft bgs)	- Basic log suite (gamma ray, formation density, neutron porosity, resistivity ^(a) , spontaneous potential ^(a) , photoelectric factor, caliper ^(a))	- Characterize basic geology (lithology, mineralogy, porosity) - Evaluate borehole condition prior to cementing
	- Enhanced log suite (dipole sonic shear log, resistivity-based microimage log, nuclear magnetic resonance log, elemental capture spectroscopy log) ^(b)	- Enhanced characterization of geologic properties that control injectivity and caprock/seal integrity
	- Inclinator survey	- Determine hole trajectory
	- Formation fluid samples - Reservoir pressure	- Focused on formations or zones in this section of the well that have sufficient porosity and permeability to host monitoring wells (e.g., Franconia) and intervals within the Mt. Simon that are candidates for CO ₂ injection. Fluid sampling from Mt. Simon may be deferred until after well completion. - Characterize baseline geochemistry of formation fluids and determine pre-injection reservoir pressure
	- Whole cores and/or sidewall cores	- Evaluate properties of caprock (Eau Claire) and injectivity of storage reservoir (Mt. Simon)
	- Cement bond log ^(c)	- Evaluate cement integrity
	- Baseline temperature log ^(c) - Baseline oxygen activation log ^(c)	- Determine natural geothermal gradient outside well for comparison to future temperature logs for external mechanical

Table 3-21. Preliminary Logging and Testing Program (Continued)

Depth Interval	Log or Test	Purpose/Comments
		<p>integrity evaluations. Baseline log is run as long as possible after drilling and casing/cementing the well as temperature anomalies due to circulation of drilling fluid will persist for several weeks to months.</p> <ul style="list-style-type: none"> - Baseline oxygen activation log will provide confirmation of temperature log and provide baseline measurement for future pulsed neutron capture logging runs aimed at detecting vertical distribution of CO₂ outside the well.
	- Injection tests (during and after drilling)	<ul style="list-style-type: none"> - During drilling, conduct open-hole tests to determine fracture pressure of caprock (Eau Claire) and storage reservoir (Mt. Simon). Testing of Mt. Simon may be deferred until after well completion. - After well is completed, test potential injection zone(s) in Mt. Simon prior to injecting CO₂.

(a) Required by IEPA UIC Permit Requirements.

(b) One or more of these logs may be run across selected intervals of this section of the well.

(c) Cased-hole log

3.9.1.1 Open-Hole Logging

All sections of the hole below the conductor casing will be logged with a basic suite of logging tools, including gamma radiation, formation lithodensity (bulk density), photoelectric factor (PEF), borehole caliper, neutron porosity, resistivity, and spontaneous potential. Logging tools are available that can combine most or all of these logs in a single tool string run at one time.

The gamma-ray tool measures the gamma radiation of uranium (U), potassium (K), and thorium (Th), which occur naturally in many rocks. Because of the relative abundance of U, Th, and K within many clay minerals, a high gamma-ray reading is usually indicative of a relatively high clay content in the rock, whereas a low gamma-ray reading often indicates quartz sands and carbonates.

The lithodensity tool consists of a ¹³⁷Cs source and two gamma-ray detectors mounted on a shielded sidewall skid that is pressed against the formation by a hydraulically activated arm. This arm also provides a caliper measurement of borehole diameter. The gamma rays emitted by the source interact with the electrons in the formation and lose energy as a result of Compton scattering. When gamma-ray energy is low (<150 kiloelectron volts), photoelectric absorption takes place. The number of gamma rays that reach the detectors is directly related to the number of electrons in the formation, which is in turn related to the formation bulk density. The bulk density can be used to calculate a porosity, using the following equation:

$$\Phi = (\rho_{gr} - \rho_b) / (\rho_{gr} - \rho_w),$$

where ρ_{gr} = mean grain density (g/cm³), ρ_w = pore-water density (g/cm³), and ρ_b = bulk density given by the tool (g/cm³).

The PEF can be assessed by comparing the counts from the far detector of the tool, which is in the high-energy region where only Compton scattering occurs, with those of the near detector, which is in the low-energy region where the PEF is dominant. Photoelectric absorption is strongly dependent on the atomic number of the constituents of the formation. Therefore, the PEF values can give an indication of the chemical composition of the rock.

The neutron porosity tool emits fast neutrons, which lose energy as they collide with hydrogen nuclei in the formation. Once the neutrons have slowed down to reach thermal energies (0.025 eV), they are captured by the nuclei of chlorine and various heavy elements. This results in a gamma-ray emission. The tool measures the number of neutrons arriving at five different detectors at varying distances from the source. This measurement is inversely proportional to the concentration of hydrogen in the formation. Because the majority of hydrogen is contained in the pore water, the resulting measurement can be used to derive a porosity. However, hydrogen bound in minerals, such as clays, also contributes to the measurement, so that the raw porosity value is often an overestimate. Furthermore, the presence of certain rare earth and trace elements with particularly large capture cross sections (e.g., boron and cadmium) can have a significant effect on the reading.

A typical resistivity logging tool provides three different measurements of electrical resistivity based on multiple depths of investigation: deep induction, medium induction, and shallow, spherically focused resistivity (SFL). Two induction devices produce an alternating magnetic field, which induces Foucault currents around the borehole. These currents produce a new inductive signal, proportional to the conductivity of the rocks which are essentially infinitely resistive relative to the pore fluids. The measured conductivities are then converted to resistivity (in ohm-meters). The SFL measures the current necessary to maintain a constant voltage drop across a fixed interval and is a direct measurement of resistivity because the solid constituents are controlled mainly by the nature of the pore fluids, porosity, and the permeability. Depending on the type of resistivity tool that is used, an optional inclinometer tool that provides tool face orientation and the hole deviation and azimuth may be run to provide information on bedding dip.

In addition to the standard suite of logs, other types of geophysical logging tools will be run over selected intervals of the well. These logs include: sonic, nuclear magnetic resonance, electrical micro imager, and elemental capture spectroscopy (ECS).

The dipole shear sonic imager (DSI) is a type of sonic log. It employs a combination of monopole and dipole transducers to make accurate measurements of sonic wave propagation in a wide variety of lithologies. In addition to robust and high-quality determination of compressional wave velocity, the DSI excites a flexural mode in the borehole that can be used to determine shear-wave velocity. Sonic data provide a means for converting surface seismic data from time-dependent data to depth-dependent data. The sonic log can also be used to create synthetic seismograms; with these synthetics, the expected changes in seismic properties from injected CO₂ can be anticipated and modeled. The results of this would allow seismic operators to change any parameters to maximize plume monitoring after injection begins. Anisotropy can also be determined with certain versions of the sonic log.

The nuclear magnetic resonance tool measures the total magnetic field using a proton precession magnetometer. It provides permeability estimates based on porosity and pore size

distribution. Consequently, it can distinguish permeability differences among rocks having the same porosity.

The microimage log creates a high resolution microresistivity image of the borehole capable of detecting features as small as 50 μm . The tool consists of multiple imaging pads, each containing multiple microelectrodes, which are in direct contact with the borehole wall and emit a focused current into the formation. The current intensity fluctuations are measured, then converted to color images that reflect microresistivity variations (the lighter the color, the greater the resistivity). This log is helpful for characterizing rock structures, such as bedding, fracturing, slump folding, and other structural and depositional features. And, because the images are oriented, bed orientations can be measured. Combined with information from the nuclear magnetic resonance log, the local stress field can be determined. This information is needed if hydraulic fracturing is deemed necessary and to support numerical modeling.

The ECS logging tool uses gamma ray spectroscopy to determine lithology and the elemental composition of the rocks adjacent to the well bore. It provides information about the relative amounts of selected elements (Si, Fe, Ca, S, Ti, Gd, Cl, Ba and H) and uses this information to infer mineralogy and matrix density.

3.9.1.2 Rock Coring and Analysis

In addition to geophysical logging, rock coring and analysis will support the geological characterization of the site. Whole core or sidewall coring may be conducted in selected intervals in the well. Whole coring will provide continuous sections of core, typically 3.5 inches in diameter by 30 feet in length, that are collected during drilling. Consequently, selection of whole core intervals depends on existing data from nearby off-set wells. For this reason, the amount of whole core collected from the initial well drilled at the site will be minimal, and additional whole core will be collected from subsequent wells (monitoring wells). Sidewall cores (small plugs approximately 1 inch in diameter) will be selected from specific points of interest identified on geophysical logs.

Core collection will most likely be limited to specific zone(s) in the injection reservoir and the caprock; these cores (possibly 2 inch diameter in length cut perpendicular to the borehole) will be collected from discrete depths after the interval of interest has been drilled and logged. Therefore, sidewall core points can be other formations that may serve as seals to prevent upward fluid migration. At least one section of whole core will be collected from the caprock (Eau Claire). Because of the thickness of the Mt. Simon Formation, at least three sections of core will be collected from this formation. These may be distributed throughout the upper, middle, and lower sections of the formation, or they may all be collected from a single continuous zone. Sidewall cores will be collected from several locations within the injection reservoir that appear to have permeability and porosity appropriate for CO₂ injection based on the geophysical logs.

Possible testing of core samples is outlined in Table 3-22. For example, a whole core would be plug sampled for permeability testing, and would be cut open (slabbed) to allow the entire section of core to be photographed, gamma logged (to determine lithology), and to determine a continuous permeability profile along the entire sample. In addition, porosity, grain density, permeability, and bulk density would be determined on one sample per foot of whole core (or similar frequency) along with all sidewall samples. In addition to these basic core tests, a suite

Table 3-22. Preliminary Core Analysis Program

Core	Test/Frequency
Whole core	Plug sampling, full core slabbing, gamma log, profile permeability, over-view slab photo (continuous)
	Porosity, grain density, horizontal permeability, bulk density (1 per ft of core or similar frequency)
	Thin section, core description, ^(a) detailed petrographic description ^(b) (selected samples)
	Geomechanical properties (e.g., triaxial and uniaxial testing for Young's Modulus, Poisson's Ratio, and compressive strength; sonic velocity testing for dynamic Young's Modulus and Poisson's Ratio; calibration of sonic and dipole log; fracture azimuth and maximum stress azimuth [sonic velocity anisotropy]) (selected samples)
	Flow properties: capillary pressure, relative permeability (selected samples)
Sidewall Core	Porosity, grain density, horizontal permeability, bulk density (all samples)
	Detailed petrographic description ^(b) (selected samples)

(a) Parameters such as lithology, texture, inorganic and biogenetic structures, fossils, grain size trends, depositional environment may also be included.

(b) May include thin section analysis, x-ray diffraction (XRD), scanning electron microscopy/energy dispersive spectrometer (SEM/EDS) for quantitative determination of composition, visual estimation of interconnected macroporosity, description of sorting and porosity, measurement of framework grain size and a qualitative assessment of reservoir quality.

of more detailed core analyses would be performed on a subset of samples. These analyses would include a petrographic description, a conventional core description, and geomechanical and flow tests. All of these tests would yield important information about the formation properties as well as help calibrate the wireline logs.

3.9.1.3 Fluid Sampling

If possible, formation fluid (brine) samples will be collected from selected formations during borehole drilling operations. More than likely, fluid samples would be collected by conducting a drill-stem test since this method also provides a means for determining reservoir pressure. Alternatively, wireline tools may also be used to collect open-hole fluid samples and to determine formation pressure. In a drill stem test, fluid from the formation is recovered through the drill stem, while several measurements of pressure are being made. The basic drill stem test tool consists of a packer or packers, valves or ports that may be opened and closed from the surface, and two or more pressure-recording devices. The tool is lowered on the drill pipe to the zone to be tested. The packer or packers are set to isolate the zone from the drilling fluid column, and testing measurement begins. Formation fluid is recovered in the drill pipe through temporary relief of backpressure imposed on the formation. Typical drillstem tests consist of several flow and shut in (pressure buildup) periods, during which reservoir pressure data are recorded. Depending on the predefined requirements and goals for the test, it may be of short (an hour or less) or long (e.g., several days) duration. Since these tests would be conducted while drilling, they would be kept short to reduce rig standby time.

Formations of primary interest for fluid sampling include the Mt. Simon Sandstone and permeable units overlying the primary seal, such as the St. Peter Sandstone and possibly the Franconia Formation, since these zones could potentially be used to monitor for upward

leakage of CO₂ (Table 3-23). The Ironton Galesville Sandstone, if present at this location, is another possible candidate for fluid sampling. Fluid sample collection from the Mt. Simon Formation may be deferred until after the well is completed (perforated).

Table 3-23. Possible Intervals for Fluid Sampling During Drilling

Formation	Formation and Approximate Depth to Top/Bottom
St. Peter Sandstone	4,781 to 4,858 (77 ft)
Franconia Formation (Lower Knox)	6,405 to 6,705 (300 ft) If present at this location, the Ironton Galesville Formation is an alternate candidate zone.
Mt. Simon Sandstone	7,353 to 8,996 (1,643 ft) Specific sampling interval(s) to be determined. Fluid sampling from Mt. Simon may be deferred until after well is completed

Estimated depth interval of Undifferentiated Knox Group is 4,858 to 6,705 ft bgs; see Section 2.

Fluid samples will be analyzed to determine the chemical and isotopic characteristics of the formation fluids. These analyses will provide a means for characterizing the baseline (pre injection) geochemistry of these formation fluids. This information will allow detection of CO₂ invasion and a better understanding of the chemical interactions between injected CO₂, brine, and host minerals. Results of the analyses may also provide information on the relative age of the fluids, whether there has been mixing of brine with meteoric water, and if hydraulic isolation exists between permeable layers that are separated by seals.

3.9.1.4 Open-Hole Injection Testing to Determine Formation Fracture Pressure

During drilling, open hole mini frac testing (microhydraulic fracturing) will be conducted in the caprock (Eau Claire Formation) to determine the fracture pressure of this formation. This parameter is important for designing the CO₂ injection strategy because it will constrain the upper bound of the injection pressure. CO₂ injection pressures will be maintained at a value below the fracture pressure of the caprock to avoid creating fractures that could provide conduits for upward fluid migration out of the storage reservoir.

Mini-frac testing will most likely be conducted using a wireline tool that is designed specifically for this purpose (Schlumberger's Modular Reservoir Dynamics Tester [MDT]) or with a straddle-packer assembly. With this tool, it is possible to isolate a small interval (approximately 5 ft in length) for fracture testing. An upper and lower packer on the tool bounds the test interval, and fluid is pumped into the formation from the surface to build pressure. Pressure gauges on the tool monitor pressure throughout the test and convey this information to surface. Pressure buildup is allowed to continue until the formation fractures. Once the formation fractures, pumping is discontinued and declining pressures are recorded to determine the fracture closure pressure. This cycle can be repeated multiple times within each test interval before moving to another interval in the formation. This tool is best suited for low-permeability formations.

Mini-frac testing with the MDT tool may not be possible in the storage reservoir (Mt. Simon) due to the higher volumetric pump rates required to achieve fracture pressure. Therefore, injection tests in the Mt. Simon Formation may be conducted after the well is cased and perforated using

conventional step-rate testing techniques if the MDT tool or other open-hole techniques are not feasible. Possible test intervals for open-hole mini-frac testing during drilling are identified in Table 3-24.

Table 3-24. Test Intervals for Microhydraulic Fracture Testing During Drilling Using MDT Tool

Formation	Formation and Approximate Depth to Top/Bottom
Eau Claire Formation (Caprock)	6,705 to 7,353 (648 ft) Specific test interval(s) to be determined after geophysical logging. At least 3 locations would be tested.
Mt. Simon Formation	7,353 to 8,996 (1,643 ft), Specific sampling interval(s) to be determined. May not be possible to achieve fracture pressure with MDT tool; therefore, may be deferred until after well completion.

3.9.1.5 Other Types of Open-Hole Reservoir Tests

In addition to the mini-frac testing described above, other types of reservoir tests might be conducted during drilling when the borehole is still in an open-hole condition across the storage reservoir (i.e., after drilling to total depth but before installing casing), depending on how long the hole is left open before installing casing. For example, a dynamic fluid logging survey (flow meter and fluid temperature) conducted during an open borehole, air-lift pumping test would provide a means of identifying zones of higher permeability within an open borehole section that are contributing flow to the borehole. These zones would be candidates for injecting CO₂. Results of these tests would be useful for identifying zones that are candidates for CO₂ injection and also for additional reservoir testing before or after well completion.

3.9.1.6 Cased-Hole Logging

After each casing string is cemented and the cement has set up, a cement bond logging tool will be run across the entire length of the casing string (all casing strings will be cemented to surface). The purpose of running the cement bond logging tool is to evaluate the integrity of the cement sheath outside the casing, primarily to ensure that channels do not exist that could prove conduits for fluid migration out of the storage reservoir.

3.9.2 During and After Casing Installation Drilling

After the well is drilled, including installation and cementing of the long-casing string, the well will be completed with the formation (i.e., perforated). Once this is done, additional injection testing may be conducted prior to beginning regular CO₂ injection.

3.9.2.1 Well Completion

Well completion will primarily entail perforating the well across intervals within the Mt. Simon Formation where CO₂ will be injected. Perforation intervals will be determined based on results of geophysical logging, core analyses, and other characterization and testing data gathered during drilling. Acid treatment of the well will be conducted in conjunction with perforating to reduce or remove wellbore “skin” associated with perforating, drilling, and cementing and to

enhance the connectivity between the well and the formation. At this time, the need for more extensive well stimulation (e.g., hydrofracturing) is not anticipated, although this will be verified during injection testing after well completion.

Prior to perforating the well, acid will be introduced into the bottom of the well so that it covers the perforating interval(s) and is in contact with the perforations when the well is perforated. After the well is perforated, pressure will be applied to the well by pumping in brine to encourage the acid to enter the perforations. After the acid has been in contact with the perforations for a period of time, the well will be swabbed to remove the acid and to collect formation fluid samples. During swabbing, fluid samples will be recovered at land surface and analyzed to monitor water quality parameters (e.g., specific conductance, pH). Once sufficient water has been removed via swabbing so that representative formation fluids unaffected by acid are being recovered, water samples for laboratory analysis will be collected. Because the well will likely be perforated across a considerable length, the process of perforating, acidizing, and swabbing will likely be conducted in a series of steps in which an isolated section of the well is completed.

3.9.2.2 Injection Testing

Once the well is completed, one or more injection tests will be conducted to test the injectivity of the Mt. Simon Formation. If open-hole testing was not conducted to determine the fracture pressure of the formation, the injection tests will be conducted in a manner to determine fracture pressure.

One type of injection test will involve conducting step-rate injection tests using water (brine) as the injection fluid. The test is conducted by injecting into the formation at a series of increasing rates, allowing each to stabilize, and noting the stabilized injection pressure for each rate. A plot of injection pressure versus injection rate is then made to identify the fracture pressure. Data from a step-rate test can also be analyzed to determine reservoir properties, such as permeability. The principle is the same as the microhydraulic fracturing test (mini frac test) described previously. The basic equipment required to conduct a step-rate test includes: a supply (this could be several hundreds of thousands of barrels) of clean, filtered water (brine) with weight similar to that in the test formation; a pressure source (e.g., a cement truck) capable of pumping the water into the well under increasing pressures; monitoring equipment capable of measuring injection rate at the surface and injection and bottomhole pressure. Injection is accomplished through tubing with a packer to isolate the test interval on the top. When testing a section of the well that is perforated above and below, it would be necessary to also use a bridge plug or similar device to isolate the test interval on the bottom in addition to the packer on top.

The following outlines the process of conducting a step-rate fracture test.

- Prior to the test, the well should be shut in long enough so that the bottomhole pressure is near the shut-in formation pressure (e.g., 48 hours).
- Each rate should be allowed to stabilize before proceeding to the next higher rate. A step duration of 60 minutes is usually required for formations with permeability less than 10 mD, and 10 to 30 minutes for formations with permeability greater than 10 mD. However, shorter test durations may be required if the required volume of fluid to be injected is excessive such that the test becomes infeasible. Each step should be similar in duration to the preceding step.

- Ideally, injection rates for the test should ramp up to and include the proposed maximum daily injection rate (e.g., 5%, 10%, 20%, 40%, 80%, and 100%); however, given the high proposed CO₂ injection rate (578,568 lb/hr is approximately equal to 2,051 gallons [49 bbls] per minute), depending on the temperature and pressure of the CO₂ (which affects density), it will not be possible to test at these rates. The first rate should be near the rate at which the formation begins to accept fluid. In addition, it is preferable to test at least two rates below the expected fracture pressure.
- Once the fracture pressure is reached, continuing the test by stepping downward will refine the fracture pressure and provide quality control for the test. However, if the test is not continued after fracturing occurs, pressure monitoring should be continued for a sufficient period of time after injection is stopped to capture the pressure fall-off response. These data can then be analyzed to provide valuable information about the hydraulic properties (e.g., transmissivity) of the formation.
- Specific intervals within the Mt. Simon Formation will be identified for injection testing. Zones that have log characteristics that could be correlated to other intervals will be given priority.
- Other types of injection tests that may be conducted after the well is completed include extended constant rate pumping or injection tests. These longer-term tests are aimed at characterizing hydraulic properties of the injection reservoir away from the well. Examples of types of data that can be obtained from these types of tests include far-field permeability and information about hydraulic boundaries useful for reservoir modeling. Also, pilot-scale CO₂ injection testing may be conducted using a truck-supplied source of CO₂. These additional tests, if conducted, would be carried out before regular CO₂ injection commences.

3.9.3 Demonstration of Mechanical Integrity

After the well is completed, including the installation of tubing, packer, and annular (packer) fluid, but prior to initiating regular CO₂ injection, a test of the well's internal mechanical integrity will be performed. Internal integrity refers to the absence of leaks in the tubing, packer, and casing above the packer. This will be accomplished by conducting an annular pressure test (APT). The APT is a short-term test wherein the fluid in the annular space between the tubing and casing is pressurized, the well is shut in and the pressure of the annular fluid is monitored. If the pressure can be maintained for a specified period of time within a specified percentage of loss or gain, the well is deemed to have internal mechanical integrity. The criteria for the initial APT will be as follows:

- the test shall consist of the annulus being pressured to the maximum injection pressure and held for one hour.
- if the pressure has less than a $\pm 10\%$ loss in pressure, the well will be deemed to have adequate mechanical integrity.

If the well fails the APT, the tubing and packer may need to be removed from the well to determine the cause of the leak. Regulators will be notified at least 30 days prior to conducting the APT so that they can witness the test, if desired. A repeat APT will be performed any time

the injection tubing/packer is removed from the well (e.g., well workovers) prior to resuming injection.

Additional testing will be conducted after regular CO₂ injection begins to demonstrate that the well has sufficient external mechanical integrity. External mechanical integrity refers to the absence of fluid movement/leaks through channels adjacent to the injection wellbore that could result in fluid migration into an USDW. External integrity is usually evaluated annually after the start of injection. Typical methods for evaluating external mechanical integrity include:

- a tracer survey such as oxygen-activation logging or radioactive tracer logging;
- a temperature or noise log; or,
- a casing inspection log.

One or more of these methods will be used to routinely evaluate the well's external mechanical integrity.

A baseline temperature log and oxygen activation log will be run on the well after well construction but prior to commencing CO₂ injection. These logs will serve as a reference for comparing future temperature logs and oxygen activation logs. An oxygen activation log is done using pulsed neutron capture technology, which is also useful for detecting CO₂ outside the well. Therefore, oxygen activation logging can be used to determine the vertical distribution of CO₂ outside the wellbore and to determine if fluid movement is occurring.

3.9.4 Copies of the Logs and Tests Listed Above

Copies of all logs and testing results obtained during drilling will be provided to the agency in the well completion report that will be submitted after the well is drilled. The well completion report comprises part of this UIC permit application (Form 4h).

Results of logging and testing that will be conducted after drilling may not be available in the timeframe required for the well completion report (e.g., the well completion report is usually required within 3 to 4 months from the time the well is drilled). For example, the well may not be perforated immediately after drilling is completed. In this case, any cased-hole injection tests that are planned would not be available until later. Similarly, the baseline temperature log and oxygen activation log may be conducted several months after the well is drilled to ensure that any potential anomalies due to drilling have dissipated. Results of these logs/tests would be submitted at a later date as an addendum to the well completion report.

3.10 References

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DRAFT UIC PERMIT FORMS

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

FORM 4c - OPERATION PROGRAM AND SURFACE FACILITIES

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

<u>4.1</u>	I.	Operation Program
<u>4.1.1</u>	A.	Area Injection Project (if applicable)
<u>4.1.1.1</u>		1. Maximum fluid to be injected per day
<u>4.1.1.2</u>		2. Years remaining in area injection project
<u>4.1.1.3</u>		3. Anticipated total number of injection wells required
<u>4.1.1.4</u>		4. Injection wells operate with/without common manifold
<u>4.1.1.5</u>		5. Number of injection zone monitoring wells, include list and schematics
<u>4.1.1.6</u>		6. Number of, name and location of injection wells currently in project, see instructions
<u>4.1.2</u>	B.	Single Injection Well (if area permit is applied for, provide for typical well)
<u>4.1.2.1</u>		1. Number or name of well
<u>4.1.2.2</u>		2. Location, see instructions
<u>4.1.2.3</u>		3. Expected service life
<u>4.1.2.4</u>		4. Operation during 24 hour period
<u>4.1.2.5</u>		5. Operation days per month
<u>4.1.2.6</u>		6. Injection pressure, average and maximum
<u>4.1.2.7</u>		7. Injection rate, average and maximum
<u>4.1.2.8</u>		8. Casing-tubing annulus pressure, average and maximum
	a.	During operation, average and maximum
<u>4.1.2.9</u>		9. Other annulus pressure
<u>4.1.2.10</u>		10. Number of injection zone monitoring wells, include schematics
<u>4.2</u>	II.	Surface Facilities
<u>4.2.1</u>	A.	Injection fluid storage
<u>4.2.1.1</u>		1. Storage capacity in days and gallons
<u>4.2.1.2</u>		2. Type of storage facility(s)
<u>4.2.1.3</u>		3. Storage capacity in case of well failure, describe
<u>4.2.2</u>	B.	Holding tanks and flow lines, describe
<u>4.2.3</u>	C.	Process and Instrumentation Diagram attachment

- 4.2.4 D. Filter(s)
- 4.2.4.1 1. Location
- 4.2.4.2 2. Type
- 4.2.4.3 3. Name
- 4.2.4.4 4. Model Number
- 4.2.4.5 5. Capacity, gallons per minute
- 4.2.4.6 6. Pore size, microns
- 4.2.5 E. Injection Pump(s)
- 4.2.5.1 1. Location
- 4.2.5.2 2. Type
- 4.2.5.3 3. Name
- 4.2.5.4 4. Model Number
- 4.2.5.5 5. Capacity, gallons per minute

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

4. OPERATION PROGRAM AND SURFACE FACILITIES (Form 4c)

4.1 Operation Program

As an area UIC permit is being requested, information is being provided in Sections 4.1.1 and 4.1.2, per the Illinois EPA UIC Permit instructions. Section 4.1.1 describes the total amount of CO₂ to be injected, number and location of injection wells, and number, location, and description of injection zone monitoring wells (i.e., monitoring wells completed in the injection reservoir). A map is included (Figure 4-1) that shows preliminary locations for the primary and alternate injection wells and deep monitoring wells (final locations cannot be determined until the final plot plan for the FutureGen plant is available). Section 4.1.2 provides additional information about the operational aspects of the injection program, including life expectancy of the injection well, the injection schedule (e.g., hours per day, days per month), injection pressure, etc. Where two sections are present with the same title, information is provided only once and referenced in the other section. For example, Sections 4.1.1.5 and 4.1.2.10 both are titled “Number of Injection Zone Monitoring Wells, Include List and Schematics”.

4.1.1 Area Injection Project

Two CO₂ injection wells may be constructed. The primary injection well will be constructed at the onset of the project. The second well will be drilled if results from the drilling, characterizing and testing of the first well indicate that the additional well is needed; or, if early CO₂ injection results indicate the need for the additional well. Therefore, an area UIC permit is requested.

4.1.1.1 Maximum Fluid to be Injected Per Day

The FutureGen facility is designed to process a range of coals, though it plans to operate using Illinois 6 coal, which also results in the highest CO₂ production. The maximum flow of CO₂ for the Illinois 6 coal will be 6,312 metric tons per day (578,568 lb/hr). The flow rate will be reduced during periods when the plant is operated below full capacity. The CO₂ injection wells have been designed to inject the maximum production rate.

4.1.1.2 Years Remaining in Area Injection Project

The planned duration of CO₂ injection is 4 years.

4.1.1.3 Anticipated Total Number of Injection Wells Required

Up to two CO₂ injection wells may be constructed. The primary injection well will be constructed at the onset of the project. The second well will be drilled if results from the drilling, characterizing and testing of the first well indicate that the additional well is needed; or, if early CO₂ injection results indicate the need for the additional well. Regular well maintenance, such as mechanical integrity tests, will be scheduled during plant shutdowns (planned maintenance outages).

4.1.1.4 Injection Wells Operate With/Without Common Manifold

A single pipeline will convey CO₂ from the plant to the injection well. In the event that the alternate well will also be drilled and used for injection, the pipeline will include a “T” connection

that connects the main branch of the pipeline to two secondary branches, each going to one of the injection wells.

4.1.1.5 Number of Injection Zone Monitoring Wells, Include List and Schematics

Up to three injection zone monitoring wells are planned at this time. Their preliminary locations are shown on Figure 4-1. The location of these wells may change once the CO₂ monitoring program is finalized. These monitoring wells would likely be used for multiple monitoring purposes, for example pressure monitoring, fluid sampling, and cross-well seismic monitoring.

A diagram illustrating the construction specifications for the monitoring wells is provided in Figures 4-2 and 4-3. Note that two designs are proposed for the monitoring wells: one design has an intermediate casing string that is approximately 5,000 ft deep; the other has an intermediate casing string that is approximately 7,000 ft deep. The design with the deeper intermediate string would be implemented if there is an indication that hole stability below 5,000 ft is an issue and thus would warrant extending the depth of this casing string to isolate problem zones. As with the injection wells, the final design may not be determined until drilling is underway. The monitoring wells would extend to the base of the Mt. Simon and would be constructed very similar to the injection wells except they would be smaller in diameter. The diameter of the long-string casing in the monitoring wells will be 7 inches rather than 9-5/8 inches. The intermediate casing string would be 9-5/8 inches rather than 13-3/8 inches, and the surface casing would be 13-3/8 inches in diameter rather than 20 inches. As with the injection wells, all casing strings would be cemented to surface, and acid resistant cement would be used across the injection reservoir. Completion details for the monitoring wells (e.g., perforated zone, internal components such as type of packer and instrumentation) may differ. The wells would be perforated across a portion of the Mt. Simon and would include tubing and a packer as illustrated in the well diagrams in Figures 4-2 and 4-3; however, the exact perforation interval(s) and specifications for the internal well components cannot be determined until after the CO₂ monitoring program is finalized.

4.1.1.6 Number of, Name, and Location of Injection Wells Currently In Project

The location of the primary injection well and the alternate well is provided on Table 4-1, including: county name, township, range, section and coordinate within the section. Also included are the coordinates in Illinois State Plane and in latitude and longitude.

4.1.2 Single Injection Well

Not applicable.

4.1.2.1 Number or Name of Well

Not applicable.

4.1.2.2 Location

See Section 4.1.1.6.

Figure 4-1. Location of Injection Wells and Injection Reservoir Monitoring Wells

Figure 4-2. Monitoring Well Construction Diagram (5,000 ft Intermediate Casing)

Figure 4-3. Monitoring Well Construction Diagram (7,000 ft Intermediate Casing)

Table 4-1. Location of Primary Injection and Backup Wells

Descriptor	Primary Injection Well	Alternate Injection Well
County name	COLES COUNTY	COLES COUNTY
Township	12N	12N
Range	7E	7E
Section	8	8
Coordinates within the section ^(a)	Quarter Quarter Section C1	Quarter Quarter Section F6
Coordinates (State Plane, NAD 83)	NAD83 State Plane Illinois East FIPS 1201 Northing 1029866.71, Easting 954973.88	NAD83 State Plane Illinois East FIPS 1201 Northing 1031943.5, Easting 952125.16
Coordinates (latitude and longitude)	Lat-Long NAD83 39.494704478° N, 88.437072080° W	Lat-Long NAD83 39.500396646° N 88.447175686° W

(a) This refers to the 1/8 mile × 1/8 mile square that the wells are located within. Each section is divided into 64 1/8 mile × 1/8 mile squares (8 × 8). The rows are numbered from east to west and lettered from south to north.

4.1.2.3 Expected Service Life

The expected service life of the wells was discussed in Section 3.4. The wells have been designed to exceed the planned injection period of 4 years. With proper maintenance and periodic inspection and replacement of certain critical components (e.g., tubing, packer), the wells should be able to operate for much more than 4 years.

4.1.2.4 Operation During 24-Hour Period

The FutureGen facility is designed to operate 24 hours per day and 7 days per week with planned maintenance outages twice per year. The planned outages will initially be four weeks in duration. The number and duration of the planned outages are expected to be reduced after the first few years of operation. During initial operation, there will be unplanned outages such that the overall on-line availability will be less than 100%. The maximum flow of CO₂ for the Illinois 6 coal will be 6,312 metric tons per day (578,568 lb/hr). The flow rate will be reduced during periods when the plant is operated below full capacity (i.e., this amount of CO₂ will not be produced on a continuous basis).

4.1.2.5 Operation Days Per Month

The FutureGen facility is designed to operate 24 hours per day and 7 days per week, except during scheduled shutdown events.

4.1.2.6 Injection Pressure, Average, and Maximum

The injection pressure was discussed in Section 3.7.3. Refer to that section for information on injection pressure at the wellhead and at the top of the injection zone as well as the method and assumptions used to calculate these pressures.

4.1.2.7 Injection Rate, Average, and Maximum

The maximum flow of CO₂ for the Illinois 6 coal will be 6,312 metric tons per day (578,568 lb/hr). The flow rate will be reduced for other coal types as well as during periods when the plant is operated below full capacity.

4.1.2.8 Casing Tubing Annulus Pressure, Average, and Maximum

The injection well will be equipped with a system that regulates the pressure of the annular fluid between the tubing and the long-string casing. This system was described in Section 3.7.5. The pressure of the annular fluid (measured at the surface) will be maintained so that the pressure above the packer is greater than the pressure of the injection zone formation below the packer. This arrangement will maintain a downward pressure gradient across the packer at all times.

4.1.2.9 Other Annulus Pressure

Not applicable.

4.1.2.10 Number of Injection Zone Monitoring Wells, Include Schematics

See Section 4.1.1.5.

4.2 Surface Facilities

FutureGen is a government-industry, cost-shared project to design, build, and operate a first-of-a-kind coal-fueled, near-zero emission power plant. The FutureGen power plant will produce electricity and hydrogen from coal while capturing and permanently storing CO₂ in a deep geologic formation. The nominally rated 275-megawatt (MW) prototype power plant will operate as a production plant, generating commercially significant levels of electric power. It may also provide a large-scale engineering laboratory for testing new and clean power generation, CO₂ capture, and coal-to-hydrogen technologies, as well as including syngas slip-stream access for testing and developing new technologies. It is expected that the FutureGen program will build and operate the cleanest coal-fueled power plant in the world.

The FutureGen facility design has been broken up into process areas or islands for ease of design. Each island is composed of unique geographical process elements called “Areas”. The following reflects those Areas:

- Coal Handling Island – Area 100
- Air Separation Unit Island – Area 200
- Gasification Island – Area 300
- Shift Reaction – Area 400
- Mercury Removal – Area 500
- Acid Gas Removal – Area 510
- Sulfur Removal – Area 520
- Tail Gas Treatment Unit – Areas 510, 520 and 530
- Syngas Process Island – Areas 500 through 530
- Power Island – Area 600A
- Grid Interface – Area 600B
- Integration – Area 700
- Balance of Plant – Area 800A
- Process Water Treatment Island – Area 800B
- CO₂ Compression Island – Area 900A
- Sequestration (i.e., pipeline and injection wells) – Area 900B

The areas are shown in a flowsheet relationship in Figure 4-4.

Figure 4-4. Process Areas and their Flowsheet Relationships

4.2.1 Injection Fluid Storage

The FutureGen facility will not have storage capacity for the injection fluid, CO₂. There will be some storage of CO₂ inherent to the system design because of the pipeline size and the knockout pots in the CO₂ compression system. The CO₂ pipeline from the outlet of the CO₂ compressor to the injection well is constructed of 12 inch diameter carbon steel pipe. The final length of the pipeline has not been determined at this time but the initial estimate is 5,800 feet.

4.2.1.1 Storage Capacity in Days and Gallons

Not applicable.

4.2.1.2 Type of Storage Facility(s)

Not applicable.

4.2.1.3 Storage Capacity in Case of Well Failure

Not applicable.

4.2.2 Holding Tanks and Flow Lines

The FutureGen facility will not have storage capacity for the injection fluid, CO₂.

The CO₂ pipeline will be constructed of 12 inch API 5L X65 steel pipe. The pipeline will be buried until it reaches the wellhead(s). The pipeline will have a backpressure control valve at the compressor outlet that can also be used as an isolation valve if necessary. If a second well is drilled, the pipeline will have a branch tee near the backup injection well. The pipeline sections downstream from the tee will be the same size and material as the main pipeline.

wellhead. Each branch line (or mainline if there is only one injection well) will have a flow control valve and an on/off isolation valve near the wellhead. The isolation valves are remote-controlled valves that can automatically isolate the wellheads if necessary. The flow control valves can be used to control flow if both wells are in use. This would not be normal operation and will likely only be used when switching flow between injection wells. That is, when one well is taken off-line for inspection and the other well is put into service so that plant operation will not be impacted.

Several instruments will be used to monitor the pipeline and well operations. Temperature and pressure are measured at the outlet of the final compressor stage and flowrate near the wellhead. If two wells are drilled, pressure will be measured before the branch tee and flow measured in each leg after the branch tee. The flow meter(s) will also measure fluid density. A corrosion monitor will also be installed on the pipeline.

4.2.3 Process and Instrumentation Diagram Attachment

The detailed Process and Instrumentation Diagrams (P&IDs) are not completed at this stage of design for the FutureGen project. The draft Process Flow Diagrams (PFDs) including major instrumentation are shown in Figure 4-5 (CO₂ compression with the primary injection well and possible second injection well) and 4-6 (CO₂ dehydration) for the processes of dehydration, compression, and transport to the injection wells. Note that the details of the compression area are not shown on Figure 4-5 as the design is not finalized. These PFDs and the detailed P&IDs will be completed during definitive design.

4.2.4 Filter(s)

The FutureGen facility will not have filters on the CO₂ line(s). The particulate is removed from the syngas stream prior to the separation of the CO₂ and downstream processing.

4.2.4.1 Location

Not applicable.

4.2.4.2 Type

Not applicable.

4.2.4.3 Name

Not applicable.

4.2.4.4 Model Number

Not applicable.

4.2.4.5 Capacity, Gallons Per Minute

Not applicable.

4.2.4.6 Pore Size, microns

Not applicable.

Figure 4-5. FutureGen Process Flow Diagram - CO₂ Compression and Injection Wells
(Also attached as an oversized map)

Figure 4-6. FutureGen Process Flow Diagram - CO₂ Dehydration
(Also attached as an oversized map)

4.2.5 Injection Pump(s)

The CO₂ compressor system is a centrifugal unit with two compression sections (cases) with each section having two stages of compression.

No interstage cooling is required for the section in low pressure (LP) service. The section in high pressure (HP) service has interstage cooling with the final stage discharging in the supercritical region (2,225 psia) to the air cooled HP CO₂ Compressor Aftercooler. The first suction drum removes water from the inlet streams before the first compression stage. The second knockout drum removes water from the CO₂ stream between the LP and HP compression sections. Intercooling is provided by the CO₂ LP 1st Stage Cooler and CO₂ HP 1st Stage Cooler. In addition, the HP CO₂ Compressor Recycle Cooler has been included around the final stage of compression. This cooler will provide the ability to operate the compressor in recycle mode (i.e., full-load recycle if the downstream system is being brought on line or taken off line) without overheating the compressor. This will be normally necessary only for initial operation of injection wells and startup of the compression system.

The CO₂ Compressor Suction Drum Pump is a small centrifugal type pump that returns any produced water for use in slurry preparation in the gasification area. Although the CO₂ is not normally expected to be saturated with water, in some modes of operation a small amount of water may be produced.

The triethylene glycol (TEG) Dehydration Package treats the CO₂ at the third stage discharge pressure to reduce the water content to <100 ppmv (4.8 Lb/MMscf) to meet the pipeline moisture specification. The TEG package is a high-pressure absorption/low-pressure regeneration circulating solvent system utilizing 99% TEG as the absorbing solution. Heat for regeneration is supplied using 450 psig plant steam. Cooling for the unit is supplied by air coolers and all vent streams from regeneration are recycled back to the main process. The gas compression system will be housed in a metal building approximately 80 ft L × 40 ft W × 35 ft H (at eaves). The specifics of the compression system have not been finalized and may change from the description provided in this section.

4.2.5.1 Location

The CO₂ compression system is located near the center of the surface facility located in the north-central area of the FutureGen site. A preliminary plot plan for the FutureGen site is shown in Figure 4-7 (also attached as an oversized map). The compressor area (900A) is located on the northeast side of the process island. The pipeline routing shown in the figure is for representation only because the exact routing has not been established at this time.

4.2.5.2 Type

The compression system consists of two centrifugal compressors in series. Each compressor has two stages in series for a total of four stages. There is cooling and water removal between the compressors. The downstream HP compressor has heat exchange, water removal and dehydration (using a separate TEG unit) between stages.

4.2.5.3 Name

The final make and model has not been determined at this stage of design. Preliminary design is based on a Dresser-Rand DATUM compressor system (Figure 4-8). This is composed of two centrifugal compressors driven by one 30,000 horsepower (hp) motor. The low-pressure

compressor design is based on a D6R6S DATUM compressor with a gear increaser. The high-pressure compressor design is based on a D12R9B DATUM compressor with a gear increaser.

4.2.5.4 Model Number

See previous section.

4.2.5.5 Capacity, Gallons Per Minute

As shown on the PFDs provided in Figure 4-5 and Figure 4-6, there are several streams at different temperatures and pressures entering the compressors. There are four inlet pressures for the various streams: 15 psia, 45 psia, 70 psia, and 145 psia. The total CO₂ stream flow rate exiting the last compressor is 578,568 lb/hr at 2,225 psia. The exact volumetric flow rate is only an estimate at this time because of the gas density issues near the supercritical region at a temperature of 120°F and a pressure of 2,225 psia, the density of the fluid will be approximately 35 lb/ft³ such that the estimated volumetric flow is 16,456 actual ft³/hr or 2,051 gpm. This is the maximum volume of the CO₂ injection stream that will be delivered to the injection well(s). See Section 7.3 of this document for an expanded discussion of the volume of injection fluid for the range of operating conditions that are anticipated.

Figure 4-7. FutureGen Preliminary Plot Plan (Location of Well is Preliminary)
(Also attached as an oversized map)

Figure 4-8. Dresser-Rand DATUM Compressor
(Found at <http://www.dresser-rand.com/products/turbo/datum/>)

DRAFT UIC PERMIT FORMS

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION**

FORM 4d - AREA OF REVIEW

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

- 5.1 I. Radius of the Area of Review
- 5.2 II. Method of Radius determination, see instructions
- 5.3 III. Map with information required by Section 730.114(a)(2) or 730.134(a)(2)
- 5.4 IV. Description of Anticipated Injection Fluid Movement During the Life of the Project, see instructions
- 5.5 V. Wells Within the Area of Review
 - 5.5.1 A. Tabulation of well data required by 730.114(a)(3) or 730.134(a)(3)
 - 5.5.2 B. Number of wells within 2 ½ miles of injection well penetrating within 300 feet of the uppermost injection zone which are:
 - 5.5.2.1 1. Properly plugged and abandoned
 - 5.5.2.2 2. Temporarily abandoned
 - 5.5.2.3 3. Operating
 - 5.5.2.4 4. Improperly sealed, completed or abandoned
 - 5.5.3 C. Plugging affidavits for all plugged wells
 - 5.5.4 D. Proposed corrective action for unplugged wells penetrating the injection zone

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

5. AREA OF REVIEW (Form 4d)

5.1 Radius of the Area of Review

A fixed radius of 2.5 miles beyond the edge of the Mattoon Site property was selected for the AOR.

5.2 Method of Radius Determination

Modeling performed to determine the anticipated movement of the injected fluid suggests that the radius of the plume will be considerably less than the fixed radius (see Section 5.4).

5.3 Map with Information Required by Section 730.114(a)(2) or 730.134(a)(2)

Figure 5-1 (also attached as an oversized map) shows the locations of all of the wells described in the tables found in Appendix 5-1. Each “dot” is representative of a single latitude and longitude coordinate that can contain up to three individual wells. Multiple wells may have the same latitude and longitude listed in the various databases due to the use of the 10-acre plot system, whereby wells are plotted by dividing a section into 64, 10-acre plots. If a well log does not contain a specific latitude and longitude and uses only the 10-acre plot system, the latitude and longitude listed will be the coordinates of the center of that plot. Therefore, several wells may have the same latitude and longitude listed in the database, but are not necessarily in the same location, only in the same 10-acre area.

Wells with the same latitude and longitude designations are grouped together on tables located in Appendix 5-1 with bold outlines.

5.4 Description of Anticipated Injection Fluid Movement During the Life of the Project

Predictions of the quantity and distribution of CO₂ injected into the Mt. Simon saline reservoir at the Mattoon Site were made using numerical simulation. The governing equations used in the modeling describe the flow and transport of supercritical CO₂ through a saline geologic formation and are based on conservation equations for thermal energy, water mass, CO₂ mass and salt (White and Oostrom, 2000). The CO₂ is prescribed to move through connected pores either through the mobile gas or aqueous phases, where the gas phase comprises mainly supercritical CO₂ and water vapor, and the aqueous phase comprises mainly liquid water and dissolved CO₂ and salt. The flow of mobile phases is described using the multiple-fluid form of Darcy's law. Mass components (i.e., water, CO₂, and salt) migrate through the pore space via advection, hydraulic dispersion and diffusion. Thermal energy is transported through the geologic media via diffusion through the host rock and fluids filling the pores and advectively through the mobile fluids. The governing flow and transport equations contain numerous parameters (e.g., viscosity, solubility, relative permeability, density) that must be computed from the principal unknowns of the governing flow and transport equations. The intermediate equations that relate parameters to the principal unknowns are referred to collectively as the

Mattoon, IL – Area of Review

Figure 5-1. Well Locations
(Also attached as an oversized map)

constitutive equations. Constitutive equations can be divided into two categories — those that are independent and dependent on the host rock. Independent constitutive equations are generally associated with fluid properties (e.g., viscosity, density, diffusion coefficient, enthalpy). Dependent constitutive equations are generally associated with transport parameters associated with the host rock (e.g., intrinsic permeability, saturation-capillary pressure relation, relative permeability-saturation relation, thermal conductivity). Numerical simulations of CO₂ injection, migration, and redistribution used dependent constitutive equations and parameters determined from site specific data.

5.4.1 Simulation Software Description and General Assumptions

Numerical simulations were executed using the sequential version of the Subsurface Transport Over Multiple Phases (STOMP) simulator developed by the Pacific Northwest National Laboratory. STOMP is a collection of multifluid flow and reactive transport simulators with numerous operational modes. STOMP-CO₂e is the operational mode used for the numerical simulations described in this document. STOMP-CO₂e solves four nonlinear hyperbolic partial differential conservation equations: (1) water mass, (2) CO₂ mass, (3) salt mass, and (4) thermal energy. The governing equations are transformed to algebraic form using integral volume spatial discretization on structured orthogonal grids (e.g., Cartesian, cylindrical, or curvilinear boundary fitted) and a backward-Euler temporal discretization (i.e., fully implicit). Nonlinearities in the resulting algebraic equations are linearized via multivariate Newton-Raphson iteration, where the Jacobian matrix is computed using numerical derivatives. Phase transitions are handled using primary variable switching. Details concerning the solved governing equations and numerical solution approaches are reported in the STOMP Theory Guide (White and Oostrom, 2000). Details concerning the use of STOMP-CO₂e, including input formatting details, are reported in the STOMP User's Guide (White and Oostrom, 2006).

The STOMP-CO₂e simulator was chosen for its balance of numerical efficiency and simulation capabilities. Inherent in this balance, however, are assumptions concerning the flow and transport processes. STOMP-CO₂e does not simulate geochemical reactions. Injecting CO₂ is anticipated to lower the formation aqueous pH to values approaching 3.5, which can affect the dissolution of host minerals and subsequent precipitation of carbonates. For these investigations, however, it was assumed that the time-scales for the mineralization reactions to significantly affect the amount of CO₂ in the supercritical phase were well beyond the time periods of interest. Therefore, these simulations were conducted without considering reactive transport. However, salt precipitation was modeled as affecting CO₂ injectivity by reducing the available pore space.

In addition to geochemical alterations, the reservoir formations are additionally subjected to mechanical stresses via elevated injection pressures and temperature gradients imposed from injecting cold CO₂ received via pipeline. However, geomechanical effects were not specifically analyzed for this study. In order to minimize geomechanical effects, injection pressures have been constrained to minimize potential for fracturing both the host formation and especially the primary caprock seal. Also, the short pipeline distances at the Mattoon site mean that wellhead temperatures can easily be controlled to ensure that temperature of the CO₂ injected into the reservoir is within a few degrees of in situ conditions, thus minimizing geomechanical stresses induced by temperature change.

5.4.2 Site Specific Assumptions and Methodology

The primary sequestration reservoir for the Mattoon Site is the Mt. Simon Sandstone, in the interval between depths of 7,353 and 8,996 ft bgs. The Mt. Simon is overlain by the Eau Claire shale and underlain by Precambrian basement rock, both of which act as seals.

Data from the Weaber-Horn #1 well, the closest well that fully penetrates the Mt. Simon with geophysical porosity logs, were used to provide data on the expected rock properties in the Mt. Simon at the Mattoon Site. The Weaber-Horn #1 well is located approximately 36 miles southwest of the Mattoon Site, in Loudon Oil Field, Fayette County, Illinois. Grid spacing in the vertical direction for the reservoir corresponded to the normalized layering from the interpreted Weaber-Horn #1 well, where the 1,500-ft interval of Mt. Simon in the Weaber-Horn well was normalized to the expected 1,643-ft thickness of the Mt. Simon at the Mattoon Site.

Log data from the Weaber-Horn #1 Well, reported in 0.5-ft intervals, were grouped into 53 model layers based on analysis of the sonic porosity log. The modeling domain was discretized using a two-dimensional (2D) radially symmetric grid with 60 radial nodes and 63 vertical nodes. The Mt. Simon reservoir is represented in the model by 53 vertical nodes and the overlying and underlying seals were each represented by five vertical nodes. The overlying and underlying seals were included in the simulation domain to allow for energy transfer out of the reservoir as CO₂ is injected at a lower temperature than that of the formation. The computational domain was designed to simulate the radial and vertical migration of the injected CO₂ from a central well. The radial domain extended from the well casing 4.81 in. (0.12 m) to 16,404.2 ft (5000 m), using a geometrically radially increasing grid spacing with a 3.28-ft (1-m) grid spacing adjacent to the well casing.

Only the vertical distributions of estimated porosity and intrinsic permeability were available for the Weaber-Horn #1 well; therefore, a layered lithology with no horizontal heterogeneity was assumed for distribution of rock properties within the reservoir. The STOMP-CO₂ simulator assigns hydrologic properties to grid cells either by specifying a distribution of rock/soil types across the domain and then assigning properties to the specified rock/soil types, or direct specification for every grid cell. For the Mattoon Site, 53 rock types were specified for the model layers in the Mt. Simon. Porosity data for the 53 model layers were computed from the Weaber-Horn #1 well logs. Permeability values for each layer were estimated from the average porosity data using the following correlation, established by the Illinois State Geologic Survey (Appendix, Mattoon Subsurface Data package submitted by ISGS, 1_1_3_ReservoirGeology_Mattoon.doc, 1_2_3_pressure_resvr_mattoon.doc, 1_2_4_temp_resvr_mattoon.doc, 1_2_7_perm_resvr_mattoon.doc, 1_2_8_Pc_Manlove_Hazen_5.pdf):

$$\log k = 0.268 \phi - 2.08$$

where:

k = permeability

ϕ = porosity (expressed as percent)

Relative permeability-saturation-capillary pressure function parameters (k-s-P parameters) were derived from mercury injection data for four core samples from the Hazen #5 Well in the Manlove field. Parameters for the k-s-P functions were assigned to the 53 rock types using

porosity binning over the four core data. A summary of the hydrologic properties specified for the Mattoon Site rock types is provided in Table 5-1.

Initial conditions for the Mattoon Site simulations were determined from the injection reservoir depth, hydrostatic pressure gradients, geothermal temperature gradients, temperature datums, and salinity data provided by the ISGS (Appendix, Mattoon Subsurface Data package submitted by ISGS, 1_1_3_ReservoirGeology_Mattoon.doc, 1_2_3_pressure_resvr_mattoon.doc, 1_2_4_temp_resvr_mattoon.doc, 1_2_7_perm_resvr_mattoon.doc, 1_2_8_Pc_Manlove_Hazen_5.pdf). The hydrostatic pressure gradient and reservoir depth suggested by the ISGS were used to establish a reference pressure in the sequestration reservoir, but the initial pressure gradient within the reservoir was determined from the density of the reservoir fluids for the initial pressure, temperature, and salinity conditions by the STOMP-CO₂e simulator. The upper and lower boundaries of the computational domain for the Mattoon Site were assumed to be impermeable. The outer radial boundary was assumed to be under hydrostatic conditions in equilibrium with the initial conditions. A summary of the initial conditions for the Mattoon Site is provided in Table 5-2.

Table 5-1. Summary of Hydrologic Properties for the Mt. Simon

Parameter, Units	Average	Minimum	Maximum	Standard Deviation
Diffusive Porosity	0.131	0.063	0.234	0.042
Total Porosity	0.131	0.063	0.234	0.042
Rock Compressibility, 1/Pa	9.72×10^{-10}			
Intrinsic Permeability, mD	161.36	0.405	2600	398.5
Brooks and Corey ψ , cm	213.025	71.00	289.8	98.76
Brooks and Corey λ	0.833	0.621	1.353	0.250
Brooks and Corey s_{ir}	0.066	0.044	0.081	0.011
Burdine Aqueous λ	0.833	0.621	1.353	0.250
Burdine Gas λ	0.833	0.621	1.353	0.250
Longitudinal Dispersivity, m	0.0			
Transverse Dispersivity, m	0.0			

Table 5-2. Summary of Initial Conditions

Parameter	English	SI
Reservoir Bottom Temperature	152.91°F	67.17°C
Reservoir Temperature Gradient	-0.01°F/ft	-0.018°C/m
Aqueous Saturation	1.0	1.0
Reservoir Bottom Pressure	4041.6 psi	27.9 MPa
Reservoir Pressure Gradient	-0.47 psi/ft	0.011 MPa/m
Salinity	130,000 ppm	130,000 ppm

5.4.3 Simulation Results

Numerical simulations of CO₂ injection and redistribution were conducted under the following scenario. The scenario, referred to as the Plant-Lifetime Injection Scenario, involved the injection of 50 MMT of CO₂ at a continuous rate of 0.006312 MMT/day (6,312 metric ton (MT)

per day) (~1.95 MMT/yr). Under this scenario, CO₂ was injected for approximately 25.6 years and then allowed to redistribute in the reservoir, until the simulation concluded at 50 years.

The CO₂ injection was not over the entire Mt. Simon, but confined to a high permeability interval deep in the Mt. Simon, based on analogy with the Weaber-Horn #1 well. Limiting the injection to this deeper zone would tend to increase the amount of time before appreciable amounts of CO₂ migrate to the top of the Mt. Simon, directly below the Eau Claire seal, and would tend to reduce the pressure exerted by the CO₂ on the seal. The injection zone included three of the 53 layers in the Mt. Simon and was 260 ft thick, with an estimated top of 8,698 ft and a base of 8,958 ft, just 38 ft above the base of the Mt. Simon. The estimated porosity and permeability in this lower zone were more than sufficient for injection of the stream of CO₂ anticipated over the life of the power plant.

Plume radii were calculated by integrating the mass of CO₂ over the total numerical grid domain and setting the radius at the radial distance from the injection well where 95% of the CO₂ mass was contained. The 95% cutoff was used to ensure that the reported plume radii represent the bulk of the injected CO₂. Thin high-permeability zones (stringer layers) interpreted from well log data result in thin layers of CO₂ that advance ahead of the main plume. These stringers account for a very small fraction of the injected CO₂ and neither their extent nor their actual presence is known. Hence, use of the 95% cutoff prevented these structures from dominating the plume radius calculations and giving an unrealistically high spatial resolution interpretation of the plume radii that is not justified by the quality of the available reservoir data. Plume radii are presented for selected years in Table 5-3. The modeling results show that the plume, as defined by 95% of the CO₂ mass, will remain well within the AOR.

Table 5-3. Plume Radii (miles) for Modeled Injection Scenario at Selected Times

Time (years)	Radius (feet)	Radius (miles)
5	2,237	0.42
10	2,831	0.54
20	3,303	0.63
50	4,251	0.81

To visually understand the development of the pure-phase plume of injected CO₂, including the potential role of high permeability stringers, a sequence of color-scale profiles of the gas saturation is shown in Figure 5-2. In the injection scenario used in the modeling, CO₂ injection halted after 25.6 years and the images in Figure 5-2 show dominantly radial plume growth during the injection period. Between 20 and 50 years, buoyancy effects dominate and the pure-phase plume movement is primarily vertical. The total plume volume decreases during this period with increasing dissolution of CO₂ into the aqueous phase. The modeling results in Figure 5-2 show that, even after 50 years, the CO₂ mass present in the high permeability stringers remains well within the fixed 2.5 mile (13,200 ft) radius for the AOR. This is the same conclusion reached for the radius estimated from the 95% mass calculation.

Figure 5-2. Gas-Phase Saturation Profiles at 5, 10, 20, and 50 Years for the Modeled Injection Scenario (Injection of 50 MMT over 25.6 years.)

The bottom right figure illustrates how the CO₂ plume relaxes (vertically and horizontally) under the influence of buoyancy after injection stops. Considerable immobile residual gas is trapped in the deepest part of the Mt. Simon formation as the plume relaxes.

5.5 Wells Within the Area of Review

5.5.1 Tabulation of Well Data Required by 730.114(a)(3) or 730.134(a)(3)

Section 730.114(a)(3) requires “A tabulation of data on all wells within the area of review that penetrate into the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging or completion, and any additional information the Agency may require.”

Section 730.134(a)(3) requires, “A tabulation of data reasonably available from public records or otherwise known to the applicant on wells within the area of review included on the map required under paragraph (a)(2) which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Agency may require. In cases where the information would be repetitive and the wells are of similar age, type and construction the Agency may elect to only require data on a representative number of wells.”

Per the above requirements a tabulation of data was compiled from the ISGS WATER database, the ISGS OIL database and the ISWS on all of the known wells located within the 2½ mile AOR. A total of 348 wells are located within the 2½ mile AOR. The most common types of wells are oil wells (164 of 348) and water supply wells (51 of 348 wells) (refer to Appendix 5-1). All of the water supply wells have a depth of less than 425 ft. Other wells include dry and/or

abandoned wells, gas wells, test holes, engineering test holes, stratigraphic test holes, monitoring wells, brine wells and unknown well types.

5.5.2 Number of Wells Within 2½ Miles of Injection Well Penetrating Within 300 Feet of the Uppermost Injection Zone

Upon reviewing the well logs available through ISGS, it was found that there are no unplugged wells within the 2½ mile AOR that penetrate deeper than 3,300 ft. The deepest unplugged well located in the AOR, is a gas well (API # 120290063201) that is at a depth of 3,254 ft, and approximately 2.8 miles from the injection site. The term unplugged indicates that there are no affidavits showing the well was properly plugged and abandoned. The deepest plugged well is a dry and abandoned well that is 3,585 ft deep, and approximately 0.7 miles from the injection site. The depth of the injection well is expected to be more than 3,000 ft below the maximum depth of known wells.

5.5.2.1 Properly Plugged and Abandoned

There are no plugged or abandoned wells within 2½ miles of the injection well that penetrate within 300 ft of the uppermost injection zone.

5.5.2.2 Temporarily Abandoned

There are no temporarily abandoned wells within 2½ miles of the injection well that penetrate within 300 ft of the uppermost injection zone.

5.5.2.3 Operating

There are no operating wells within 2½ miles of the injection well that penetrate within 300 ft of the uppermost injection zone.

5.5.2.4 Improperly Sealed, Completed, or Abandoned

There are no improperly sealed, completed or abandoned wells within 2½ miles of the injection well that penetrate within 300 ft of the uppermost injection zone.

Therefore, there are no wells in the 2½ mile area of review expected to penetrate within 300 ft of the uppermost injection zone.

5.5.3 Plugging Affidavits for All Plugged Wells

Plugging affidavits were obtained from the ISGS office and are included as Appendix 5-2. The well plugging information was included in the well data tabulation per 730.134(a)(3).

5.5.4 Proposed Corrective Action for Unplugged Wells Penetrating the Injection Zone

No wells have been found to penetrate within 300 ft of the uppermost injection zone necessitating corrective action, per 730.114(14).

5.6 References

Appendix, Mattoon Subsurface Data package submitted by Illinois State Geological Survey, 1_1_3_ReservoirGeology_Mattoon.doc, 1_2_3_pressure_resvr_mattoon.doc, 1_2_4_temp_resvr_mattoon.doc, 1_2_7_perm_resvr_mattoon.doc, 1_2_8_Pc_Manlove_Hazen_5.pdf

White, M.D. and M. Oostrom. 2000. STOMP - Subsurface Transport over Multiple Phases Version 2.0, Theory Guide. PNNL-12030, Pacific Northwest National Laboratory, Richland, Washington.

White, M.D. and M. Oostrom. 2006. STOMP Subsurface Transport over Multiple Phases, Version 4.0, User's Guide. PNNL-15782, Pacific Northwest National Laboratory, Richland, Washington.

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

FORM 4e - MONITORING, INTEGRITY TESTING and CONTINGENCY PLAN

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

- 6.1 I. Waste Sampling and Analysis
 - 6.1.1 A. Sampling frequency
 - 6.1.2 B. Analysis parameters
 - 6.1.3 C. Sampling location
 - 6.1.4 D. Detailed waste analysis plan
- 6.2 II. Monitoring Program
 - 6.2.1 A. Recording devices, see instructions
 - 6.2.1.1 1. Injection pressure gauges
 - 6.2.1.2 2. Casing-tubing annulus pressure gauges
 - 6.2.1.3 3. Flow meters
 - 6.2.1.4 4. pH recording devices
 - 6.2.1.5 5. Temperature
 - 6.2.2 B. USDW Monitoring in Area of Review
 - 6.2.2.1 1. Number of wells
 - 6.2.2.2 2. Type of wells
 - 6.2.2.3 3. Frequency of monitoring
 - 6.2.2.4 4. Type of sample
 - 6.2.2.5 5. Parameters
 - 6.2.2.6 6. Map of well location and logs
 - 6.2.3 C. Detailed Groundwater Monitoring Plan
- 6.3 III. Mechanical Integrity Tests During Service Life of Well, see instructions
- 6.4 IV. Contingency Plan for Well Failure or Shut In, see instructions
 - 6.4 A. Detailed contingency plan
 - 6.5 B. Corrosion Monitoring Plan (this section is not part of Form 4e, but was added at the request of I. EPA).

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

6. MONITORING, INTEGRITY TESTING, AND CONTINGENCY PLAN (Form 4e)

6.1 Waste Sampling and Analysis

6.1.1 Sampling Frequency

Samples of the CO₂ stream will be collected quarterly for chemical analyses.

6.1.2 Analysis Parameters

Table 6-1 presents parameters to be analyzed in the CO₂ stream. The list of parameters was developed based on the anticipated composition of the CO₂ stream at the sampling location. Gas concentration analyses will be done by Atlantic Analytical Laboratory, Inc. (Whitehouse, New Jersey) or a laboratory with similar capabilities. Atlantic Analytical specializes in gas analyses and routinely performs specialized analyses on CO₂ for industrial clients.

Table 6-1. Analytes to be Measured in the CO₂ Stream

Constituent	Rational	Analytical Method	Laboratory	Frequency ^(a)
N ₂	Minor constituent of CO ₂ stream	Mass Spectrometry	Atlantic Analytical	Quarterly
O ₂	Indicator of atmospheric contamination	Mass Spectrometry	Atlantic Analytical	Quarterly
Ar	Minor constituent of CO ₂ stream	Mass Spectrometry	Atlantic Analytical	Quarterly
He	Indicator of insufficient cylinder purging	Mass Spectrometry	Atlantic Analytical	Quarterly
H ₂	Minor constituent of CO ₂ stream	Mass Spectrometry	Atlantic Analytical	Quarterly
CO	Minor constituent of CO ₂ stream	Gas chromatography	Atlantic Analytical	Quarterly
CH ₄	Minor constituent of CO ₂ stream	Gas chromatography	Atlantic Analytical	Quarterly
CO ₂	Major constituent of CO ₂ stream	Orsat Analysis / Calculation by Difference	Atlantic Analytical	Quarterly
Volatile Sulfur Compounds	Detection of minor sulfur constituents (H ₂ S, COS)	Gas chromatography, Sulfur Chemo-luminescence Detector	Atlantic Analytical	Quarterly
Water Vapor	Minor constituent of CO ₂ stream	Electrolytic Hygrometry	Atlantic Analytical	Quarterly

(a) Additional analyses will be performed if coal type changes.

6.1.3 Sampling Location

Samples of the CO₂ stream will be collected at a location in the system where the material is representative of the material injected. The sampling location is on the contactor knockout drum within the TEG dehydration package, located within the 900A (compression) area. This point is located just upstream of the CO₂ compressor suction to minimize the potential of any liquid condensation in the pipeline. Thus, this stream is representative of the CO₂ composition delivered to the injection wells, although at a lower pressure. Pressure at this point in the

system is approximately 700 psia; therefore, the CO₂ sample will be in a gas phase when it is collected. Physical characteristics of the vapor stream leaving the knockout drum are provided on Table 6-2; a material (chemical) balance for the vapor stream is provided in Table 6-3 and Table 6-4. The information on Table 6-2, Table 6-3, and Table 6-4 is an estimate based on a heat and material balance conducted for the power plant; therefore, actual properties and composition may vary slightly.

**Table 6-2. Physical Characteristics of CO₂ Stream 911
(Vapor Stream Leaving Knockout Drum)**

Parameter	Units	ILL 6 ^(a)	ILL 6 ^(b)
Temperature	°F	101.8	102
Pressure	psia	701.0	701
Mass Flow	lb/hr	578,568	531,161
Mole Flow	lbmole/hr	13,479	12,467
Volume Flow	ft ³ /hr	89,923	83,872
Vapor Frac		1.000	1.000
Enthalpy	mmbtu/hr	-2,227	-2,039
Mass Enthalpy	Btu/lb	-3,849	-3,840
Density	lb/ ft ³	6.434	6.333
Molecular Weight		42.92	42.61
Comp. Factor (Z)		0.7762	0.7825
Viscosity	cp	0.0179	0.0179
Thermal Cond.	Btu/hr-ft-R	0.0144	0.0148
CP/CV		1.2846	1.2856
Heat Capacity	Btu/lb-R	0.3173	0.3147

(a) Based on Gasifier Technology #1

(b) Based on Gasifier Technology #2

mmbtu – one million BTU

R - Rankine

6.1.4 Detailed Waste Analysis Plan

A sampling station consisting of a valve and a ¼ inch National Pipe Threads (NPT) fitting will be installed on the TEG knockout drum for the purpose of collecting gas samples. For gas concentration analyses, double-ended sample cylinders will be provided from Atlantic Analytical, Inc. (Figure 6-1). Specially-treated sulfur-inert cylinders are also available for quantification of low-level sulfur speciation (<1 ppm). Cylinders will be connected directly to the sampling station on the knockout drum and purged with sample gas at least five times prior to sample collection to remove laboratory-added helium gas and ensure a representative sample. During purging, the outlet of the sample cylinder will be connected to a ventilation line and all waste gas will be vented out of the building. A proper sampling technique is critical for any gas analysis program. Therefore, great care will be taken to ensure that the cylinder is not contaminated by atmospheric gas and the sample is representative of the gas in the knockout drum. To accomplish this, sampling procedures developed by Atlantic Analytical, Inc. will be closely followed (Figure 6-2). Although there is no maximum hold time for the analytes of interest listed in Table 6-1, samples will be shipped to the lab immediately after collection. Because the filled sample cylinders will be under pressure at approximately 700 psi, they will be shipped as hazardous material through a qualified ground courier (e.g., FedEx, UPS) with appropriate hazard labels.

**Table 6-3. Estimated Composition of CO₂ Stream 911
(Vapor Stream Leaving Knockout Drum) – Gasifier Technology #1**

ILL 6		
Constituent	Mass %	Mole %
Nitrogen	0.0587	0.0900
Argon	0.0381	0.0409
Hydrogen	0.1091	2.3234
Methane	0.1139	0.3047
CO	0.0307	0.0470
CO ₂	99.6385	97.1786
H ₂ S	0.0016	0.0021
COS	0.0048	0.0035

**Table 6-4. Estimated Composition of CO₂ Stream 911
(Vapor Stream Leaving Knockout Drum) – Gasifier Technology #2**

ILL 6		
Constituent	Mass %	Mole %
Nitrogen	0.2635	0.4008
Argon	0.0392	0.0418
Hydrogen	0.1485	3.1380
Methane	0.0003	0.0007
CO	0.0719	0.1094
CO ₂	99.4640	96.2923
H ₂ S	0.0027	0.0034
COS	0.0053	0.0038
Water	0.0041	0.0096

Figure 6-1. Double-Ended Sample Cylinder Provided by Atlantic Analytical Laboratory

Introduction

Atlantic Analytical Laboratory (AAL) provides pre-cleaned and conditioned stainless steel and sulfur-inerted sampling cylinders as a convenience to our customers. Rental cylinders are available in a variety of sizes, including 75cc, 300cc, 500cc, and 1 liter. All cylinders are DOT rated for 1,800 psig service, and are equipped with a burst-disc type relief valve set to approximately this pressure. All cylinders are dual ended, with 1/4" NPT valve port fittings. Cylinders are normally shipped with approximately 10 psig UHP grade helium backfill gas to prevent atmospheric contamination during shipment. Cylinders can be shipped under vacuum upon request.

Safety

Before sampling, review all MSDS information related to the gases present. Always wear safety glasses, protective gloves, and other necessary safety equipment. Sampling cylinders are only to be used by personnel trained in handling pressurized gases. For safety, always assume any cylinder or gas line contains the maximum amount of pressure possible in the system. Whenever possible, ensure that the sampling cylinder outlet port is attached to an appropriate vent line to avoid a potentially hazardous buildup of the gas being sampled, especially for oxygen and flammable gases. Refer to the back of this page for a diagram of a typical sampling setup.

- **DO NOT** sample toxic, corrosive, pyrophoric, or extremely reactive gases with these cylinders.
- **DO NOT** sample cryogenic or liquefied gases using these instructions; instead, refer to separate instructions available from AAL for proper sampling techniques for these gases.
- **DO NOT EXCEED the MAXIMUM 1,800 PSIG fill pressure.** If the relief valve burst disc ruptures, the cylinder cannot be used for sampling - return to AAL immediately for repairs, cleaning, and recertification.

Equipment

Sampling cylinder, 1/4" NPT brass end cap, 1/4" NPT brass plug, ID tag.

Sampling Procedure

- 1) Remove the brass cylinder end cap and plug and store them in a clean, secure location.
- 2) Loosely connect the inlet valve of the sampling cylinder to the gas source valve.
- 3) Carefully open the gas source valve and purge the connecting fittings of air - then tighten these fittings. Keep the gas source valve open until step 11.
- 4) Carefully open the cylinder inlet valve to allow the sample gas to fill the cylinder.
- 5) Close the cylinder inlet valve. Do not over tighten, as this may damage the valve seat and cause leakage.
- 6) Open the cylinder outlet valve, and allow a majority the cylinder gas to vent. **DO NOT** blow down completely to atmospheric pressure, as this may cause outside contaminants to diffuse into the cylinder.
- 7) Close the cylinder outlet valve.
- 8) Repeat steps 4 - 7 a minimum of 5 times to ensure the cylinder has been purged of all fill gas and conditioned with the sample gas.
- 9) Open the cylinder inlet valve and partially open the cylinder outlet valve to allow the sample gas to flow through the cylinder for at least 2 minutes.
- 10) Close the cylinder outlet valve and wait at least 30 seconds for the cylinder to fully pressurize.
- 11) Close both the cylinder inlet and gas source valves - then carefully disconnect the cylinder. Beware of excess gas pressure trapped between the two valves which may release suddenly when disconnecting the cylinder.
- 12) Apply new teflon tape to the NPT threads on the inlet valve of the cylinder and the brass outlet plug and securely cap both ends of the cylinder. **DO NOT** over tighten fittings or thread damage may result.
- 13) Record all sample data on the cylinder ID tag - please do not affix labels to the cylinder body.
- 14) Package the cylinder in a DOT/IATA approved shipping box or container and insert a completed AAL "Analytical Testing Request" form. Follow all applicable shipping regulations including affixing the proper sample UN designation, shipping name, hazard labels, and identification of the sample contents on all courier paperwork.
- 15) Ship the sample to AAL via an express air (if eligible) or qualified ground courier as soon as possible.

Figure 6-2. Atlantic Analytical Gas Sampling Instruction Sheet

6.2 Monitoring Program

This section describes the pressure, temperature and flow monitoring that will be conducted on the injection well(s). Other types of monitoring, for example monitoring the CO₂ injection stream and USWD monitoring, are described elsewhere in this document.

6.2.1 Recording Devices

Recording devices will be used to monitor injection parameters including CO₂ injection rate, temperature, and pressure. In addition, bottomhole pressure and temperature and annular pressure will be monitored using instruments affixed to the injection well.

6.2.1.1 Injection Pressure Gauges

The injection well will continuously monitor and record the pressure and temperature of the CO₂ as it enters the well. A pressure transmitter (Foxboro I/A Series® Electronic Pressure Transmitter [or similar] with 4 to 20 mA analog output and maximum pressure rating of 4,500 psi) and a temperature transmitter (Foxboro I/A Series® Intelligent Temperature Transmitter Model RTT20 [or equivalent] with 4 to 20 mA analog output sensor/transmitters and a maximum temperature rating of 85°F) will be located on the CO₂ pipeline at the wellhead. The gauge specifications are included in Appendix 6-1; if a similar gauge is used, it will be sized to ensure that the maximum ratings are 20% greater than the maximum anticipated operating parameters.

Each sensor/transmitter will be connected to an RTU (Weatherford CS7X– Well Site Management System [or similar]) that will be housed in the WMMS building, located approximately 100 ft from the injection wells. The RTU will allow temperature and pressure, along with other monitored parameters, at each well to be viewed in real time. The temperature and pressure transmitters will also be connected to the Plant Control Center via a PLC in the WMMS building so that these parameters can be monitored by the plant operators in real time. Data can be retrieved from the RTU via cable download or from the data historian located in the Plant Control Center.

Pressure will also be continuously monitored in/near the bottom of the well using a pressure transmitter placed in the tubing either just above the packer or below the packer. The pressure transmitters will include a temperature sensor/transmitter; therefore, bottomhole pressure and temperature data will be collected concurrently. Bottomhole pressure and temperature will be monitored using real-time surface readout instrumentation. These instruments do not have to be removed from the well to retrieve the data because they are connected to a surface controller with display capabilities via a downhole cable. These arrangements are illustrated in Figure 6-3.

The type of sensor/transmitter that will be used in the injection wells is the Weatherford mPOD™2+ multi-point digital pressure/temperature sensor/transmitter (or similar), which is a pizeoresistive, silicon on insulator (SOI) type instrument (specifications included in Appendix 6-1). The sensor/transmitters will be constructed of stainless steel and have a pressure rating of 7,500 psi, an accuracy of 0.075% of full scale (typically 0.05%) and a resolution of 0.002%. The temperature sensor/transmitter is rated to 59° to 257°F, with an accuracy of ±1.8°F and a resolution of 0.1°F. The bottomhole pressure/temperature transmitter will be connected to the Weatherford CS7X – Well Site Management System (or similar) RTU that will be located in the WMMS building so that data can be viewed in real time. Data will also be logged at this RTU and can be retrieved at this location at any time. As with the surface pressure/temperature transmitter, the bottomhole pressure/temperature transmitter will also be connected to the Plant Control Center via a PLC in the WMMS building so that these parameters can be monitored by the plant operators in real time.

Figure 6-3. Illustration of Bottomhole Monitoring Installations

Injection pressure is one of the key parameters that will be used to initiate automatic shutdown of CO₂ injection if the pressure exceeds the maximum allowable injection pressure specified in the UIC permit. Control logic will be developed so that CO₂ injection can be halted if surface (injection) pressure or bottomhole pressure exceeds allowable limits.

6.2.1.2 Casing-Tubing Annular Pressure Gauges

Annular pressure (i.e., pressure of the annular fluid between the injection tubing and the long-string casing) will be continuously measured using a pressure transmitter (Foxboro I/A Series® [or similar] Electronic Pressure Transmitter with 4 to 20 milliamper (mA) analog output and maximum pressure rating of 4,500 psi) installed on the wellhead. As with the other monitoring instrumentation on/in the well, the annulus pressure transmitter will be connected to the Weatherford CS7X – Well Site Management System [or similar] RTU that will be located in the WMMS building. It will also be connected to the Plant Control Center via a PLC in the WMMS building so that these parameters can be monitored by the plant operators in real time. Annular pressure data will be electronically stored by the Real Time Data Base (RTDB) system for retrieval and analysis.

Control logic will be put in place that will trigger alarms and/or halt CO₂ injection if annular pressure suggests failure of internal mechanical integrity (e.g., tubing leak). Flow can be halted automatically by closing the flow valve to the well and the master valves on the well. Each

injection well will be equipped with two actuated master valves that can be operated remotely from the Control Center.

6.2.1.3 Flow Meters

The pipeline will have a backpressure control valve at the compressor outlet that can also be used as an isolation valve if necessary. The pipeline will be buried until it reaches the injection wells.

If a second injection well is drilled, the pipeline will have a branch tee near the backup injection well. The pipeline sections downstream from the tee will be the same size and material as the main pipeline (12 inch API X65 steel). Each branch line will have a flow control valve and an on/off isolation valve on the wellhead. The isolation valves are remote-controlled valves that can automatically isolate the wellheads if necessary. The flow control valves can be used to control flow if both wells are in use. This would not be normal operation and will likely only be used when switching flow between injection wells (i.e., when one well is taken off-line for inspection and the other well is put into service so that plant operation will not be impacted). Refer to the process flow diagrams in Section 4 (Figure 4-5 and Figure 4-6) for valve and instrument placements.

Several instruments will be used to monitor the pipeline and well operations. Temperature and pressure are measured at the outlet of the final compressor stage, the flowmeter will be located on the pipeline, between the outlet of the compression unit and before the wellhead. The flowrate and density will be continuously measured by a Preso Venturi Flowmeter (or similar), rated to measure 776,648 lb/hr and data stored on the RTDB system (specifications included in Appendix 6-1). A corrosion monitor will also be installed on the pipeline.

6.2.1.4 pH Recording Devices

Because the injection fluid is non-aqueous, it has no pH. Thus, pH cannot be determined.

6.2.1.5 Temperature

As described in Section 6.2.1.1, the injection well will be instrumented to continuously monitor and record the pressure and temperature of the CO₂ as it enters the well. This will be accomplished with a temperature transmitter (Foxboro I/A Series® Intelligent Temperature Transmitter Model RTT20 [or equivalent] with 4 to 20 mA analog output) located on the CO₂ pipeline where it connects to the wellhead.

In addition to monitoring injection temperature, bottomhole temperature will also be monitored in the injection well.

6.2.2 USDW Monitoring in Area of Review

6.2.2.1 Number of Wells

Four groundwater monitoring wells will be installed to monitor the USDW aquifer in the vicinity of the CO₂ injection well. If a second injection well is added, additional monitoring wells will be installed (at least 3). The wells will be constructed to monitor the interface of the bedrock and overlying unconsolidated glacial sediments (Figure 6-4a). A previous investigation by Patrick Engineering, Inc. (Environmental Information Volume, September 15, 2006) found fractured bedrock (Mattoon Formation) overlain by glacial sediments at approximately 85 ft (boring B-1-M) in the southwest corner of the Mattoon site, though the depth to bedrock varies across the site.

Patrick Engineering, Inc. did not find groundwater present at the bedrock contact in boring B-1-M. If groundwater is not found at the bedrock interface, the wells will be screened in an alternate (deeper) zone (Figure 6-4b). As described in Section 2.7.2, there is no major shallow aquifer present, and the local USDW consists of Quaternary-aged glacially-deposited sand and gravel lenses and discontinuous layers of sand approximately 25 to 125 ft bgs. The exact depths and placement of the monitoring wells will be determined based upon the results of exploratory borings conducted while drilling the boreholes for the monitoring wells.

6.2.2.2 Type of Wells

In November 2006, Patrick Engineering completed seven test soil borings at the site ranging from 30 to 90 ft bgs (see Section 2.7.2.3). These borings, which terminated in the unconsolidated sediments overlying bedrock, were successfully completed using hollow-stem auger drilling. Therefore, monitoring wells will be installed using this technology unless they have to be drilled deeper (i.e., into bedrock). If the wells have to be completed in bedrock, they will be drilled with an appropriate technique (e.g., air or mud rotary).

Monitoring wells will be constructed with typical materials used for groundwater monitoring wells. Well screens will be constructed with 2-inch or 4-inch diameter slotted polyvinyl chloride (PVC) casing from the bottom of the boring to a height based on the monitoring interval identified by examining the core samples produced during drilling. A solid PVC riser casing will be used to complete the installation. Sand will be placed in the annular space around the screened interval up to approximately 2 feet above the top of the well screen interval. A bentonite seal at least 2 ft in thickness will be emplaced directly above the sand filter pack. The remaining annular space around the solid portion of the PVC pipe will be backfilled with a cement (95%) bentonite (5%) slurry to approximately 4 ft bgs. If the monitoring wells are completed in bedrock, a conductor casing set a short distance into bedrock will also be necessary to provide borehole stability and to prevent water in shallow unconsolidated sediments from flowing down the outside of the well casing and contaminating deeper groundwater. If necessary, a steel protective well cover with a locking flange will be placed over the PVC well casing and the remaining annulus will be filled with cement. Figure 6-4 shows typical well construction details for the USDW monitoring wells. All groundwater monitoring wells will be installed and eventually abandoned according to Illinois Department of Public Health regulations (Section 920.170 of the Illinois Water Well Construction Code: <http://www.ilga.gov/commission/jcar/admincode/077/07700920sections.html>).

6.2.2.3 Frequency of Monitoring

At least eight samples will be collected from each USDW monitoring well before CO₂ injection begins in order to establish background concentrations for parameters of interest. During the four-year active injection period, the monitoring frequency will be quarterly for the full suite of parameters (see Section 6.2.3.2 for a detailed explanation of analytes). The sampling will continue semi-annually for at least 2 years after injection ceases. If, after two years, there is no evidence that there has been CO₂ migration into the USDW and no operational disturbances that could cause leakage or migration, monitoring will be discontinued.

At this time, the total monitoring timeline is 7 to 8 years, including one to two years of pre-injection monitoring, 4 years of monitoring during active injection, and 2 years of post-injection monitoring.

Figure 6-4b. Example Monitoring Well Construction Details for Wells Constructed in the Shallow Bedrock. If water is not found at bedrock interface, an alternative water-bearing unit will be located. Well may stick up above ground surface or be flush with ground surface depending on site location.

6.2.2.4 Types of Samples

Grab samples will be obtained from the USDW monitoring wells and analyzed for a suite of chemical parameters that are indicators of CO₂ or brine invasion into the shallow aquifer. For details regarding sample collection procedures, analyses and quality assurance see Section 6.2.3.

6.2.2.5 Parameters

The following sample/data types will be collected as part of the USDW monitoring program:

- Discrete water samples will be collected from the shallow USDW wells following the sampling timeline outlined in Section 6.2.2.3. The water quality in the USDW formations will be used to determine if deep formation brine and CO₂ are leaking upward. Great care will be taken to ensure the water samples taken from the USDW are representative of water within the formation. Details regarding the collection methods, parameters measured, and analytical methods for water samples collected from USDW are located in Section 6.2.3.
- Water quality parameters will be measured during well purging prior to sample collection. Groundwater pH, temperature, conductivity, dissolved oxygen, and oxidation/reduction potential (ORP) will be monitored in the field using portable meters and flow-through cells.
- In addition to water quality parameters, the water level in each well will be either continuously monitored using a dedicated pressure transducer and/or periodically (e.g., quarterly) determined using an electronic water level indicator prior to sample collection.
- During the drilling of the wells located in the USDW, soil cores or cuttings will be photographed and described.
- A pneumatic slug test (or similar) will be performed to determine shallow aquifer properties (hydraulic conductivity) after well installation.

6.2.2.6 Map of Well Location and Logs

The locations of the monitoring wells are designed to monitor the area corresponding to the size of the CO₂ plume after 4 years of injection at the rate of approximately 1.95 MMT/year and 2 years of post-injection relaxation. A radius of 0.39 miles was originally modeled for the plume extent after the initial limited injection operation, and can be used for estimation purposes.

Figure 6-5 shows the approximate locations of the proposed USDW monitoring wells (locations are tentative, pending the final location of the injection well(s)). Two of the four primary USDW monitoring wells will be placed near the injection well, as close as possible without interfering with plant facilities or injection operations. An additional well as requested by the IEPA will also be placed near the anticipated 4-year plume boundary in the direction that is up-dip from the injection well (i.e., buoyant forces may result in preferentially spreading CO₂ in the up-dip direction), as requested by the IEPA. However, this well cannot be located until after the seismic survey is completed to determine bedrock dip direction. A fourth monitoring well will be located outside the modeled CO₂ plume in the southwest corner of the site to serve as a control well during injection. If the secondary injection site is used, three more USDW wells will be installed

Figure 6-5. USDW Monitoring Well Locations (Locations are tentative, pending the final location of the injection well)

following the same rationale explained above. That is, two of the wells would be located near the injection location and a third well would be placed near the anticipated plume boundary in the up-dip direction relative to the injection well.

6.2.3 Detailed Groundwater Monitoring Plan

6.2.3.1 Project Definition and Objectives

A comprehensive groundwater monitoring plan is proposed to detect any CO₂ leakage or upward displacement of deep brine fluids into groundwater formations used as a water supply near the injection wells. Monitoring wells will provide access to the aquifer to obtain both hydraulic and geochemical data. Water levels in the monitoring wells will be either continuously or periodically monitored to monitor changes in the direction of groundwater movement. Water quality monitoring will focus on parameters most influenced by the addition of CO₂. Geochemical modeling suggests that CO₂ effects on water quality will likely influence the carbonate system and will be expressed as changes in pH, dissolved CO₂, and alkalinity. Stable carbon and oxygen isotopic analyses will also be performed to monitor isotopic changes in shallow groundwater caused by mixing of injected CO₂ which has a significantly different isotopic signature. This section details the groundwater sampling methodology, chemical parameters to be measured and quality assurance plans for the shallow groundwater monitoring plan.

6.2.3.2 Geochemical Parameters

Groundwater samples will be analyzed for a suite of chemical parameters that are indicators of CO₂ or brine invasion into the shallow aquifer. As outlined in Section 6.2.2.3, the monitoring wells will be sampled quarterly for one year prior to injection for the entire suite of parameters to obtain representative background conditions and continue through the injection and post-injection phases.

Table 6-5 outlines the geochemical parameters to be measured in the grab samples obtained from the monitoring wells, and Table 6-6 suggested analytical laboratories to be used. As mentioned previously, CO₂ invasion would likely first influence carbonate phases in affected groundwaters, and consequently dissolved CO₂ will be measured directly. Increased dissolved CO₂ concentrations would also lead to increased carbonic acid concentrations and lower pH, which may result in increased dissolution rates of subsurface carbonates, and therefore increased alkalinity concentrations. TDS, cations, anions and metals will be measured to monitor possible mixing of upwelling deep brine fluid with groundwater. Stable oxygen and hydrogen isotopes of formation water will help characterize the fluids in different formations. In the midcontinent basins, the isotopic composition of the bedrock fluids shows characteristic deviations from the global meteoric water line (Graf et al., 1965, Clayton et al., 1966). If fluids from deeper formations began to mix with shallower units, oxygen and hydrogen isotope ($\delta^{18}\text{O}$ and δD) analyses could identify such mixing. Stable carbon isotopes ($\delta^{13}\text{C}$) will be measured in the dissolved CO₂ and bicarbonate (HCO₃⁻). Carbon isotopes in CO₂ resulting from coal combustion are typically more strongly depleted (-20 to -25‰) than dissolved inorganic carbon (CO₂ and HCO₃⁻) in groundwater. Measurements of carbon isotopes in both the CO₂ stream and the shallow groundwater will allow the calculation of a two component mixing model to determine if CO₂ is migrating upward into the aquifer.

Table 6-5. Sample Container, Holding Time, and Preservation Methods for Laboratory Analytes

Parameters	Method	Preservation	Container	Holding Time	Laboratory
Cations and metals Na, K, Ca, Mg, Fe, Mn, Al, Ba	SW6010 or 6020	HNO ₃ to pH<2, Filter 0.45 µm	250 mL HDPE	6 months	DHL
Anions Cl ⁻ , SO ₄ ⁼ , Br ⁻ , F ⁻	E300	Cool, 4±2°C	1 L HDPE	28 days	
pH	M4500-H+ B			None	
Alkalinity	M2320 B			28 days	
Total Dissolved Solids	M2540C			7 days	
Dissolved Silica	M4500 Si-D			28 day	
Dissolved Carbon Dioxide	AM20GAX	Benzalkonium-Cl, 4±2°C	2x40 mL VOA	14 days	Microseeps
Stable Isotopes δ ¹³ C (in HCO ₃ and CO ₂), δ ¹⁸ O, δD (in H ₂ O)	DIR/MS ^(a) CRDS ^(b)	None	100 mL HDPE, zero headspace	None	Isotech

(a) Dual inlet ratio mass spectrometry for δ¹³C.

(b) Cavity ring-down spectroscopy for δD and δ¹⁸O.

HDPE – high density polyethylene

Table 6-6. Analytical Laboratories

Laboratory
DHL Analytical 2300 Double Creek Drive Round Rock, TX 78664 Microseeps 220 William Pitt Way Pittsburgh, PA 15238 Isotech Laboratory 1308 Parkland Court Champaign, IL 61821-1826

Field parameters will also be measured using a portable water quality meter and flow through cell prior to collecting water samples. These parameters include pH, temperature, conductivity, dissolved oxygen, turbidity, and ORP. These measurements are used primarily for monitoring water chemistry changes during purging to ensure that a representative sample is collected (see Section 6.2.3.3), but can also be useful for detecting possible chemical changes due to CO₂ leakage (pH, ORP) and brine invasion (conductivity).

6.2.3.3 Groundwater Sample Collection

6.2.3.3.1 Water Level Measurements

Water-level measurements will be taken from each monitoring well prior to initiating the purging or sampling processes for the purposes of determining the current borehole volume of the well and evaluate drawdown during the purging process. The following procedure will be used to determine the level of water in the wells:

- The water-level probe will be cleaned with de-ionized water.
- The probe will be lowered slowly until the instrument alarm and light response indicate that the water surface has been encountered. The measurement will be taken from the surveyed point on the well's protective enclosure or well casing.
- The measurement will be checked by slowly raising and lowering the tape and watching the instrument response. The measurement will be recorded in the field logbook.
- As the probe is withdrawn from the well, a clean paper towel will be used to wipe any foreign material or liquids off of the probe lead wire.

6.2.3.3.2 Well Purging Procedures

All wells to be sampled will be purged prior to collecting water samples using a submersible pump or a low-flow bladder pump if the well does not produce enough water to sustain the minimum flow rate produced by a submersible pump. Purging ensures that the water samples that are collected for analyses are representative of the formation water and entails pumping groundwater from the well until water quality parameters (pH, conductivity, temperature, turbidity) stabilize, or pumping a pre-specified volume of groundwater from the well. The water-level measurements made before sampling and purging will be used to determine the volume of water in the well (i.e. borehole volume).

During purging, the discharge water from the pump will be routed to a flow-through cell to measure field parameters, and will be released into a drum or bucket so the effluent can be contained and the volume of water measured. During the purging process, the water levels in the wells will be measured frequently to avoid excessive drawdown (i.e., within 5 feet of the top of the screened interval) of the water level in the well.

Wells that yield sufficiently will be purged using a submersible pump according to the following:

- (1) Remove 1.5 borehole volumes of water. During purging, the pumping rate should be adjusted to prevent drawdown of the water level in the well from being less than 5 feet from the top of the well screen.
- (2) During purging of the first 1.5 borehole volumes, measurements of field water quality parameters will be made after each 0.25 borehole volume is purged. Purging will be considered adequate after 1.5 borehole volumes have been purged from the well if field parameters have stabilized during the final three measurements, as indicated by the following criteria:
 - Temperature $\pm 1^{\circ}\text{C}$
 - Specific conductance <10% variation
 - Turbidity <10% variation
 - pH ± 0.2 pH units

These parameters will be measured with a portable field instrument connected to the flow-through cell. The instruments will be cleaned and calibrated in accordance with the manufacturer's instructions.

- (3) If the purging is considered complete per the requirements in Step 2, proceed to Step 5.

- (4) If criteria for sufficient purging, presented in Step 2 are not met, continue purging until three consecutive field-parameter readings meet the criteria presented in Step 2. If the water-quality parameters have not stabilized after three borehole volumes have been removed from the well, the purging process will still be considered adequate. Proceed to Step 5.
- (5) Allow well to recover to approximately 80% of its static condition prior to collecting the sample.

For wells that do not yield a sufficient flow rate to sustain an electrical submersible pump without causing excessive drawdown, purging and sampling will be conducted with a low-flow bladder pump. Because purging would be conducted at a very low flow rate, purging would be discontinued once water quality parameters have stabilized as described above, regardless of the volume of water removed from the well.

6.2.3.4 Sample Collection Procedures

Sample collection procedures will follow methods recommended by the analytical laboratories for the specific analyte being collected. Sample preservation methods and containers to be used are outlined in. Samples for metals analysis will be filtered through 0.45 µm flow-through high capacity filters (ASTM Method D6564-00). Prior to collection, a minimum of 100 mL of sample will be flushed through each filter. All samples will be placed into ice chests in the field, maintained at approximately 4°C, and immediately shipped to analytical laboratories to be analyzed within the holding times presented in.

6.2.3.5 Sample Chain of Custody

All sample bottles will be labeled with waterproof labels and indelible markings. A unique identification number and sampling date/time will be recorded on the sample bottle as well as in the field logbook and purge logs. The logbook will indicate the sampling personnel, date/time, sample location/well, identification number, collection procedures, measured field parameters, well purge logs and additional comments.

A chain-of-custody record will be completed and will accompany every sample or group of samples shipped to analytical laboratories during an individual sampling event to establish documentation of sample possession. This record will contain the following: sampling personnel (with affiliation, address, phone number), project number, project location, sample identification numbers, sample date/time, signature of sampling personnel, and remarks regarding the samples. The sample containers will then be placed into plastic bags and put into an ice chest containing either ice in sealed containers or blue ice packs. Samples will not be considered hazardous and thus will not require any special handling during shipping. The ice chest will be sealed with custody seals prior to shipment to the laboratory to verify the samples have not been tampered with during shipment. Samples will either be shipped to the laboratory overnight or hand delivered the same day of collection. Copies of all chain of custody documentation will be saved electronically.

6.2.3.6 Field Quality Control

Wells will be purged prior to sample collection following the procedures outlined in Section 6.2.3.3 to ensure a representative sample. Water quality meters and flow-through cells used during purging will be calibrated according to the manufacturer's instructions and

decontaminated with de-ionized water between wells. The pump used for sample collection will be thoroughly cleaned with de-ionized water prior to each use. New polyethylene tubing will be used at each well. If bladder pumps are used, a separate pump may be dedicated to each well.

New unused sample containers provided by the laboratories will be used for sample collection. When collecting samples for volatile analysis such as dissolved CO₂, collection methods will minimize contact time with the atmosphere. Filter capsules used for field-filtering samples for dissolved metals analysis will be rinsed with the sample prior to sample collection.

At one of the wells during each sampling event, a field duplicate will be collected for each analysis. The purpose of the field duplicate sample is to evaluate the precision of the overall sample collection and analysis processes. The field duplicate will be collected at the same time using the same methods as one of the original samples. The duplicate samples will be labeled in a manner uniquely identifying the sample as a duplicate sample. An equipment rinsate blank will also be prepared and analyzed for each sampling event. This sample will be prepared by collecting deionized water that is used to rinse the sampling equipment after decontamination.

After the samples are collected and properly preserved, each sample will be placed into an ice chest along with a chain of custody form, kept at 4°C, and immediately shipped to the analytical laboratories.

6.2.3.7 Laboratory Quality Control

Laboratory quality control (QC) is addressed through the analysis of the laboratory's own QC samples according to established methods and internal laboratory QC practices. Detailed laboratory QC reports will be received with sample results, including results of analytical replicates, matrix spikes, matrix spike duplicates, and spike recovery tests.

6.2.3.8 Data Review and Validation

Project data will undergo a three step data verification and review process. The goal of the process is to perform a systematic review of the analytical data and to determine the accuracy and quality of the data. The verified data will then be assessed to determine the suitability of the data for meeting the overall project objectives.

The first step will be to verify that the analytical data were produced by instruments that were in analytical control (i.e., calibrated correctly and operating properly) as defined by the specific methods being used. This step will be performed by the analytical laboratory.

The second step will be to verify and report study data in relation to the method detection and reporting limits of the analytical method. Data qualifiers or flags will be added to the data if necessary to indicate any exceptions to the limits (e.g., the result falls between the method detection and reporting limits is considered to be an estimated value). This step will be performed by the analytical laboratory.

The third step will be to verify and report study data in relation to the QC criteria (e.g. the holding time was exceeded for a sample and the result is considered to be an estimated value). This step will also be performed by the analytical laboratory.

The analytical laboratory that generates the data has the primary responsibility for the accuracy and completeness of the data. Before releasing any analytical data, the laboratory will review and verify that the data have met all of the method criteria and are scientifically accurate.

Battelle will review the data reports produced by the analytical laboratories to ensure that the reports are complete and the data quality is acceptable for meeting the project objectives.

6.2.3.9 Data Analysis

Background values and subsequent post-injection monitoring data from USDW wells will be analyzed using statistical methods to determine the natural variance of background values, and statistically significant changes after injection has begun. Specific statistical methods for the determination of background values and monitoring post-injection chemical data are discussed below.

6.2.3.9.1 Determination of Background Values

Background values will be determined for all analytes outlined in Table 6-5 that are above the detection limit. At least eight background samples will be collected from each well before injection (see Section 6.2.2.3). Major ion data will be plotted on Piper trilinear diagrams to evaluate the similarities and differences between samples from the water-bearing formations. Because each well will be sampled at least eight times prior to injection, sufficient data should be available for intrawell comparisons. The background values for all analytes will be assessed to determine how the data are distributed and if multiple populations are present. Probability plots will also be used to estimate background concentration ranges by identifying outliers and differentiating between separate populations. If multiple populations are present, it will be necessary to determine which population represents ambient conditions. Geochemical analyses will be used to ensure that the identified background populations are consistent with the chemical characteristics of the groundwater environment. Additionally, the combined Shewart-cumulative sum (CUSUM) control chart procedure will be used to provide an estimate of the mean and standard deviation of background concentrations for each analyte. These analyses will provide the background data set for each analyte that can be used for subsequent comparisons against groundwater monitoring results collected after CO₂ injection begins.

6.2.3.9.2 Comparisons to Background Values

Groundwater data collected after the start of injection will be compared to the background data to monitor for potential impacts to the USDW aquifer caused by CO₂ injection. Data from each well will be compared to background data from that well (intrawell comparisons) each time a sampling event is conducted. A number of statistical methods may be used to determine whether post-injection concentrations are elevated compared to the background values. Specific methods will depend on the characteristics of the data (e.g., distribution, variability). Shewart-CUSUM control charts are a statistical and visual tool for detecting sudden or gradual changes in concentrations and are useful for conducting intrawell comparisons. Once the background data have been collected and plotted on the Shewart-CUSUM control chart, subsequent sampling results can be statistically compared to the estimated control limit, in terms of both their absolute magnitude and cumulative sum. Another test method that will be considered is the parametric and non-parametric prediction limit test. More information on these methods can be found in a number of references, including: Davis and McNichols, 1999; Gibbons, 1994; Gilbert, 1987; O'Brien and Gilbert, 1997; United States Environmental Protection Agency [U.S. EPA], 1992; and U.S. EPA, 1998a and 1998b.

6.2.3.9.3 Criteria for Determining when Background Values are Exceeded and Response Actions

Specific criteria used to determine when a significant increase has been observed will be determined after background values have been analyzed and natural variation and other characteristics of the analytical parameters have been determined. In general, the criteria will be designed to minimize the chance of failing to detect a significant increase in the concentration of a parameter above background. For tests such as the prediction limit test, the attainable site-wide significance level will also depend on factors such as the number of available background measurements and the number of comparisons to be performed (number of analytes multiplied by number of wells).

In the event that a statistically significant change in groundwater quality is indicated, the IEPA will be notified and an assessment of the data will be undertaken to evaluate potential causes such as sampling error, analytical error, or evaluation error. In addition, the suspect well(s) may be re-sampled (verification re-sampling). If the excursion is attributable to one of these factors, a report will be submitted to IEPA demonstrating that the change in groundwater quality was caused by sampling or analysis error, or some other cause other than injection-related activities. In the event that a statistically significant change cannot be ruled out as being caused by a non-injection related cause (sampling error, analysis error, evaluation error, etc.), the Illinois EPA will be notified.

6.3 Mechanical Integrity Tests During Service Life of Well

Regular mechanical integrity testing will be conducted after CO₂ injection commences to ensure that the well has adequate internal and external mechanical integrity as injection continues. As described in Section 3.9.3, an initial APT will be conducted on the well upon completion of the well and installation of the tubing, packer and annular fluid. Also, a baseline temperature log and pulsed neutron capture log will be conducted before CO₂ injection commences to demonstrate the well's external mechanical integrity. This section describes the mechanical integrity tests that will be conducted during the period of active CO₂ injection.

6.3.1 Continuous Monitoring of Annular Pressure

Internal mechanical integrity will be continuously monitored by monitoring the annular pressure in the well. Per 35 Ill. Adm. Code, 730.108, continuous monitoring of annular pressure while maintaining an annular pressure that is greater than atmospheric pressure measured at the surface, is one method for demonstrating internal mechanical integrity. A description of the annular protection system (WMMS) that will maintain pressure on the annular fluid was provided in Section 3.7.5.

Annular pressure will be continuously measured and logged using a pressure sensor/transmitter (Foxboro I/A Series[®] [or similar] Electronic Pressure Transmitter with 4 to 20 mA analog output) installed on the wellhead. The sensor/transmitter will be connected to the RTU that will be located in the WMMS building. The RTU will allow annular pressure along with other injection pressures and temperatures at each well to be viewed in real time. The annular pressure sensor/transmitter will also be connected to the real time data base system via the PLC in the WMMS building (near the well) so that this parameter can be monitored in real time and logged on the data historian.

If annular pressure suggests failure of internal mechanical integrity (e.g., tubing or packer leak), an alarm will be triggered and flow to the well may be halted. Flow can be halted automatically by closing the flow valve to the well and the master valves on the well. The injection well will be equipped with two actuated master valves that can be operated remotely from the Control Center. The alarm and shut down procedure is discussed in Section 6.4 of this document.

In addition to continuous monitoring of the annular pressure, an annular pressure test will be performed whenever the tubing or packer is removed from the well (e.g., during well workovers). The annular pressure test would be conducted in the same manner as the initial annular pressure test, as described in Section 3.9. Procedures for performing the annular pressure testing are provided in Appendix 6-2. Note the procedure provided in Appendix 6-2 may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

6.3.2 External Mechanical Integrity Testing

External mechanical integrity refers to the absence of fluid movement/leaks through channels adjacent to the injection wellbore that could result in fluid migration into USDW. Generally accepted methods for evaluating external integrity include the following:

- a tracer survey such as oxygen-activation logging or radioactive tracer logging;
- a temperature or noise log; or,
- a casing inspection log.

As described in Section 3.9.3, an initial (baseline) temperature log and pulsed neutron capture (PNC) log will be run on the well after well construction but prior to commencing CO₂ injection. These logs will serve as a reference for comparing future temperature and PNC logs for evaluating external mechanical integrity. The following subsections describe temperature logging and PNC logging during the service life of the well. A third type of mechanical integrity test, a radioactive tracer survey, is also described. This method may be used instead of or in addition to temperature logging or PNC logging if needed to help explain results.

6.3.2.1 Temperature Logging

Temperature logs are a very versatile and sensitive means of identifying fluids that have moved along channels adjacent to the well bore. In addition to identifying injection-related flows behind casing, temperature logs can often locate small casing leaks. They can also be used to monitor fluid movement through the confining zone adjacent to the well bore (inter-formational flows).

Injection of CO₂ will have a cooling or heating effect on the natural temperature in the storage reservoirs, depending on the temperature of the injected CO₂ and other factors. Once injection starts, the flowing temperature will stabilize quickly (assuming conditions remain steady). When an injection well is shut in for logging, the wellbore fluid begins to revert toward ambient conditions; it is this change that helps identify potential problems in the injection well. Zones that have taken injectate, either by design or not, will exhibit a "storage" signature on shut in temperature surveys (storage signatures are normally cold anomalies in deeper wells, but may be cool or hot depending on the temperature contrast between the injectate and the reservoir). Losses behind pipe from the injection zone can be detected on both flowing and shut in temperature surveys and exhibit a "loss" signature.

In order for temperature logging to be effective, there should be a contrast in the temperature of the injected CO₂ and the reservoir temperature. Natural bottomhole temperatures in the Mt. Simon Formation is expected to be approximately 135°F to 145°F; the temperature of the injected CO₂ is anticipated to be on the order of 105°F to 120°F at the surface but will undergo some additional heating as it travels down the well. The greater the contrast in the CO₂ when it reaches the injection zone and the ambient reservoir temperature, the easier it will be to detect temperature anomalies due to leakage behind casing. After the baseline temperature log has been run to determine ambient reservoir temperature, it will be possible to determine whether there will be sufficient temperature contrast to make the temperature log an effective method for evaluating external mechanical integrity.

A temperature logging procedure (Kansas Department of Health & Environment) for the purpose of evaluating a well's external mechanical integrity is provided in Figure 6-6. Temperature logging would be conducted through the tubing and therefore would not require removal of the tubing and packer from the well. A method for controlling pressure, such as a wellhead lubricator, would be required. Procedures for performing the temperature logging are provided in Appendix 6-2. Note the procedure provided in Appendix 6-2 may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

6.3.2.2 Pulsed Neutron Capture Logging

PNC is a geophysical logging technique that is sensitive to the change in formation fluids due to the introduction of CO₂. Thus, it is a potentially useful method for detecting the absence of vertical distribution of CO₂ adjacent to the well that is logged. A baseline logging run is collected prior to injection and data from subsequent logging runs is compared to this.

The PNC tool takes advantage of the nuclear reactions for different rocks and fluids. The tool works by pulsing out neutrons into the formation and measuring the rate in which gamma rays are produced when the neutrons interact with the environment. Specifically, when the neutrons are initially emitted, they are of high energy. As they react with the rock, they slow down and become low energy thermal neutrons. These thermal neutrons subsequently interact with the different elements present in the formation, formation fluid or borehole and are captured. This capture reaction emits gamma rays and the rate at which the gamma rays are created is measured in capture units (c.u.). The capture value, referred to as sigma (Σ), is recorded by the logging tool (Smonlen, 1996).

The sigma value for the bulk formation that is recorded by the tool includes contributions from the rock matrix and the formation fluid. To resolve the amount of sigma that is due to the formation fluid, additional information about the formation must be known — specifically porosity and lithology. This allows for an assessment of the relative contribution of both the rock matrix and the formation fluid.

The depth of investigation of the tool is typically less than 1 ft. Therefore, PNC logging provides information about the formation immediately adjacent to the wellbore. The vertical resolution is approximately 1.5 ft. PNC logging should be considered primarily a “near well” monitoring tool. It will detect the movement of CO₂ in the formation, near the borehole; however, behavior further into the formation cannot be inferred. The accuracy of PNC tools is ± 0.5 c.u. (Butch, 2009).

Processing of the PNC data will be completed as part of the acquisition process. Borehole conditions need to be accounted for so that any sigma values presented are representative of true formation values. Factors that need to be addressed include the casing, the borehole fluid and tubing (if present). Processed output will be an updated (i.e., corrected) PNC log. When results of subsequent surveys are “differenced” from (i.e., compared to) the baseline results, the processed log will also provide an assessment of CO₂ presence and saturation outside the wellbore. Data are provided as an image file and in an Excel-type data file. The data include sigma values and CO₂ saturation values versus logged depth in 1 ft increments. Procedures for performing the PNC logging are provided in Appendix 6-2. Note this procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

A potential limitation of this method is that it becomes difficult to assess formation fluid characteristics if the porosity is less than 6%. This is largely because at low porosity values the changes in sigma caused by the changes in formation fluid are a small portion of the total sigma value. Thus, at low porosity values, it may not be possible to detect CO₂, especially when the rock is only partially saturated with CO₂.

PNC logging would be conducted through the tubing and therefore not require removal of the tubing or packer from the well. As with temperature logging, a method for controlling pressure, such as a wellhead lubricator, will be required. Furthermore, logging can be conducted while injecting CO₂ or with the well shut in.

6.3.2.3 Radioactive Tracer Logging

A radioactive tracer (RAT) survey is a method for tracking the downward movement of the injected fluid through the well and determining the location(s) (e.g., perforations, leaks through casing) where it exits the well. RAT surveys can also detect fluid movement in vertical channels adjacent to the well. RAT surveys are conducted during injection (i.e., through tubing); however, the injection rate must be limited to a low flow rate so that flow is laminar and detection of the radioactive tracer is possible with the wireline tool.

A RAT survey may be conducted in one of two ways. The first way is referred to as slug tracking (or vertical chase survey). In this method, a small slug (typically about 100 mL) of radioactively tagged brine (Iodide 131, a gamma-ray emitter, is the most commonly used radioisotope for this purpose) is ejected from the RAT tool (Figure 6-7) and released into the well at a pre-determined depth, usually some distance above the well perforations, while the well is injecting at a low rate (Baker Hughes recommends releasing the iodide tracer 500 ft above the bottom of the tubing). Upon release, the slug begins to move downward into the well toward the perforations. As the slug moves downward in the well, the tool, which is equipped with two gamma detectors (only one is used for this type of test), is repeatedly lowered and raised through the slug to detect and track the position of the radioactive slug over time (i.e., by measuring gamma ray intensity). As the slug moves out of the wellbore through the perforations and horizontally away from the well, the vertical position of the slug will remain relatively constant until eventually the slug moves far enough away from the well that it can no longer be detected. However, if vertical flow channels exist outside the wellbore, the slug would appear to move up over time instead. Thus, the purpose of this test is to verify that no fluid is traveling back vertically behind (outside) the long-string casing.

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KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT

PROCEDURE FOR CONDUCTING THE TEMPERATURE LOG FOR EVALUATING EXTERNAL MECHANICAL INTEGRITY OF A CLASS I WASTE DISPOSAL WELL

Procedure #: UICI-9

Narrative:

The purpose of this test is to evaluate the external mechanical integrity of the well. A well has external mechanical integrity if there is no fluid movement behind the casing through vertical channels adjacent to the wellbore. One method of checking external mechanical integrity is to conduct a series of temperature logs following the procedures listed in this document.

A plan for this test shall be submitted to KDHE for review and approval prior to conducting the test. In order to provide KDHE opportunity to witness the test, the schedule for conducting the test shall be mutually agreed upon. Plan approval shall be obtained from KDHE before commencing the test. The plan shall include a schematic of the well configuration for the test, a prognosis and a schedule for conducting the test. The procedure listed is general in nature. When developing a test procedure for an individual well; the well configuration, geology, hydrology, and operating conditions must be considered. K.A.R. 28-46-33 establishes mechanical integrity requirements.

Procedure:

1. Clear the wellbore of any material that would be corrosive to the logging tools and ensure that there are no obstructions that will prevent the passage of the temperature tool.
2. The temperature log must be conducted through the injection tubing to obtain "real condition" data and to be protective of human health and the environment.
3. An appropriate scale for the temperature log must be selected. Frequent shifts in the log will be required if the scale selected is too small which makes the log difficult to interpret. If the scale is too large, the log is again difficult to interpret because temperature changes and gradients are difficult to discern. A scale range of 4°F/inch to 10°F/inch is generally the best.
4. The temperature log shall be conducted in tandem with a collar locator log and a gamma-ray log. A differential temperature curve shall be included.
5. The temperature tool shall be sensitive to temperature changes of at least 0.1°F.
6. The temperature log shall be run going into the well. The logging speed should be between 20-35 feet per minute. The logging speed shall be kept constant for all sequential passes. Stopping the tool during a log run should be avoided.

Figure 6-6. Temperature Logging Procedure

7. The well shall be shut-in for a minimum of 24 hours to allow the well to reach "static" conditions prior to running the base log.
8. Record the beginning and ending clock time on each log pass.
9. Run the base log from surface to total depth after the 24-hour shut-in period.
10. Record the temperature of the liquid to be injected just prior to injection and then periodically during injection, record the temperature of the liquid injected. Provide this information with the final report.
11. Inject the greater of either three well volumes or one barrel of fluid per each foot of disposal interval. The well volume is to be calculated using the volume of the longstring casing plus the open hole interval, if applicable. The best results are obtained when the difference between the injected fluid temperature and the wellbore temperature at the zone of interest is at least 35° F, especially if the temperature log is conducted through the tubing. In no case shall the temperature difference be less than 10°F. Even minor variations in the temperature of the injection water can adversely influence the results; thus, a source of water with a uniform temperature should be used. The injection rate used should be at a normal operational injection rate and, if feasible, the maximum permitted injection rate.
12. Cease injection and place the logging tool at a depth 300 feet above the disposal zone. Make three passes from 300 feet above the disposal zone to total depth at the one-hour, two-hour and the four-hour interval after stopping injection.
13. Pull the temperature log to surface. Run the final base temperature log from surface to total depth.
14. Submit the temperature logs to KDHE with the following information on each log:
 - a. time log was run
 - b. well conditions, shut-in, injecting
 - c. scales
 - d. logging speed
 - e. depth and size of various casings, depth and size of tubing, packer seat depth

A report shall accompany the logs describing the procedure, volume of fluid injected, well construction data, rate at which fluid was injected, and the injection pressure. The report shall also include an interpretation of the logs and a description of the temperature log results by a person with the technical expertise to evaluate the logs.
15. If the well is determined to be lacking external mechanical integrity, injection shall cease immediately and the permittee shall submit the following to KDHE for review and approval: 1) an evaluation of the impact to the environment which may require additional testing approved by KDHE, 2) an environmental remediation plan and implementation schedule, and 3) a repair plan and implementation schedule for the well. No work is to commence until plan and schedule approval has been obtained from KDHE.

Procedure.UICI-9
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Figure 6-6. Temperature Logging Procedure (Continued)

The second method for conducting a RAT survey is the shot (or stationary) method. In the velocity shot method, a small quantity (shot) of radioactive tracer is ejected from the tool while it is held stationary and the time required for the tracer to travel between the two detectors on the tool is measured. These time measurements are converted to fluid velocities, then to an injection profile. For an injection well, the preferable method is to have the tool arranged such that the two gamma ray detectors are below the ejector section; the time of tracer travel between detectors is then easily measured on a time drive chart. This test is to check for upward fluid migration outside of the tailpipe, either inside the well or outside the long-string casing.

**Figure 6-7. Radioactive Tracer Tool for Injection Logging
(From U.S. EPA, 1994)**

The following recommendations are suggested for use when conducting a RAT survey (source <http://www.tceq.state.tx.us/assets/public/permitting/waste/uic/mitguidelines.doc>):

- The recommended technique for the RAT is to use a logging tool with a gamma detector above the ejector port and one or two below it. The tool should be able to

continuously record during tracer fluid ejection. The upper detector should be recorded in track 1 at a scale of 0 to 100 or 150 API units. The lower detector(s) should be recorded in tracks 2 and 3 at a higher scale, typically 0 to 1000 API units.

- Prior to testing, an initial gamma ray base log should be recorded from at least 100 ft above the injection tubing packer to total depth or plugged-back depth (TD/PBTD) of the well.
- A concurrent casing collar locator log for depth correlation is recommended. Two 5 minute time drive statistical checks should also be run prior to the ejection of tracer fluid. These logs and statistical checks are run to determine background radiation prior to tracer fluid ejection.
- During the survey, injection flow rates should be set at the rate at which the fluid will be under laminar flow, while remaining within the maximum permitted operating parameters. The volume of the tracer fluid slug should be sufficient to cause a gamma curve deflection of at least 25x background reading as the ejected slug passes the lower detector(s). This would typically be a full-scale deflection.
- A constant injection (moving) survey (i.e., slug method) should be run from, at least, above the packer to the perforations or screen to check for leaks between those two points. This survey should consist of ejecting a slug above the packer, verifying the ejection, and then dropping down through the slug, and logging up through the slug to above where the slug was first ejected. The tool should then be dropped down through the slug again and logging should continue upward to above where the slug was encountered on the previous pass. This process should be repeated a minimum of two times, until the slug passes out into the formation. If necessary, the injection rate may be decreased to accomplish this test.
- A stationary survey (i.e., shot method) should be run approximately 20 feet or less above the top of the perforated interval or screen to check for upward fluid migration outside the cemented casing. Flow during the stationary surveys should be at sufficient rates to approximate normal operating conditions in the well. The procedure consists of logging on time drive, ejecting a slug, verifying the ejection, and waiting an appropriate amount of time to allow the slug to exit the wellbore and return through channels outside the pipe. The time spent at the station will vary but should be at least twice the time estimated to detect the tracer fluid if channeling existed, or for a minimum of 15 minutes, whichever is greater. If tracer fluid is detected channeling outside of the pipe at any time during the stationary survey, then the survey may be stopped and the tracer fluid's movement should be documented by logging up on depth drive until the tracer exits the channel.

6.4 Contingency Plan for Well Failure or Shut In

This section describes the process that will be implemented to safely halt CO₂ injection in the event of an injection well or equipment failure. The injection process will be monitored by the WMMS, an integrated system of equipment (tanks, lines, pumps, valves) and instrumentation (pressure and temperature transmitters, PLC, RTU) that will be capable of detecting when injection conditions are out of acceptable limits and responding by either adjusting conditions or

halting injection. The system is designed to operate automatically with minimal operator intervention. This section is organized into the following sections:

- A description of the alarm system, including the values for tubing pressure, flow rate and annular pressure which will trigger the alarm.
- A description of the automatic shut down of the injection pumps, including the annular pressure, injection pressure and flow rate which will trigger pumps shut down.
- A list of the persons designated to oversee well operations in the event of an emergency. Phone numbers and qualifications should be included.

6.4.1 Description of Control and Alarm System for the Well Monitoring and Maintenance System

The WMMS control system architecture and functionality, including process alarms, plant interlocks, shutdown alarms and automatic shutdown sequence, are described in this section. A process flow diagram for the CO₂ injection WMMS and instrumentation is also discussed.

6.4.1.1 Control System Overview

The proposed control system for the WMMS consists of a local PLC interfaced with the plant Distributed Control System (DCS) via a communications network. The WMMS PLC will provide control and monitoring of the injection pressure, annular pressure, and related parameters associated with the WMMS. A standard communications protocol (e.g., Modbus) will be used for the PLC to DCS link. Alarms, run enable, and other critical signals will be passed between the WMMS PLC and the plant DCS. A description of the WMMS was provided in Section 3.7 (Annular Protection System) of this permit application. A basic block diagram of the WMMS control system architecture is shown in Figure 6-8.

The WMMS PLC will be located in a WMMS building near the CO₂ injection well. The WMMS building will house the WMMS PLC and a local Human Machine Interface (HMI), the wellhead RTU, which serves as an interface for the wellhead instruments, the annular fluid pressure control system, and the nitrogen system. The local HMI will be used to perform startup and testing independently of the plant control system. After startup, the local HMI will be available only for maintenance use. User privileges and other security measures will be implemented to limit access and control of the WMMS equipment through the local HMI during plant operation. Operator interface and control of the WMMS during normal plant operation will be performed through the control room HMI inside the plant. Alarm reporting, alarm logs, command logs, real time trending, and historical trending will be performed by the plant DCS through the control room HMI.

6.4.1.2 Annular Fluid Pressure Control

A description of the Annular Protection System, which is part of the WMMS, was provided in Section 3.7 of this permit application; a brief overview is provided here. An annular fluid pressure control system will maintain the annular fluid in the well at prescribed levels. Two or more banks of nitrogen tanks will supply gas pressure to the annular fluid pressure control system. Control valves will provide a controlled gas charge (pressure) on an accumulator (pressurized tank) that contains excess annular fluid that can be supplied to the well when necessary. A low pressure control valve will add nitrogen to increase the pressure on the

accumulator; a high pressure control valve will vent nitrogen to the atmosphere to reduce the pressure. The fluid level in the accumulator will be monitored and controlled by the PLC.

Pumps included in the annular fluid pressure control system will replenish the accumulator with annular fluid from a storage tank when the annular fluid level in the well drops by an amount that is greater than the volume of the accumulator. This may occur during seasonal cooling cycles or if the temperature of the injected CO₂ decreases. Pressure control valves are included to allow annular fluid to flow to the storage tank from the well when the annular fluid volume in the well expands by an amount that is greater than the capacity of the accumulator. This may occur during seasonal heating or if the temperature of the injected CO₂ increases.

Figure 6-8. WMMS Control System Block Diagram

6.4.1.3 Injection Process Control

Injection pressure will be controlled by the pressure of the CO₂ exiting the plant. The current design calls for a maximum CO₂ pressure from the plant of 2,200 psi, but this may be increased to 3,000 psi. Some pressure drop is expected between the plant and the injection well; therefore, the maximum pressure at the wellhead will be slightly less than pressure exiting the plant. A control valve will be installed on the CO₂ pipeline at a location upstream of where the

pipeline connects to the wellhead. Adjustments to the injection pressure can be made with the control valve if necessary to stay under the injection pressure limit.

As described in Section 3.7.5, the annulus protection system will be capable of automatically maintaining the pressure of the annular fluid in the CO₂ injection well at pre-determined levels. For example, if necessary, the pressure on the annular fluid can be maintained within a pre-determined range either above or below the pressure of the CO₂ in the injection tube. Annular pressure will be recorded with a pressure transmitter on the wellhead (Instrument Number PT-13).

6.4.2 Automatic Shutdown Procedure

Alarms will be implemented throughout the plant DCS and monitored by the control room operator. Alarms are of three types: process (non-shutdown) alarms; shutdown alarms; and interlock alarms. Process alarms will be used to alert the control room operator whenever process variables are out of the accepted operating range and operator or maintenance action may be required. Shutdown alarms will indicate critical conditions. An active shutdown alarm or plant interlock will trigger an automatic shutdown sequence in which the CO₂ injection process is automatically shut down by the plant DCS and the WMMS PLC. The automatic shutdown sequence for the CO₂ injection well is outlined in Section 6.4.2.4.

6.4.2.1 Process Alarms (Non-shutdown)

Process alarm designations will indicate the relative value of the process variable versus the normal value. For instance, a low pressure alarm will indicate that the process pressure is lower than the normally expected pressure. Process alarms will include low, low-low, high, high-high, and deviation (deviation alarm is for a process variable that deviates from the setpoint or expected value). Discrete inputs from binary devices such as pressure switches or alarm contacts are shown as alarms in Figure 6-9 and will be used to indicate conditions that may require action.

Process (non-shutdown) alarms will be used for the following parameters.

- PT-9 Annular Supply Pressure
- PT-13 Annular Pressure Injection Well (High, Low)
- PT-14 CO₂ Injection Pressure (High)
- PIC-3 Annular Fluid Pressure Controller
- PT-3 Annular Fluid Expansion Tank Pressure
- TT-5 Annular Fluid Storage Tank Temperature
- TT-8 Annular Fluid Tank Temperature
- LT-7 Accumulator Fluid Level Transmitter
- LT-4 Annular Fluid Storage Tank Level Transmitter
- PAL-1 Nitrogen Bank 1 Low Pressure Switch
- PAL-2 Nitrogen Bank 2 Low Pressure Switch.

Further detail of the process control instrumentation including instrument numbers and a listing of process alarms is provided in Table 6-7.

6.4.2.2 Shutdown Alarms

The CO₂ injection process will be automatically shut down under two conditions. One shutdown condition will occur when the annular fluid pressure (instrument number PT-13, see Table 6-7 and Figure 6-9) falls outside the pre-determined range for a period of time that exceeds

allowable limits. The other primary shutdown condition will occur when the CO₂ injection pressure (instrument number PT-14, see Table 6-7 and Figure 6-9) exceeds the maximum injection pressure specified in the permit. Additional automatic shutdowns will be implemented due to plant interlocks as discussed below. Operator intervention will be necessary to restart the injection process after an automatic shutdown sequence

Shutdown alarms will be used for the following parameters.

- PT-13 Annular Fluid Pressure, Injection Well (High-High Alarm, Low-Low Alarm)
- PT-14 CO₂ Injection Pressure (High-High Alarm).

Further detail of the process control instrumentation including instrument numbers and a listing of shutdown alarms is shown in Table 6-7.

6.4.2.3 Plant Interlocks

Plant interlock status signal(s) will be sent from the plant DCS to the WMMS PLC. The plant interlock will indicate whether conditions in the main plant are acceptable for the injection process to occur. During run operation, the plant interlock will be used to initiate an automatic shutdown sequence in the event of equipment malfunctions, critical alarms, or other conditions in the main plant that warrant a shutdown of the injection process. During startup operations, the plant interlock will act as a run permission command for the injection process to start up.

6.4.2.4 Automatic Shutdown Sequence

The automatic shutdown sequence will be triggered by a shutdown alarm or plant interlock as described previously.

The following automatic shutdown sequence will be implemented by the plant DCS and the WMMS PLC.

- (1) Plant DSC to close main CO₂ flow valve controlling flow to well.
- (2) Plant DSC/WMMS PLC receives indication CO₂ flow valve is closed.
- (3) WMMS PLC to close wing valve on injection well (FV-10B).
- (4) WMMS PLC/plant DSC receives indication wing valve (FV-10B) is closed.
- (5) WMMS PLC to close main valve on injection well (FV-10A).
- (6) WMMS PLC/plant DSC receives indication main valve (FV-10A) is closed.
- (7) WMMS PLC will automatically adjust annular fluid pressure to setpoint.
- (8) Annular fluid pressure system will remain on standby unless shutdown by operator.
- (9) Plant DSC/WMMS PLC will continue to collect all data (e.g., annular pressure in well, CO₂ pressure in the injection tube).

6.4.3 Persons Designated to Oversee Well Operations

A staffing plan has been developed for the FutureGen plant that includes staff responsible for overseeing certain aspects of the injection well operations. The plant staff that will be engaged in well operations includes staff from various departments, including operations, maintenance, and Environmental Safety Health and Quality (ESH&Q). Operations positions are staffed continuously (4 shifts per day), whereas maintenance and ESH&Q staff are one shift per day. Examples of well-oversight responsibilities and the responsible staff are identified on Table 6-7.

Table 6-7. Description of WMS Instrumentation, Well #1 and Common Equipment^(a)

Instrument Category	Instrument Number^(b)	Description	Comments/Details^(c)
Wellhead Instruments – Pressure Transmitters	PT-9	Annular Fluid Supply Line Pressure	<ul style="list-style-type: none"> • HMI Object • Low Alarm • Deviation Alarm (deviates from another transmitter reading what should be the same pressure)
	PT-11	Injection Well Bottom-hole Pressure	<ul style="list-style-type: none"> • HMI Object • Modbus to PLC from RTU
	PT-13	Injection Well Annular Fluid Pressure	<ul style="list-style-type: none"> • HMI Object • Low Alarm • High Alarm • Low-Low Alarm • High-High Alarm • Deviation Alarm (deviates from another transmitter reading what should be the same pressure) • Shut Down on Low-Low Alarm • Shut Down on High-High Alarm • Modbus to PLC from RTU
	PT-14	CO ₂ Injection Pressure	<ul style="list-style-type: none"> • HMI Object • Low Alarm • High Alarm • High-High Alarm • Shut Down on High-High Alarm • Modbus to PLC from RTU
Wellhead Instruments – Temperature Transmitters	TT-12	Injection Well Bottom-hole Temperature	<ul style="list-style-type: none"> • HMI Object • Modbus to PLC from RTU
	TT-15	CO ₂ Injection Temperature	<ul style="list-style-type: none"> • HMI Object • Modbus to PLC from RTU
Wellhead Instruments – Open/Close Controls	HS-10	Valve Open Close Control	<ul style="list-style-type: none"> • HMI Object • Controls solenoid valves to open and close Main and Wing Valves on well (i.e., FV-10A and FV-10B)
	FV-10A	Main Valve	<ul style="list-style-type: none"> • Controls pneumatic supply to wellhead valve
	FV-10B	Wing Valve	<ul style="list-style-type: none"> • Controls pneumatic supply to wellhead valve
Wellhead Instruments – Position Switches	ZSO-10A	Master Valve Open	<ul style="list-style-type: none"> • HMI Object
	ZSC-10A	Master Valve Closed	<ul style="list-style-type: none"> • HMI Object
	ZSO-10B	Wing Valve Open	<ul style="list-style-type: none"> • HMI Object
	ZSC-10B	Wing Valve Closed	<ul style="list-style-type: none"> • HMI Object
Annular Fluid Pressure Control Equipment – Pressure Controls	PIC-3	PLC Function - Annular Fluid Pressure Controller	<ul style="list-style-type: none"> • HMI Object • Calculated based upon Injection Pressure • Process variable input from PT-3 • Control output to PY-3A, PY-3B (pressure control valves) • Deviation Alarm (actual pressure from PT-3 deviates from Injection Pressure calculation)
	PY-3A	Analog Setpoint from PIC-3	<ul style="list-style-type: none"> • HMI Object
	PV-3A	Annular Fluid Pressure Control Valve	<ul style="list-style-type: none"> • HMI Object

Table 6-7. Description of WMMS Instrumentation, Well #1 and Common Equipment^(a) (Continued)

Instrument Category	Instrument Number ^(b)	Description	Comments/Details ^(c)
	PY-3B	Analog Setpoint from PIC-3	<ul style="list-style-type: none"> HMI Object
	PV-3B	Annular Fluid Pressure Control Valve	<ul style="list-style-type: none"> HMI Object
Annular Fluid Pressure Control Equipment - Pressure Transmitter	PT-3	Annular Fluid Expansion Tank Pressure	<ul style="list-style-type: none"> HMI Object Deviation Alarm (deviates from another transmitter reading what should be the same pressure)
Annular Fluid Pressure Control Equipment - Temperature Transmitters	TT-5	Annular Fluid Storage Tank (T-1000) Temperature	<ul style="list-style-type: none"> HMI Object Low Alarm (freeze protection)
	TT-8	Accumulator Tank (V-1002-A) Fluid Temperature	<ul style="list-style-type: none"> HMI Object Low Alarm (freeze protection)
Annular Fluid Pressure Control Equipment – Accumulator Level Controls	LIC-7	PLC Function – Accumulator Tank (V-1002-A) Fluid Level Controller	<ul style="list-style-type: none"> HMI Object Process variable input from LT-7 Control output to LY-7
	LY-7	Analog Setpoint from LIC-7	<ul style="list-style-type: none"> HMI Object
	LV-7	Accumulator Tank (V-1002-A) Fluid Level Control Valve	<ul style="list-style-type: none"> HMI Object
	FC-6	Pump Selector	<ul style="list-style-type: none"> HMI Object Selects pump control and discharge valve for either Pump P-1001 or P1002
	FV-6A	P1002 Discharge Valve Solenoid Valve	<ul style="list-style-type: none"> Controls pneumatic supply to P1002 Discharge Valve
	HC-6A	P1002 Starter Control	<ul style="list-style-type: none"> Starts Pump P1002
	YI-6A	P1002 Starter Aux Contact	<ul style="list-style-type: none"> HMI Object P1002 Motor Run Indicator
	FV-6B	P1001 Discharge Valve Solenoid Valve	<ul style="list-style-type: none"> Controls pneumatic supply to P1001 Discharge Valve
	HC-6B	P1001 Starter Control	<ul style="list-style-type: none"> Starts Pump P1001
	YI-6B	P1001 Starter Aux Contact	<ul style="list-style-type: none"> HMI Object P1001 Motor Run Indicator
Annular Fluid Pressure Control Equipment – Accumulator Level Transmitter	LT-7	Accumulator Tank (V-1002-A) Fluid Level Transmitter	<ul style="list-style-type: none"> HMI Object Low Alarm High Alarm
Annular Fluid Pressure Control Equipment – Storage Tank Level Transmitter	LT-4	Storage Tank Level Transmitter	<ul style="list-style-type: none"> HMI Object Low Alarm
Nitrogen System	PAL-1	Nitrogen-cylinder Bank #1 Low Pressure Switch	<ul style="list-style-type: none"> HMI Object Discrete Alarm
	PAL-2	Nitrogen-cylinder Bank #2 Low Pressure Switch	<ul style="list-style-type: none"> HMI Object Discrete Alarm

NOTES:

- Instrumentation is shown for a single injection well and equipment common to both wells. Instrumentation for the second injection well is not shown but will have an identical configuration.
- Temporary instrument numbers are given for illustration only. Permanent instrument numbers will comply with the plant tag numbering format.
- HMI Object refers to the status or process variable that is shown on the HMI display. HMI Objects may also have real time or historical trends and have the data logged as appropriate.

Table 6-8. Major Responsibilities for Individuals Overseeing Well Operations

Activity	Staff Position (Department)	Staff, Shifts per Day
Monitor well operations remotely from the plant control room,	Control Room Operator (Operations)	2(4)
Respond to/investigate alarm situations	Control Room Operator (Operations)	2(4)
Conduct periodic inspections of the well site, including the Well Maintenance and Monitoring System (WMMS)	Area (Outside) Operators (Operations); Security (Operations)	6(4) (Operators) 1(4) (Security)
Perform maintenance on WMMS as needed including for example. <ul style="list-style-type: none"> • Change out nitrogen cylinders when depleted • Inspect fluid level in annular fluid tank and mix/add annular fluid to the tank or pump off annular fluid to provide capacity for expansion • Remove and test pressure relief valves (several) • Replace air filters associated with limit switches on actuated valves on well (8 per well - 4 per valve) • Periodically inspect fluid pumps to assure the oil level is satisfactory. Change oil periodically. • Conduct visual inspection for leaks along above ground section of annular fluid line 	Millwrights (Maintenance)	2(1)
<ul style="list-style-type: none"> • Test operation of limit switches on actuated valves on well (2 valves per well), adjust as needed. • Calibrate wellhead instrumentation (pressure, temperature sensors/transmitters) 	I&C Technician (Maintenance)	2(1)
<ul style="list-style-type: none"> • Check circuit breaker to heat trace controller for heat trace on annular fluid line 	Electrician (Maintenance)	2(1)
Regulatory compliance and reporting	Electrician (Maintenance)	2(1)
Conduct well workovers, mechanical integrity tests, and ambient pressure (fall-off) tests	ESH&Q Manager (ESH&Q)	1(1)
	Contractor	

6.5 Corrosion Monitoring Plan

This subsection discusses the measures that will be taken to monitor corrosion of well materials, including tubulars (i.e., casing, tubing) and cement; it also describes the planned corrosion monitoring frequency. Although this section is not explicitly called out in the UIC permit application instructions, the IEPA requested that a corrosion monitoring plan be included in the application.

6.5.1 Casing and Tubing

Potential sites for corrosion of casing and tubing will be evaluated periodically throughout the life of the injection well using wireline tools. Wireline tools are lowered into the well to directly measure properties of the well tubulars (tubing and casing) that indicate corrosion. Four types of wireline tools are available for assessing corrosion of well materials – mechanical,

electromagnetic, ultrasonic, and videographic. Mechanical and/or ultrasonic tools will be used to monitor well corrosion. If necessary, a wireline video camera may also be used if results of the other methods are ambiguous or inconclusive. Table 6-9 summarizes examples of mechanical and ultrasonic casing evaluation tools. These tools or similar tools from alternate vendors will be used to monitor the condition of well tubing and casing.

Mechanical casing evaluation tools, referred to as calipers, have multiple “fingers” that measure the inner diameter (I.D.) of the tubular as the tool is raised or lowered through the well. Modern-day calipers have several fingers and are capable of recording information measured by each finger so that the data can be used to produce highly detailed three-dimensional images of the well. Figure 6-10 is an illustration of the type of output that can be obtained with a mechanical casing evaluation tool. Examples of caliper tools include Schlumberger’s Multifinger Imaging Tool and Halliburton’s multiple arm caliper (MAC) tool. Both tools are available in multiple sizes to accommodate various sizes of well tubing and casing.

Ultrasonic tools are capable of measuring wall thickness in addition to the inner diameter (radius) of the well tubular. Consequently, these tools can also provide information about the outer surface of the casing or tubing. Examples of ultrasonic tools include Schlumberger’s Ultrasonic Casing Imager (UCI) and Ultrasonic Imager (USI), and Halliburton’s CAST-V (Figure 6-11) and FastCast Acoustic Scanning Tools. Specifications for these tools are provided on Table 6-9.

Monitoring corrosion of well materials will also be conducted using the corrosion coupon method. Corrosion monitoring of well materials will be conducted using coupons placed in the CO₂ pipeline (Figure 6-12). The coupons will be of the same material as the long string of casing and the injection tubing. The coupons will be removed periodically (e.g., quarterly) and assessed for corrosion using ASTM G1-03, Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens. This method measures the corrosivity toward steel of both aqueous and non-aqueous liquid wastes. Upon removal, coupons will be inspected visually for evidence of corrosion (e.g., pitting). The weight and size (thickness, width, length) of the coupons will also be measured and recorded each time they are removed. Corrosion rate will be calculated as the weight loss during the exposure period divided by the duration (i.e., weight loss method). The reader is referred to Section 10 of the method, which discusses factors that affect accuracy and precision of the method and measures that can be taken to minimize error in these parameters.

6.5.2 Well Cement

The cement associated with the section of long-string casing that spans the injection reservoir (i.e., Mt. Simon Formation) is susceptible to corrosion because of its exposure to injected CO₂. Several measures will be taken during the construction and operation of the injection well to monitor the condition of the cement. As described in Section 3 (see Section 3.7), a corrosion resistant cement will be used in this section to mitigate corrosion that could lead to the formation of channels that could transmit fluid. Furthermore, the condition of the cement will be determined initially when the casing string is cemented using cement bond logging (see Section 3.9), and external mechanical integrity tests will be conducted periodically (see Section 6.3) using temperature surveys or other means to look for evidence of fluid movement behind casing that could be caused by cement corrosion. In addition to these measures,

cement evaluation logging will be conducted whenever the tubing is removed from the injection well (i.e., during well workovers).

Some ultrasonic casing evaluation tools listed in Table 6-9 are capable of assessing the condition of the cement behind casing at the same time that the casing is evaluated (e.g., Schlumberger's USI tool and Halliburton's FastCast Tool). Therefore, information about the near wellbore cement condition will be obtained whenever tubing is removed from the well and a casing evaluation run is performed using one of these casing inspection logging tools (i.e., during well workovers). Information provided by these ultrasonic tools is limited to the cement-to-casing bond; therefore, a standard cement bond logging tool will also be run to inspect the condition of the cement beyond the casing-cement contact. CBL tools are capable of providing both cement-to-casing and cement-to-formation information.

6.5.3 Deployment Plan

Wireline logging for the purpose of evaluating corrosion of the well tubing and casing will be conducted periodically as permitted by injection operations. Wireline logging to inspect the condition of the tubing can be conducted without removing the tubing but requires halting CO₂ injection and temporary shut in of the well. Therefore, tubing inspections will be coordinated with plant shutdowns, unless a well shutdown is triggered that requires an investigation of a potential tubing leak. At minimum, the tubing will be inspected annually to using a casing evaluation wireline tool. Casing evaluation tools are not capable of sensing the condition of the long-string casing through tubing; therefore, tubing must be removed from the well to inspect the condition of the long-string casing and its cement. Therefore, evaluation of the long-string casing and cement will only be conducted when the tubing is removed from the well (i.e., during well workovers).

Because the wells will be under pressure as a result of injecting CO₂, pressure control equipment (e.g., grease injectors) will be required when performing cased-hole logging operations. Because of this, mechanical casing evaluation tools (e.g., multifinger imaging tool and MAC tool) are advantageous because they can be run in either memory mode or with a single conductor cable. The ultrasonic tools require a multi-conductor cable, which requires specialized pressure-control equipment that may not be readily available. Furthermore, mechanical caliper tools can also be run in memory (datalogging) mode rather than surface readout, which eliminates a conductor cable to surface and the need for pressure control equipment. Cased-hole evaluations in CO₂ injection wells will also require the use of CO₂-resistant cables.

Figure 6-10. A 3D View from a Multi-Arm Caliper (MAC) Tool Shows an Enlarged O.D. Caused by Perforating the Well (Source Halliburton)

Table 6-9. Examples of Wireline Tools for Monitoring Corrosion of Casing and Tubing

	Ultrasonic Tools		Mechanical Tools	
Tool Name	Ultrasonic Casing Imager ^(a)	FastCast Acoustic Scanning Tool ^(b)	Multifinger Imaging Tool ^(a)	Multi Arm Caliper Tool ^(b)
Type	Ultrasonic	Ultrasonic	Mechanical	Mechanical
What It Measures (i.e., output)	ID, wall thickness. Up to 180 measurements per revolution	ID, wall thickness Full 360 degree borehole image	Internal radius; does not measure wall thickness	Internal radius; does not measure wall thickness
Tool O.D. (inches)	3.41 to 8.66	3.625	1.6875 (PMIT-A) 2.75 (PMIT-B) 4 (PMIT-C)	1.69, 2.75, 4.0, 8.0
Tubular Size That Can Be Measured Minimum/Maximum (inches)	4.5/13.375	4.25/22.0	2/4.5 (PMIT-A) 3/7 (PMIT-B) 5/10 (PMIT-C)	1.75-4.5 24 arm 2.75-7.0" 40 arm 2.4-9.63 60 arm
Resolution (mm) Vertical/Radial	51 to 381/0.005 2 degrees radial	0.1 to 3 in./NA	2.1/0.1 (PMIT-A) 2.8/0.13 (PMIT-B) 4.24/0.18 (PMIT-C)	0.127 0.508 0.127
Accuracy (mm)	A=±1 (internal radius) A=±4% (thickness) 3.8 mm (0.15 inch) pit 7.6 mm (0.3 inch) defect	NA	A=±0.76 to ±1.3	0.635

**Table 6-9. Examples of Wireline Tools for Monitoring Corrosion
of Casing and Tubing (Continued)**

	Ultrasonic Tools		Mechanical Tools	
Borehole Fluid Limitations/ Requirements	Requires static fluid filled borehole; therefore, logging all the way to surface is usually not possible. Gas does not transmit acoustic signal. Heavy oil base mud systems cause attenuation issues. Scale on interior of casing can distort tool response. Brine, oil, or very light muds should be used.	Requires static fluid filled borehole; therefore, logging all the way to surface is usually not possible. Gas does not transmit acoustic signal. Heavy oil base mud systems cause attenuation issues. Scale on interior of casing can distort tool response.	Any type is acceptable.	Only restricted by inside diameter of tubular string. 350°F @ 15k psi rated
Comments, limitations, special requirements, etc.	An alternate version of this tool – the USI can assess cement simultaneously; however, may lose some accuracy/ resolution. Therefore, the USI is recommended over UCI because it provides cement data as well as casing data.	Pipe inspection and cement inspection can be conducted simultaneously. High logging speed (60 ft/min) is possible.	Typically run on memory using slickline. Can also be run in surface real time mode.	Typically run on memory using slickline. Can also be run in surface real time mode.

(a) Schlumberger

(b) Halliburton

NA = not available

The multifinger imaging tool (Schlumberger) and MAC Tool (Halliburton) are essentially the same tool (verbal communication, Jim Hill, Halliburton).

Figure 6-11. Output from Halliburton's CAST-V Acoustic Monitoring Tool (CAST-V has since been replaced by the FastCast Tool). Track 1 shows casing ovality, eccentricity, hole deviation, and gamma ray. Track 2 shows a cross-sectional presentation of the pipe shape. A cross-sectional of the pipe wall is presented in Track 3. Track 4 provides the average, minimum, and maximum value of the pipe radius that is shown in Track 5. Track 6 provides the average, minimum, and maximum value of the pipe thickness that is the image plotted in last Track 7. On the image logs red shows pipe thinning while blue indicates pipe thickening. (Source: Halliburton).

Figure 6-12. Corrosion Coupon Illustration in Pipeline
(Source: Rohrback Cosasco Systems, Inc.)

6.6 References

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DRAFT UIC PERMIT FORMS

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

FORM 4f - CHARACTERISTICS, COMPATIBILITY and PRE-INJECTION TREATMENT
of INJECTION FLUID

USEPA ID NUMBER not applicable

IEPA ID NUMBER 0290255208

WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

- 7.1 I. Component Streams Forming Injection Fluid
- 7.2 II. Source and Generation Rate of Component Streams
- 7.3 III. Volume of Injection Fluid Generated Daily and Annually
- 7.4 IV. Physical and Chemical Characteristics of Injection Fluid, see instructions
 - 7.4.1 A. Generic waste/Fluid name
 - 7.4.2 B. Fluid phase
 - 7.4.3 C. Complete waste analysis
 - 7.4.4 D. Flash point
 - 7.4.5 E. Organics
 - 7.4.6 F. TDS
 - 7.4.7 G. pH
 - 7.4.8 H. Temperature
 - 7.4.9 I. Density
 - 7.4.10 J. Specific gravity
 - 7.4.11 K. Compressibility
 - 7.4.12 L. Micro organisms
 - 7.4.13 M. Chemical persistence
 - 7.4.14 N. Key component name(s)
- 7.5 V. Injection Fluid Compatibility
 - 7.5.1 A. Compatibility with injection zone
 - 7.5.2 B. Compatibility with minerals in the injection zone
 - 7.5.3 C. Compatibility with minerals in the confining zone
 - 7.5.4 D. Compatibility with injection well components
 - 7.5.4.1 1. Injection tubing
 - 7.5.4.2 2. Long string casing
 - 7.5.4.3 3. Cement
 - 7.5.4.4 4. Annular fluid
 - 7.5.4.5 5. Packer(s)
 - 7.5.4.6 6. Well head equipment
 - 7.5.4.7 7. Holding tanks(s) and flow lines
 - 7.5.5 E. Compatibility with filter and filter components
 - 7.5.6 F. Full description of compatibility concerns
 - 7.5.7 VI. Pre-Injection Fluid Treatment, see instructions

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

7. CHARACTERISTICS, COMPATIBILITY AND PRE-INJECTION TREATMENT OF INJECTED FLUID (Form 4f)

7.1 Component Streams Forming Injection Fluid

Section 4.2 of this document provided a description of the FutureGen facility, including the process areas comprising the facility and the component streams forming the injection fluid. As described in Section 4.2 and shown on the process flow diagrams provided in Figure 4-5, and Figure 4-6, there are several streams at different temperatures and pressures entering the compressors and four inlet pressures for the various streams: 15, 45, 70, and 145 psia.

7.2 Source and Generation Rate of Component Streams

The total CO₂ stream flow rate exiting the last compressor is 578,568 lb/hr at 2,225 psia. The actual flow rate will depend on the type of gasifier used. This rate is the highest estimated mass flow rate for Illinois 6 (ILL 6) coal and two different gasifier technologies that are currently being considered.

7.3 Volume of Injection Fluid Generated Daily and Annually

The volumetric flow rate of the CO₂ stream can be estimated from the predicted mass flow rate and product density. The mass flow rate is dependent on the type of coal and the gasifier technology. The density is also a function of the temperature. The design temperature is 120°F at the plant exit; however, the fluid may be cooled to 105°F to facilitate injection. As mentioned in the previous section, two gasifier technologies are currently being evaluated. Table 7-1 presents estimates of volumetric flow rate for three coal types, two gasifier technologies, and temperatures of 105°F and 120°F. The highest volumetric flow rate (16,456 ft³/hr) corresponds to the Illinois 6 coal, gasifier technology #1, and a temperature of 120°F. The lowest volumetric flow rate (11,149 ft³/hr) corresponds to the Pitt 8 coal, gasifier technology #2, and a temperature of 105°F. This corresponds to a range of daily volumetric flow rates of 267,565 to 394,949 ft³/day and a range of annual flow rates of approximately 98 to 144 million ft³/yr.

Table 7-1. Volumetric Flow Rate Estimates

Parameter	Units	Gasifier Technology #1	Gasifier Technology #2
		ILL 6 Coal	ILL 6 Coal
Mass Flow ^(a)	lb/hr	578,568	531,161
Volume Flow @ 2,225 psi 120°F ^(b)	ft ³ /hr	16,456	15,606
Volume Flow @ 2,225 psi 105°F ^(b)	ft ³ /hr	12,366	11,353

(a) Mass flow rate estimates based on ASPEN model output for Location 909 (compressor outlet).

(b) Volumetric flow rates at 120°F based on density estimates provided in Table 7-2; volumetric flow rates at 105°F based on a density estimate of 46.8 lb/ft³.

7.4 Physical and Chemical Characteristics of Injection Fluid

Table 7-2 provides a description of the physical and chemical characteristics of the injection fluid. The information in Table 7-2 describes the injection fluid downstream of the final compression stage and therefore is representative of the fluid that will be delivered to the injection wells. The CO₂ will be in a supercritical liquid phase at this point. This information is an estimate based on a heat and material balance conducted for the power plant; therefore, actual properties may vary slightly. Also, actual temperature may be reduced via air cooling to as low as 105°F and pressure may be increased as high as 3,000 psia if necessary to facilitate injection.

Table 7-2. Physical and Chemical Characteristics of Injection Fluid

Parameter	Units	Gasifier Technology #1	Gasifier Technology #2
		ILL 6 Coal	ILL 6 Coal
Temperature	°F	120	2,225
Pressure	psia	2,225	2,225
Mass Flow	lb/hr	578,568	531,161
Mole Flow	lbmole/hr	13,479	12,467
Volume Flow	ft ³ /hr	16,456	15,606
Enthalpy	mmbtu/hr	-2,262	-2071.4
Mass Enthalpy	btu/lb	-3,910	-3,900
Density	lb/ ft ³	35.158	34.036
Molecular Weight		42.92	42.61
Dense Phase			
Comp. Factor (Z)		0.4367	0.4473
Viscosity	cp	0.0431	0.0416
Thermal Cond.	Btu/hr-ft-R	0.0372	0.0365
C _p /C _v		1.2804	1.2814
Heat Capacity	Btu/lb-R	0.7874	0.7940

cp – centipoises

C_p/C_v – specific heat capacity ratio

7.4.1 Generic Waste/Fluid Name

Carbon dioxide.

7.4.2 Fluid Phase

The injection fluid will be in a supercritical liquid phase when it is injected into the well.

7.4.3 Complete Waste Analysis

An estimate of the injection fluid composition based on a heat and material balance analysis for the power plant was provided in Table 7-2 of this document. Actual properties and composition may vary slightly.

Characteristics of the injection fluid (e.g. toxicity, reactivity, corrosiveness, radioactivity and ignitability) were evaluated according to the provisions of 35 Ill. Adm. Code, Part 721, Subparts C and D: Characteristics of Hazardous Waste. The injection fluid is not considered to be

ignitable or toxic. The liquid is non-aqueous and cannot be considered corrosive. It is not reactive nor does it contain any radioactive components. The CO₂ stream is not considered hazardous.

7.4.4 Flash Point

The injection fluid is not flammable; therefore, flashpoint is not applicable.

7.4.5 Organics

Methane and carbonyl sulfide are the only organic compounds expected to be present in the injection fluid (both at trace levels). The estimated quantity of methane in the injection fluid is 0.0002% to 0.17% by weight, depending on the type of coal and the gasifier technology that is employed. The estimated quantity of carbonyl sulfide is 0.0003 to 0.0053% by weight. No other organic compounds, including volatile organic compounds and semi-volatile organic compounds, are expected to be present in the injection fluid. See Table 7-2 for a comprehensive estimate of the chemical composition of the injection fluid.

7.4.6 TDS

The combined content of all inorganic and organic substances contained in the injection fluid is very small; therefore, the TDS concentration of the injection fluid is expected to be negligible.

7.4.7 pH

Because the injection fluid is non-aqueous, it has no pH and this term is not applicable. Injection of CO₂ will result in lowering of the pH in the Mt. Simon storage reservoir. Modeling conducted by the Illinois Geological Survey (Fisher, 2005, Table 8-5) suggest that the pH of the Mt. Simon formation water may be reduced from an initial value of 6.3 to approximately 3.4 due to the formation of carbonic acid when the injected CO₂ reacts with pore water.

7.4.8 Temperature

The current design temperature of the injection fluid exiting the plant is approximately 120°F; however, additional cooling capacity may be added to reduce the product temperature to as low as 105°F in order to increase the density of the product and facilitate injection. The injection fluid will undergo a small amount of temperature change as it travels through the pipeline on the way to the injection wells; however, given the short distance of the pipeline, the temperature change will be small.

7.4.9 Density

The estimated density of the injection fluid is 35 lb/ft³ at temperature of 120°F and a pressure of 2,225 psi (Table 7-2). This estimate was derived from the ASPEN process-engineering software that was used to model the heat and material balance for the power plant. This model uses a Peng-Robinson equation of state to determine product density. At a temperature of 105°F, the density will be greater. A density of 46.8 lb/ft³ was estimated based on the Peng-Robinson equation of state and a pressure of 2,225 psi. The plant is being designed to compress the CO₂ stream up to 3,000 psi. At a pressure of 3000 psi, the density of the compressed CO₂ stream is estimated to be 49.91 lb/ft³ at 120°F and 52.69 lb/ft³ at 105°F.

7.4.10 Specific Gravity

At a temperature of 120°F and a pressure of 2,225 psi (density of 35 lb/ft³), the injection fluid will have a specific gravity of approximately 0.55. At a temperature of 105°F and a pressure of 2,225 psi (density of 47 lb/ft³), the injection fluid will have a specific gravity of approximately 0.75. Similarly, the specific gravity would be higher at a temperature of 105°F and a pressure of 3,000 psi. These estimates are based on a reference density of water equal to 62.4 lb/ft³.

7.4.11 Compressibility

Because the injection fluid will be in a liquid phase, its compressibility is negligible. The estimated compressibility factor (Z) for the injection fluid is estimated to be approximately 0.44 (Table 7-2).

7.4.12 Microorganisms

Microorganisms are not a component of the injection fluid.

7.4.13 Chemical Persistence

The predominant component of the injection fluid is CO₂, representing approximately 99.5% of the injection fluid by mass. The major fate processes that will affect the injected CO₂ are partitioning and chemical reaction. Injected CO₂ would partition in the reservoir between the non-aqueous pure phase, entrapped phase, and dissolved phase. The short-term partitioning of CO₂ between the pure and aqueous phases is dependent on the aqueous phase salinity; the amount of CO₂ dissolved in the aqueous phase is inversely proportional to the salinity. Dissolution is expected to be a very slow process such that most of the injected CO₂ will remain in the pure phase. Depending on the reservoir geochemical environment and rock compositions, injected CO₂ may also mineralize as carbonates over time (salt formation). Chemical reactivity between the injected CO₂ and the rocks and minerals comprising the storage reservoir is expected to be very limited, as discussed in Sections 7.5.1 through 7.5.3.

7.4.14 Key Component Name(s)

A description of the injection fluid composition was provided in Tables 6-3 and 6-4 of this document.

7.5 Injection Fluid Compatibility

7.5.1 Compatibility with Injection Zone

A recent assessment of carbon sequestration potential in the Illinois Basin found no incompatibility for injection of CO₂ into the Mt. Simon Sandstone (Fisher, 2005). That study used geochemical modeling to evaluate the effects of CO₂ injection into a saline reservoir in the Illinois Basin. The geochemical modeling software package Geochemist's Workbench (Bethke, 2004) was used for the modeling. The conceptual model for the reservoir was based on geologic and water chemistry data from the Mt. Simon Formation at Manlove Gas Storage Field, in Illinois. Geologic data from Manlove Field were used as an analog in developing estimates of properties expected for the Mt. Simon at the Mattoon Site (e.g., Section 2.4.3.4 of this application). Several geochemical reactions were modeled in that study, including formation of CO₂ plume water from reaction of supercritical CO₂ with Mt. Simon formation water; reaction of the CO₂ plume water with minerals of the Mt. Simon Formation (discussed in Section 7.5.2); and

reaction of that water with shale interbeds in the Mt. Simon and with the Eau Claire sealing formation (discussed in Section 7.5.3).

The reaction of formation water with supercritical CO₂ did not suggest any incompatibility of the injection fluid and the Mt. Simon formation water. The reaction led to a decrease in pH from an initial value of 6.3 to 3.4, and an increase in dissolved carbon from 81.8 to 4.4×10^4 mg/kg H₂O (Fisher, 2005, Table 8-5).

7.5.2 Compatibility with Minerals in the Injection Zone

Fisher (2005) modeled the reaction of the fluid formed by reaction of supercritical CO₂ with Mt. Simon formation water with the minerals of the Mt. Simon Formation. The composition of the Mt. Simon at Manlove Field is dominantly quartz sand with a small amount of potassium feldspar (Fisher, 2005). Because quartz sand does not react strongly to low-pH water, Fisher (2005) modeled the reaction of the CO₂ plume fluid with microcline (a potassium feldspar). Modeling of this reaction led to an increase in pH of the plume fluid from 3.4 to 4.95. A small amount of sodium aluminum carbonate hydroxide (dawsonite) was predicted to precipitate, reducing the porosity from 10% to approximately 9.9%. The small amount of porosity reduction expected in the Mt. Simon Sandstone would not be expected to have any impact on injection of CO₂ into the formation.

Fisher (2005) also modeled the interaction of the plume fluid with shale interbeds that are present within the Mt. Simon Sandstone at Manlove Field. Samples from the shale interbeds have about 50% shale, most of which is illite. As the result of the reaction with the shale interbeds, the fluid pH would increase to 6.7, a small amount of illite would dissolve, and several minerals would precipitate in small concentrations (Fisher, 2005, Figure 8-6). However, total change in porosity would be minor, a decrease from 10% to about 9.3%. Again, this would not be expected to impact injection of the CO₂, and indicates a potential for a small amount of CO₂ to be sequestered in the Mt. Simon Formation by mineral precipitation.

7.5.3 Compatibility with Minerals in the Confining Zone

Due to buoyancy of the CO₂ plume, it will eventually rise until it contacts the Eau Claire Shale, the primary confining unit (e.g., see Section 5.4). Fisher (2005) modeled the reaction of the CO₂ plume water with the minerals of the Eau Claire Formation. The composition of the Eau Claire was estimated from a silty shale sample provided by the ISGS. The composition of that sample was about 40% clay, with most of that being illite. This is very similar to the composition of the Mt. Simon shale interbeds, so the same results would be obtained by reaction of the illite in the Eau Claire with the plume fluid, i.e., dissolution of a small amount of illite, with precipitation of small amounts of magnesite, quartz, kaolinite and other minerals (Fisher, 2005, Figure 8-6). The minor amounts of dissolution and precipitation described by Fisher (2005) based on geochemical modeling, with an overall small net decrease in porosity of the Eau Claire, do not suggest anything that would decrease the integrity or effectiveness of the caprock.

7.5.4 Compatibility with Injection Well Components

Corrosion of the injection tubing and long-string casing will be mitigated in several ways: using corrosion resistant alloys for selected portions of the well; injecting dry CO₂, which reduces the formation of corrosive carbonic acid; fully cementing the long-string casing to surface to

minimize contact with brine and CO₂ that could cause corrosion; and using an annular fluid with corrosion inhibitors.

7.5.4.1 Injection Tubing

Because of the similarity between the injection tubing and the long-string casing, this section discusses compatibility between the CO₂ injection stream and both the injection tubing and long-string casing. Injection tubing and long-string casing used in the injection well(s) will be comprised of API grade carbon steel (e.g., N-80) and a corrosion resistant stainless steel such as 13% chromium material (Cr13%). At minimum, the section of the long-string casing spanning the injection zone (the Mt. Simon Sandstone) will be comprised of a corrosion resistant alloy material. The injection tubing may be comprised of carbon steel (e.g., N-80) or stainless steel because the tubing will be periodically inspected for corrosion and replaced if necessary.

A corrosion modeling assessment was conducted to evaluate the compatibility of carbon steel (API Grade L-80) (L-80 is comparable to N-80 in terms of physical properties such as yield strength. L-80 is more suitable for sour gas service, which is not a concern at this site) and three varieties of stainless steel with the CO₂ injection fluid to aid in selecting appropriate well materials. Two types of corrosion were evaluated – general corrosion and pitting corrosion. The three grades of stainless steel that were evaluated in the assessment include: conventional Cr13%, modified Cr13%, and Super Cr13% (Super Cr13% is a trade name of the Sumitomo Company). Other steel companies refer to this material by other names. For example, JFE manufactures a similar material that is called HP2 Cr13%. The composition of the three alloys used in the modeling is provided in Table 7-3. The significant difference between these materials is the decreased amount of carbon and the increased amount of other materials, namely molybdenum (Mo) and nickel (Ni) going from conventional Cr13% to Super Cr13%.

Table 7-3. Composition of Three Stainless Steel Alloys

Grade	C	Mn	Si	Cr	Mo	P	S	Ni
Conventional Cr13%	0.21	0.35	0.46	12.8	0.02	0.015	0.001	0.12
Modified Cr13% ^a	0.007	0.67	0.26	12.77	0.6	0.004	0.001	4.59
Super Cr13% ^a	0.007	1.25	0.23	12.2	2	0.02	0.001	6.05

(a) Amaya, Hisashi, Tomoki Mori, Kunio Kondo, Hiroyuki Hirata, and Masakatsu Ueda. 1998. "Effect on Chromium and Molybdenum on Corrosion Resistance of Super Cr 13 Martensitic Stainless Steel in CO₂ Environment," NACE International, CORROSION 98, March 22-27.

The modeling assessment estimated the time required for general corrosion to penetrate each material, assuming an initial wall thickness of 0.5 inches. Parameters used for the corrosion modeling analyses are summarized in Table 7-4. Parameters used to model general corrosion include temperature, CO₂ pressure, and pipe properties (wall thickness, composition). Parameters used for the pitting corrosion scenario include temperature, CO₂ pressure, pipe properties (wall thickness, composition), and flow rate. In addition, the general and pitting analyses assume sufficient water (>18 ppm H₂O) is present to activate corrosion immediately. The section of the long-string casing that is below the packer and tubing is the most likely section to be affected by CO₂-induced corrosion because CO₂ might mix with water in this zone.

Table 7-4. Operating Conditions for Corrosion Modeling Analyses

Parameter	Value	Scenario
Tubing	O.D. = 5-1/2 inches I.D. = 4.50 inches (wall thickness=0.50 inches)	General Corrosion, Pitting Corrosion
Casing	O.D. = 9-5/8 inches I.D. = 8.50 inches (wall thickness=0.5 inches)	General Corrosion, Pitting Corrosion
Wellhead pressure	2,200 psi	General Corrosion, Pitting Corrosion
Bottomhole temperature	147°F to 165°F	General Corrosion, Pitting Corrosion
Reynolds Number	561,266 (corresponding to mass flow rate of approximately 263 tonnes/hr) 256,000 (corresponding to mass flow rate of approximately 114 tonnes/hr)	Pitting Corrosion

Figure 7-1 shows the general corrosion modeling results for the four different steel materials over a range of temperatures. The temperature interval from 147°F to 165°F is highlighted because this is the approximate temperature range of the reservoir at the bottom of the well. As shown on Figure 7-1, there is a decrease in penetration time with increasing temperature. For the temperature range of interest, estimated penetration times for the four materials range from approximately 3.5 years (carbon steel, highest temperature) to 127 years (SuperCr13, lowest temperature) (Table 7-5).

Figure 7-1. Expected Penetration Times (0.5 inch) for Four Materials Assuming General Corrosion Process (Red Lines Bracket Anticipated Bottomhole Temperature)

**Table 7-5. Expected Life (100% penetration of 0.5 inch) for Four Materials
Assuming General Corrosion**

Temperature (°F)	Expected life (years) Carbon Steel	Expected life (years) Cr13%	Expected life (years) MCr13%	Expected life (years) SCr13%
147	4.9	49	79	127
165	3.5	35	56	91

MCr13% - Modified Cr13%

SCr13% - SuperCr13%

The pitting analysis evaluated penetration time of the 5-1/2 inch (4.5 inch I.D.) injection tubing due to pitting corrosion. The pitting analysis takes into account the flow conditions (represented by Reynolds Number). Pitting can occur only after a defect develops; however, in this analysis, it was conservatively assumed that the defect is present initially to activate corrosion. Results are provided in Table 7-6 and Figure 7-2. Results are provided in Table 7-6 for a range of Reynolds numbers and materials. There is an inverse relationship between Reynolds number and the modeled penetration time for any particular material. Penetration occurs most rapidly in carbon steel and takes considerably longer in corrosion resistant alloys. In Figure 7-2, a Reynolds number of 561,266 is highlighted because this is the approximate value anticipated for the Reynolds number when CO₂ mass flow rate is steady at the maximum possible plant output of 263 tonnes/hr (578,568 lb/hr). This flow rate corresponds to the rate that would be expected if the plant is continuously producing the maximum possible amount of CO₂. If the flow rate is less, this would result in a lower Reynolds number. For example, for a flow rate of 1 million tonnes per year (114 tonnes/hr), the Reynolds number is 256,000 (also highlighted on the figure). As shown on Figure 7-2, a lower Reynolds number results in longer penetration time. These results suggest that there is a potential for penetration of the injection tubing within the four-year injection phase under the worst case scenario of continuous injection at the maximum flow rate. Periodic (e.g., annual) corrosion monitoring can be performed to detect and monitor pitting and take correction action as needed (e.g., replacement) before complete penetration of the injection tubing occurs. Using stainless steel material for the injection tubing would decrease the potential for corrosion and the frequency of well workovers requiring tubing replacement or repair.

Table 7-6. Expected Penetration Time for Injection Tubing Assuming Pitting Corrosion

Material	Modeled Penetration Time (years) for Various Values of Reynolds Number				
	Re=1,100,000	Re=1,000,000	Re=500,000	Re=300,000	Re=100,000
Carbon Steel	1.50	1.62	2.82	4.24	10.22
Conventional Cr13%	1.55	1.67	2.91	4.37	10.53
Modified Cr13%	2.03	2.19	3.81	5.74	13.81
Super Cr13%	2.26	2.44	4.25	6.40	15.42

Note: The Reynolds number is based on the non-dimensional expression: $Re = \frac{\rho VD}{\mu} = \frac{VD}{\nu}$ where, V is the mean fluid velocity, (m/s), μ is the dynamic viscosity of the fluid (Pa•s or N•s/m²), ν is the kinematic viscosity, ($\nu = \mu/\rho$), ρ is the density of the fluid (Kg/m³), and D is the diameter of the pipe (m).

Figure 7-2. Expected Penetration Time for Injection Tubing Four Materials Assuming Pitting Corrosion

7.5.4.2 Long String Casing

Compatibility between the CO₂ injection stream and long-string casing was discussed in the previous section.

7.5.4.3 Cement

A CO₂-resistant cement will be used for the injection interval to provide increased resistance to degradation by CO₂ (carbonic acid) compared to traditional portland cement-based materials. At this time, the cement that has been selected for the long-string casing opposite the storage reservoir is EverCRETE™ Cement (Schlumberger). A description of this material, including its corrosion resistant properties, was provided in Section 3.7.4.4 of this document.

7.5.4.4 Annular Fluid

An annular fluid will be emplaced in the well in the space above the packer between the injection tubing and the long-string casing. The specific fluid will be a light brine such as KCl or CaCl₂ with a weight of approximately 8.5 ppg. The final weight will be determined following drilling and downhole testing to determine the weight and pressure of the formation fluid in the Mt. Simon injection interval. The annular fluid will be filtered to avoid introducing suspended matter into the annular that could interfere with the downhole equipment and the aboveground annular pressure maintenance system (see Section 3.7.5). The annular fluid will contain a corrosion inhibitor that is compatible with the well materials and an oxygen scavenger to reduce the potential for corrosion of the tubing, casing and packer. A sample annular corrosion inhibitor that is compatible with both carbon steel and stainless steel (e.g., Cr13%) is CORSAF SF, manufactured by Tetra Technologies, Inc. (The Woodlands, Texas). This inhibitor would be applied at a rate of approximately 20 gallons per 100 bbls of annular fluid.

7.5.4.5 Packer(s)

Examples of the type of packer that will be used in the injection wells were presented in Section 3 (see Section 3.7.5.6.1) of this document. Materials of construction for the packers will be compatible with the injection fluid and the potential for CO₂-induced corrosion. The steel components of these packers can be manufactured from a choice of materials, including carbon steel, nickel-coated steel, or corrosion resistant alloys such as 13Cr, Super13Cr and higher grades. Most likely, the steel components will be of 13Cr, which is also being considered for the lower portion of the 9-5/8 inch long-string casing and the 5-1/2 inch tubing. The packer element will be hydrogenated nitrile butadiene rubber (HNBR). The packer will be a retrievable type packer so that it can be removed without milling for re-dressing or replacement if necessary.

7.5.4.6 Well Head Equipment

The wellhead and Christmas tree will be comprised of materials that are compatible with the injection fluid to minimize corrosion. In general, all components that come into contact with the CO₂ injection fluid will be a corrosion-resistant alloy such as stainless steel. Because the CO₂ injection fluid will be very dry, use of stainless steel components for the flow-wetted components is a conservative measure to minimize corrosion and increase the life expectancy of this equipment. Materials that will not have contact with the injection fluid will be manufactured of carbon steel. A preliminary materials specification for the wellhead and Christmas tree assembly is described in Table 7-7 using material classes as defined in API Specification 6A (Specification for Wellhead and Christmas Tree Equipment). A summary of material class definitions is provided in Table 7-8. The final wellhead and Christmas tree materials specification may vary slightly from the information given below because the wellhead/Christmas tree has not yet been selected. An illustration of the wellhead and Christmas tree is provided in Figure 7-3.

Table 7-7. Materials Specification of Wellhead and Christmas Tree

Component		Material Class ^(a)
Casing Head Housing (for 20 inch surface casing)		DD, EE
Casing Head Spool (for 13-3/8 inch intermediate casing)	Casing spool (20-3/4" 3K X 13-5/8 5K)	AA, BB, DD, EE
	Casing hanger (20" X 13-3/8")	AA, DD
Tubing Spool Assembly (for 9-5/8 inch long-string casing)	Spool	AA
	Casing hanger	AA, DD
Christmas Tree	Tubing head adapter	DD, EE
	Manual Gate Valve	BB
	Pneumatic actuated Gate Valves (2)	BB
	Tubing hanger (for 5-1/2-inch tubing)	CC

(a) When multiple classes given, highest class applies. Cameron uses this convention because not all components are available in all class types.

Figure 7-3. Illustration of the Wellhead and Christmas Tree

**Table 7-8. Material Classes from API 6A
(Specification for Wellhead and Christmas Tree Equipment)**

API Material Class	Body, Bonnet, End & Outlet Connections	Pressure Controlling Parts, Stems, & Mandrel Hangers
AA – General Service	Carbon or alloy steel	Carbon or low alloy steel
BB – General Service	Carbon or low alloy steel	Stainless steel
CC – General Service	Stainless Steel	Stainless steel
DD – Sour Service ^(a)	Carbon or low alloy steel ^(b)	Carbon or low alloy steel ^(b)
EE – Sour Service ^(a)	Carbon or low alloy steel ^(b)	Stainless steel ^(b)
FF – Sour Service ^(a)	Stainless steel ^(b)	Stainless steel ^(b)
HH – Sour Service ^(a)	Corrosion Resistant Alloy ^(b)	Corrosion Resistant Alloy ^(b)

Source: Cameron Surface Systems, Houston, Texas

(a) As defined by National Association of Corrosion Engineers (NACE) Standard MR075.

(b) In compliance with NACE Standard MR0175.

7.5.4.7 Holding Tanks(s) and Flow Lines

There are no CO₂ holding tanks associated with the CO₂ sequestration system. CO₂ will be piped from the plant to the injection wells via a pipeline.

7.5.5 Compatibility with Filter and Filter Components

Not applicable.

7.5.6 Full Description of Compatibility Concerns

As discussed previously in this section, no significant compatibility issues have been reported between the CO₂ injection fluid and the geologic containment system (i.e., injection reservoir and confining unit). As discussed, geochemical modeling of CO₂ injection into the Mt. Simon Formation predicted a small amount of mineral precipitation and a minor reduction in porosity; however, the small amount of porosity reduction would not be expected to have any impact on the injection of CO₂ into the formation. A similar effect (i.e., minor dissolution followed by precipitation, with an overall small net decrease in porosity) was predicted for the Eau Claire Formation, the primary confining unit overlying the Mt. Simon Formation; however, the extent of these processes would be small and would not be expected to decrease the integrity or effectiveness of the caprock.

Critical well materials that are exposed to the CO₂ injection fluid (i.e., tubing, long-string casing, packer, cement, wellhead and Christmas tree) have been designed to minimize the potential for corrosion and increase the service life of the well. Therefore, the well has been designed to eliminate compatibility issues.

7.5.7 Pre-Injection Fluid Treatment

After the CO₂ stream undergoes compression, it will not undergo further treatment that will alter its physical characteristics or composition, other than those caused by pressure and temperature changes as the fluid travels down the well.

7.6 References

Bethke, C.M. 2004. *The Geochemist's Workbench*. Rockware, Golden, CO.

Fisher, S. 2005. "Geochemistry of the Mt. Simon Sandstone with Carbon Dioxide Sequestration." In, *An Assessment of Geological Carbon Sequestration Options in the Illinois Basin*, Final Report for U.S. DOE Contract DE-FC26-03NT41994, Principal Investigator Robert Finley, p. 360-374. Available April 22, 2009 at <http://sequestration.org/report.htm>.

DRAFT UIC PERMIT FORMS

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

FORM 4g - PLUGGING AND ABANDONMENT PROCEDURE

USEPA ID NUMBER not applicable
IEPA ID NUMBER 0290255208
WELL NUMBER FutGen-INJ-1 and FutGEN-INJ-2

Location in Application

<u>8.1</u>	I.	Description of Plugging Procedures, see instructions
<u>8.1.1</u>	A.	Abandonment during construction
<u>8.1.2</u>	B.	Abandonment after injection
<u>8.1.3</u>	C.	Type and quantity of plugging materials, depth intervals
<u> </u>	D.	Detailed plugging and abandonment procedures
<u> </u>	E.	Cost estimate for plugging and abandonment

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name & Official Title

Phone Number

Signature

Date Signed

Note: per direction from the Illinois EPA, a signature is not required on this form.

8. PLUGGING AND ABANDONMENT PROCEDURES (Form 4g)

As discussed previously, no significant compatibility issues have been reported between the CO₂ injection fluid and the geologic containment system (i.e., injection reservoir and confining zone).

8.1 Description of Plugging Procedures for Injection Well

This section describes procedures for plugging and abandoning the injection well at various stages of the well's life, including during construction (i.e., drilling) and after the useful life of the well has been reached.

8.1.1 Injection Well Abandonment During Construction

Plugging and abandonment of the well during construction (during drilling) is highly unlikely as this implies that the well would be abandoned prior to completing its construction, perhaps even before reaching total depth of the well. However, per the requirements of the UIC permit application, it is necessary to define how the well would be plugged in such a case. The plugging and abandonment procedure that would be implemented during well construction depends on the stage of drilling when abandonment occurs. Three discrete scenarios are possible: after the conductor casing has been set but before the surface casing has been set; after the surface casing has been set but before the intermediate casing has been set; and after the intermediate casing has been set but before the long-string casing has been set. Since there are two possible depth scenarios for the intermediate casing string (i.e., 5,000 and 7,000 ft), this results in a total of five possible scenarios. A description of each of the five "abandonment during construction" scenarios follows:

- Scenario 1: Drilling terminates at 500 ft before setting the 20 inch surface casing. Therefore, open borehole (26 inch diameter) exists from the bottom of the 30 inch conductor casing @100 ft to TD@ 500 ft.
- Scenario 2: Drilling terminates at 5,000 ft before setting the 13-3/8 inch intermediate casing. Therefore, open borehole (17-1/2 inch diameter) exists from the bottom of the 20 inch surface casing @500 ft to TD@ 5,000 ft.
- Scenario 3: Drilling terminates at 7,000 ft before setting the 13-3/8 inch intermediate casing. Therefore, open borehole (17-1/2 inch diameter) exists from the bottom of the 20 inch surface casing @500 ft to TD@ 7,000 ft.
- Scenario 4: Drilling terminates at 9,100 ft before setting the 9-5/8 inch long casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch intermediate casing @5,000 ft to TD@ 9,100 ft.
- Scenario 5: Drilling terminates at 9,100 ft before setting the 9-5/8 inch long casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch intermediate casing @7,000 ft to TD@ 9,100 ft.

If the well has to be abandoned during construction, it would be filled with a series of cement plugs placed at strategic locations in the well. Strategic locations for setting cement plugs include: across the drinking water aquifer (200 ft below the lowest USDW to surface); across

coal seams (50 ft above and 50 ft below); casing size transition or line junction (50 ft above and 50 ft below); injection zone (250 ft above the injection zone). A plugging plan for all five abandonment scenarios is provided in Table 8-1, including the depth interval where the plug(s) would be placed, the quantity and type of cement that would be used, and any additives that would be used. The placement of the cement plugs is also shown graphically in Figure 8-1.

Prior to initiating well abandonment procedures, every attempt will be made to recover all in-hole equipment. In-hole equipment may consist of drill collars, drill pipe, drill bits, and testing tools (core barrel, well log tool, etc.). Following equipment recovery, standard plugging and abandonment procedures will be initiated per the UIC permit.

Table 8-1. Cement Plugs and Quantities Assuming Drilling Terminates Before Well is Completed

Cement Plug Depth Interval	Plug Description	Cement (Qty/Type/Additives)	Casing/Hole Description
Scenario 1: Drilling terminates at 500 ft before setting the 20 inch surface casing. Therefore, open borehole (26 inch diameter) exists from the bottom of the 30 inch conductor casing @100 ft to TD@ 500 ft.			
0-500'	Continuous plug from ground surface to 500 ft.	360 sks Class A (inside 30-inch conductor string) 1,240 sks Class A	0'-100' 30" conductor; 100' – 500' open borehole (26 inch)
Scenario 2: Drilling terminates at 5,000 ft before setting the 13-3/8 inch intermediate casing. Therefore, open borehole (17-1/2 inch diameter) exists from the bottom of the 20 inch surface casing @500 ft to TD@ 5,000 ft.			
0'-150'	Continuous plug from ground surface to 50 ft below conductor casing shoe.	241 sks Class A	0'–500' 20" 133 lb/ft surface casing; 500'–5,000' open borehole (17-1/2 inch)
150'-450'	Mud	Mud	
450'-1,200'	From 50 ft above surface casing shoe to 50' below coal seams	1,063 sks Class A	
1,200 -4,500	Mud	Mud	
4,500-5,000'	Across St. Peter	702 sks Class A	
Scenario 3: Drilling terminates at 7,000 ft before setting the 13-3/8 inch intermediate casing. Therefore, open borehole (17-1/2 inch diameter) exists from the bottom of the 20 inch surface casing @500 ft to TD@ 7,000 ft.			
0-150'	Class A	241 sks Class A	0'–500' 20" 133 lb/ft surface casing; 500'–7,000' open borehole (17-1/2 inch)
150'-450'	Mud	Mud	
450-1,200'	From 50 ft above surface casing shoe to 50' below coal seams	1,063 sks Class A	
1,200' - 4,500'	Mud	Mud	
4,500'- 5,000'	Across St. Peter	702 Class A	
5,000' – 7,000'	Mud	Mud	
Scenario 4: Drilling terminates at 9,100 ft before setting the 9-5/8 inch long casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch intermediate casing @5,000 ft to TD@ 9,100 ft.			
0-150'	Class A	109 sks Class A	0-5,000' 13-3/8" 54.5 to 68 lb/ft intermediate casing; 5,000' – 9,100 ft open borehole (12-1/4 inch)
150'-450'	Mud	Mud	
450'-550'	From 50' above to 50' below surface casing shoe	73 sks Class A	

Table 8-1. Cement Plugs and Quantities Assuming Drilling Terminates Before Well is Completed (Continued)

Cement Plug Depth Interval	Plug Description	Cement (Qty/Type/Additives)	Casing/Hole Description
550'-4,950'	Mud	Mud	
4,950'-5,050'	From 50' above to 50' below intermediate casing shoe	71 sks Class A	
5,050' – 7,000'	Mud	Mud	
7,000'-9,100'	Across Mt. Simon	1444 sks Class A with 1% D65 (TIC), 0.1% D201 Retarder	
Scenario 5: Drilling terminates at 9,100 ft before setting the 9-5/8 inch long casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch intermediate casing @7,000 ft to TD@ 9,100 ft.			
0-150'	Class A	109 sks	0-7,000' 13-3/8" 54.5 to 68 lb/ft Intermediate casing; 7,000' – 9,100' open borehole (12-1/4 inch)
150'-450'	Mud	Mud	
450'-550'	From 50' above to 50' below surface casing shoe	73 sks Class A	
550'-6,950'	Mud	Mud	
6,950'-9,100'	From 50' above intermediate casing shoe extending across Mt. Simon to TD	1480 sks Class A with 1% D65 (TIC), 0.1% D201 Retarder	

TIC – turbulence inducer

Figure 8-1. Plugging Scenarios for Injection Abandonment During Construction

8.1.2 Injection Well Abandonment After Injection

At the end of the serviceable life of the injection well, the well will be plugged and abandoned. The well will be filled with cement from its total depth to ground surface as required by the IEPA. This could be accomplished in one of two ways: either by filling the entire well with cement in one continuous effort until it is full, or by emplacing the cement in sections, allowing time between each section. The first approach would require significantly less time; however, it would cost more than the second approach. Therefore, the first approach is described in this section because it provides a more conservative (i.e., higher) cost basis for financial assurance and would allow either option to be implemented. Regardless of the abandonment approach implemented, every attempt will be made to recover the injection equipment (injection tubing, packer, etc.) from the cased hole prior to initiating abandonment procedures. The type and quantity of plugging materials are described in Section 8.1.3. A detailed description of the procedure for abandoning the well is described in Section 8.1.4.

8.1.3 Type and Quantity of Plugging Materials, Depth Intervals

Two types of cement will be used to plug the well after injection. Cement plugs set below a depth of 3,000 ft would be Type A cement with 1% D-65 TIC (retarder). Cement plugs above a depth of 3,000 ft would be Type A cement. The quantity of cement required to fill approximately 9,100 ft of 9-5/8 inch casing following this procedure would be approximately 3,160 sks emplaced in 24 plugs. The types of cement and quantity of materials required are summarized in Table 8-2.

Table 8-2. Cement Types and Quantities for Abandonment After Injection

Depth Interval	Number Plugs and Quantity of Material	Type of Plugging Material
0 – 7,600 ft	19 plugs, 140 sks each (approx 2,660 sks total)	Type A cement
7,600 – 9,100 ft	5 plugs, 100 sks each (approx 500 sks total)	Type A cement with 1% D-65 TIC (retarder).

8.1.4 Detailed Plugging and Abandonment Procedures

This section describes plugging and abandonment procedures after injection. The plugging procedure will consist of removing all components of the completion system and then spotting cement plugs along the entire length of the well. At the surface, the wellhead will be removed, casing will be cut off 3 ft below grade, and a steel blanking plate (inscribed with the required permit information) will be welded across the top of the well casing. This inscribed blanking plate will serve as a marker monument to the location of the well. A detailed plugging and abandonment procedure is described below:

1. Prior to commencing plugging and abandonment activities, ensure that all local, state, and Federal agencies are properly notified and that all required permits are in place and followed, as described.
2. Move in a workover rig with pump and appropriate tanks.
3. Nipple down wellhead and nipple up blow-out preventer.

4. Fill hole with workover brine of sufficient density to maintain well control.
5. Remove tubing and packer from well.
6. Pick up 3-1/2 inch tubing work string (or comparable) and trip in hole to PBTD.
7. Circulate hole with two revolutions to ensure that uniform density fluid is in the well.
8. Start setting cement plugs by spotting 100 sks of Class A cement with 1% D-65 TIC and 0.15% D 201. This amount is equal to 300 ft in the 9-5/8 inch casing. Pull 10 joints of tubing and reverse circulate hole for two tubing volumes. Lay down tubing as it is pulled from the well.
9. Repeat plug setting procedure until uppermost set of perforations is covered, then reverse circulate hole one revolution.
10. Pull 20 joints of tubing and shut down overnight.
11. On the next morning, trip in the hole with 20 joints of tubing and tag cement plug. Resume plugging procedure as before but increase plug 140 sks each, covering an interval approximately 400 ft in length with each. Use 1% D-65 TIC in plugs below 3,000 ft.
12. Repeat above procedure until just before the last plug at surface; the appropriate volume of cement to reach is within 3 ft of surface.
13. Nipple down blow-out preventers.
14. Cut off all wellhead components and cut off all casings at 3 ft below ground level.
15. Finish filling well with cement.
16. Install permanent marker back to surface on which all pertinent well information is inscribed.
17. Fill cellar (dug out area surrounding well) with topsoil.
18. Rig down workover unit and move out all equipment. Haul off all workover fluids to proper disposal site.
19. Reclaim surface to normal grade and reseed location with desired vegetation, depending on land use requirements.

8.1.5 Cost Estimate for Plugging and Abandonment

A cost estimate for plugging and abandoning a single injection well after injection operations are completed is summarized in Table 8-3. Costs for abandoning two injection wells would be double the cost given on Table 8-3, assuming the wells are abandoned at different times. The cost estimate conservatively assumes the injection well will be continuously cemented from its total depth to land surface. In addition to the cost for plugging (cementing) the well, the total cost estimate also includes other items required by the IEPA's UIC permit application instructions, including: evaluation of the condition of the cement and casing and repairing problems prior to plugging the well; disposal of miscellaneous equipment and drilling fluids; oversight labor; taxes; and, a contingency. In this case, it was assumed that a 500-ft section of cement would need to be rehabilitated before the well can be plugged. This would be

Table 8-3. Itemized Plugging and Abandonment Costs (Single Injection Well)

Event	Event Description	Cost Estimate
Casing and Cement Evaluation	Mobilization of wireline equipment and crews to Mattoon, IL, equipment setup, and report preparation/submittal.	\$9,014
	UltraSonic Imager Tool - Gamma Ray. Cement and casing inspection log (includes gamma ray and tool insurance).	\$14,447
	Cement Bond Log - Variable Density Log.	\$5,062
	Temperature Log via Platform Basic Measurement Sonde (includes pressure, temperature, and gamma ray). Assumes three passes of the survey tool.	\$13,104
	Perform pressure test of casing supported by pump truck, plus engineering/coordination/labor.	\$11,745
Evaluation of problems discovered by the casing evaluation	Includes interpretation of survey logs listed above by log analyst and assessment of corrective action alternatives.	\$2,372
Repair of any problems identified and cleanup of any groundwater or soil contamination	Assumes a hypothetical cement squeeze job required at 6,000 ft to 6,500 ft, which also necessitates perforation of casing and a bridge plug. Contamination of groundwater and or soil is not anticipated therefore, soil and groundwater remediation costs are not included.	\$25,290
Well Plugging (i.e., cementing) ^(a)	Well plugging assumes plugging from total depth of well to surface. Assumes 5 days to perform well plugging services.	\$200,000
Labor, engineering, rig time, equipment, and consulting	Costs include labor and engineering services. Rig and associated equipment are included in the costs above for "Well Plugging". Contracted consulting services/fees are also considered for this event.	\$17,750
Decontamination of equipment	A cost for decontamination of equipment is not included as this is not relevant; however, cost associated with the disposal of well fluids is considered.	\$9,240
Disposal of any equipment	Disposal of equipment/scrap metal from the project site will not incur cost. Cost is for a waste dumpster and hauling for miscellaneous debris which will be required.	\$300
Estimated sales tax	Sales tax for the City of Mattoon Illinois is 6.75%. Assumes sales tax for the tasks outlined above.	\$20,812
Miscellaneous and minor contingencies	Miscellaneous and minor contingencies are calculated by assuming 20% of the costs outlined in the tasks above.	\$65,827
Total		\$384,963^(b)

(a) Costs for alternate well plugging (i.e., cementing) scenarios are as follows: Scenario B1 –\$54,000; Scenarios B2 and B3 –\$68,000; Scenario B4 –\$73,000; Scenario B5 –\$75,000.

(b) Total plugging and abandonment cost (\$384,963) is for a single injection well, cost will be doubled for determining financial responsibility requirements.

accomplished by perforating the casing opposite the damaged section of cement and emplacing new cement behind casing via "squeezing".

8.2 Description of Plugging Procedures for Injection Reservoir Monitoring Well

This section describes procedures for plugging and abandoning the injection reservoir monitoring well at various stages of the well's life, including during construction (i.e., drilling) and after the useful life of the well has been reached.

8.2.1 Injection Reservoir Monitoring Well Abandonment During Construction

As previously mentioned in Section 8.1.1, plugging and abandonment of the well during construction is highly unlikely; however, per the requirements of the UIC permit application, this section details how the injection reservoir monitoring well will be plugged in such a case. Since the injection reservoir monitoring well will be very similar in construction to the injection well (the difference being casing diameter), plugging and abandonment scenarios and procedures outlined in Section 8.1.1 will be consistent.

Table 8-4 provides the plugging plan for all five abandonment scenarios, including the depth interval where the plug(s) would be placed, the quantity and type of cement that would be used, and any additives that would be used. The subject table (Table 8-4) is identical to Table 8-1, with the exception of the casing diameters and cement quantities because the injection reservoir monitoring well casing is smaller. A graphical illustration of these scenarios is provided above in Figure 8-1.

Table 8-4. Cement Plugs and Quantities Assuming Drilling Terminates Before Well is Completed

Cement Plug Depth Interval	Plug Description	Cement (Qty/ Type/Additives)	Casing/Hole Description
Scenario 1: Drilling terminates at 500 ft before setting the 13-3/8 inch surface casing. Therefore, open borehole (17-1/2 inch diameter) exists from the bottom of the 20 inch conductor casing @100 ft to TD@ 500 ft.			
0-500'	Continuous plug from ground surface to 500 ft.	160 sks Class A (inside 20-inch conductor string) 561 sks Class A	0'-100' 20" conductor; 100' – 500' open borehole (17-1/2 inch)
Scenario 2: Drilling terminates at 5,000 ft before setting the 9-5/8 inch intermediate casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch surface casing @500 ft to TD@ 5,000 ft.			
0'-150'	Continuous plug from ground surface to 50 ft below conductor casing shoe.	117 sks Class A	0'–500' 13-3/8" 133 lb/ft surface casing; 500'–5,000' open borehole (12-1/4 inch)
150'-450'	Mud	Mud	
450'-1,200'	From 50 ft above surface casing shoe to 50' below coal seams	518 sks Class A	
1,200' -4,500'	Mud	Mud	
4,500-5,000'	Across St. Peter	345 sks Class A	
Scenario 3: Drilling terminates at 7,000 ft before setting the 9-5/8 inch intermediate casing. Therefore, open borehole (12-1/4 inch diameter) exists from the bottom of the 13-3/8 inch surface casing @500 ft to TD@ 7,000 ft.			
0-150'	Class A	117 sks Class A	0'–500' 13-3/8" 133 lb/ft surface casing; 500'–7,000' open borehole (12-1/4 inch)
150'-450'	Mud	Mud	
450-1,200'	From 50 ft above surface casing shoe to 50' below coal seams	518 sks Class A	
1,200' - 4,500'	Mud	Mud	
4,500'- 5,000'	Across St. Peter	345 Class A	
5,000' – 7,000'	Mud	Mud	

Table 8-4. Cement Plugs and Quantities Assuming Drilling Terminates Before Well is Completed (Continued)

Cement Plug Depth Interval	Plug Description	Cement (Qty/Type/Additives)	Casing/Hole Description
Scenario 4: Drilling terminates at 9,100 ft before setting the 7 inch long casing. Therefore, open borehole (8-1/2 inch diameter) exists from the bottom of the 9-5/8 inch intermediate casing @5,000 ft to TD@ 9,100 ft.			
0-150'	Class A	57 sks Class A	0-5,000' 9-5/8" 54.5 to 68 lb/ft intermediate casing; 5,000' – 9,100 ft open borehole (8-1/2 inch)
150'-450'	Mud	Mud	
450'-550'	From 50' above to 50' below surface casing shoe	38 sks Class A	
550'-4,950'	Mud	Mud	
4,950'-5,050'	From 50' above to 50' below intermediate casing shoe	37 sks Class A	
5,050' – 7,000'	Mud	Mud	
7,000'-9,100'	Across Mt. Simon	736 sks Class A with 1% D65 (TIC), 0.1% D201 Retarder	
Scenario 5: Drilling terminates at 9,100 ft before setting the 7 inch long casing. Therefore, open borehole (8-1/2 inch diameter) exists from the bottom of the 9-5/8 inch intermediate casing @7,000 ft to TD@ 9,100 ft.			
0-150'	Class A	57 sks	0-7,000' 9-5/8" 54.5 to 68 lb/ft Intermediate casing; 7,000' – 9,100 open borehole (8-1/2 inch)
150'-450'	Mud	Mud	
450'-550'	From 50' above to 50' below surface casing shoe	38 sks Class A	
550'-6,950'	Mud	Mud	
6,950'-9,100'	From 50' above intermediate casing shoe extending across Mt. Simon to TD	770 sks Class A with 1% D65 (TIC), 0.1% D201 Retarder	

8.2.2 Injection Reservoir Monitoring Well Abandonment After Construction

At the end of the serviceable life of the injection reservoir monitoring well, the well will be plugged and abandoned, consistent with the procedures detailed in Section 8.1.2 and 8.1.4. The type and quantity of plugging materials are described in Section 8.2.3.

8.2.3 Type and Quantity of Plugging Materials, Depth Intervals

Two types of cement will be used to plug the well after injection. Cement plugs set below a depth of 3,000 ft would be Type A cement with 1% D-65 TIC (retarder). Cement plugs above a depth of 3,000 ft would be Type A cement. The quantity of cement required to fill approximately 9,100 ft of 9-5/8 inch casing following this procure would be approximately 1,673 sks emplaced in 24 plugs. The types of cement and quantity of materials required are summarized in Table 8-5.

8.2.4 Detailed Plugging and Abandonment Procedures

Section 8.1.4 provides detailed procedures for plugging and abandoning the injection well. Those same procedures will be implemented for plugging and abandoning the injection

Table 8-5. Cement Types and Quantities for Abandonment After Injection

Depth Interval	Number Plugs and Quantity of Material	Type of Plugging Material
0 – 7,600 ft	19 plugs, 74 sks each (approx 1,408 sks total)	Type A cement
7,600 – 9,100 ft	5 plugs, 53 sks each (approx 265 sks total)	Type A cement with 1% D-65 TIC (retarder).

reservoir monitoring well, with the exception of procedural Step 8 and Step 11 because of the smaller casing diameter of the injection reservoir monitoring well. For the purposes of plugging and abandonment of the injection reservoir monitoring well, replace procedural Step 8 and Step 11 in Section 8.1.4 with the procedural steps detailed below.

8. (*Replacement Step*) Start setting cement plugs by spotting 53 sks of Class A cement with 1% D-65 TIC and 0.15% D 201. This amount is equal to 300 ft in the 7 inch casing. Pull 10 joints of tubing and reverse circulate hole for two tubing volumes. Lay down tubing as it is pulled from the well.
11. (*Replacement Step*) On the next morning, trip in the hole with 20 joints of tubing and tag cement plug. Resume plugging procedure as before but increase plug 74 sks each, covering an interval approximately 400 ft in length with each. Use 1% D-65 TIC in plugs below 3,000 ft.

8.2.5 Cost Estimate for Plugging and Abandonment

The cost estimate presented in Table 8-3 (cost estimate for plugging and abandonment of a single injection well) will also be used for the cost basis for plugging and abandoning a single injection reservoir monitoring well after injection operations are completed. As previously stated, the difference in the two types of wells is that the casing diameter is smaller for the injection reservoir monitoring well. Hence, the events detailed in Table 8-3 will be the same for plugging and abandonment of the injection reservoir monitoring well and the cost represents a conservative (i.e., higher) estimate for financial assurance. The cost estimate (\$384,963) conservatively assumes continuous cement from total depth to land surface. In addition, the cost includes all items required by the IEPA's UIC permit application instructions.

8.3 Description of Plugging Procedures for USDW Well

This section describes procedures for plugging and abandoning the USDW well at various stages of the well's life, including during construction (i.e., drilling) and after the useful life of the well has been reached.

8.3.1 USDW Well Abandonment During Construction

Plugging and abandonment of the well during construction (during drilling) is highly unlikely; however, per the requirements of the UIC permit application, it is necessary to define how the well would be plugged in such a case. The plugging and abandonment procedure that would be implemented during well construction is consistent, one scenario possible, regardless of the stage of drilling when abandonment occurs. The USDW well construction is a single casing, 4-inch PVC with 4-inch stainless steel screen; therefore plugging during construction would occur before casing is set.

Plugging and abandonment of the well during construction could occur from surface to 100 ft bgs (maximum depth of USDW well). If the well has to be abandoned during construction, it would be filled with a continuous plug of neat cement tremied from the bottom of the borehole to surface. Regardless of depth, prior to initiating well abandonment procedures, every attempt will be made to recover all in-hole equipment. In-hole equipment may consist of drill pipe, drill bit, etc. Following equipment recovery, standard plugging and abandonment procedures will be initiated per the UIC permit.

8.3.2 USDW Well Abandonment After Construction

At the end of the serviceable life of the USWD well, the well will be plugged and abandoned. The well will be filled with cement from its total depth to 2 ft bgs. This will be accomplished by filling the entire well with cement in one continuous effort until it is full. Prior to initiating the abandonment procedure, every attempt will be made to recover the in-well equipment (if any) from the cased hole. The type and quantity of plugging materials are described in Section 8.3.3. A detailed description of the procedure for abandoning the well is described in Section 8.3.4.

8.3.3 Type and Quantity of Plugging Materials, Depth Intervals

Neat cement (portland cement) will be used to plug the well at the end of the serviceable life of the well. The cement plug will be continuous, tremied from the bottom of the borehole to 2 ft bgs. The quantity of cement required to fill 100 ft (maximum depth of USDW well) of 4 inch casing would be approximately 18 sks emplaced in one continuous plug.

8.3.4 Detailed Plugging and Abandonment Procedures

This section describes plugging and abandonment procedures at the end of the serviceable life of the well. The plugging procedure will simply consist of removing all components (if any) from the well and then spotting a continuous cement plug along the entire length of the well. At the surface, the wellhead will be removed, casing will be cut off 2 ft below grade, and topsoil will be used as backfill material to restore surface to native elevation. A detailed plugging and abandonment procedure is described below:

1. Prior to commencing plugging and abandonment activities, ensure that all local, state, and Federal agencies are properly notified and that all required permits are in place and followed, as described.
2. Move in a service truck with pump and appropriate tanks.
3. Remove all components from within the well.
4. Set cement plug by spotting 18 sacks of neat cement. This amount is equal to 100 ft in the 4 inch casing.
5. Cut off all wellhead components and cut off all casings at 2 ft below ground level.
6. Finish filling well with cement.
7. Dispose of all waste equipment and materials.
8. Reclaim surface to normal grade and reseed location with desired vegetation, depending on land use requirements.

8.3.5 Cost Estimate for Plugging and Abandonment

In accordance with the plugging and abandonment procedures, the cost estimate for plugging and abandonment of a single USDW well will be \$760. The cost estimate conservatively assumes continuous cement from total depth to land surface. In addition, the cost includes all items required by the IEPA's UIC permit application instructions.

APPENDIX 3-1

Well Cementing Plan

CemCADE^{*} Well Cementing Recommendation for 20" Surface Casing (500 ft)

^{*} Mark of Schlumberger

CemCADE^{*} well cementing recommendation for 20" Surface

Operator : Mattoon/Future Gen **Well** : ISGS/ADM Well #1
Country : USA **Field** : CO2 Disposal
State : IL

Prepared for : SLB **Location** : Decatur, IL
Proposal No. :
Date Prepared : 05-26-2009 **Service Point** : Prestonsburg
 Business Phone : (606) 298 2200
 FAX No. : (606) 298 2248

Prepared by : Donald Leach
Phone : (606) 791-4194
E-Mail :
 dleach@prestonsburg.oilfield.slb.com

well description

Configuration	Casing	Stage : Single	Rig Type : Land
Csg/Liner	MD : 550.0 ft	OD : 20 in	Weight : 106.5 lb/ft
Landing Collar MD		510.0 ft	
Casing/liner Shoe MD		550.0 ft	
Mud Line		0.0 ft	
Total MD		550.0 ft	
BHST		68 degF	
Bit Size		24 in	
Mean OH Diameter		24.000 in	
Mean Annular Excess		75.0 %	
Mean OH Equivalent Diameter		26.608 in	
Total OH Volume		378.3 bbl (including excess)

Disclaimer Notice:

This information is presented in good faith, but no warranty is given by and Schlumberger assumes no liability for advice or recommendations made concerning results to be obtained from the use of any product or service. The results given are estimates based on calculations produced by a computer model including various assumptions on the well, reservoir and treatment. The results depend on input data provided by the Operator and on estimates as to unknown data and can be no more accurate than the model, the assumptions and such input data. The information presented is Schlumberger's best estimate of the actual results that may be achieved and should be used for comparison purposes rather than absolute values. The quality of input data, and hence results, may be improved through the use of certain tests and procedures which Schlumberger can assist in selecting.

The Operator has superior knowledge of the well, the reservoir, the field and conditions affecting them. If the Operator is aware of any conditions whereby a neighboring well or wells might be affected by the treatment proposed herein it is the Operator's responsibility to notify the owner or owners of the well or wells accordingly.

Prices quoted are estimates only and are good for 30 days from the date of issue. Actual charges may vary depending upon time, equipment, and material ultimately required to perform these services.

Freedom from infringement of patents of Schlumberger or others is not to be inferred.

Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 1: fluid sequence

Job Objectives:

20" SURFACE CEMENT TREATMENT AS PER CUSTOMER REQUEST

Original fluid	Fresh Water	8.32 lb/gal	
	Pv : 0.900 cP		Ty : 0.50 lbf/100ft2
Displacement Volume	178.8 bbl		
Total Volume	386.9 bbl		
TOC	0.0 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
Fresh Water	20.0	0.0		8.32	Pv:0.900 cP	Ty:0.50 lbf/100ft2
Lead Slurry	124.0	382.6		15.60	k:2.99E-1 lbf.s^n/ft2	n:0.269 Ty:1.84 lbf/100ft2
Tail Slurry	64.1	167.4	382.6	15.60	Pv:63.653 cP	Ty:86.23 lbf/100ft2
Fresh Water	178.8		0.0	8.32	Pv:0.900 cP	Ty:0.50 lbf/100ft2

WARNING : CASING PUMP OUT

Static Security Checks :		
Frac	0 psi	at 0.0 ft
Pore	0 psi	at 0.0 ft
Collapse	566 psi	at 510.0 ft
Burst	2410 psi	at 0.0 ft
Csg.Pump out	-5 ton

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 2: pumping schedule

Pumping Schedule						
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	Comments
Fresh Water	6.0	20.0	3.3	20.0	80	Water spacer ahead of cement
Lead Slurry	5.0	124.0	24.8	124.0	80	A + D130
Tail Slurry	5.0	64.1	12.8	64.1	80	A + S001 + D130
Pause	0.0	0.0	3.0	0.0	80	Shut Down, Drop Plug
Fresh Water	6.0	178.8	29.8	178.8	80	Start Displacement
Total			01:13 hr:mn	386.9 bbl		

End Job:

Cement not at surface in simulation due to 75% excess hole size in design

Dynamic Security Checks :		
Frac	0 psi	at 0.0 ft
Pore	0 psi	at 0.0 ft
Collapse	566 psi	at 510.0 ft
Burst	2196 psi	at 0.0 ft

Temperature Results			
BHCT	80 degF	Simulated Max HCT	80 degF
Simulated BHCT	80 degF	Max HCT Depth	550.0 ft
CT at TOC	75 degF	Max HCT Time	01:09:20 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	62 degF
Bottom Hole	(degF)	(degF)	68 degF

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 3: fluid description

Lead Slurry DESIGN

Fluid No: 1
Rheo. Model : HERSCHEL_B.
At temp. : 80 degF

Density : 15.60 lb/gal
k : 2.99E-1 lbf.s^n/ft2
n : 0.269
Ty : 1.84 lbf/100ft2
Gel Strength : 62.97 lbf/100ft2

DESIGN

BLEND

Name : A
Dry Density : 197.27 lb/ft3
Sack Weight : 94 lb

SLURRY

Mix Fluid : 5.248 gal/sk
Yield : 1.18 ft3/sk
Solid Fraction : 40.6 %

Job volume : 124.0 bbl
Quantity : 589.10 sk

BASE FLUID

Type : Fresh water

Density : 8.32 lb/gal

Base Fluid : 5.248 gal/sk

Additives		
Code	Conc.	Function
D130	0.250 lb/sk blend	Lost circ

Thickening Time	Schedule ()	100 Bc	at	02:19 hr:mn
Compressive Strength	Schedule ()	(psi)	at	(hr:mn)

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Fresh Water DESIGN

Fluid No: 2
 Rheo. Model : BINGHAM
 At temp. : 60 degF

Density : 8.32 lb/gal
 Pv : 0.900 cP
 Ty : 0.50 lbf/100ft2
 Gel Strength : 0.00 lbf/100ft2

Job volume : 198.8 bbl

Tail Slurry DESIGN

Fluid No: 3
 Rheo. Model : BINGHAM
 At temp. : 80 degF

Density : 15.60 lb/gal
 Pv : 63.653 cP
 Ty : 86.23 lbf/100ft2
 Gel Strength : 66.17 lbf/100ft2

DESIGN

BLEND

Name : A
 Dry Density : 197.27 lb/ft3
 Sack Weight : 94 lb

SLURRY

Mix Fluid : 5.239 gal/sk
 Yield : 1.19 ft3/sk
 Solid Fraction : 41.1 %

Job volume : 64.1 bbl
 Quantity : 302.63 sk

BASE FLUID

Type : Fresh water
 Density : 8.32 lb/gal
 Base Fluid : 5.239 gal/sk

Additives		
Code	Conc.	Function
D130	0.250 lb/sk blend	Lost circ
S001	1.000 %BWOC	Accelerator

Thickening Time Schedule () 70 Bc at 01:55 hr:mn
 Compressive Strength Schedule () (psi) at (hr:mn)

CemCADE^{*} Well Cementing Recommendation for 13-3/8" Intermediate Casing (5,000 ft)

^{*} Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

CemCADE^{*} well cementing recommendation for 13 3/8" Intermediate

Operator : Mattoon/Future Gen **Well** : Batelle Mattoon/FutureGen
Country : USA **Field** : CO2 Disposal
State : IL

Prepared for : SLB **Location** : Decatur, IL
Proposal No. :
Date Prepared : 05-26-2009 **Service Point** : Prestonsburg
 Business Phone : (606) 298 2200
 FAX No. : (606) 298 2248

Prepared by : Donald Leach
Phone : (606) 791-4194
E-Mail :
 dleach@prestonsburg.oilfield.slb.com

well description

Configurat ion	Casing	Stage : Single	Rig Type : Land
Prev.String	MD : 350.0 ft	OD : 20 in	Weight : 94.0 lb/ft
Csg/Liner	MD : 5000.0 ft	OD : 13 3/8 in	Weight : 72.0 lb/ft
Landing Collar MD		4960.0 ft	
Casing/liner Shoe MD		5000.0 ft	
Mud Line		0.0 ft	
Total MD		5000.0 ft	
BHST		117 degF	
Bit Size		17 1/2 in	
Mean OH Diameter		17.500 in	
Mean Annular Excess		50.0 %	
Mean OH Equivalent Diameter		19.234 in	
Total OH Volume		1671.0 bbl (including excess)

Disclaimer Notice:

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The Operator has superior knowledge of the well, the reservoir, the field and conditions affecting them. If the Operator is aware of any conditions whereby a neighboring well or wells might be affected by the treatment proposed herein it is the Operator's responsibility to notify the owner or owners of the well or wells accordingly.

Prices quoted are estimates only and are good for 30 days from the date of issue. Actual charges may vary depending upon time, equipment, and material ultimately required to perform these services.

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Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 4: fluid sequence

Job Objectives:

13.375" casing cement treatment

Original fluid	Drilling Mud	9.00 lb/gal	
	Pv : 32.969 cP		Ty : 6.02 lbf/100ft2
Displacement Volume	738.6 bbl		
Total Volume	1776.0 bbl		
TOC	0.0 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
MUDPUSH II	50.0	0.0		12.00	Pv:19.736 cP	Ty:16.38 lbf/100ft2
CW100	50.0	0.0		8.33	Pv:0.900 cP	Ty:0.50 lbf/100ft2
35:65 @ 12.7 ppg	746.7	4004.1		12.70	Pv:8.190 cP	Ty:9.14 lbf/100ft2
D901 Tail @ 15.6 ppg	190.8	995.9	4004.1	15.60	k:7.49E-2 lbf.s^n/ft2	n:0.450 Ty:1.05 lbf/100ft2
Drilling Mud	738.6		0.0	9.00	Pv:32.969 cP	Ty:6.02 lbf/100ft2

Static Security Checks :		
Frac	49 psi	at 350.0 ft
Pore	79 psi	at 350.0 ft
Collapse	1394 psi	at 4960.0 ft
Burst	5020 psi	at 0.0 ft
Csg.Pump out	74 ton

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 5: pumping schedule

Start Job:

Hole circulated with mud @ 75F for 4 hours before pumping job

Pumping Schedule						Comments
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	
MUDPUSH II	7.0	50.0	7.1	50.0	80	
CW100	7.0	50.0	7.1	50.0	80	
35:65 @ 12.7	7.0	746.7	106.7	746.7	80	
ppg						
D901 Tail @	7.0	190.8	27.3	190.8	80	
15.6 ppg						
Pause	0.0	0.0	5.0	0.0	80	
Drilling Mud	7.0	730.0	104.3	730.0	80	
Drilling Mud	2.0	8.6	4.3	738.6	80	
Total			04:21 hr:mn	1776.0 bbl		

End Job:

Designed displacement is with drilling mud

Dynamic Security Checks :		
Frac	47 psi	at 350.0 ft
Pore	12 psi	at 350.0 ft
Collapse	1394 psi	at 4960.0 ft
Burst	3881 psi	at 0.0 ft

Temperature Results			
BHCT	101 degF	Simulated Max HCT	117 degF
Simulated BHCT	86 degF	Max HCT Depth	5000.0 ft
CT at TOC	84 degF	Max HCT Time	00:00:00 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	62 degF
Bottom Hole	(degF)	(degF)	117 degF

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 6: fluid description

35:65 @ 12.7 ppg DESIGN

Fluid No: 1
Rheo. Model : BINGHAM
At temp. : 81 degF

Density : 12.70 lb/gal
Pv : 8.190 cP
Ty : 9.14 lbf/100ft2
Gel Strength : 19.21 lbf/100ft2

DESIGN

BLEND

Name : 35:65
Dry Density : 181.77 lb/ft3
Sack Weight : 90 lb

SLURRY

Mix Fluid : 11.397 gal/sk
Yield : 2.10 ft3/sk
Solid Fraction : 27.6 %

Job volume : 746.7 bbl
Quantity : 1992.60 sk

BASE FLUID

Type : Fresh water

Density : 8.32 lb/gal

Base Fluid : 11.047 gal/sk

Additives		
Code	Conc.	Function
D020	4.000 %BWOB	Extender
D044	10.000 %BWOW	Salt
D046	0.200 %BWOB	Antifoam
D042	5.000 lb/sk blend	LCM/extender

Thickening Time Schedule () 70 Bc at 04:36 hr:mn
 Compressive Strength Schedule () (psi) at (hr:mn)

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

CW100 DESIGN

Fluid No: 2	Density : 8.33 lb/gal
Rheo. Model : BINGHAM	P _v : 0.900 cP
At temp. : 60 degF	T _y : 0.50 lbf/100ft ²
	Gel Strength : 0.00 lbf/100ft ²
	Job volume : 50.0 bbl

Drilling Mud DESIGN

Fluid No: 4	Density : 9.00 lb/gal
Rheo. Model : BINGHAM	P _v : 32.969 cP
At temp. : 80 degF	T _y : 6.02 lbf/100ft ²
	Gel Strength : 17.08 lbf/100ft ²

MUD

Mud Type : WBM	Job volume : 738.6 bbl
Water Type : Fresh	

VOLUME FRACTION

Solids : 4.5 %
Oil : 0.0 %
Water : 95.5 %

MUDPUSH II DESIGN

Fluid No: 5	Density : 12.00 lb/gal
Rheo. Model : BINGHAM	P _v : 19.736 cP
At temp. : 81 degF	T _y : 16.38 lbf/100ft ²
	Gel Strength : 12.81 lbf/100ft ²
	Job volume : 50.0 bbl

D901 Tail @ 15.6 ppg DESIGN

Fluid No: 6	Density : 15.60 lb/gal
Rheo. Model : HERSCHEL_B.	k : 7.49E-2 lbf.s ⁿ /ft ²
At temp. : 81 degF	n : 0.450
	T _y : 1.05 lbf/100ft ²
	Gel Strength : (lbf/100ft ²)

DESIGN

BLEND

Name : A
Dry Density : 197.27 lb/ft ³
Sack Weight : 94 lb

SLURRY

Mix Fluid : 5.217 gal/sk
Yield : 1.19 ft ³ /sk
Solid Fraction : 41.3 %

Job volume : 190.8 bbl
Quantity : 900.92 sk

BASE FLUID

Type : Fresh water	Density : 8.32 lb/gal	Base Fluid : 5.217 gal/sk
--------------------	-----------------------	---------------------------

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Additives		
Code	Conc.	Function
D065	1.000 %BWOC	Dispersant
D167	0.200 %BWOC	Fluid loss
D046	0.200 %BWOC	Antifoam

Thickening Time Schedule () (Bc) at (hr:mn)
 Compressive Strength Schedule () (psi) at (hr:mn)

CemCADE^{*} Well Cementing Recommendation for 13-3/8" Intermediate Casing (7,000 ft)

1st (Lower) Stage of 2-Stage Cement Installation

^{*} Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

CemCADE^{*} well cementing recommendation for 13 3/8" Intermediate

Operator : Mattoon/Future Gen **Well** : Batelle Mattoon/FutureGen
Country : USA **Field** : CO2 Disposal
State : IL

Prepared for : SLB **Location** : Decatur, IL
Proposal No. : **Service Point** : Prestonsburg
Date Prepared : 05-26-2009 **Business Phone** : (606) 298 2200
FAX No. : (606) 298 2248

Prepared by : Donald Leach
Phone : (606) 791-4194
E-Mail :
 dleach@prestonsburg.oilfield.slb.com

well description

Configurat	Casing	Stage : 1st of 2	Rig Type : Land
on			
Prev.String	MD : 500.0 ft	OD : 20 in	Weight : 106.5 lb/ft
Csg/Liner	MD : 7000.0 ft	OD : 13 3/8 in	Weight : 72.0 lb/ft
1st Stage Collar		5000.0 ft	
Landing Collar MD		6920.0 ft	
Casing/liner Shoe MD		7000.0 ft	
Mud Line		0.0 ft	
Total MD		7000.0 ft	
BHST		139 degF	
Bit Size		17 1/2 in	
Mean OH Diameter		17.500 in	
Mean Annular Excess		50.0 %	
Mean OH Equivalent Diameter		19.234 in	
Total OH Volume		2335.8 bbl (including excess)

Disclaimer Notice:

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The Operator has superior knowledge of the well, the reservoir, the field and conditions affecting them. If the Operator is aware of any conditions whereby a neighboring well or wells might be affected by the treatment proposed herein it is the Operator's responsibility to notify the owner or owners of the well or wells accordingly.

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Freedom from infringement of patents of Schlumberger or others is not to be inferred.

Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 7: fluid sequence

Job Objectives:

13.375" TWO-STAGE CASING CEMENT TREATMENT

Original fluid	Drilling Mud	9.00 lb/gal	
	Pv : 32.969 cP		Ty : 6.02 lbf/100ft2
Displacement Volume	1030.5 bbl		
Total Volume	1500.5 bbl		
TOC	5070.1 ft		
1st stage collar	5000.0 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
MUDPUSH II	50.0	269.4	4531.2	12.00	Pv:19.736 cP	Ty:16.38 lbf/100ft2
CW100	50.0	269.4	4800.7	8.33	Pv:0.900 cP	Ty:0.50 lbf/100ft2
1st Stage - 15.6 ppg Class H	185.3	998.5	5070.1	15.60	Pv:60.176 cP	Ty:49.90 lbf/100ft2
1st Stage - 16.2 ppg Class H	184.7	931.4	6068.6	16.20	Pv:67.068 cP	Ty:59.77 lbf/100ft2
Drilling Mud	1030.5		0.0	9.00	Pv:32.969 cP	Ty:6.02 lbf/100ft2

Static Security Checks :		
Frac	166 psi	at 500.0 ft
Pore	17 psi	at 500.0 ft
Collapse	1728 psi	at 6920.0 ft
Burst	5020 psi	at 0.0 ft
Csg.Pump out	163 ton

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 8: pumping schedule

Start Job:

Hole circulated with mud @ 75F for 4 hours before pumping job

Pumping Schedule						Comments
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	
MUDPUSH II	7.0	50.0	7.1	50.0	80	
CW100	7.0	50.0	7.1	50.0	80	
1st Stage - 15.6 ppg Class H	7.0	185.3	26.5	185.3	80	
1st Stage - 16.2 ppg Class H	7.0	184.7	26.4	184.7	80	
Pause	0.0	0.0	5.0	0.0	80	
Drilling Mud	7.0	1020.0	145.7	1020.0	80	
Drilling Mud	2.0	10.5	5.2	1030.5	80	
Total			03:43 hr:mn	1500.5 bbl		

End Job:

Designed displacement is with drilling mud

Dynamic Security Checks :		
Frac	163 psi	at 500.0 ft
Pore	17 psi	at 500.0 ft
Collapse	1284 psi	at 3480.0 ft
Burst	4226 psi	at 0.0 ft

Temperature Results			
BHCT	117 degF	Simulated Max HCT	111 degF
Simulated BHCT	93 degF	Max HCT Depth	4714.3 ft
CT at TOC	99 degF	Max HCT Time	00:00:00 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	118 degF
Bottom Hole	(degF)	(degF)	139 degF

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

Section 9: fluid description

CW100 DESIGN

Fluid No: 2	Density	: 8.33 lb/gal
Rheo. Model : BINGHAM	P _v	: 0.900 cP
At temp. : 60 degF	T _y	: 0.50 lbf/100ft ²
	Gel Strength	: 0.00 lbf/100ft ²
	Job volume	: 50.0 bbl

Drilling Mud DESIGN

Fluid No: 4	Density	: 9.00 lb/gal
Rheo. Model : BINGHAM	P _v	: 32.969 cP
At temp. : 80 degF	T _y	: 6.02 lbf/100ft ²
	Gel Strength	: 17.08 lbf/100ft ²
	Job volume	: 1030.5 bbl

MUD

Mud Type : WBM
Water Type : Fresh

VOLUME FRACTION

Solids : 4.5 %
Oil : 0.0 %
Water : 95.5 %

MUDPUSH II DESIGN

Fluid No: 5	Density	: 12.00 lb/gal
Rheo. Model : BINGHAM	P _v	: 19.736 cP
At temp. : 81 degF	T _y	: 16.38 lbf/100ft ²
	Gel Strength	: 12.81 lbf/100ft ²
	Job volume	: 50.0 bbl

1st Stage - 16.2 ppg Class H DESIGN

Fluid No: 6	Density	: 16.20 lb/gal
Rheo. Model : BINGHAM	P _v	: 67.068 cP
At temp. : 80 degF	T _y	: 59.77 lbf/100ft ²
	Gel Strength	: (lbf/100ft ²)

DESIGN

BLEND

Name : H
Dry Density : 197.27 lb/ft³
Sack Weight : 94 lb

SLURRY

Mix Fluid : 4.605 gal/sk
Yield : 1.09 ft³/sk
Solid Fraction : 43.7 %

Job volume : 184.7 bbl
Quantity : 948.45 sk

BASE FLUID

Type : Fresh water

Density : 8.32 lb/gal

Base Fluid : 4.605 gal/sk

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Additives		
Code	Conc.	Function
D201	0.200 %BWOC	Retarder

Thickening Time Schedule () (Bc) at (hr:mn)
 Compressive Strength Schedule () (psi) at (hr:mn)

1st Stage - 15.6 ppg Class H DESIGN

Fluid No: 7
 Rheo. Model : BINGHAM
 At temp. : 80 degF

Density : 15.60 lb/gal
 P_v : 60.176 cP
 T_y : 49.90 lbf/100ft²
 Gel Strength : (lbf/100ft²)

DESIGN

BLEND

Name : H SLURRY
 Dry Density : 197.27 lb/ft³ Mix Fluid : 5.279 gal/sk Job volume : 185.3 bbl
 Sack Weight : 94 lb Yield : 1.18 ft³/sk Quantity : 879.07 sk
 Solid Fraction : 40.4 %

BASE FLUID

Type : Fresh water Density : 8.32 lb/gal Base Fluid : 5.259 gal/sk

Additives		
Code	Conc.	Function
D201	0.200 %BWOC	Retarder
D047	0.020 gal/sk blend	Antifoam

Thickening Time Schedule () (Bc) at (hr:mn)
 Compressive Strength Schedule () (psi) at (hr:mn)

CemCADE^{*} Well Cementing Recommendation for 13-3/8" Intermediate Casing (7,000 ft)

2nd (Upper) Stage of 2-Stage Cement Installation

^{*} Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

CemCADE^{*} well cementing recommendation for 13 3/8" Intermediate

Operator : Mattoon/Future Gen **Well** : Batelle Mattoon/FutureGen
Country : USA **Field** : CO2 Disposal
State : IL

Prepared for : SLB **Location** : Decatur, IL
Proposal No. : **Service Point** : Prestonsburg
Date Prepared : 05-26-2009 **Business Phone** : (606) 298 2200
FAX No. : (606) 298 2248

Prepared by : Donald Leach
Phone : (606) 791-4194
E-Mail :
 dleach@prestonsburg.oilfield.slb.com

well description

Configurat on	Casing	Stage : 2nd of 2	Rig Type : Land
Prev.String	MD : 500.0 ft	OD : 20 in	Weight : 106.5 lb/ft
Csg/Liner	MD : 7000.0 ft	OD : 13 3/8 in	Weight : 72.0 lb/ft
1st Stage Collar		5000.0 ft	
Landing Collar MD		6920.0 ft	
Casing/liner Shoe MD		7000.0 ft	
Mud Line		0.0 ft	
Total MD		7000.0 ft	
BHST		117 degF	
Bit Size		17 1/2 in	
Mean OH Diameter		17.500 in	
Mean Annular Excess		50.0 %	
Mean OH Equivalent Diameter		19.234 in	
Total OH Volume		2335.8 bbl (including excess)

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The Operator has superior knowledge of the well, the reservoir, the field and conditions affecting them. If the Operator is aware of any conditions whereby a neighboring well or wells might be affected by the treatment proposed herein it is the Operator's responsibility to notify the owner or owners of the well or wells accordingly.

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Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 10: fluid sequence

Job Objectives:

13.375" TWO-STAGE CASING CEMENT TREATMENT

Original fluid	Drilling Mud	9.00 lb/gal	
	Pv : 32.969 cP		Ty : 6.02 lbf/100ft2
Dead end fluid	CW100		8.33 lb/gal
Displacement Volume	746.2 bbl		
Total Volume	1784.1 bbl		
TOC	0.0 ft		
Previous TOC	5070.1 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
MUDPUSH II	50.0	0.0		12.00	Pv:19.736 cP	Ty:16.38 lbf/100ft2
CW100	50.0	0.0		8.33	Pv:0.900 cP	Ty:0.50 lbf/100ft2
2nd Stage - 35:65 @ 12.7 ppg	842.5	4485.9		12.70	Pv:7.514 cP	Ty:8.83 lbf/100ft2
2nd Stage - 15.6 ppg Class A	95.4	514.1	4485.9	15.60	k:1.43E-4 lbf.s^n/ft2	n:0.979 Ty:9.97 lbf/100ft2
Drilling Mud	746.2		0.0	9.00	Pv:32.969 cP	Ty:6.02 lbf/100ft2

Static Security Checks :		
Frac	70 psi	at 500.0 ft
Pore	113 psi	at 500.0 ft
Collapse	1452 psi	at 5000.0 ft
Burst	5020 psi	at 0.0 ft

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 11: pumping schedule

Start Job:

Hole circulated with mud @ 75F for 4 hours before pumping job

Pumping Schedule						Comments
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	
MUDPUSH II	7.0	50.0	7.1	50.0	80	
CW100	7.0	50.0	7.1	50.0	80	
2nd Stage - 35:65 @ 12.7 ppg	7.0	842.5	120.4	842.5	80	
2nd Stage - 15.6 ppg Class A	7.0	95.4	13.6	95.4	80	
Pause	0.0	0.0	5.0	0.0	80	
Drilling Mud	7.0	737.0	105.3	737.0	80	
Drilling Mud	2.0	9.2	4.6	746.2	80	
Total			04:23 hr:mn	1784.1 bbl		

End Job:

Designed displacement is with drilling mud

Dynamic Security Checks :		
Frac	67 psi	at 500.0 ft
Pore	17 psi	at 500.0 ft
Collapse	1452 psi	at 5000.0 ft
Burst	3945 psi	at 0.0 ft

Temperature Results			
BHCT	101 degF	Simulated Max HCT	91 degF
Simulated BHCT	84 degF	Max HCT Depth	1938.8 ft
CT at TOC	82 degF	Max HCT Time	00:00:00 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	62 degF
Bottom Hole	(degF)	(degF)	117 degF

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 12: fluid description

CW100 DESIGN

Fluid No: 1	Density	: 8.33 lb/gal
Rheo. Model : BINGHAM	P _v	: 0.900 cP
At temp. : 60 degF	T _y	: 0.50 lbf/100ft ²
	Gel Strength	: 0.00 lbf/100ft ²
	Job volume	: 50.0 bbl

Drilling Mud DESIGN

Fluid No: 3	Density	: 9.00 lb/gal
Rheo. Model : BINGHAM	P _v	: 32.969 cP
At temp. : 80 degF	T _y	: 6.02 lbf/100ft ²
	Gel Strength	: 17.08 lbf/100ft ²
MUD	Job volume	: 746.2 bbl

Mud Type : WBM
 Water Type : Fresh
VOLUME FRACTION
 Solids : 4.5 %
 Oil : 0.0 %
 Water : 95.5 %

MUDPUSH II DESIGN

Fluid No: 4	Density	: 12.00 lb/gal
Rheo. Model : BINGHAM	P _v	: 19.736 cP
At temp. : 81 degF	T _y	: 16.38 lbf/100ft ²
	Gel Strength	: 12.81 lbf/100ft ²
	Job volume	: 50.0 bbl

2nd Stage - 35:65 @ 12.7 ppg DESIGN

Fluid No: 7	Density	: 12.70 lb/gal
Rheo. Model : BINGHAM	P _v	: 7.514 cP
At temp. : 81 degF	T _y	: 8.83 lbf/100ft ²
	Gel Strength	: 18.14 lbf/100ft ²

DESIGN

BLEND	SLURRY	
Name : 35:65	Mix Fluid : 11.397 gal/sk	Job volume : 842.5 bbl
Dry Density : 181.77 lb/ft ³	Yield : 2.10 ft ³ /sk	Quantity : 2248.25 sk
Sack Weight : 90 lb	Solid Fraction : 27.6 %	

BASE FLUID

Type : Fresh water	Density : 8.32 lb/gal	Base Fluid : 11.047 gal/sk
--------------------	-----------------------	----------------------------

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Additives		
Code	Conc.	Function
D020	4.000 %BWOB	Extender
D044	10.000 %BWOW	Salt
D046	0.200 %BWOB	Antifoam
D042	5.000 lb/sk blend	LCM/extender

Thickening Time Schedule () (Bc) at (hr:mn)
 Compressive Strength Schedule () (psi) at (hr:mn)

2nd Stage - 15.6 ppg Class A DESIGN

Fluid No: 8 Density : 15.60 lb/gal
 Rheo. Model : HERSCHEL_B. k : 1.43E-4 lbf.s^n/ft2
 At temp. : 80 degF n : 0.979
 Ty : 9.97 lbf/100ft2
 Gel Strength : (lbf/100ft2)

DESIGN

BLEND **SLURRY**
 Name : A Mix Fluid : 5.217 gal/sk Job volume : 95.4 bbl
 Dry Density : 197.27 lb/ft3 Yield : 1.19 ft3/sk Quantity : 450.58 sk
 Sack Weight : 94 lb Solid Fraction : 41.3 %
BASE FLUID
 Type : Fresh water Density : 8.32 lb/gal Base Fluid : 5.217 gal/sk

Additives		
Code	Conc.	Function
D065	1.000 %BWOC	Dispersant
D167	0.200 %BWOC	Fluid loss
D046	0.200 %BWOC	Antifoam

Thickening Time Schedule () (Bc) at (hr:mn)
 Compressive Strength Schedule () (psi) at (hr:mn)

CemCADE^{*} Well Cementing Recommendation for 9-5/8" Long Casing (9,100 ft)

Single Stage

^{*} Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

CemCADE^{*} well cementing recommendation for 9 5/8"

Production Longstring

Operator	: Mattoon/Future Gen	Well	: Batelle Mattoon/Future Gen
Country	: USA	Field	: CO2 Disposal
State	: IL		
Prepared for	: SLB	Location	: Decatur, IL
Proposal No.	:	Service Point	: Prestonsburg
Date Prepared	: 04-25-2009	Business Phone	: (606) 298 2200
		FAX No.	: (606) 298 2248
Prepared by	: Donald Leach		
Phone	: (606) 298 2200		
E-Mail	:		
	dleach@prestonsburg.oilfield.slb.com		

well description

Configuration	Casing	Stage : Single	Rig Type : Land
Prev.String	MD : 5000.0 ft	OD : 13 3/8 in	Weight : 72.0 lb/ft
Csg/Liner	MD : 9100.0 ft	OD : 9 5/8 in	Weight : 58.4 lb/ft
Landing Collar MD		9020.0 ft	
Casing/liner Shoe MD		9100.0 ft	
Mud Line		0.0 ft	
Total MD		9100.0 ft	
BHST		162 degF	
Mean OH Diameter		12.250 in	
Mean Annular Excess		35.0 %	
Mean OH Equivalent Diameter		13.045 in	
Total OH Volume		677.7 bbl (including excess)

Disclaimer Notice:

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Freedom from infringement of patents of Schlumberger or others is not to be inferred.

Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 13: fluid sequence

Job Objectives:

9 5/8" SINGLE STAGE PRODUCTION CEMENT TREATMENT

Original fluid	KCl Drilling Mud	9.70 lb/gal	
	k : 2.54E-2 lbf.s^n/ft2	n : 0.399	Ty : 0.02 lbf/100ft2
Displacement Volume	645.9 bbl		
Total Volume	1318.4 bbl		
TOC	0.0 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
MUDPUSH II	60.0	0.0		11.00	k:2.79E-2 lbf.s^n/ft2	n:0.387 Ty:4.59 lbf/100ft2
35:65 Lead @ 12.5 ppg	379.5	6079.3		12.50	k:2.17E-3 lbf.s^n/ft2	n:0.747 Ty:2.29 lbf/100ft2
EverCRETE-6	233.0	3020.7	6079.3	15.83	k:1.92E-2 lbf.s^n/ft2	n:0.719 Ty:1.22 lbf/100ft2
Fresh Water	645.9		0.0	8.32	Pv:0.900 cP	Ty:0.50 lbf/100ft2

Static Security Checks :		
Frac	748 psi	at 5000.0 ft
Pore	1075 psi	at 5000.0 ft
Collapse	3333 psi	at 5500.0 ft
Burst	6870 psi	at 0.0 ft
Csg.Pump out	115 ton

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 14: pumping schedule

Start Job:

Hole circulated with mud @ 75F for 3 hours before pumping job

Pumping Schedule						Comments
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	
MUDPUSH II	7.0	60.0	8.6	60.0	80	
35:65 Lead @	7.0	379.5	54.2	379.5	80	
12.5 ppg						
EverCRETE-6	7.0	233.0	33.3	233.0	80	
Pause	0.0	0.0	5.0	0.0	80	
Fresh Water	7.0	636.0	90.9	636.0	80	
Fresh Water	2.0	9.9	5.0	645.9	80	
Total			03:16 hr:mn	1318.4 bbl		

End Job:

Designed displacement is with Fresh Water

Dynamic Security Checks :		
Frac	670 psi	at 9100.0 ft
Pore	348 psi	at 5000.0 ft
Collapse	3333 psi	at 5500.0 ft
Burst	4284 psi	at 0.0 ft

Temperature Results			
BHCT	134 degF	Simulated Max HCT	134 degF
Simulated BHCT	132 degF	Max HCT Depth	8542.9 ft
CT at TOC	81 degF	Max HCT Time	03:16:53 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	62 degF
Bottom Hole	(degF)	(degF)	162 degF

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 15: fluid description

Fresh Water DESIGN

Fluid No: 2
 Rheo. Model : BINGHAM
 At temp. : (degF)

Density : 8.32 lb/gal
 Pv : 0.900 cP
 Ty : 0.50 lbf/100ft2
 Gel Strength : (lbf/100ft2)

Job volume : 645.9 bbl

MUDPUSH II DESIGN

Fluid No: 4
 Rheo. Model : HERSCHEL_B.
 At temp. : 81 degF

Density : 11.00 lb/gal
 k : 2.79E-2 lbf.s^n/ft2
 n : 0.387
 Ty : 4.59 lbf/100ft2
 Gel Strength : 12.81 lbf/100ft2

Job volume : 60.0 bbl

35:65 Lead @ 12.5 ppg DESIGN

Fluid No: 5
 Rheo. Model : HERSCHEL_B.
 At temp. : 115 degF

Density : 12.50 lb/gal
 k : 2.17E-3 lbf.s^n/ft2
 n : 0.747
 Ty : 2.29 lbf/100ft2
 Gel Strength : 12.81 lbf/100ft2

DESIGN

BLEND
 Name : 35:65 LP3:A
 Dry Density : 181.77 lb/ft3
 Sack Weight : 90 lb

SLURRY
 Mix Fluid : 11.005 gal/sk
 Yield : 2.01 ft3/sk
 Solid Fraction : 26.6 %

Job volume : 379.5 bbl
 Quantity : 1062.59 sk

BASE FLUID
 Type : Fresh water
 Density : 8.32 lb/gal
 Base Fluid : 11.005 gal/sk

Additives		
Code	Conc.	Function
D020	6.000 %BWOB	Extender
D046	0.200 %BWOB	Antifoam
D167	0.400 %BWOB	Fluid loss

Thickening Time Schedule () 100 Bc at 08:33 hr:mn
 Compressive Strength Schedule () 283 psi at 24:00 hr:mn

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

EverCRETE-6 DESIGN

Fluid No: 6
Rheo. Model : HERSCHEL_B.
At temp. : 110 degF

Density : 15.83 lb/gal
k : 1.92E-2 lbf.s^n/ft2
n : 0.719
T_y : 1.22 lbf/100ft2
Gel Strength : 28.82 lbf/100ft2

DESIGN

BLEND

Name : EverCRETE_15
Dry Density : 158.71 lb/ft3
Sack Weight : 100 lb

SLURRY

Mix Fluid : 3.413 gal/sk
Yield : 1.09 ft3/sk
Solid Fraction : 58.0 %

Job volume : 233.0 bbl
Quantity : 1204.22 sk

BASE FLUID

Type : Fresh water

Density : 8.32 lb/gal

Base Fluid : 3.153 gal/sk

Additives		
Code	Conc.	Function
D081	0.040 gal/sk blend	Retarder
D168	0.200 gal/sk blend	Fluid loss
D047	0.020 gal/sk blend	Antifoam

Thickening Time Schedule () 100 Bc at 08:30 hr:mn
Compressive Strength Schedule () 3230 psi at 24:00 hr:mn

CemCADE^{*}

Well Cementing Recommendation for 9-5/8"
Long Casing (9,100 ft)

Two Stage Option

^{*} Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

CemCADE^{*} well cementing recommendation for 9 5/8"

Production Longstring

Operator	: Mattoon/Future Gen	Well	: Batelle Mattoon/Future Gen
Country	: USA	Field	: CO2 Disposal
State	: IL		
Prepared for	: SLB	Location	: Decatur, IL
Proposal No.	:	Service Point	: Prestonsburg
Date Prepared	: 04-25-2009	Business Phone	: (606) 298 2200
		FAX No.	: (606) 298 2248
Prepared by	: Donald Leach		
Phone	: (606) 298 2200		
E-Mail	:		
	dleach@prestonsburg.oilfield.slb.com		

well description

Configuration	Casing	Stage : Single	Rig Type : Land
Prev.String	MD : 7000.0 ft	OD : 13 3/8 in	Weight : 72.0 lb/ft
Csg/Liner	MD : 9100.0 ft	OD : 9 5/8 in	Weight : 58.4 lb/ft
Landing Collar MD		9020.0 ft	
Casing/liner Shoe MD		9100.0 ft	
Mud Line		0.0 ft	
Total MD		9100.0 ft	
BHST		162 degF	
Bit Size		12 1/4 in	
Mean OH Diameter		12.250 in	
Mean Annular Excess		35.0 %	
Mean OH Equivalent Diameter		13.045 in	
Total OH Volume		347.1 bbl (including excess)

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Mark of Schlumberger

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 16: fluid sequence

Job Objectives:

9 5/8" SINGLE STAGE PRODUCTION CASING CEMENT TREATMENT

Original fluid	KCl Drilling Mud	9.70 lb/gal	
	k : 2.54E-2 lbf.s^n/ft2	n : 0.399	Ty : 0.02 lbf/100ft2
Displacement Volume	645.9 bbl		
Total Volume	1316.7 bbl		
TOC	0.0 ft		

Name	Volume (bbl)	Ann. Len (ft)	Top (ft)	Fluid Sequence		Rheology
				Density (lb/gal)		
MUDPUSH II	60.0	0.0		11.00	k:2.79E-2 lbf.s^n/ft2	n:0.387 Ty:4.59 lbf/100ft2
35:65 Lead @ 12.5 ppg	393.8	6082.1		12.50	k:2.17E-3 lbf.s^n/ft2	n:0.747 Ty:2.29 lbf/100ft2
EverCRETE-6	217.0	3017.9	6082.1	15.83	k:1.92E-2 lbf.s^n/ft2	n:0.719 Ty:1.22 lbf/100ft2
Fresh Water	645.9		0.0	8.32	Pv:0.900 cP	Ty:0.50 lbf/100ft2

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 17: pumping schedule

Start Job:

Hole circulated with mud @ 75F for 3 hours before pumping job

Pumping Schedule						
Name	Flow Rate (bbl/min)	Volume (bbl)	Stage Time (min)	Cum.Vol (bbl).	Inj. Temp. (degF)	Comments
Pause	0.0	0.0	5.0	0.0	80	4-Drop Bottom Plug
MUDPUSH II	7.0	60.0	8.6	60.0	80	7-Start Pumping Spacer
35:65 Lead @ 12.5 ppg	7.0	393.8	56.3	393.8	80	13-Start Mixing Lead Slurry
EverCRETE-6	6.0	217.0	36.2	217.0	80	16-Start Mixing Tail Slurry
Pause	0.0	0.0	7.0	0.0	80	18-Drop Top Plug and Wash Lines
Fresh Water	8.0	645.9	80.7	645.9	80	19-Start Displacement
Total			03:13	1316.7 bbl		
			hr:mn			

End Job:

Designed displacement is with Fresh Water

Dynamic Security Checks :			
Frac	581 psi		at 9100.0 ft
Pore	487 psi		at 7000.0 ft
Collapse	3333 psi		at 5500.0 ft
Burst	4139 psi		at 0.0 ft

Temperature Results			
BHCT	134 degF	Simulated Max HCT	133 degF
Simulated BHCT	131 degF	Max HCT Depth	8171.4 ft
CT at TOC	81 degF	Max HCT Time	00:05:00 hr:mn:sc
Static temperatures :			
At Time	(hr:mn)	(hr:mn)	Geo. Temp.
Top of Cement	(degF)	(degF)	62 degF
Bottom Hole	(degF)	(degF)	162 degF

Client : Mattoon/Future Gen
Well : ISGS/ADM Well #1
String : 20" Surface
District : Prestonsburg
Country : USA
Loadcase : 20

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

Section 18: fluid description

Fresh Water DESIGN

Fluid No: 2
 Rheo. Model : BINGHAM
 At temp. : (degF)

Density : 8.32 lb/gal
 Pv : 0.900 cP
 Ty : 0.50 lbf/100ft2
 Gel Strength : (lbf/100ft2)

Job volume : 645.9 bbl

MUDPUSH II DESIGN

Fluid No: 4
 Rheo. Model : HERSCHEL_B.
 At temp. : 81 degF

Density : 11.00 lb/gal
 k : 2.79E-2 lbf.s^n/ft2
 n : 0.387
 Ty : 4.59 lbf/100ft2
 Gel Strength : 12.81 lbf/100ft2

Job volume : 60.0 bbl

35:65 Lead @ 12.5 ppg DESIGN

Fluid No: 5
 Rheo. Model : HERSCHEL_B.
 At temp. : 115 degF

Density : 12.50 lb/gal
 k : 2.17E-3 lbf.s^n/ft2
 n : 0.747
 Ty : 2.29 lbf/100ft2
 Gel Strength : 12.81 lbf/100ft2

DESIGN

BLEND
 Name : 35:65 LP3:A
 Dry Density : 181.77 lb/ft3
 Sack Weight : 90 lb

SLURRY
 Mix Fluid : 11.005 gal/sk
 Yield : 2.01 ft3/sk
 Solid Fraction : 26.6 %

Job volume : 393.8 bbl
 Quantity : 1102.63 sk

BASE FLUID
 Type : Fresh water
 Density : 8.32 lb/gal
 Base Fluid : 11.005 gal/sk

Additives		
Code	Conc.	Function
D020	6.000 %BWOB	Extender
D046	0.200 %BWOB	Antifoam
D167	0.400 %BWOB	Fluid loss

Thickening Time Schedule () 100 Bc at 08:33 hr:mn
 Compressive Strength Schedule () 283 psi at 24:00 hr:mn

Client : Mattoon/Future Gen
 Well : ISGS/ADM Well #1
 String : 20" Surface
 District : Prestonsburg
 Country : USA
 Loadcase : 20

EverCRETE-6 DESIGN

Fluid No: 6
Rheo. Model : HERSCHEL_B.
At temp. : 110 degF

Density : 15.83 lb/gal
k : 1.92E-2 lbf.s^n/ft2
n : 0.719
T_y : 1.22 lbf/100ft2
Gel Strength : 28.82 lbf/100ft2

DESIGN

BLEND

Name : EverCRETE_15
Dry Density : 158.71 lb/ft3
Sack Weight : 100 lb

SLURRY

Mix Fluid : 3.413 gal/sk
Yield : 1.09 ft3/sk
Solid Fraction : 58.0 %

Job volume : 217.0 bbl
Quantity : 1121.53 sk

BASE FLUID

Type : Fresh water

Density : 8.32 lb/gal

Base Fluid : 3.153 gal/sk

Additives		
Code	Conc.	Function
D081	0.040 gal/sk blend	Retarder
D168	0.200 gal/sk blend	Fluid loss
D047	0.020 gal/sk blend	Antifoam

Thickening Time Schedule () 100 Bc at 08:30 hr:mn
Compressive Strength Schedule () 3230 psi at 24:00 hr:mn

APPENDIX 3-2

Material Safety Data Sheets for Annular Fluid Additives and Inhibitors

Specific MSDS sheets for TETRA chemical products can be obtained at <http://www.tetrachemicals.com/>

APPENDIX 3-3

Example Packers for Above Packer Monitoring and Below Packer Monitoring

Weatherford Sealbore and Production Packer specifications can be found at
<http://www.weatherford.com/Products/Completion/PackerSystems/>

APPENDIX 5-1

Tables Listing Oil and Gas Wells and Water Wells in the Area of Review

Table 5-1. Oil and Gas Wells
Area of Review (2.5 Miles) Well Records Available at Mattoon, IL

API_NUMBER	Latitude NAD 83	Longitude NAD 83	Township	Sec	Well Status	Permit #	Depth (ft)	Formation	Elev (ft)	Owner/Name	Well No.	Company/Operator	Date Began	Drilling Data's			Cement Record						Well Completion Data					Plugging Details																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
														Date Completed	Surface Casing		Intermediate Casing		Producing Casing		Perforated	Shut	Acidized	Fractured	Plug Back	Description	Date Began	Date Completed	Casing Depth Pulled Out (ft)			Filled With, Kind of Plug (ft)	Drilling Contractor																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
															Diam (in)	Depth (ft)	Cement (sacks)	Diam (in)	Depth (ft)	Cement (sacks)									Diam (in)	Depth (ft)	Cement (sacks)			Surface	Intermediate	Producing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
12022297700	39.499	-89.454	0.698	12N7E	7	DAOP	10254	3371	Devonian	693	KB-	2	Tri-Star Producing, Inc.	9/25/1980	8.5/8	120	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5-1. Oil and Gas Wells
Area of Review (2.5 Miles) Well Records Available at Mattoon, IL

API NUMBER	Latitude NAD 83	Longitude NAD 83	Township	Sec	Well Status	Permit #	Depth (ft)	Formation	Elev Ref	Owner Name	Well No.	Company/Operator	Drilling Data		Cement Record				Well Completion Data				Pugging Details				Drilling Contractor					
													Date Begun	Date Completed	Surface Casing		Intermediate Casing		Producing Casing		Perforated	Shut	Acidized	Fractured	Plug Back	Description		Date Begun	Date Completed	Surface	Casing Depth Pugged Out (ft)	Filled With, Kind of Plug (ft)
															Diam (in)	Depth (ft)	Diam (in)	Depth (ft)	Diam (in)	Depth (ft)												
120209104000	39.497	-88.394	12NTE	11	OLP	1867		Aux Vases	711	GL	Honnam	3	Luttrell & Simpson	12/8/1945	10.3 34	116										10/22/1971	10/23/1971	4	333	Mud (1782-1760, Bridge Plug (1760-1739), Cement (1735-1705), Mud (1705-290), Cement (250-200), Mud (200-28), Cement (128-9), Mud (128-9), Cement (15-3), Earth (3-9))	Homer, Luttrell & Birmingham, IL	
120209104001	39.497	-88.394	12NTE	11	INJ	2025		Roadclare	711	GL	Honnam	3	Ashland Oil & Refining Company	12/11/1960												10/23/1971						
120209105000	39.497	-88.392	12NTE	11	DAOP	2038		Roadclare	711	GL	Honnam	4		12/18/1945												12/18/1945						
120209105001	39.497	-88.392	12NTE	11	OLP	349		Roadclare	711	KB	Honnam	4	Schaeffer Oil Company	7/20/1970	10	100	Circ.	-	-	-	-	-	-	-	-	10/11/1983	10/11/1983	3	1455	Cement (1960-1900), Mud & Cavings (1900-250), Cement (250-3), Sol (3-0)	Sledge Drilling Co. Mt. Vernon, IL	
120209105100	39.495	-88.392	12NTE	11	OLP	129		Roadclare	720	GL	Honnam	8	Luttrell & Simpson	3/12/1946	10.3 34	102	-	-	-	-	-	-	-	-	-	4/26/1982	4/26/1982	3	841	Cement (1975-1915), Mud & Cavings (1915-250), Cement (250-3)	Budget Pugging Control, Casey, IL	
120209105200	39.495	-88.394	12NTE	11	OLP	244		Roadclare	723	GL	Band	1	Cascade Refining Co	5/21/1946	10.3 34	100	-	-	-	-	-	-	-	-	-	10/7/1988	10/7/1988	4	4	Cement (1989-1948, Earth (4-0))	M & E Drilling Co., IL	
120209105300	39.491	-88.395	12NTE	11	OL	1973		Roadclare	729	GL	Swenson, J.	1	Blasick, Joe	3/1/1946	10.3 34	130	-	-	-	-	-	-	-	-	-	2/16/1951	2/17/1951	0	422	Cement (1970-1930), Mud (1930-140), Cement (140-115), Mud (115-25), Cement (25-3), Cement (25-3), Earth (3-2)	W.R. Walker Mt. Vernon, IL	
120209105600	39.493	-88.392	12NTE	11	OLP	2161		Roadclare	725	GL	Swenson, J.	1	Duncan, Walter	11/1/1946																		
120209105700	39.491	-88.392	12NTE	11	TA	2031		Roadclare	730	GL	Swenson, J.	2	Blasick, Joe	7/11/1946																		
120209105900	39.490	-88.389	12NTE	11	OLP	2076		Roadclare	696	GL	Taylor, Corbin W.	2	Duncan, Walter	11/1/1946	10.3 34	123	-	-	-	-	-	-	-	-	-	10/30/1969	10/31/1969	3	1023	P.P.B. (1967-1904), Mud (1904-130), Cement (130-200), Mud (200-30), Cement (30-3), Earth (3-0)	N.V. Duncan Drilling Co., Fairfield, IL	
120209106000	39.498	-88.389	12NTE	11	DA	2800		Roadclare	701	DF	Taylor, Corbin W.	3	Duncan, Walter	11/1/1946																		
120209106200	39.522	-88.396	12NTE	11	OLP	2390		Roadclare	695	DF	Taylor, Corbin W.	5	Duncan, Walter	12/11/1946	10.3 34	147	100	-	-	-	-	-	-	-	-	10/29/1969	10/29/1969	3	-	P.P.B. and Cement (1778-1703), Mud (1703-230), Cement (250-200), Mud (200-197), Cement (197-132), Mud (132-30), Cement (30-3), Earth (3-0)	General Geophysical	
120209106400	39.504	-88.392	12NTE	11	GASP	992		Devonian	695	DF-	Taylor, Corbin W.	7	Duncan, Walter	8/1/1948	10.3 34	91	90	-	-	-	-	-	-	-	-	11/13/1969	11/4/1969	3	405	P.P.B. & Cement (1360-1745), Cement plug (1745-1704), Mud (1704-250), Cement plug (250-120), Mud (120-101), Cement plug (101-76), Mud (Lawrenceville, IL (76-30), Cement plug (30-3), Earth (3-0))	Doa Miller Drilling Co., Lawrenceville, IL	
120209106500	39.493	-88.396	12NTE	11	INJ	2022			728	GL			Tanner Construction	11/1/1946	10.3 34	110	-	-	-	-	-	-	-	-	-	28/1972	21/1972	5	1156	P.P.B. (1920-1700), Tapping Plug (1700-1699), Cement (1699-1640), Mud (1640-250), Cement (250-200), Mud (200-20), Cement (120-98), Mud (98-15), Cement (15-3), Earth (3-0))	N.V. Duncan Drilling Co., Fairfield, IL	
120209106600	39.493	-88.396	12NTE	11	OLP	2124			728	GL			Tanner Constr.	10/31/1960																		
120209106700	39.493	-88.396	12NTE	11	OLP	2013			734	DF			Tanner Construction	11/1/1946	10.3 34	157	-	-	-	-	-	-	-	-	-	8/9/1982	8/10/1982	0	1124	Cement (2013-1900, Mud (1900-167), Cement (167-142), Mud (142-25), Cement (25-3), Earth (3-0))	Doa Miller Drilling Co., Lawrenceville, IL	
120209106701	39.493	-88.394	12NTE	11	OLP	1976		Roadclare	726	GL	Vannamatham	1	Luttrell & Simpson	12/31/1946																		
120209106800	39.491	-88.394	12NTE	11	OLP	130			734	DF	Van Lammingham-Bad	2	Luttrell & Simpson	2/26/1946	10.3 34	125	-	-	-	-	-	-	-	-	-	8/7/1996	8/7/1996	4	300	Cement (1985-1918), Well Bore Fluid (1918-250), Cement (250-197), Sol (197-430), Cement (430-520), Cement (520-520), Cement (5		

Table 5-1. Oil and Gas Wells
Area of Review (2.5 Miles) Well Records Available at Mattoon, IL

API_NUMBER	Latitude NAD 83	Longitude NAD 83	Township	Sec	Well Status	Permit #	Depth (ft)	Formation	Elev (ft)	Elev Ref	Owner Name	Well No.	Company/Operator	Drilling Dates		Cement Record				Well Completion Data				Plugging Details																
														Date Begun	Date Completed	Surface Casing		Intermediate Casing		Producing Casing		Perforated	Short	Acidized	Fractured	Plug Back	Description	Date Begun	Date Completed	Surface	Intermediate	Producing	Filled With, Kind of Plug (ft)	Drilling Contractor						
																Diam (in)	Depth (ft)	Diam (in)	Depth (ft)	Diam (in)	Depth (ft)														Diam (in)	Depth (ft)				
120290108700	39.477	-88.396	12N1E	14	OILP	524	1951		719	DF	Harris, Fred	2	Potter, J. C.	10.34	121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (1952-1952), Mud (1952-250), Cement (25-3), Earth (3)	Tex-Harvey Salem, L.	
120290108800	39.476	-88.391	12N1E	14	OILP	689	1951	Rosiclare	716	DF-Electric	Harvey, Arthur	1	Potter, J. C.	10.34	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0 to 34"	Unknown	
120290108900	39.479	-88.391	12N1E	14	DAP		1955		719	DF	Ill. Central R.R.	20	Monahan, J.W. & Co.	10.34	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Perforated 4 shots (1602-1612)		
120290109001	39.479	-88.391	12N1E	14	OIL	2050			719	DF	ILL. CENT. R.R.	1-A	Einhart & Armentrout	10.34	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (1970-1706), Rotary Mud (1700-250), Cement (250-20), Rotary Mud (200-140), Cement (140-10), Rotary Mud (10-5), Cement (15-3), Earth (3-0)	N.A. Badridge Ashby, L.	
120290109100	39.487	-88.395	12N1E	14	OILP	2119	1974		727	DF	Murray	1	Black, Joe	8	162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Well Bore Fluid (1974-1700), GBS & Cement (1700-1840), Well Bore Fluid (1840-250), Cement (25-4), Earth (140)	James R. Eckling	
120290109200	39.489	-88.388	12N1E	14	DAP		1985	Rosiclare	735	GL	Reeves & Dixon	1	Potter, J.C.	8.58	127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Previous Plug Back (1985-1947), Cement (1947-1732), Mud (1732-250), Cement (250-20), Mud (200-37), Cement (13-107), Mud (107-17), Cement (12-3)	Center Drilling Co. Mt. Vernon, IL	
120290109201	39.489	-88.388	12N1E	14	OIL	1437	1989		735	GL	HOPKINS COMM	1	Harley, David F.	8.58	127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (17-3)	Charles Armentrout	
120290109300	39.480	-88.392	12N1E	14	TA	1105			730	KB	I.C.C.R. Unit,	1	Einhart & Armentrout	8.58	142	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (257-307), Wellbore Fluid (307-205), Cement (205-1900), Wellbore Fluid (1900-250), Cement (250-4), Earth (140)	Charles Armentrout		
120290109400	39.480	-88.392	12N1E	14	OILP	1167	3257		721	GL-Electric	C.R.R. Unit	1	Einhart & Armentrout	8.58	142	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2025-1900), Wellbore Fluid (1900-340), Cement (340-4), Top Soil (4-4)	Charles Armentrout	
120290215000	39.480	-88.390	12N1E	14	OILP	101	1987		734	KB	I.C.C.R.	2	Einhart & Armentrout	10.34	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Plug back (2005-853), Cement (1830-1730), Mud (1730-250), Cement (250-20), Mud (200-128), Cement (128-100), Mud (100-853), Cement (85-4), Cement (105-100), Mud (100-853), Cement (85-4)	M.H. Hess	
120290031500	39.478	-88.401	12N1E	15	OILP		2005		719	DF	C.C.C. & St. Louis R1		Asland Oil & Refining Company	10.34	120	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2130-2070), Rotary mud (2070-859), Cement (859-859), Rotary mud (859-122), Cement (122-72), Rotary mud (72-27), Cement (27-2), Earth (2-2)	Don Slape	
120290031600	39.477	-88.411	12N1E	15	DA	1718	2130	Fredonia	715	DF	Gudger, E.	1	Fulk, Perry	10.34	120	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2115-205), Rotary mud plug (205-1000), Cement (1000-400), Rotary mud plug (400-530), Cement (530-432)	George & Weather Oil	
12029001700	39.490	-88.408	12N1E	15	DAP	1737	2115		727	GL	Lallyville Daily	1	George & Weather Oil	10.34	121	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2115-205), Rotary mud plug (205-1000), Cement (1000-400), Rotary mud plug (400-530), Cement (530-432)	George & Weather Oil	
12029004300	39.484	-88.403	12N1E	15	DAP	3440	2178		723	DF	Rose	1	Henson, O.L., Earl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rotary mud (2175-2000), Cement (2000-950), Rotary mud (1950-1800), Cement (180-1754), Rotary mud (1754-91), Cement (91-51), Rotary mud (51-18), Cement (8-3)	O.L. Henson	
120290058700	39.489	-88.399	12N1E	15	OILP	1562	2013	Rosiclare	731	DF	Willsburg	1	Taylor, Gordon W.	8.58	123	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2115-205), Mud (1950-300), Cement (300-4), Earth (4-0), Mud (1947-165), Cement (165-140), Mud (140-25), Cement (25-3), Earth (3-0)	Edson Drilling	
120290109400	39.477	-88.401	12N1E	15	OILP	1950	1997		713	DF	Gano Construction	1	Duncan, Walker	10.34	154	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2015-1950), Mud (1950-165), Cement (165-140), Mud (140-25), Cement (25-3), Earth (3-0)	Dee Miller Drilling Co., Lawrenceville, L.
120290109401	39.477	-88.401	12N1E	15	OILP	2686	1997		713	DF	Gano Const.	1	Black, Joe	10.34	154	-	7	879	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Plug back (2003-807), Cement (807-1707), Mud (1707-250), Cement (250-20), Mud (200-161), Cement (161-139), Mud (139-15), Cement (15-4)	Joe Black
120290109500	39.477	-88.399	12N1E	15	OILP	316	1997		717	DF	Ivory Consolidated	1	Duncan, Walker	10.34	142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (1997-1947), Mud (1947-152), Cement (152-127), Mud (127-25), Cement (25-4)	Dee Miller Drilling Co., Lawrenceville, L.
120290109600	39.481	-88.388	12N1E	15	OIL		2010		728	GL	Lyle Park Comm	1	Duncan, Walker	10.34	142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2010-930), Mud (1930-330), Cement (250-200), Mud (200-148), Cement (148-123), Mud (123-25), Cement (25-3), Earth (3-0)	Schoenfeld-Hunter-Koon Co.
120290109700	39.479	-88.401	12N1E	15	OILP	1811	2009		716	GL	Myers, W. A.	1	Hinkle, J. Frank	10.34	138	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2010-930), Mud (1930-330), Cement (250-200), Mud (200-148), Cement (148-123), Mud (123-25), Cement (25-3), Earth (3-0)	Schoenfeld-Hunter-Koon Co.
120290109800	39.480	-88.398	12N1E	15	OILP		2010		734	DF	Noyes, F. V. heirs	1	Duncan, Walker	10.34	127	105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2003-1959), Mud (1959-140), Cement (140-10), Mud (10-30), Cement and Cap (30-2), Earth (2-0)	Dee Miller Drilling Co., Lawrenceville, L.
120290109900	39.479	-88.399	12N1E	15	OILP	497	2005		719	DF	Noyes, F. V.	1-A	Duncan, Walker	10.34	132	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2005-1959), Mud (1959-142), Cement (142-117), Mud (117-25), Cement (25-3), Earth (3-0)	Dee Miller Drilling Co., Lawrenceville, L.
120290110000	39.488	-88.403	12N1E	15	DAO		2005	Sta Geneva	725	DF	Roskie, Harrell	1	Luttrell & Simpson	12.11/1945																								-	Cement (1997-2015), 360 shots (1972-2015), 20 shots (1804-1814)	Dee Miller Drilling Co., Lawrenceville, L.
120290110100	39.477	-88.403	12N1E	15	DAP		2005	Genevieve	713	DF	Roslier	1	Thomas P & Thomas N	8.58	120	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2015-1915), Mud (1915-140), Cement (140-15), Mud (15-27), Cement (27-4)	J.W. Menhall
120290110200	39.486	-88.400	12N1E	15	OILP		2040	Springfield Coal	727	DF	Roytek	1	Wagner, Mark	10.34	119	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cement (2040-2010), Mud (2010-135), Cement (135-105), Mud (105-30), Cement and Cap (30-2)	Dee Miller Drilling Co., Lawrenceville, L.

Table 5-1. Oil and Gas Wells

Area of Review (2.5 Miles) Well Records Available at Mattoon, IL

API_NUMBER	Latitude NAD 83	Longitude NAD 83	Township	Sec	Well Status	Permit #	Depth (ft)	Formation	Elev (ft)	Owner/Name	Well No.	Company/Operator	Drilling Dates				Cement Record				Well Completion Data				Plugging Details								
													Date Began	Date Completed	Diam (in)	Depth (ft)	Cement (sacks)	Intermediate Casing	Producing Casing	Perforated	Short	Acidized	Fractured	Plug Back	Description	Date Began	Date Completed	Surface	Intermediate	Producing	Out (ft)	Filled With, Kind of Plug (ft)	Drilling Contractor
12022012800	39.462	-88.406	12N7E	22	OIL		1981		722	GL	3	Derickson, T. Blake	12/18/1945	10/120	-	-	-	-	-	-	-	-	-	-	-	11/1947	0	-	800	-	Cement (188'-881'), Mud (188'-140), Cement (140'-15), Mud (115'-27), Cement (27'-0)	S.H.K. Drilling Co. Tulsa, OK	
12022013100	39.464	-88.403	12N7E	22	OIL		1992		713	DF	8	Derickson, T. Blake	2/7/1946	10/34	103	-	-	-	-	-	-	-	-	-	-	11/1946	0	-	490	-	Cement (1862'-862), Mud (1862'-28), Cement (28'-0)	Schoerfeld-Hunter-Kuhn Co.	
12022013200	39.464	-88.406	12N7E	22	OIL	141	1983	Rosiclave	717	DF-	9	Derickson, T. Blake	3/7/1946	10/34	121	NA	-	-	-	-	-	-	-	-	-	6/5/1951	0	-	847	-	Cement (1981'-831'), Aquagel (1931'-31), Cement (131'-106), Aquagel (106'-27), Cement (27'-2)	S.H.K. Drilling Co.	
12022013300	39.467	-88.399	12N7E	22	TAO		1975		719	GL	1	Derickson, T. Blake	4/7/1946	10/34	120	-	-	-	-	-	-	-	-	-	-	6/1/1951	0	-	715	-	Aquagel (1480'-130), Cement (130'-103), Aquagel (105'-27), Cement (27'-2), Earth (23')	S.H.K. Drilling Co. Tulsa, OK	
12022013301	39.462	-88.399	12N7E	22	TAO		1975		719	GL	1	Derickson, T. Blake	8/7/1946	10/34	120	-	-	-	-	-	-	-	-	-	-	6/1/1951	0	-	715	-	Aquagel (1480'-130), Cement (130'-103), Aquagel (105'-27), Cement (27'-2), Earth (23')	S.H.K. Drilling Co. Tulsa, OK	
12022013302	39.462	-88.399	12N7E	22	SWOP		3191		719	GL	1	Stegfield R.H. Inc	8/25/1946	10/34	120	-	-	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013400	39.475	-88.401	12N7E	22	OIL	2171	1990		709	GL	1	The Texas Company	12/28/1945	2/4/1946	10/34	120	30	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013401	39.475	-88.401	12N7E	22	INJ		1990		709	GL	1	The Texas Company	3/8/1954	10/34	120	-	-	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013500	39.473	-88.401	12N7E	22	OIL	91	1990	Rosiclave	710	GL	2	The Texas Company	1/25/1946	3/27/1946	10/34	120	-	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013501	39.473	-88.401	12N7E	22	OIL		1990		710	GL	2	The Texas Company	5/24/1952	10/34	120	-	-	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013600	39.473	-88.398	12N7E	22	OIL	102	1979	Rosiclave	719	GL-	3	The Texas Company	1/24/1946	2/18/1946	10/34	120	70	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013601	39.473	-88.398	12N7E	22	OIL		1979		719	GL-	3	The Texas Company	5/15/1953	10/34	120	-	-	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Warren-Bradshaw Drilling Co.
12022013700	39.475	-88.398	12N7E	22	OIL	204	1990	Rosiclave	713	GL-	4	The Texas Company	2/16/1946	3/15/1946	10/34	177	100	-	-	-	-	-	-	-	-	6/26/1967	9/5/1967	3	-	817	-	Cement (1955'-905), Mud (1905'-45), Cement (145'-85), Mud (95'-20), Cement (20'-3)	Schoerfeld-Hunter-Kuhn Co.
120220217500	39.471	-88.399	12N7E	22	GAS	575	3200	Devonian	712	KB	1	Botts, Elton M.	10/7/1971	8/58	106	50	-	-	-	-	-	-	-	-	-	9/12/1996	9/17/1996	4	-	220	-	Acidized 1000 gal. (2' 64"-2' 84") 3000 gal. 28% (3' 21"-3' 15%)	DGL Development Fund
120220237100	39.473	-88.399	12N7E	22	GAS	37	3206	Tully	714	KB-Electric	2	Botts, Elton M.	3/28/1973	8/58	123	100	-	-	-	-	-	-	-	-	-	1/28/1982	1/28/1982	0	-	0	-	Perforated 400 gal. (3' 15"-3' 16") 3135-1445	Dupont Drilling Effingham, IL
120220238600	39.471	-88.404	12N7E	22	DAOP	285	3185	Devonian	710	KB-	1	Botts, Elton M.	7/7/1973	7/28/1973	8/58	132	50	-	-	-	-	-	-	-	-	7/28/1973	7/28/1973	3	-	-	-	Cement (147'-17), Rotary Mud (117'-25), Cement (75'-3), Earth (3-0)	Illinois Drilling Company Springfield, IL
120220240800	39.471	-88.405	12N7E	22	DAOP	731	3225	Devonian	709	DF-	2	Botts, Elton M.	11/28/1973	12/6/1973	8/58	131	NA	-	-	-	-	-	-	-	-	12/6/1973	12/7/1973	3	-	-	-	Cement (147'-17), Rotary Mud (117'-25), Cement (75'-3), Earth (3-0)	Illinois Drilling Company Springfield, IL
120220242100	39.469	-88.399	12N7E	23	OIL		1954		714	DF	2	Duncan, Walter	12/7/1945	10/34	126	-	-	-	-	-	-	-	-	-	-	10/31/1973	11/2/1973	3	-	4	-	Mud (1972-1930), Cement (1930'-457), Mud (1457'-30), Cement (30'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
120220247400	39.475	-88.396	12N7E	23	OIL	239	1975		712	DF	2	Duncan, Walter	2/13/1946	2/17/1946	10/34	126	-	-	-	-	-	-	-	-	-	10/31/1973	10/31/1973	3	-	4	-	Mud (1972-1930), Cement (1930'-457), Mud (1457'-30), Cement (30'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
12022017500	39.475	-88.396	12N7E	23	OIL	266	1980		719	DF	2	Duncan, Walter	2/1/46	10/34	129	-	-	-	-	-	-	-	-	-	-	10/31/1973	10/31/1973	3	-	4	-	Mud (1972-1930), Cement (1930'-457), Mud (1457'-30), Cement (30'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
12022017600	39.475	-88.394	12N7E	23	OIL	592	1980		715	GL	3	Duncan, Walter	4/12/1946	4/18/1946	10/34	165	-	-	-	-	-	-	-	-	-	10/30/1973	10/30/1973	3	-	4	-	Mud (1972-1930), Cement (1930'-457), Mud (1457'-30), Cement (30'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
12022017700	39.473	-88.394	12N7E	23	SWD		1960		710	GL	4	Duncan, Walter	11/1/1956	10/34	126	-	-	-	-	-	-	-	-	-	-	10/30/1973	10/30/1973	3	-	4	-	Mud (1972-1930), Cement (1930'-457), Mud (1457'-30), Cement (30'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
12022017702	39.473	-88.394	12N7E	23	GAS	666	3131	Devonian	710	GL	4-A	Gross, Tom E.	12/7/1972	10/34	158	125	7	1986	175	-	-	-	-	-	-	9/20/1977	9/23/1977	3	-	1903	-	Cement (313'-3100), Rotary Mud (3103'-30), N.V. Duncan Drilling Co. Fairfield, IL	
12022018200	39.471	-88.394	12N7E	23	OIL	776	1990		710	DF	4	Duncan, Walter	5/9/1946	5/7/1946	10/34	-	110	-	-	-	-	-	-	-	-	4/1/2003	4/1/2003	-	-	-	-	Wellbore Fluid (1970-900), Cement (1900'-100), Wellbore Fluid (1700-225), Cement (225'-193), & Cement (2028'-193), Mud (1924-183)	Harold D. Allen
12022018400	39.460	-88.406	12N7E	27	OIL		2025		722	DF	3	Duncan, Walter	10/25/1945	11/1/1945	10/34	157	100	-	-	-	-	-	-	-	-	2/19/1969	2/20/1969	3	-	1245	-	P.P.B. & Cement (2028'-193), Mud (1924-183), Cement (193'-13), Mud (133'-20), Cement (20'-3), Earth (3-0)	Die Miller Drilling Co. Lawrenceville, IL
12022018401	39.460	-88.406	12N7E	27	SWOP		2025		722	DF	3	Duncan, Walter	7/27/1955	10/34	126	-	-	-	-	-	-	-	-	-	-	6/9/1956	6/9/1956	0	-	-	-	Rotary Mud (2195'-75), Cement (75'-50), Rotary Mud (634'-30), Cement (8-2), Cement (338-6)	Arnett Inc Co. Salem, IL
120220057400	39.474	-88.404	12N7E	28	DA	1218	1934		735	KB	1	Becker, Joe	6/7/1957	8/58	163	65	-	-	-	-	-	-	-	-	-	6/9/1956	6/9/1956	0	-	-	-	Rotary Mud (2195'-75), Cement (75'-50), Rotary Mud (634'-30), Cement (8-2), Cement (338-6)	R.K. Parham Corp.
12139008400	39.521	-88.477	13W6E	36	DAP	1934	2150	Rosiclave	660	GL-	1	Arnett Drilling Co.	9/31/1956	6/9/1956	8/58	310	225	-	-	-	-	-	-	-	-	6/10/2005	6/10/2005	0	-	-	-	Rotary Mud (2195'-75), Cement (75'-50), Rotary Mud (634'-30), Cement (8-2), Cement (338-6)	K.K. Parham Corp.
12139217600	39.527	-88.484	13W6E	36	DAP	57022	2150	McCloskey Int'l	661	KB-Computer Bank Trust	1	R.I. Petroleum Corp.	9/6/2005	6/10/2005	8/58	310	225	-	-	-	-	-	-	-	-	6/10/2005	6/10/2005	0	-	-	-	Rotary Mud (2195'-75), Cement (75'-50), Rotary Mud (634'-30), Cement (8-2), Cement (338-6)	K.K. Parham Corp.
12022005300	39.527	-88.445	13W7E	32	DAP	572	2124	Springfield Coal	668	GL-	1	Barthel, A.J.	10/1/1946	8/58	150	NA	-	-	-	-	-	-	-	-	-	4/18/1946	4/18/1946	2	-	-	-	Rotary Mud (2195'-75), Cement (75'-50), Rotary Mud (634'-30), Cement (8-2), Cement (338-6)	K.K. Parham Corp.
12022005400	39.523	-88.401	13W7E	34	TA	96	1975		687	DF-	1	H.F. Robinson, Inc.	11/1/1957	10/34	44	NA	-	-	-	-	-	-	-	-	-	11/4/1957	11/4/1957	0	-	1311	-	Cement (1972-889), Mud (188-40), Cement (661'-61), Mud (29-3), Cement (8-3), Soil (3-0)	H.F. Robinson, Inc.

Table 5-1. Oil and Gas Wells
Area of Review (2.5 Miles) Well Records Available at Mattoon, IL

API NUMBER	Latitude NAD 83	Longitude NAD 83	Approx. Distance (mi)	Township	Sec	Well Status	Permit #	Depth (ft)	Formation	Elev (ft)	Owner Name	Well No.	Company/Operator	Drilling Dates		Cement Record				Well Completion Data						Plugging Details											
														Date Began	Date Completed	Surface Casing		Intermediate Casing		Producing Casing		Plug Back	Fractured	Acidized	Shut	Description	Date Began	Date Completed	Surface	Intermediate	Producing	Casing Depth Pulled Out (ft)	Filled With, Kind of Plug (ft)	Drilling Contractor			
Diam (in)	Depth (ft)	Diam (in)	Depth (ft)	Diam (in)	Depth (ft)	Diam (in)	Depth (ft)																														
120290146200	39.521	-89.408	2.416	13N7E	34	DAP	2090	2661		693	DF-	1	Nation, Ben H.	10/14/1945	12/1/1945	10.34	81	-	-	-	-	-	-	-	-	-	-	-	-	4/30/1946	5/3/1946	2	-	1595	-	Cement (2002-892), Rotary Mud (892-86), Cement (86-60), Rotary Mud (60-27), Cement (27-59) (23)	Dunbar Drilling Co.
120292337100	39.521	-89.415	2.154	13N7E	34	DAP	39923	2668	Rosiclere Sand	689	GL-	1	Cox, Harold E.	4/2/1987	4/6/1987	8.58	154	NA	-	-	-	-	-	-	-	-	-	-	-	4/6/1987	4/6/1987	0	-	-	-	Mud (2058239), Cement (250-0)	M & E Drilling Co., Casey, IL
120290292700	39.521	-89.396	2.911	13N7E	35	DA	1943	1987		685	GL	1	Kull, Joseph A.	10/6/1946	10/17/1946	10.34	85	-	-	-	-	-	-	-	-	-	-	-	-	8/29/1947	8/25/1947	0	-	1042	-	Mud (19845105), Cement (105-80), Mud (80-28), Cement (28-3), Soil (3-0)	W.R. Kurenski
120292295001	39.499	-89.386	2.413																																		
DA=	Geological Record Obtained and in House from ISGS													DA=	Geological Record Obtained and in House from ISGS																						
DAP=	Dry and Abandoned, Oil Shows, Plugged													DAP=	Dry and Abandoned, Oil Shows, Plugged																						
DAO=	Dry and Abandoned, Oil Shows													DAO=	Dry and Abandoned, Oil Shows																						
DGP=	Dry and Abandoned, Gas Shows, Plugged													DGP=	Dry and Abandoned, Gas Shows, Plugged																						
UNK=	Unknown													UNK=	Unknown																						

DAQ= Dry and Abandoned, Oil Shows
 DAP= Dry and Abandoned, Oil Shows, Plugged
 GAS= Gas Only and Abandoned, No Shows, Plugged
 GAS= Gas
 DA= Dry and Abandoned
 DAQ= Dry and Abandoned, Gas Shows, Plugged

GAS= Gas, Plugged
 IN= Injection, Unknown
 TAP= Temporarily Abandoned, Plugged
 TAP= Temporarily Abandoned, Oil
 UNK= Unknown

Table 5-2. Water Wells

API NUMBER	Longitude (NAD 83)	Latitude (NAD 83)	Approx. Distance (mi)	County	Township	Sec	Well Status	Depth (ft)	Formation	Top	Bottom	Elev (ft)	Elev Ref	Owner Name	Well	Driker	Rate (gpm)	Casing Diam (in)	Casing Depth (ft)	Screen Length (ft)	Screen Diam (in)	Screen Slot	Bedrock Depth	Starting Bedrock
12139210400	-88.474	39.319	2.248	Monroe	12N6E	1	ENG	40				651	GL	FAS 542 over Crabapple Creek	1(E Abt)	IL Dept. of Transportation								
12139210500	-88.474	39.319	2.248	Monroe	12N6E	1	ENG	45				651	GL	FAS 542 over Crabapple Creek	2(W Pier)	IL Dept. of Transportation								
12139210600	-88.493	39.308	2.823	Monroe	12N6E	2	ENG	26				98	GL	Whitley Creek box Culvert	2 S-END	IL Dept. of Transportation								
12139210600	-88.492	39.319	3.088	Monroe	12N6E	2	ENG	26				98	GL	TR 170 over Whitley Creek	1 N-END	IL Dept. of Transportation								
12139233300	-88.489	39.499	2.492	Monroe	12N6E	12	WATER	52	sand & gravel	30	32	0		Voyles, Harvin & Linda	1	Baker, Earl Jr.	7	6 pipe SCH 40 1.96 0.280, 36 concrete pipe	2-19, 19-52					
12029225100	-88.390	39.511	2.860	Coles	12N7E	2	WATER	57		0	0	0		Duncan, Walter Inc.	1	Baker, E. C. & Sons	15	7 (6.62" hole below casing)	0-289		105	black shale		
12029225100	-88.391	39.511	2.934	Coles	12N7E	2	WATER	348	sandstone	289	340	690	GL	Water Test Hole	S-1	Duncan, Walter Oil Co.	0							
1202920073100	-88.387	39.512	3.056	Coles	12N7E	2	WATER	55		0	0	0		Degler, G. F.	1	Degler, Ray	0							
120292364800	-88.410	39.406	1.763	Coles	12N7E	3	WATER	39		0	0	0		Koelling, Robert #1		Steen, Thomas F.	0				117	gray shale		
120292360000	-88.408	39.406	1.880	Coles	12N7E	3	WATER	124	dry	0	0	0		Koelling, Robert #2		Steen, Thomas F.	0							
120292364000	-88.408	39.406	1.880	Coles	12N7E	3	WATER	52		0	0	0		Koelling, Robert #2		Steen, Thomas F.	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0	0	0		Cooks Mills, Village of	1-70	Baker, E. C. & Sons	0							
120292364000	-88.400	39.507	2.312	Coles	12N7E	3	WATER	0		0														

Table 5-2. Water Wells

API Number	Longitude (NAD 83)	Latitude (NAD 83)	Approx. Distance (mi)	County	Township	Sec	Well Status	Depth (ft)	Formation	Top	Bottom	Elev (ft)	Elev Ref	Owner Name	Well	Driller	Rate (gpm)	Casing diam (in)	Casing Depth (ft)	Screen Length (ft)	Screen diam (in)	Screen Slot	Bedrock Depth	Starting Bedrock
120292384600	-88.435	39.469	2.035	Coles	12NTE	21	ENG	51		69	75	0	GL	TR-24 Sta.9+78 Mattoon Twp.	1 S-ABT	IL Dept. of Transportation	15	7 OD	0-71	3	5.5	80		
120292283700	-88.428	39.469	2.178	Coles	12NTE	21	WATER	75	sand & gravel					Browning, Carl	1	Baker, E. C. & Sons	0							
120292384500	-88.425	39.462	2.607	Coles	12NTE	21	ENG	50				695	GL	Sa.15+19 TR 95	1 E-ABT	IL Dept. of Transportation	0	36 concrete pipe	-1-70					
120292271500	-88.421	39.462	2.708	Coles	12NTE	21	WATER	70	sand & gravel	68	70	0		Chapin, Maxine		Kohmen, Clarence E.	0	36 concrete pipe						
120292027100	-88.414	39.474	2.203	Coles	12NTE	22	WATER	75		0	0	716	GL	Mattoon Test Hole	1	Central Illinois Public Service	5	7 OD	0-69	4	6	0.016		
120290195300	-88.403	39.475	2.579	Coles	12NTE	22	WATER	73	sand & gravel	69	73	0		Diam Henry	1	Baker, E. C. & Sons	7	6	0-67	4	5.6	10		
120292263800	-88.402	39.474	2.674	Coles	12NTE	22	WATER	70	sand & gravel	67	70	0		Schrock Edwin	2	Baker, Earl Jr.	0	36 concrete pipe	-1-42					
120292343200	-88.398	39.475	2.804	Coles	12NTE	22	WATER	42	sand & gravel	28	29	0		Coyne's John		Kohmen, Clarence E.	0	36 concrete pipe	-1-40					
120290217700	-88.397	39.475	2.814	Coles	12NTE	22	WATER	40	sand & gravel	11	12	0		Berkheimer Norman		Kohmen, Clarence E.	0	36 concrete pipe	-1-40					
120290174400	-88.400	39.470	2.927	Coles	12NTE	22	WATER	72	sand	67	72	0		Miller Dale	1	Baker, E. C. & Sons	7	7 new OD	-1-69	3	6	16		
120290170200	-88.399	39.469	3.015	Coles	12NTE	22	WATER	71	sand & gravel	68	71	0		Wilson Orval	3	Baker, E. C. & Sons	5	7 OD	-1-68	3	6	10		
120292365900	-88.396	39.475	2.900	Coles	12NTE	23	WATER	84	12 of water	0	0	0		C. I. P. S.		Rue, J. A.	0							
120290215900	-88.422	39.457	3.005	Coles	12NTE	28	WATER	81	sand	75	80	0		Howard Bill	1	Fleming, D. D.	10	4 steel #11 (4" hole below casing)	0-75	5	3	20		
120290156600	-88.423	39.456	3.051	Coles	12NTE	28	WATER	79	sand	78	79	0		Howard Bill	1	Fleming, D. D.	7	4 plastic (4" hole below casing)	0-75	4	2.5	12		
120290156600	-88.453	39.458	2.837	Coles	12NTE	29	WATER	120	sand	111	120	0		Bel Bill	23377	Baker, E. C. & Sons	15	6 new ID	0-118	4	6	25		
121732421500	-88.454	39.527	2.114	Coles	13NTE	29	DRYP	81	dry hole			650	GL	Jackson, David	Dry 1	Wessenhofer, Andrew						81	bedrock	
121392138800	-88.476	39.524	2.596	Moultrie	13N6E	36	ENG	30				650	GL	FA 33	2	IL Dept. of Transportation								
121392103700	-88.476	39.531	2.974	Moultrie	13N6E	36	ENG	36				650	GL	FA 33	1	IL Dept. of Transportation								
120290145900	-88.463	39.539	3.064	Coles	13NTE	30	WTST	57		0	0	679	GL	Mattoon Test Hole	30	C.I.P.S.	0							
120292264100	-88.455	39.455	3.039	Coles	13NTE	30	WTST	144		128	143	0		Champion, H.	2	Baker, Earl Jr.	2	6 OD	0-126	15	4	35		
120290226600	-88.454	39.524	1.885	Coles	13NTE	31	WTST	42		0	0	0		Ombly, W. H. Mrs.	2	Baker, Earl Jr.	0					37	shale	
120290237000	-88.455	39.524	1.910	Coles	13NTE	31	WTST	37		0	0	0		Ombly, W. H. Mrs	6	Baker, Earl Jr.	0					32	shale	
120290236500	-88.454	39.524	1.923	Coles	13NTE	31	WTST	42		0	0	0		Ombly, W. H.	1	Baker, E. C. & Sons	0					33	shale	
120290236700	-88.455	39.524	1.946	Coles	13NTE	31	WTST	42		0	0	0		Ombly, W. H. Mrs.	3	Baker, E. C. & Sons	0					40	shale	
120290236900	-88.454	39.525	1.957	Coles	13NTE	31	WTST	42		0	0	0		Ombly, W. H. Mrs.	5	Baker, Earl Jr.	0							
120290240000	-88.454	39.525	1.957	Coles	13NTE	31	WATER	42	sand	27	28	0		Ombly, W. H. Mrs.	1	Baker, Earl Jr.	0	6 0.28 wall black steel, 36 concrete casing	-3-9, -9-40			32	gray shale	
120290161000	-88.459	39.524	2.035	Coles	13NTE	31	WATER	379		0	0	0		Ombly, W. H.	2	Baker, Earl Jr.	2	5, 4	0-126, 118-353			124	limestone	
120290161100	-88.458	39.524	2.035	Coles	13NTE	31	WATER	150		0	0	0		Ombly, W. H.	1	Baker, Earl Jr.	2	10, 8	0-40, 35-147			90	shale	
120290236800	-88.454	39.526	2.065	Coles	13NTE	31	WTST	37		0	0	673	GL	Ombly, W. H. Mrs	4	Baker, Earl Jr.	0					33	shale	
120290146100	-88.435	39.536	2.620	Coles	13NTE	32	WATER	326		0	0			Hoagland, Ernest	1	Baker, E. C. & Sons	7	6, 5	0-55, 50-285			108	shale/light	
120292297400	-88.424	39.522	1.873	Coles	13NTE	33	WATER	50	gravel	34	48	0		Rooney, Mrs.	1	Baker, Earl Jr.	3	8	0-50					
120292297500	-88.424	39.522	1.873	Coles	13NTE	33	WATER	49	sand	40	49	0		Rooney, Wm.	3	Baker, Earl Jr.	6	6	0-49					
120292297300	-88.423	39.523	1.958	Coles	13NTE	33	WATER	50	sand	0	50	0		Dole, Joseph Mrs.	1	Baker, Earl Jr.	10	8	0-50			80		
120292402800	-88.435	39.528	2.118	Coles	13NTE	33	ENG	46				664	GL	Sa.9+70 CH 13 (North Olaw Twp.)	1 S-ABT	IL Dept. of Transportation						39	gray shale	
120292402900	-88.435	39.528	2.118	Coles	13NTE	33	ENG	46				664	GL	Sa.10+36 CH 13 (North Olaw Twp.)	2 N-ABT	IL Dept. of Transportation						39	gray shale	
120292297600	-88.411	39.522	2.301	Coles	13NTE	34	WATER	48	sand & gravel	42	47	0		Donnell, Thomas	2	Baker, E. C. & Sons	6	6 steel	0-43	4	5.5	0.016		

ENG= Engineering Test
 STRAT= Stratigraphic Test
 DRY= Dry Well
 DRYP= Dry Well, Plugged
 = Not Active Water Well
 WATERS= Private Water Well, Water Well for Commercial Operation, or Municipal Water Supply
 WATERSP= Water Supply Well
 WATERSP= Water Supply Well, Plugged
 WTST= Test Hole

APPENDIX 5-2
Plugging Affidavits for Wells in the Area of Review

2-12N-7E

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Harry J. Adams

and

Lester Burton

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil and / or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Oliver #2 and located as follows: 330 ft. north;330 ft. south; 330 ft. east; ft. westof the SW corner of the SE Quarterof the Quarter of the Quarter ofSection 2, Township 12 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 680 ft.Total depth 1930 Formation Lower RoseclareDate permit to drill issued 2/28/64 Permit No. 270Permit issued to Harry J. AdamsDate drilling began 5/5/64Date drilling completed 5/10/64Kind of drilling tools used RotaryDate plugging began 5/10/64Date plugging completed 5/10/64 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)Lessor Oliver EstateAddress Mattoon, IllinoisLessee Harry J. AdamsAddress 2345 S. 13th Terre Haute, Ind.Drilling Contractor W. L. DillierAddress Cassidy, Illinois

DETAILS OF PLUGGING:

Filled with From To feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1930 To 1870 feetFilled with Mud From 1870 To 200 feetKind of Plug Cement From 200 To 100 feetFilled with Mud From 100 To 10 feetKind of Plug Cement From 10 To 3 feetFilled with Soil From 3 To 0 feetKind of Plug From To feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) No workable coal(1) Have pits and other excavations been filled? ☐ Yes ☒ No(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>117</u>				<u>117</u>		<u>MAY 15 1964</u>

RECEIVED
DIVISION OF OIL & GASDEPARTMENT OF
MINES & MINERALSHarry J. Adams, 2345 S. 13th Terre Haute, Ind.
(Signature of person, firm or corporation having custody or control of well.)Per Lester BurtonAddress Sumner, IllinoisLester Burton Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address R. R. #3, Martinville, IllinoisSubscribed and sworn to before me this 13 day of May, A.D. 19 64My commission expires June 8, 1965

Notary Public.

Form 006
STATE OF ILLINOIS
County of Coles

WELL PLUGGING AFFIDAVIT

UNTY No. 17-98

Bangert Casing Pulling Corp For Charles Armantrout and
Kevin Spencer being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Gas
known as the Oliver #1 (Indicate whether for oil, gas, water or other purposes)
and located as follows: 330 ft. north;
330 ft. south; 330 ft. east; 330 ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the SW corner of the SE Quarter
of the SW Quarter of the SE Quarter of
Section 2, Township 12 (North of South)
Range 7, (East of West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 694 ft.
Ground 695 ft.

Total depth 3172 Formation Devonian

Date permit to drill issued 5/25/70 Permit No. 415

Permit issued to Charles Armantrout

Date drilling began 5/26/1970

Date drilling completed 6/5/70

Kind of drilling tools used Rotary

Date plugging began 6/22/89

Date plugging completed

Lessor Oliver Address Mattoon
Lessee Charles Armantrout Address RR #3 Mattoon
Drilling Contractor Calvert Eastern Address Olney IL

DETAILS OF PLUGGING:

Filled with <u>Mud</u> (Rotary Mud, Cement, or Other Materials)	From <u>3172</u>	To <u>3130</u> feet
Kind of Plug <u>Cement</u>	From <u>3136</u>	To <u>3080</u> feet
Filled with <u>Mud</u>	From <u>3080</u>	To <u>300</u> feet
Kind of Plug <u>Cement</u>	From <u>300</u>	To <u>4</u> feet
Filled with <u>Soil</u>	From <u>4</u>	To <u>0</u> feet
Kind of Plug	From	To feet
Filled with	From	To feet
Kind of Plug	From	To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	123		4		119		100 Sacks
4 1/2	3160		1482		1678		200 Sacks

(Signature of person, firm or corporation having custody or control of well)
Per Kevin Spencer
Address Clay City IL
Kevin Spencer Well Insp I
(Signature and title of party supervising plugging of well)
Address Box 449 Martinsville IL 62442 GAS DIV.

Subscribed and sworn to before me this 13 day of July, A.D. 19 89

Previous
3123-3136

OG-6 WELL PLUGGING REPORT

719781

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Northfield Gas PERMITTEE NO. 1190

WELL NAME: Oliver #12-A PERMIT NO. 000743 REFERENCE NO. 140810
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 1650 FT. SOUTH; AND
330 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE NE QUARTER OF THE SW
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattson

WELL DATA:

SURFACE ELEVATION	<u>686</u> FT.	PRODUCING / INJECTION INTERVALS	
TOTAL DEPTH OF WELL	<u>3134</u> FT.	FROM <u>3123</u> TO <u>3134</u>	
PLUGGED BACK TOTAL DEPTH	<u>N/A</u> FT.	FROM _____ TO _____	
BASE OF FRESHWATER ZONE	<u>336</u> FT.	FROM _____ TO _____	
WORKABLE COALS PRESENT AT	<u>N/A</u> FT.	FROM _____ TO _____	

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u>	FROM <u>3134</u> TO <u>2939</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>wellbore fluid</u>	FROM <u>2939</u> TO <u>400</u> FT.
FILLED WITH <u>cement</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>surface</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	NR	NR	NR	NR	4'
INTERMEDIATE / MINE STRING / OR LINER	7"	1964	NR	NR	NR	408
PRODUCTION	4 1/2	3123	NR	6 3/4	NR	518

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature] PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 24 April 1995

ADDRESS

RECEIVED 25 April 1995

CITY, STATE

ZIP

APR 28 1995

MAY 2 1995

4-19-95

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

CO # 22431

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

119220

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Northfield Gas PERMITTEE NO. 1190WELL NAME: Oliver #15-A PERMIT NO. 000548 REFERENCE NO. 140812
(ISSUE DATE IF NO NUMBER) COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND
990 FT. EAST; OR _____ FT. WEST OF THE Sec 2
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mallory

WELL DATA:

SURFACE ELEVATION	<u>688</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>3135</u> FT.	FROM <u>3123</u> TO <u>3133</u>
PLUGGED BACK TOTAL DEPTH	<u>NONE</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>3138</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NONE</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>3135</u> TO <u>2925</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>Wellbore Fluid</u>	FROM <u>2925</u> TO <u>400</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>Top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>8 7/8</u>	<u>120</u>	<u>50</u>			<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>4 1/2</u>	<u>3123</u>	<u>150</u>	<u>6 1/2</u>		<u>1270</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature] DATE PLUGGING BEGAN 14 April 95
PERMITTEE OR DESIGNEE

ADDRESS

DATE PLUGGING COMPLETED 19 April 95

CITY, STATE

ZIP

(OVER)

RECEIVED

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APR 24 1995

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5-6

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756

COUNTY No. 544

524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

776910

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Walter Duncan Inc PERMITTEE NO. 868

WELL NAME: Oliver #9 PERMIT NO. 002804 REFERENCE NO. 129365
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: 2310 FT. NORTH; OR _____ FT. SOUTH; AND
1650 FT. EAST; OR _____ FT. WEST OF THE SW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.
Mattoon

WELL DATA:

SURFACE ELEVATION	<u>688</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1922</u> FT.	FROM <u>1895</u> TO <u>1922</u>
PLUGGED BACK TOTAL DEPTH	<u>N/A</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>330</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u> (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM <u>1922</u> TO <u>1750</u> FT.
FILLED WITH <u>Wellbore fluid</u>	FROM <u>1750</u> TO <u>396</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>396</u> TO <u>4</u> FT.
FILLED WITH <u>Top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
COMMENTS: _____	

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>120</u>	<u>125</u>	<u>12"</u>	<u>61</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>7"</u>	<u>1890</u>	<u>125</u>	<u>8 1/2</u>	<u>850</u>	<u>630</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Baser
PERMITTEE OR DESIGNEE
P.O. Box 832
ADDRESS
Mattoon, IL, 61938
CITY, STATE ZIP

DATE PLUGGING BEGAN 2 May 97
DATE PLUGGING COMPLETED 6 May 97
MAY 27 1997

4-14-95

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

Co # 23154

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☐ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☒ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Northfield Gas PERMITTEE NO. 1190WELL NAME: Oliver #1-N PERMIT NO. 024119 REFERENCE NO. 140811
(ISSUE DATE IF NO NUMBER) COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 660 FT. SOUTH; AND
330 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE SE QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.
Mattoon

WELL DATA:

SURFACE ELEVATION	<u>689</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>3175</u>	FT.	FROM <u>3145</u> TO <u>3158</u>
PLUGGED BACK TOTAL DEPTH	<u>3160</u>	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>339</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NONE</u>	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>3160</u> TO <u>2950</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>wellbore fluid</u>	FROM <u>2950</u> TO <u>400</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>stop soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>8 7/8</u>	<u>176</u>	<u>125</u>	<u>12 1/2</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>4 1/2</u>	<u>3164</u>	<u>200</u>	<u>7 7/8</u>		<u>1520</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Jim Anderson
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 13 April 1995DATE PLUGGING COMPLETED 14 April 1995

ADDRESS

CITY, STATE

ZIP

RECEIVED
APR 20 1995

APR 20 1995

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STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Carl Glidewell

and

H. L. Noblit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Oliver # 1 and located as follows: 330 ft. north;ft. south; 330 ft. east; 330 ft. westof the SE corner of the SW Quarterof the Quarter of the Quarter ofSection 2, Township 12 (North or ~~South~~)Range 7, (East or ~~West~~), of thePrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.{ Ground 689.3 ft.Total depth 1941 Formation RosiclareDate permit to drill issued 1/4/82 Permit No. 17626Permit issued to Tom E. GraceDate drilling began 1/19/82Date drilling completed 1/25/82Kind of drilling tools used RotaryDate plugging began 1/25/82Date plugging completed 1/25/82

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Mary E. & Edgar P. Oliver Address Mattoon, IllinoisLessee Tom E. Grace Address Box # 457 Mattoon, IL 61938Drilling Contractor M & E. Drilling CO. Address Casey, ILL. 62420

DETAILS OF PLUGGING:

Filled with Cement From 1941 To 1800 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1800 To 250 feetFilled with Cement From 250 To 03 feetKind of Plug From To feetFilled with From To feetKind of Plug From To feetFilled with From To feetKind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None(1) Have pits and other excavations been filled? Yes No(2) Have the following been removed? Yes NoEquipment Concrete bases Debris (3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been leveled? Yes NoIf this was a producing well, give date and amount of last production Dry Hole

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	124		0		124		

Tom E. Grace

(Signature of person, firm or corporation having custody or control of well.)

Per Carl GlidewellAddress Toledo, ILL.H. L. Noblit State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, ILL. 62420Subscribed and sworn to before me this 25 day of January, A.D. 19 82My commission expires August 27 1985 Maude Noblit

Notary Public

WELL PLUGGING AFFIDAVIT

County of Coles

Banger Casing Pulling Corp. For Charles Armantrout

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

oil (Indicate whether for oil, gas, water or other purposes)

known as the Oliver E-1 and located as follows:

Locate well accurately on plat of section (Scale one inch=2,000 ft.)

330 ft. north; 330 ft. south; 330 ft. east; 330 ft. west of the SE corner of the SW Quarter of the Quarter of the Quarter of Section 2, Township 12 (North) Range 7, (East of the Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 692 ft. Ground 689 ft.

Total depth 1954 Formation Rosiclare

Date permit to drill issued 7/20/82 Permit No 19815

Permit issued to Charles Armantrout

Date drilling began 7/20/82

Date drilling completed 7/27/82

Kind of drilling tools used Rotary

Date plugging began 6/21/89

Date plugging completed 6/22/89

Lessor Oliver Address

Lessee Charles Armantrout Address Mattoon IL

Drilling Contractor Depoister Drlg Address Effingham IL

DETAILS OF PLUGGING:

Filled with Cement (Rotary Mud, Cement, or Other Materials) From TD To 1693 feet Kind of Plug Mud From 1693 To 300 feet Filled with Cement From 300 To 4 feet Kind of Plug Soil From 4 To 0 feet Filled with From To feet Kind of Plug From To feet Filled with From To feet Kind of Plug From To feet

*IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? Yes No
- (2) Have the following been removed? Equipment Yes No Concrete bases Yes No Debris Yes No
- (3) Has surface casing been cut off three feet below ground surface? Yes No
- (4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
8 5/8	124	4	120	100 Sacks
4 1/2	1956	1155	801	150 Sacks

(Signature of person, firm, or corporation having custody of copies of well.) Per 16667 DEPT. MINES & MINERAL RESOURCES JUL 19 1989 Address Clay City IL Kevin Spencer Well Insp I (Signature and title of party supervising plugging of well.) Address Box 449 Martinsville IL 62442

Subscribed and sworn to before me this 13 day of July, A.D. 1989

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756

524 South Second Street
Springfield, Illinois 62701-1787

COUNTY NO. 2156

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☐ PRODUCTION ☒ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Charles Armantrout PERMITTEE NO. 110

WELL NAME: Oliver "C" #2 PERMIT NO. 003792 REFERENCE NO. 1327
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 02
TOWNSHIP 12N RANGE 07E
LOCATION: 0330 FT. NORTH; OR _____ FT. SOUTH; AND
_____ FT. EAST; OR 1650 FT. WEST OF THE SE
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>685.9</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1934</u> FT.	FROM <u>1913</u> TO <u>1915</u>
PLUGGED BACK TOTAL DEPTH	<u>1800</u> FT.	FROM <u>1747</u> TO <u>1767</u>
BASE OF FRESHWATER ZONE	<u>135.9</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: bridge plug set at 1800'

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u> <small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>	FROM <u>1800</u> TO <u>1693</u> FT.
FILLED WITH <u>wellbore fluid</u>	FROM <u>1693</u> TO <u>211</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>200</u> TO <u>0</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS: Bridge plug set at 1800'

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	97				4
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	4 1/2	1934	150	7 7/8		4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Charles Armantrout
PERMITTEE OR DESIGNEE

ADDRESS: 121 MOULTRIE

MATCOH, IL, 61838

DATE PLUGGING BEGAN 8-6-2001
RECEIVED

DATE PLUGGING COMPLETED 8-7-2001
AUG 22 2001

GEOLOGIC RECORDS

County Coles

Sec. 02 Twp. 12N R. 07E

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

BANGERT CASING PULLING CORP FOR CHARLES ARMANTROUT and

KEVIN SPENCER

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the OLIVER E-3

and located as follows: 330 ft. north;

330 ft. south; 330 ft. east; 330 ft. west

of the SW corner of the SE Quarter

of the SW Quarter of the SE Quarter of

Section 2, Township 12 (North or South)

Range 7, (East or West), of the

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 690 ft.

{ Ground 688 ft.

Total depth 1956 Formation ROSICLARE

Date permit to drill issued 10/27/82 Permit No. 21484

Permit issued to CHARLES ARMANTROUT

Date drilling began 10/27/82

Date drilling completed 10/29/82

Kind of drilling tools used ROTARY

Date plugging began 6/22/89

Date plugging completed 6/23/89

Lessor OLIVER

Address MATTOON IL

Lessee CHARLES ARMANTROUT

Address MATTOON IL

Drilling Contractor

Address

DETAILS OF PLUGGING:

Filled with MUD From 1956 To 1936 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug CEMENT From 1936 To 1880 feet

Filled with MUD From 1880 To 300 feet

Kind of Plug CEMENT From 300 To 4 feet

Filled with SOIL From 4 To 0 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE

(1) Have pits and other excavations been filled? Yes ☒ No ☐

(2) Have the following been removed?

Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been leveled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	119		4				100 sacks
4 1/2	1956		1428				100 sacks

(Signature of person, firm or corporation having custody or control of well.)

Per Kevin Spencer

Address CLAY CITY IL

Kevin Spencer WELL INSP. I

(Signature and title of party supervising plugging of well.)

Address BOX 449, MAERTINSVILLE IL. 62442

Subscribed and sworn to before me this 3 day of

A.D. 1989

My commission expires

Notary Public

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756

524 South Second Street
Springfield, Illinois 62701-1787

COUNTY NO. 645

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Merk Reeves Oil & Gas Producers

PERMITTEE NO. 555

WELL NAME: Oliver #4

PERMIT NO. 002143

(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 503572

COUNTY Coles SECTION 02
TOWNSHIP 12N RANGE 07E
LOCATION: 2310 FT. NORTH; OR _____ FT. SOUTH; AND
_____ FT. EAST; OR 2310 FT. WEST OF THE SE
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE SE
QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>686</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1765</u> FT.	FROM <u>1748</u> TO <u>1760</u>
PLUGGED BACK TOTAL DEPTH	_____ FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>136</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>1765</u> TO <u>1698</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>wellbore fluid</u>	FROM <u>1698</u> TO <u>211</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>211</u> TO <u>0'</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>9 5/8</u>	<u>112</u>	<u>25</u>	<u>12</u>		<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1764</u>	<u>150</u>	<u>7 7/8</u>		<u>1016'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Dennis J. Sharf
PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 3-7-2001

RECEIVED
DATE PLUGGING COMPLETED 3-7-2001

ADDRESS

MAR 23 2001

CITY, STATE

ZIP

GEOLOGIC RECORDS

County Coles Sec. 02 Twp. 12N R. 07E

STATE OF ILLINOIS
 County of DOUGLAS

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector

and

Don Robson -- Tri-State Casing Pulling Co.

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Schaefer # 1

and located as follows: _____ ft. north;

1346 ft. south; _____ ft. east; 1750 ft. west

of the NE corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 2, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
 Ground 693 ft.

Total depth 1995 Formation McCloskyDate permit to drill issued 12/12/66 Permit No. 1930Permit issued to Schaefer Oil Co.Date drilling began 2/6/67Date drilling completed 2/14/67Kind of drilling tools used RotaryDate plugging began 2/22/68Date plugging completed 2/23/68

Locate well accurately on plat of section
 (Scale one inch--2,000 ft.)

Lessor James L. SchaeferAddress Mattoon, IllinoisLessee Schaefer Oil Co.Address Mattoon, IllinoisDrilling Contractor N.A. BaldridgeAddress Ashley, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1995</u>	To <u>1725</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Mud</u>	From <u>1725</u>	To <u>150</u> feet
Filled with <u>Cement</u>	From <u>150</u>	To <u>100</u> feet
Kind of Plug <u>Mud</u>	From <u>100</u>	To <u>30</u> feet
Filled with <u>Cement</u>	From <u>30</u>	To <u>GL - 3</u> feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed.

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
 (2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production 2/1/68 2 Bbls. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8"	125		3		122		Surface casing
1 1/2"	1995		1310		685		

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress Mattoon, Illinois

Richard L. Hanson / Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, Illinois

Subscribed and sworn to before me this 23rd day of March, A.D. 1968

My commission expires 5/10/71Camilla R. Hanson

Notary Public.

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
PO. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☐ PRODUCTION ☒ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: WALTER DUNCAN PERMITTEE NO. 866WELL NAME: Opal Arthur #B-1 PERMIT NO. 002586 REFERENCE NO. 1326
(ISSUE DATE IF NO NUMBER) COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 1346.5 FT. SOUTH; AND
2310 FT. EAST; OR _____ FT. WEST OF THE NW 1/4
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>692</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1989</u> FT.	FROM <u>1947</u> TO <u>1952</u>
PLUGGED BACK TOTAL DEPTH	<u>1955</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>342</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NONE</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u> <u>15 sks</u>	FROM <u>1952</u> TO <u>1817</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>well bore fluid</u>	FROM <u>1817</u> TO <u>400</u> FT.
FILLED WITH <u>cement</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>surface</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 3/8	114	100	12 1/2	6h	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1987	100	7 3/8	1227	700'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: John Ordner
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 10 April 95

ADDRESS _____

DATE PLUGGING COMPLETED 10 April 95

CITY, STATE _____

ZIP _____

RECEIVED

RECEIVED

APR 18 1995

APR 20 1995
Printed on Recycled Paper

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

J. D. Moyer-W. L. Dillier

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil and/or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Oliver #1and located as follows: 990 ft. north;330 ft. south; 330 ft. east; ft. westof the sw corner of the SE Quarterof the Quarter of the Quarter ofSection 2, Township 12 (North or South)Range 7, (East or West), of thePrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground ft.Total depth 1932 Formation ResiclaireDate permit to drill issued 7-7-59 Permit No. 1230Permit issued to Harry J. AdamsDate drilling began July 7, 1959Date drilling completed July 11, 1959Kind of drilling tools used RotaryDate plugging began July 11, 1959Date plugging completed July 11, 1959 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONLessor OliverAddress Lessee Harry J. AdamsAddress 1430 Wabash Ave., Terre Haute, Ind.Drilling Contractor W. L. DillierAddress Cassey, Ill.

DETAILS OF PLUGGING:

Filled with Mud From 1932 To 1912 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1912 To 1852 feetFilled with Mud From 1852 To 125 feetKind of Plug Cement From 125 To 90 feetFilled with Mud From 90 To 8 feetKind of Plug Cement From 8 To 3 feetFilled with From To feetKind of Plug From To feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	115				115		Cemented

Harry J. Adams

(Signature of person, firm or corporation having custody or control of well.)

Per J. D. MoyerAddress Bridgmont, IllinoisLowell E. Bennett Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Martinsville, IllinoisSubscribed and sworn to before me this 7th day of Aug, A.D. 1959My commission expires 1/9/62

Notary Public.

RECEIVED
DIVISION OF OIL & GAS

AUG 18 1959

DEPARTMENT OF
MINES AND MINERALS

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756

524 South Second Street
Springfield, Illinois 62701-1787

COUNTY NO. 688

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Charles Armentrout PERMITTEE NO. 110

WELL NAME: Oliver #6-C PERMIT NO. 004282 REFERENCE NO. 128462
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 02
TOWNSHIP 12N RANGE 07E
LOCATION: 0990 FT. NORTH; OR _____ FT. SOUTH; AND
0330 FT. EAST; OR _____ FT. WEST OF THE SW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE SE
QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>686</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1934</u> FT.	FROM <u>1904</u> TO <u>1908</u>
PLUGGED BACK TOTAL DEPTH	_____ FT.	FROM <u>1743</u> TO <u>1762</u>
BASE OF FRESHWATER ZONE	<u>136</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>1934</u> TO <u>1693</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>well bore fluid</u>	FROM <u>1693</u> TO <u>190</u> FT.
FILLED WITH <u>cement</u>	FROM <u>190</u> TO <u>0</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>8 5/8</u>	<u>Not Known</u>				<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>4 1/2</u>	<u>1934</u>	<u>200</u>	<u>7 7/8</u>	<u>5' below ground level</u>	<u>1030'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Dennis J. Shupe
PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 11-22-2000

RECEIVED
DATE PLUGGING COMPLETED 11-27-2000

ADDRESS

DEC 08 2000

CITY, STATE

ZIP

GEOLOGIC RECORDS

County Coles Sec. 02 Twp. 12N R. 07E

5-7

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756524 South Second Street
Springfield, Illinois 62701-1787COUNTY No. 543

OG-6 WELL PLUGGING REPORT

776506

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan IncPERMITTEE NO. 868WELL NAME: Oliver #10PERMIT NO. 90

(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 129366

COUNTY Coles SECTION 2
 TOWNSHIP 12N RANGE 7E
 LOCATION: 1650 FT NORTH; OR _____ FT SOUTH; AND
1650 FT EAST; OR _____ FT WEST OF THE SW
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION	<u>691</u>	FT.	PRODUCING/INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1931</u>	FT.	FROM <u>1906</u> TO <u>1931</u>
PLUGGED BACK TOTAL DEPTH	<u>NA</u>	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>341</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NA</u>	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u>	FROM <u>1930</u> TO <u>1705</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>wellbore fluid</u>	FROM <u>1705</u> TO <u>400</u> FT.
FILLED WITH <u>cement</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>111</u>	<u>150</u>	<u>12</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE/MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1908</u>	<u>175</u>	<u>7 7/8</u>	<u>840</u>	<u>RECEIVED 640</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Baer

PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 6 May 97

ADDRESS

DATE PLUGGING COMPLETED 5-7-97

CITY, STATE

ZIP

5-1

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY No. 546300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

776909

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan Inc PERMITTEE NO. 868WELL NAME: Oliver #11 PERMIT NO. 000192 REFERENCE NO. 129367
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 2
 TOWNSHIP 12N RANGE 7E
 LOCATION: 990 FT. NORTH; OR _____ FT. SOUTH; AND
990 FT. EAST; OR _____ FT. WEST OF THE SW
 CORNER OF THE SW QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>692</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1985</u> FT.	FROM <u>1740</u> TO <u>1746</u>
PLUGGED BACK TOTAL DEPTH	<u>1785</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>342</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: <u>SAND ON G.I.B.</u>		

DETAILS OF PLUGGING:

FILLED WITH <u>CEMENT</u> <small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>	FROM <u>1785</u> TO <u>1645</u> FT.
FILLED WITH <u>Wellbore Fluid</u>	FROM <u>1645</u> TO <u>400</u> FT.
FILLED WITH <u>CEMENT</u>	FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TGP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>125</u>	<u>125</u>	<u>12"</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>7"</u>	<u>1985</u>	<u>175</u>	<u>8 1/2</u>	<u>800</u>	<u>550</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Baer
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 30 April 97

ADDRESS

P.O. Box 832
Mattoon Ill. 61938
 CITY, STATE ZIP

DATE PLUGGING COMPLETED 1 May 97

RECEIVED

MAY 27 1997

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756COUNTY No. 1675524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

776906

TYPE OF WELL: ☒ PRODUCTION ☒ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan IncPERMITTEE NO. 868WELL NAME: M. Oliver #13PERMIT NO. 000072
(ISSUE DATE IF NO NUMBER)REFERENCE NO. 1324 COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: 925 FT. NORTH; OR _____ FT. SOUTH; AND
1725 FT. EAST; OR _____ FT. WEST OF THE SW
CORNER OF THE NW QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION 686 FT.
TOTAL DEPTH OF WELL 1959 FT.
PLUGGED BACK TOTAL DEPTH NA FT.
BASE OF FRESHWATER ZONE 386 FT.
WORKABLE COALS PRESENT AT NA FT.

PRODUCING / INJECTION INTERVALS

FROM 1922 TO 1930
FROM 1941 TO 1944
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS) FROM 1959 TO 1709 FT.
FILLED WITH wellbore fluid FROM 1709 TO 396 FT.
FILLED WITH Cement FROM 396 TO 4 FT.
FILLED WITH top soil FROM 4 TO SURFACE FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

COMMENTS: _____

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	129	100	12"	GL	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1971	150	8"	845	625'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Baer

PERMITTEE OR DESIGNEE

ADDRESS P.O. Box 413

CITY, STATE

Mattoon, Ill. 61938
ZIP

DATE PLUGGING COMPLETED

10 May 97

DATE PLUGGING COMPLETED

12 May 97

GEOLOGIC RECORDS

County

Sec.

Twp.

R.

8-13

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY NO. 1676100 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

756738

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan Est PERMITTEE NO. 868WELL NAME: Oliver #15 PERMIT NO. 001129 REFERENCE NO. 129368
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 2
 TOWNSHIP 12N RANGE 7E
 LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND
2310 FT. EAST; OR _____ FT. WEST OF THE SW
 CORNER OF THE N/2 QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>687</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1967</u>	FT.	FROM <u>1907</u> TO <u>1916</u>
PLUGGED BACK TOTAL DEPTH	<u>NA</u>	FT.	FROM <u>1924</u> TO <u>1927</u>
BASE OF FRESHWATER ZONE	<u>337</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NA</u>	FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>1967</u> TO <u>1674</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)		
FILLED WITH <u>Wellbore Fluid</u>	FROM <u>1674</u> TO <u>395</u>	FT.
FILLED WITH <u>Cement</u>	FROM <u>395</u> TO <u>4</u>	FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>SURFACE</u>	FT.
FILLED WITH _____	FROM _____ TO _____	FT.
FILLED WITH _____	FROM _____ TO _____	FT.
FILLED WITH _____	FROM _____ TO _____	FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>112</u>	<u>100</u>	<u>NR</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1967</u>	<u>125</u>	<u>NR</u>	<u>700</u>	<u>650'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Rich Reed DATE PLUGGING BEGAN 13 Aug 96
PERMITTEE OR DESIGNEEADDRESS _____ DATE PLUGGING COMPLETED 13 Aug 96

CITY, STATE _____ ZIP _____

AUG 23 1996

5-13

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756COUNTY No. 2134524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

776908

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan IncPERMITTEE NO. 868WELL NAME: Oliver #17PERMIT NO. 001044
(ISSUE DATE IF NO NUMBER)REFERENCE NO. 129369

COUNTY Coles SECTION 2
 TOWNSHIP 12N RANGE 7E
 LOCATION: 430 FT. NORTH; OR _____ FT. SOUTH; AND
 _____ FT. EAST; OR 330 FT. WEST OF THE SE
 CORNER OF THE NE QUARTER OF THE SW
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION	<u>689</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1932</u>	FT.	FROM <u>1904</u> TO <u>1920</u>
PLUGGED BACK TOTAL DEPTH	<u>N/A</u>	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>339</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u>	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u> (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM <u>1932</u> TO <u>1670</u> FT.
FILLED WITH <u>Wellbore Fluid</u>	FROM <u>1670</u> TO <u>398</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>398</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>8 7/8</u>	<u>112</u>	<u>80</u>	<u>12 1/4</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>4 1/2</u>	<u>1901</u>	<u>125</u>	<u>7 7/8</u>	<u>1100</u>	<u>700'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Boers

PERMITTEE OR DESIGNEE

ADDRESS P.O. Box 832CITY, STATE Mattoon Ill 61938 ZIPDATE PLUGGING BEGAN 13 May 97DATE PLUGGING COMPLETED 13 May 97

MAY 27 1997

GEOLOGIC RECORDS

Printed on Recycled Paper

County _____ Sec. _____ Twp. _____ R. _____

The Seal of the State of Illinois is a circular emblem. It features an eagle with wings spread, perched on a shield with vertical stripes. The eagle is holding a banner in its beak that reads "STATE SOVEREIGN, NATIONAL UNION". The shield is inscribed with "1788". The outer ring of the seal contains the text "SEAL OF THE STATE OF ILLINOIS" at the top and "AUG. 26TH 1818" at the bottom, separated by two stars.

Office of Mines and Minerals

COUNTY No. 490

524 South Second Street
Springfield, Illinois 62701-1787

776713

PERMITTEE: Walter Duncan, Inc. PERMITTEE NO. 868

WELL NAME: Oliver #2 PERMIT NO. 3403 REFERENCE NO. 1321
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND
_____ FT. EAST; OR 330 FT. WEST OF THE NE
CORNER OF THE SW QUARTER OF THE SW
QUARTER OF THE Nw QUARTER OF THE _____
QUARTER.

Mattoon

County

Sec.

Two

R

WELL DATA:

SURFACE ELEVATION	<u>685</u>	FT.	PRODUCING / INJECTION INTERVALS	
TOTAL DEPTH OF WELL	<u>1970</u>	FT.	FROM <u>1907</u>	TO <u>1911</u>
PLUGGED BACK TOTAL DEPTH	<u>1937</u>	FT.	FROM <u>1917</u>	TO <u>1924</u>
BASE OF FRESHWATER ZONE	<u>335</u>	FT.	FROM _____	TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u>	FT.	FROM _____	TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____				

DETAILS OF PLUGGING:

FILLED WITH	<u>cement</u> (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM	<u>1970</u>	TO	<u>1940</u>	FT.
FILLED WITH	<u>wellbore fluid</u>	FROM	<u>1740</u>	TO	<u>401</u>	FT.
FILLED WITH	<u>cement</u>	FROM	<u>401</u>	TO	<u>4</u>	FT.
FILLED WITH	<u>topsoil</u>	FROM	<u>4</u>	TO	<u>0</u>	FT.
FILLED WITH		FROM		TO		FT.
FILLED WITH		FROM		TO		FT.
FILLED WITH		FROM		TO		FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	105	66	13.75	0	4'
INTERMEDIATE / MINE STRING / OR LINER	5 1/2	1968	125	7 7/8		590'
PRODUCTION						

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Rich Reed
PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 5-8-97

ADDRESS

DATE PLUGGING COMPLETED _____

CITY, STATE

ZIP

IL 472-0198 (Rev 8/93)

(OVER)

Printed on Recycled Paper

8-9

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY NO. 498300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

756512

TYPE OF WELL: ☐ PRODUCTION ☒ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan Est PERMITTEE NO. 868WELL NAME: OLIVER #3 PERMIT NO. 003402 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 1322

COUNTY Coles SECTION 2
 TOWNSHIP 12N RANGE 7E
 LOCATION: 1650 FT. NORTH; OR 330 FT. EAST; OR 330 FT. WEST OF THE SW CORNER OF THE — QUARTER OF THE — QUARTER OF THE — QUARTER OF THE — QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>690</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1985</u>	FT.	FROM <u>1916</u> TO <u>1920</u>
PLUGGED BACK TOTAL DEPTH	<u>1943</u>	FT.	FROM <u>1926</u> TO <u>1937</u>
BASE OF FRESHWATER ZONE	<u>340</u>	FT.	FROM <u>—</u> TO <u>—</u>
WORKABLE COALS PRESENT AT	<u>NONE</u>	FT.	FROM <u>—</u> TO <u>—</u>

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: —

DETAILS OF PLUGGING:

FILLED WITH <u>CEMENT</u>	(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM <u>1943</u>	TO <u>1650</u>	FT.
FILLED WITH <u>Wellbore fluid</u>		FROM <u>1650</u>	TO <u>400</u>	FT.
FILLED WITH <u>CEMENT</u>		FROM <u>400</u>	TO <u>4</u>	FT.
FILLED WITH <u>top soil</u>		FROM <u>4</u>	TO <u>SURFACE</u>	FT.
FILLED WITH <u>—</u>		FROM <u>—</u>	TO <u>—</u>	FT.
FILLED WITH <u>—</u>		FROM <u>—</u>	TO <u>—</u>	FT.
FILLED WITH <u>—</u>		FROM <u>—</u>	TO <u>—</u>	FT.

COMMENTS: —

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>117'</u>	<u>100</u>	<u>NR</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1968</u>	<u>155</u>	<u>7 7/8</u>	<u>805</u>	<u>650</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Rick Reed
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 9 Aug 96ADDRESS —DEPT. C. DATE PLUGGING COMPLETED 9 Aug 96
SPRINGFIELDCITY, STATE —ZIP —

AUG 13 1996

8-12

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY NO. 491300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

756739

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan Est PERMITTEE NO. 868WELL NAME: Oliver #4 PERMIT NO. 004160 REFERENCE NO. 129362
(ISSUE DATE IF NO NUMBER) COUNTY COLES SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND
330 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE SW QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>684</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1971</u>	FT.	FROM <u>1907</u> TO <u>1911</u>
PLUGGED BACK TOTAL DEPTH	<u>1938</u>	FT.	FROM <u>1917</u> TO <u>1927</u>
BASE OF FRESHWATER ZONE	<u>334</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u>	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>1938</u> TO <u>1713</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>wellbore fluid</u>	FROM <u>1713</u> TO <u>396</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>396</u> TO <u>4</u> FT.
FILLED WITH <u>Top soil</u>	FROM <u>4</u> TO <u>SURFACE</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>117</u>	<u>100</u>	<u>NR</u>	<u>GL</u>	<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1967</u>	<u>150</u>	<u>NR</u>	<u>750</u>	<u>680'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Rick Reed DATE PLUGGING BEGAN 12 Aug 96
PERMITTEE OR DESIGNEEADDRESS _____ DATE PLUGGING COMPLETED 12 Aug 96

CITY, STATE _____ ZIP _____ RECEIVED

The Seal of the State of Illinois is a circular emblem. It features an eagle with wings spread, perched on a rock. The eagle's right talon holds a shield with vertical stripes, and its left talon holds a bundle of arrows. A banner is draped across the eagle's chest with the word 'STATE SOVEREIGN, NATIONAL UNION'. The outer ring of the seal contains the text 'SEAL OF THE STATE OF ILLINOIS' at the top and 'AUG 26th 1818' at the bottom, separated by two stars.

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756

COUNTY No. 538

524 South Second Street
Springfield, Illinois 62701-1787

776507

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Walter Duncan, Inc. PERMITTEE NO. 868

WELL NAME: Oliver #7 PERMIT NO. 4406 REFERENCE NO. 129363
(ISSUE DATE IF NO NUMBER)

COUNTY Colles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: 1650 FT. NORTH; OR _____ FT. SOUTH; AND
990 FT. EAST; OR _____ FT. WEST OF THE SW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>689</u>	FT.	PRODUCING / INJECTION INTERVALS	
TOTAL DEPTH OF WELL	<u>1969</u>	FT.	FROM <u>1906</u>	TO <u>1910</u>
PLUGGED BACK TOTAL DEPTH	<u>N/A</u>	FT.	FROM _____	TO _____
BASE OF FRESHWATER ZONE	<u>339</u>	FT.	FROM _____	TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u>	FT.	FROM _____	TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____				

DETAILS OF PLUGGING:

FILLED WITH	<u>cement</u>	FROM	<u>1969</u>	TO	<u>1740</u>	FT.
	(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)					
FILLED WITH	<u>wellbore fluid</u>	FROM	<u>1740</u>	TO	<u>410</u>	FT.
FILLED WITH	<u>cement</u>	FROM	<u>410</u>	TO	<u>4</u>	FT.
FILLED WITH	<u>top soil</u>	FROM	<u>4</u>	TO	<u>0</u>	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.

COMMENTS: _____

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	118	100	13.75	0	4'
INTERMEDIATE / MINE STRING / OR LINER	5 1/2	1966	175	7.38	712	580'
PRODUCTION						RECEIVED

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT AND COMPLETE.

SIGNATURE OF: Kon Bauer
PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 5-7-97

P.O. Box 832
ADDRESS

DATE PLUGGING COMPLETED 5-7-97

Mattoon IL 61938
CITY STATE ZIP

County

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ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756COUNTY No. 545524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

776714

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Walter Duncan, Inc.PERMITTEE NO. 868WELL NAME: Oliver #8PERMIT NO. 88

(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 129364 COUNTY Coles SECTION 2
TOWNSHIP 12N RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND
990 FT. EAST; OR _____ FT. WEST OF THE SW
CORNER OF THE NW QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION	<u>688</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1930</u>	FT.	FROM <u>1906</u> TO <u>1910</u>
PLUGGED BACK TOTAL DEPTH	<u>N/A</u>	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>338</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u>	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH	<u>cement</u>	<u>25</u> sks	FROM <u>1930</u> TO <u>710</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)			
FILLED WITH	<u>wellbore fluid</u>		FROM <u>1710</u> TO <u>400</u> FT.
FILLED WITH	<u>cement</u>		FROM <u>400</u> TO <u>4</u> FT.
FILLED WITH	<u>top soil</u>		FROM <u>4</u> TO <u>0</u> FT.
FILLED WITH			FROM _____ TO _____ FT.
FILLED WITH			FROM _____ TO _____ FT.
FILLED WITH			FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	104	85	13.75	0	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	7	1930	125	8.75	1145	600'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: _____
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 5-9-97

ADDRESS _____

DATE PLUGGING COMPLETED 5-9-97

CITY, STATE _____

ZIP _____

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756524 South Second Street
Springfield, Illinois 62701-1787COUNTY NO. 22480

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Mack Reeves Oil & Gas Producers PERMITTEE NO. 555WELL NAME: Oliver #1 PERMIT NO. 001920 REFERENCE NO. 503570
(ISSUE DATE IF NO NUMBER) COUNTY Coles SECTION 02
TOWNSHIP 12N RANGE 07E
LOCATION: 1650 FT. NORTH; OR — FT. SOUTH; AND
— FT. EAST; OR 1650 FT. WEST OF THE SE
CORNER OF THE — QUARTER OF THE —
QUARTER OF THE — QUARTER OF THE —
QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>686</u> FT.	PRODUCING / INJECTION INTERVALS	
TOTAL DEPTH OF WELL	<u>1774</u> FT.	FROM <u>1726</u> TO <u>1750</u>	
PLUGGED BACK TOTAL DEPTH	<u>—</u> FT.	FROM <u>—</u> TO <u>—</u>	
BASE OF FRESHWATER ZONE	<u>136</u> FT.	FROM <u>—</u> TO <u>—</u>	
WORKABLE COALS PRESENT AT	<u>—</u> FT.	FROM <u>—</u> TO <u>—</u>	

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: —

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>1774</u> TO <u>1676</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT OR OTHER MATERIALS)	
FILLED WITH <u>well bore fluid</u>	FROM <u>1676</u> TO <u>210</u> FT.
FILLED WITH <u>cement</u>	FROM <u>210</u> TO <u>0</u> FT.
FILLED WITH <u>—</u>	FROM <u>—</u> TO <u>—</u> FT.
FILLED WITH <u>—</u>	FROM <u>—</u> TO <u>—</u> FT.
FILLED WITH <u>—</u>	FROM <u>—</u> TO <u>—</u> FT.
FILLED WITH <u>—</u>	FROM <u>—</u> TO <u>—</u> FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 7/8	114	25	12 1/4		4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	4 1/2	1768'	150	7 7/8		815

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Dennis L. Shop
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 3-12-2001DATE PLUGGING COMPLETED 3-13-2001

ADDRESS

CITY, STATE

ZIP

MAR 26 2001

GEOLOGIC RECORDS

County Coles Sec. 02 Twp. 12N R. 07E

65 #22483

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9

WELL PLUGGING AFFIDAVIT

SS. E. C. Reeves and
E. E. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil or Gas

(Indicate whether for oil, gas, water or other purposes)
known as the Oliver #3 and located as follows: 1650 ft. north;
ft. south; 2310 ft. east; 2310 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SE corner of the SE Quarter
of the SE Quarter of the SE Quarter of
Section 2, Township 12 (North of South)
Range 7, (East of West) of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 1775 ft.
Ground 2310 ft.

Total depth 1775 Formation Cypress

Date permit to drill issued 4/7/76 Permit No. 2144

Permit issued to E. C. Reeves

Date drilling began 4-8-76

Date drilling completed 4/12/76

Kind of drilling tools used Rotary

Date plugging began 4/13/76

Date plugging completed 4/13/76

Lessor Oliver Estate Address Mattoon, Illinois
Lessee E. C. Reeves Address Mattoon, Illinois
Drilling Contractor M & E. Drilling Co. Address Casey, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1775</u>	To <u>1700</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Rotary Mud</u>	From <u>1700</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>90</u>	feet
Kind of Plug <u>Rotary Mud</u>	From <u>90</u>	To <u>15</u>	feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet
Filled with <u>Rot Hole filled with cement TD to 03</u>	From <u>03</u>	To <u>0</u>	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)
None encountered

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production DRY HOLE - 4-13-76

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8/58"	105	-	4				Cemented w/ 50 sacks when run.

E. C. Reeves

APR 20 1976

(Signature of person, firm or corporation having custody or control of well.)

Per E. C. Reeves DEPARTMENT OF REVENUE

Address Mattoon, Illinois - 61938 MINES & MINERALS

E. E. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 17th day of April A.D. 19 76

My commission expires 10-28-76

Notary Public

WELL PLUGGING AFFIDAVIT

County of Coles } SS. J. R. Bridgeman and
H. L. Noblit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

(Indicate whether for oil, gas, water or other purposes)
known as the Oliver # 1-B and located as follows: 1650 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

ft. south; 2310 ft. east; 2310 ft. west
of the SE corner of the Quarter
of the Quarter of the Quarter
Section 2, Township 12 (North or South) x
Range 7, (East or West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 684 ft.

Total depth 1780 Formation Cypress

Date permit to drill issued 8/16/79 Permit No. 7914

Permit issued to Charles Armantrout

Date drilling began 8/16/79

Date drilling completed 8/17/79

Kind of drilling tools used Rotary

Date plugging began 10/14/83

Date plugging completed 10/14/83

Lessor Oliver Address
Lessee Charles Armantrout Address P.O. Box #217 Mattoon, IL.
Drilling Contractor Depoister Drilling Co. Address Effingham, IL.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1780</u>	To <u>1720</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Mud</u>	From <u>1720</u>	To <u>250</u> feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>03</u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet
Filled with <u> </u>	From <u> </u>	To <u> </u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet
Filled with <u> </u>	From <u> </u>	To <u> </u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? Yes ☒ No ☐

(2) Have the following been removed?
Equipment Yes ☒ No ☐ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☒

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been leveled? Yes ☐ No ☒

If this was a producing well, give date and amount of last production Abanded

CASING RECORD

PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
Size	Feet Inches	Feet	Inches	Feet	Inches	
<u>XNO</u>	<u>122233</u>					
<u>4 1/2</u>	<u>1280</u>	<u>1260</u>		<u>520</u>		
<u>8 5/8</u>	<u>105</u>	<u>3</u>		<u>102</u>		

Charles Armantrout

(Signature of person, firm or corporation having custody or control of well.)

Per J. R. Bridgeman

Address Mattoon, IL.

H. L. Noblit Well Inspector

(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 14th day of October, A.D. 19 83

My commission expires My Commission Expires August 27, 1985

Mable Noblit

Notary Public

3-9-2001

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756COUNTY NO. 22481524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Merle Reeves Oil & Gas Producers PERMITTEE NO. 555WELL NAME: Oliver #2 PERMIT NO. 001929 REFERENCE NO. 503571
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 02
 TOWNSHIP 12N RANGE 07E
 LOCATION: 2310 FT. NORTH; OR _____ FT. SOUTH; AND
 _____ FT. EAST; OR 1650 FT. WEST OF THE SE
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>686</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1774</u>	FT.	FROM <u>1744</u> TO <u>1770</u>
PLUGGED BACK TOTAL DEPTH		FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>136</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT		FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u>	FROM <u>1774</u>	TO <u>1694</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)			
FILLED WITH <u>well bore fluid</u>	FROM <u>1694</u>	TO <u>210</u>	FT.
FILLED WITH <u>cement</u>	FROM <u>210</u>	TO <u>0</u>	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>8 7/8</u>	<u>114</u>	<u>25</u>	<u>12 1/4</u>		<u>4</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>4 1/2</u>	<u>1770</u>	<u>150</u>	<u>7 7/8</u>	<u>700</u>	<u>750</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Dennis L. Shays
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 3-8-2001DATE PLUGGING COMPLETED 3-9-2001

ADDRESS

CITY STATE

ZIP

MAR 23 2001
GEOLOGIC RECORDSCounty Coles
Sec. 02 Twp. 12N R. 07E

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Bible Grounds (Vickers & Blowers)

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil or Gas 1348 NL 2408 EL NE

(Indicate whether for oil, gas, water or other purposes)

known as the George Arthur #1

and located as follows: _____ ft. north;

1348 ft. south; _____ ft. east; 2408 ft. west

of the _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 2, Township 12 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.Total depth 3195 Formation DevDate permit to drill issued 12-17-45 & 10-10-46 Permit No. 2132 & 2335Permit issued to National Consumers Oil Co.Date drilling began January 1946Date drilling completed Sept 1, 1954Kind of drilling tools used RotaryDate plugging began October 21, 1955Date plugging completed October 25, 1955Lessor Mrs. George ArthurAddress R.R., Mattoon, IllinoisLessee National Consumers Oil CompanyAddress 940 Wabash Ave., Terre Haute, Ind.

Drilling Contractor _____

Address _____

DETAILS OF PLUGGING:

Filled with _____ From _____ To _____ feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 3195 To 3090 feetFilled with Mud From 3090 To 130 feetKind of Plug Cement From 130 To 97 feetFilled with Mud From 97 To 8 feetKind of Plug Cement Cap From 8 To 3 feetFilled with Soil From 3 To 0 feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 3/4	117		none		117		Cemented in
7	1915		821		1094		Unable to pull
4 1/2	3150		1646		1504		Unable to pull

National Consumers Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Bible GroundsAddress Centralia, IllLowell E. Bennett Well Inspector

(Signature and title of party supervising plugging of well.)

Address Matineville, IllinoisSubscribed and sworn to before me this 5th day of November, A.D. 19 55My commission expires July 10, 1957Dwight D. Bennett

Notary Public

ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

60#1010
STATE OF ILLINOIS,County of Calhoun ss.815782 J
WELL PLUGGING AFFIDAVIT

O. G. 6 (3250-10M-8-45)

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled forOil
(Indicate whether for oil, gas, water or other purposes)known as the George Arthur No 9 and located as follows: Locate well accurately on plat of section
(Scale one inch=2,000 ft.)330 ft. south; _____ ft. east; 306 ft. west
of the NE corner of the NE Quarter
of the _____ Quarter of the _____ Quarter of
Section 2, Township 12 (North or South)
Range 7, (East or West), of the 3
Principal Meridian, Calhoun County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground 694 ft.Total depth of well is 3200 ft.Date permit to drill issued January 23-1946Permit issued to National Consumers Oil Co IncDate drilling began Feb 2-1946Date drilling completed Feb 15-1946Kind of drilling tools used RotaryDate plugging began May 7-1946Date plugging completed May 8-1946Lessor George Arthur Address Mattoon RR Ill
Lessee National Consumers Oil Co Inc Address 942 Upbeek Ave Terre Haute Ind.
Drilling Contractor Tom Hinds Drilling Co Address Salmon Ill

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>3200±</u>	<u>3128</u>	
Kind of Plug <u>Rotary Mud</u>	<u>3126</u>	<u>74</u>	
Filled with <u>Cement</u>	<u>74</u>	<u>50</u>	
Kind of Plug <u>Rotary Mud</u>	<u>50</u>	<u>27</u>	
Filled with <u>Cement</u>	<u>27</u>	<u>2</u>	
Kind of Plug <u>Soil</u>	<u>2</u>	<u>Surface</u>	
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details _____

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
5 1/2	2010		2010				
10	66		2		64		

Acme Casing Pulling Co
(Signature of person, firm or corporation having custody or control of well.)Per. C. J. McConasAddress Grayville 20eWalter Stewart Investigator
(Signature and title of party supervising plugging of well.)Address Pain RR 2 IllinoisSubscribed and sworn to before me this 10 day of May, A. D. 1946My commission expires Nov. 30-1947

Notary Public.

MATTOON

60 191

(47189-10M-11-56)

2

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

R. F. Anderson

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Opal Arthur #1 and located as follows: Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; 330 ft. east; _____ ft. west
of the NW corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 2, Township 12 (North or ~~South~~)
Range 7, (East or ~~West~~), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.

Total depth 1953 Formation _____Date permit to drill issued 4-6-56 Permit No. 1140Permit issued to R. F. Anderson & James McBrideDate drilling began April 5, 1956Date drilling completed April 11, 1956Kind of drilling tools used RotaryDate plugging began October 31, 1957Date plugging completed November 1, 1957Lessor Mrs. Opal Arthur Address R.F.D., Mattoon, IllinoisLessee R. F. Anderson James McBride Address Box 62, Mattoon, IllinoisDrilling Contractor W. L. Dillier Address Casey, Illinois

DETAILS OF PLUGGING:

Filled with _____ From _____ To _____ feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1953 To 1866 feetFilled with Mud From 1866 To 82 feetKind of Plug Cement From 82 To 51 feetFilled with Mud From 51 To 8 feetKind of Plug Cement From 8 To 3 feetFilled with Soil From 3 To 0 feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
8 5/8	72		none		72		Cemented in
4 1/2	1952		none		1952		Cemented in (Circ.)

R. F. Anderson & James McBride

(Signature of person, firm or corporation having custody or control of well.)

Per R. F. AndersonAddress Box 62, Mattoon, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 8 day of Nov., A.D. 1957My commission expires 8-7-60Ray Hammack
Notary Public.ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

DEPT. OF REVENUE
MINES AND METALS
RECEIVED
NOV 13 1957
DIVISION OF
OIL AND GAS ADMINISTRATION

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Walter Duncan

and

Marion Fritschle

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oilknown as the Oliver # 1 (Indicate whether for oil, gas, water or other purposes) and located as follows: 330 ft. north;330 ft. south; 330 ft. east; ft. westof the SW corner of the SW Quarterof the SW Quarter of the Quarter ofSection 2, Township 12 (North or South)Range 7, (East or West), of thePrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 693 ft.
Ground ft.Total depth 1995 Formation CypressDate permit to drill issued 10/10/46 Permit No. 1950Permit issued to Walter Duncan--John BoothDate drilling began 10/10/46Date drilling completed 10/21/46Kind of drilling tools used RotaryDate plugging began 12/29/70Date plugging completed 12/29/70 Locate well accurately on plat of section
(Scale one inch--2,000 ft.)

Lessor Oliver Estate Address Mattoon, Illinois
 Lessee Walter Duncan--John Booth Address Box 805, Mt Vernon, Illinois
 Drilling Contractor Hadaller & Persful Address Unknown

DETAILS OF PLUGGING:

Filled with	From	To	feet
PPB (See Remarks)	1995	1755	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>1775</u>	To <u>1725</u>	feet
Filled with <u>Mud</u>	From <u>1725</u>	To <u>250</u>	feet
Kind of Plug <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Filled with <u>Mud</u>	From <u>200</u>	To <u>136</u>	feet
Kind of Plug <u>Cement</u>	From <u>136</u>	To <u>105</u>	feet
Filled with <u>Mud</u>	From <u>105</u>	To <u>15</u>	feet
Kind of Plug <u>Cement</u>	From <u>15</u>	To <u>3</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? Yes ☐ No ☒
 (2) Have the following been removed?
 Equipment ☐ Yes ☒ Concrete bases ☐ Yes ☒ Debris ☐ Yes ☒
 (3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
 (4) Has well-site been levelled? Yes ☐ No ☒
 If this was a producing well, give date and amount of last production 2 bbl per week

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
7"	1908		1135		773		One string of tools and one
10 3/4"	126				123		bailer left in hole plus cement
							from 1995 to 1755.

Walter Duncan

(Signature of person, firm or corporation having custody or control of well.)

Per Division of Oil & Gas
Address R. R. # 2, Grayville, IllinoisMarion Fritschle 1974 Well Inspector

(Signature and title of party supervising plugging of well.)

Address R. R. # 1, back Liberty, IllinoisSubscribed and sworn to before me this 30th day of MINES & MINERALS, A.D. 1970My commission expires 10/20/74
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

A. C. Barnhart (W. L. Dillier Delg Cont.) and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and/or Gas 2970 ft. north SE

(Indicate whether for oil, gas, water or other purposes)

known as the Oliver # 14 and located as follows: 2970 ft. north;ft. south; 990 ft. east; _____ ft. westof the SW corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 2, Township 12 (North or South)Range 7, (East or West), of the _____Principal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.Total depth 1997 Formation _____Date permit to drill issued 11-5-58 Permit No. 2510Permit issued to Walter DuncanDate drilling began November 13, 1958Date drilling completed November 18, 1958Kind of drilling tools used RotaryDate plugging began November 19, 1958Date plugging completed November 19, 1958 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Oliver Address _____Lessee Walter Duncan Address Box 211, LaSalle, IllinoisDrilling Contractor W. L. Dillier Address Casey, Illinois

DETAILS OF PLUGGING:

Filled with Rotary Mud From 1997 To 1947 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1947 To 1873 feetFilled with Rotary Mud From 1873 To 89 feetKind of Plug Cement From 89 To 59 feetFilled with Rotary Mud From 59 To 8 feetKind of Plug Cement From 8 To 3 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	72		none		72		Cemented - Set @ 79'

Walter Duncan

(Signature of person, firm or corporation having custody or control of well.)

Per A. C. BarnhartAddress Olney, IllinoisLowell E. Bennett Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Martinsville, IllinoisSubscribed and sworn to before me this 24th day of November, A.D. 1958My commission expires 7-9-60 Lowell E. Bennett

Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140COUNTY No. 533
0000 79 000

320095 OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☐ PRODUCTION ☒ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERWELL NAME: M. Oliver #6 PERMIT NO. 250
(ISSUE DATE IF NO NUMBER)PERMITTEE: Walter Duncan #868 REFERENCE NO. 1323

COUNTY	<u>Coles</u>	SECTION	<u>2</u>	TOWNSHIP	<u>12N</u>	RANGE	<u>7E</u>
LOCATION:	<u>2310</u>	FT. NORTH; OR		FT. SOUTH; AND	<u>990</u>	FT. EAST; OR	
OF THE		CORNER OF THE		QUARTER		OF	
THE		QUARTER.					

DATE PLUGGING BEGAN 3-4-92 DATE PLUGGING COMPLETED 3-5-92PLUGGING CONTRACTOR Bangert Casing PullingADDRESS Clay City IL

WELL DATA:

TOTAL DEPTH OF WELL	<u>1964</u>	FT.	PRODUCING / INJECTION INTERVALS
PLUGGED BACK TOTAL DEPTH		FT.	FROM <u>1911</u> TO <u>1929</u>
BASE OF FRESHWATER ZONE	<u>137</u>	FT.	FROM <u>1913</u> TO <u>1919</u>
WORKABLE COALS PRESENT AT		FT.	FROM <u>1924</u> TO <u>1928</u>
<u>687</u>		FT.	FROM _____ TO _____
<u>550</u>		FT.	
<u>137</u>		FT.	
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u>	FROM <u>TD</u> TO <u>1900</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>mud</u>	FROM <u>1900</u> TO <u>250</u> FT.
FILLED WITH <u>Cement</u>	FROM <u>250</u> TO <u>4</u> FT.
FILLED WITH <u>soil</u>	FROM <u>4</u> TO <u>0</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
COMMENTS:	

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>90</u>	<u>50</u>			<u>4</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1962</u>	<u>150</u>		<u>1000'</u>	<u>1000'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Ron Baer PERMITTEE OR DESIGNEESIGNATURE OF: Perin Baer INSPECTOR WITNESSING PLUGGINGADDRESS: P.O. Box 832DATE: 3-5-92CITY, STATE: Mattoon, Ill. ZIP: 61938

2-12N-7E-1

3-30-05

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 557-6379One Natural Resources Way
Springfield, Illinois 62702/1271

Cb #23113

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Charles Armantrout

PERMITTEE#: 110

WELL NAME: Oliver #2-E

PERMIT#: 019816

REFERENCE#: 128460

(ISSUE DATE IF NO NUMBER)

COUNTY Coles

SECTION 02 TWP 12N RANGE 07E

LOCATION: 0330 FT. NORTH; OR

FT. SOUTH, AND FT. EAST; OR 0330

FT. WEST OF THE SE CORNER OF THE NE

QUARTER OF THE SE QUARTER OF THE

SW QUARTER OF THE QUARTER.

WELL DATA:

SURFACE ELEVATION: 688 FT.
 TOTAL DEPTH OF WELL 1962 FT.
 PLUGGED BACK TOTAL DEPTH FT.
 BASE OF FRESHWATER ZONE 138 FT.
 WORKABLE COALS PRESENT AT FT.
 DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

PRODUCING / INJECTION INTERVALS

FROM 1747 TO 1757
 FROM 1922 TO 1928
 FROM TO
 FROM TO

DETAILS OF PLUGGING:

FILLED WITH wellbore fluid FROM 1962 TO 1950 FT.
 (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)

FILLED WITH cement FROM 1950 TO 1690 FT.

FILLED WITH wellbore fluid FROM 1690 TO 210 FT.

FILLED WITH cement FROM 210 TO 05 FT.

FILLED WITH FROM TO FT.

FILLED WITH FROM TO FT.

FILLED WITH FROM TO FT.

FILLED WITH FROM TO FT.

Comments:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8.63	95	100	12.25	0	
INTERMEDIATE/ MINE STRING/OR LINER						
PRODUCTION	4.50	1962	100	7.88	1420	1200

Under penalties of perjury, I declare that I have examined this form including accompanying statements and documents, and to the best of my knowledge, it is true, correct and complete.

Maurice A. Judy
Signature of Permittee or Designer

3-29-05

Date Plugging began

3-30-05

Date Plugging Completed

Address

City, State, Zip

☒ Inspector present during plugging operations

Dail L Matlock

Inspector Signature

Dail L Matlock

Inspector Signature

Inspector Signature

cementing bottom

Activity

cementing top

Activity

Activity

3-29-05

Date

3-30-05

Date

Date

☐ Inspector not present during plugging operations

Authorization for Inspector not being present

Manager Signature

Date

☐ Plugging information sent to District Office

☐ Inspector site visit to pick up plugging information

Inspector

Date

APR 13 2005

ECOLOGIC RECORDS

2-12N-7E-2

MATTOON

60 191

(47189-10M-11-56)

State of ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

R. F. Anderson

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and Gas

(Indicate whether for oil, gas, water or other purposes)

known as the

Opal Arthur # 1

and located as follows:

ft. north;

330 ft. south; 330 ft. east; ft. west

of the NW corner of the Quarter

of the Quarter of the Quarter of the

Section 2, Township 12 (North or South)

Range 7, (East or West), of the

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground ft.

Total depth 1953 Formation

Date permit to drill issued 4-6-56 Permit No. 1140

Permit issued to R. F. Anderson & James McBride

Date drilling began April 5, 1956

Date drilling completed April 11, 1956

Kind of drilling tools used Rotary

Date plugging began October 31, 1957

Date plugging completed November 1, 1957

Lessor Mrs. Opal Arthur

Address R.F.D., Mattoon, Illinois

Lessee R. F. Anderson James McBride

Address Box 62, Mattoon, Illinois

Drilling Contractor W. L. Dillier

Address Casey, Illinois

DETAILS OF PLUGGING:

Filled with (Rotary Mud, Cement, or Other Materials) From To feet

Kind of Plug Cement From 1953 To 1866 feet

Filled with Mud From 1866 To 82 feet

Kind of Plug Cement From 82 To 51 feet

Filled with Mud From 51 To 8 feet

Kind of Plug Cement From 8 To 3 feet

Filled with Soil From 3 To 0 feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed?

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	72		none		72		Cemented in
4 1/2	1952		none		1952		Cemented in (Circ.)

R. F. Anderson & James McBride

(Signature of person, firm or corporation having custody or control of well.)

Per

Address Box 62, Mattoon, Illinois

Lowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, Illinois

Subscribed and sworn to before me this 8 day of Nov., A.D. 1957

My commission expires 8-7-60

Deoy Hammack
Notary Public.ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

3-12N-7E

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 418

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

4h

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER _____

PERMITTEE: Glenn A. Kursch REFERENCE NO. 123055

WELL NAME: Degler #1 PERMIT NO. 326.2

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND _____ FT. EAST; OR 330 FT. WEST
WEST OF THE Se CORNER OF THE Ne QUARTER _____ OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 4/25/91 DATE PLUGGING COMPLETED 4/26/91

PLUGGING CONTRACTOR Leattles Casing Pulling

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL ? FT.

PLUGGED BACK TOTAL DEPTH _____ FT.

BASE OF FRESHWATER ZONE 300 FT.

WORKABLE COALS PRESENT AT _____ FT.

_____ FT.

_____ FT.

PRODUCING / INJECTION INTERVALS

FROM _____ TO _____

FROM _____ TO _____

FROM _____ TO _____

FROM _____ TO _____

FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement 75X FROM TD TO 1910 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)

FILLED WITH mud FROM 1910 TO 350 FT.

FILLED WITH Cement 75SX FROM 350 TO 4 FT.

FILLED WITH Soil FROM 4 TO 0 FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

RECEIVED

APR 29 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"					4'
INTERMEDIATE /MINE STRING / OR LINER						
PRODUCTION	5 1/2	1'		7 7/8		1240'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

Greg Willette
PERMITEE OR DESIGNEE

ADDRESS

CITY, STATE

ZIP

Kevin Spencer
INSPECTOR WITNESSING PLUGGING

DATE

4/25 & 26/91

COUNTY No. 548

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140221721 AL
An

OG-6 WELL PLUGGING REPORT

COUNTY No. 548 72

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Glenn Kirsch REFERENCE NO. 123056WELL NAME: Degler #2 PERMIT NO. 3579

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 7E
 LOCATION: ~~330~~ FT NORTH; OR 330 FT SOUTH; AND ~~330~~ FT EAST; OR 330 FT WEST
 WEST OF THE NE CORNER OF THE SE QUARTER NE OF QUARTER OF
 THE QUARTER.

DATE PLUGGING BEGAN 4/30/91 DATE PLUGGING COMPLETED 4/30/91 *matson*PLUGGING CONTRACTOR Wattles Casing PullingADDRESS

WELL DATA:

TOTAL DEPTH OF WELL	<u>?</u> FT	PRODUCING / INJECTION INTERVALS
PLUGGED BACK TOTAL DEPTH	<u> </u> FT	FROM <u>N/A</u> TO <u> </u>
BASE OF FRESHWATER ZONE	<u>250</u> FT	FROM <u> </u> TO <u> </u>
WORKABLE COALS PRESENT AT	<u> </u> FT	FROM <u> </u> TO <u> </u>
	<u> </u> FT	FROM <u> </u> TO <u> </u>
	<u> </u> FT	FROM <u> </u> TO <u> </u>

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH <u>Cement 10 sks</u>	FROM <u>TD</u> TO <u>Approx 1900</u> FT
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>Mud</u>	FROM <u>1900</u> TO <u>300</u> FT
FILLED WITH <u>Cement 75 sks</u>	FROM <u>300</u> TO <u>4</u> FT
FILLED WITH <u>Soil</u>	FROM <u>4</u> TO <u>0</u> FT
FILLED WITH <u> </u>	FROM <u> </u> TO <u> </u> FT
FILLED WITH <u> </u>	FROM <u> </u> TO <u> </u> FT
FILLED WITH <u> </u>	FROM <u> </u> TO <u> </u> FT
FILLED WITH <u> </u>	FROM <u> </u> TO <u> </u> FT

RECEIVED

MAY 13 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"	?	N/A		Surface	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	?	N/A	N/A	850'	1243'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

Ray E. Watters
PERMITTEE OR DESIGNEE

Kevin Spencer
INSPECTOR WITNESSING PLUGGING

Did not supervise

ADDRESS

4/30/91
DATE

CITY, STATE

ZIP

ILLINOIS DEPARTMENT OF MINES AND MINERALS
OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 548

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

42

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Glenn A Kirsch REFERENCE NO. 123056

WELL NAME: Degler #2 PERMIT NO. _____

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND _____ FT. EAST; OR 330 FT. WEST
WEST OF THE NE CORNER OF THE SE QUARTER OF SE QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 4/25 DATE PLUGGING COMPLETED 4/26/91

PLUGGING CONTRACTOR Wattles Casing Pulling

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL ? FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE 300 FT.
WORKABLE COALS PRESENT AT _____ FT.
_____ FT.
_____ FT.

PRODUCING / INJECTION INTERVALS

FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement 85x FROM TD TO 1900 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH Mud FROM 1900 TO 350 FT.
FILLED WITH Cement 805x FROM 350 TO 4 FT.
FILLED WITH SOIL FROM 4 TO 0 FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

RECEIVED

APR 29 1991

Department of Mines & Minerals

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"					4
INTERMEDIATE /MINE STRING / OR LINER						
PRODUCTION	5 1/2			7 7/8		1226

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

 PERMITTEE OR DESIGNEE

 INSPECTOR WITNESSING PLUGGING

ADDRESS

DATE

CITY, STATE

ZIP

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

CORRECTED COPY

OG-6 WELL PLUGGING REPORT

COUNTY No. 482

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Glenn Kirsch REFERENCE NO. 12305912 3057WELL NAME: Degler #3 PERMIT NO. 2476 3580COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 14W 7E
LOCATION: 330 FT. NORTH; OR 330 FT. SOUTH; AND 330 FT. EAST; OR 330 FT. WEST
WEST OF THE SW CORNER OF THE SE QUARTER NE OF --- QUARTER OF
THE --- QUARTER.DATE PLUGGING BEGAN 5/1/91 DATE PLUGGING COMPLETED 5/1/91PLUGGING CONTRACTOR ---ADDRESS ---

WELL DATA:

TOTAL DEPTH OF WELL Approx 2000 FT
PLUGGED BACK TOTAL DEPTH --- FT
BASE OF FRESHWATER ZONE 250 FT
WORKABLE COALS PRESENT AT --- FT
--- FT
--- FT

PRODUCING / INJECTION INTERVALS

FROM N/A TO ---
FROM --- TO ---
FROM --- TO ---
FROM --- TO ---
FROM --- TO ---DESCRIBE PREVIOUS PLUGBACK PROCEDURE: ---

DETAILS OF PLUGGING:

FILLED WITH Cement 10 sks FROM TO TO 1900 FT
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH Mud FROM 1900 TO 300 FT
FILLED WITH Cement 75 sks FROM 300 TO 0 FT
FILLED WITH --- FROM --- TO --- FT
FILLED WITH --- FROM --- TO --- FT
FILLED WITH --- FROM --- TO --- FT
FILLED WITH --- FROM --- TO --- FT
FILLED WITH --- FROM --- TO --- FT

RECEIVED

MAY 13 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"	N/A	N/A			4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2"	N/A	N/A		800'	1237'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

Ray E. Clatter

PERMITTEE OR DESIGNEE

ADDRESS

CITY, STATE ZIP

DATE

5/1/91

INSPECTOR WITNESSING PLUGGING

Reinhard

COUNTY No. 547

72

220847AL
AW

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Glenn A Kirsch REFERENCE NO. 123059

WELL NAME: Degler #3 PERMIT NO.

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND _____ FT. EAST; OR 330 FT. WEST
WEST OF THE NE CORNER OF THE SE QUARTER _____ OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 4/24/91 DATE PLUGGING COMPLETED 4/25/91PLUGGING CONTRACTOR Wattles Casing Rilling

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL	FT.	PRODUCING / INJECTION INTERVALS
PLUGGED BACK TOTAL DEPTH	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>300</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	FT.	FROM _____ TO _____
	FT.	FROM _____ TO _____
	FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH		FROM	TO	FT.
<u>Cement</u>	<u>10SX</u>	<u>TD</u>	<u>1900</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)				
<u>Mud</u>		<u>1900</u>	<u>350</u>	FT.
<u>Cement</u>	<u>75SX</u>	<u>350</u>	<u>4</u>	FT.
<u>Soil</u>		<u>4</u>	<u>0</u>	FT.
FILLED WITH		FROM	TO	FT.
FILLED WITH		FROM	TO	FT.
FILLED WITH		FROM	TO	FT.
FILLED WITH		FROM	TO	FT.

RECEIVED

APR 29 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE						
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	2	?	7 7/8		1100'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

 PERMITTEE OR DESIGNEE

 INSPECTOR WITNESSING PLUGGING

 ADDRESS

 DATE
 4/24+25/91

CITY, STATE

ZIP

ILLINOIS DEPARTMENT OF MINES AND MINERALS
OIL AND GAS DIVISION
(217) 782-7756

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

221720 A
4h

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Glenn Kirsch REFERENCE NO. 123059

WELL NAME: Degley #3 PERMIT NO. 9976

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 14W
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND _____ FT. EAST; OR 330 FT. WEST
WEST OF THE NE CORNER OF THE SE QUARTER _____ OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 5/1/91 DATE PLUGGING COMPLETED 5/1/91

PLUGGING CONTRACTOR _____

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL Approx 2000' FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE 250 FT.
WORKABLE COALS PRESENT AT _____ FT.
_____ FT.
_____ FT.

PRODUCING / INJECTION INTERVALS

FROM N/A TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement 10 sks FROM TD TO 1900 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH mud FROM 1900 TO 300 FT.
FILLED WITH Cement 75 sks FROM 300 TO 0 FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

RECEIVED

MAY 13 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"	N/A	N/A			4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2"	N/A	N/A		1800'	1237'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: *Ray E. Watters*
PERMITTEE OR DESIGNEE

Kevin Spencer
INSPECTOR WITNESSING PLUGGING

ADDRESS _____

5/1/91
DATE

CITY, STATE _____ ZIP _____

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OG-6 WELL PLUGGING REPORT

COUNTY No. 538

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Glenn Kirsch-Wattles Casing Pulling REFERENCE NO. 123060

WELL NAME: Degler #5 PERMIT NO. _____

COUNTY Coles SECTION 3 TOWNSHIP 12W RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND _____ FT. EAST; OR 330 FT. WEST
WEST OF THE SE CORNER OF THE NE QUARTER SE OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 4/23/91 DATE PLUGGING COMPLETED 4/24/91

PLUGGING CONTRACTOR Wattles Casing Pulling

ADDRESS RR#3 Box 150 Louisville IL 62858

WELL DATA:

TOTAL DEPTH OF WELL N/A FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE 300 FT.
WORKABLE COALS PRESENT AT _____ FT.
_____ FT.
_____ FT.

PRODUCING / INJECTION INTERVALS

FROM N/A TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>Cement 105X</u> <small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>	FROM <u>TD</u> TO <u>1900</u> FT.
FILLED WITH <u>Mud</u>	FROM <u>1900</u> TO <u>350</u> FT.
FILLED WITH <u>Sol Cement 755X</u>	FROM <u>350</u> TO <u>4</u> FT.
FILLED WITH <u>Sal</u>	FROM <u>4</u> TO <u>0</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

RECEIVED

APR 29 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"	?	?	?	Surface	4'
INTERMEDIATE /MINE STRING / OR LINER						
PRODUCTION	5 1/2	?	?	7 7/8	?	792'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

PERMITTEE OR DESIGNEE

ADDRESS

CITY, STATE

ZIP

INSPECTOR WITNESSING PLUGGING

DATE

4/23+24/91

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140221722AL
FH
COUNTY No. 620
72

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Glenn Kirsch REFERENCE NO. 123061WELL NAME: Degler #6 PERMIT NO. 2607

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 14E 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND 330 FT. EAST; OR _____ FT. WEST
WEST OF THE SW CORNER OF THE NE QUARTER OF SE QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 5/2/91 DATE PLUGGING COMPLETED 5/2/91PLUGGING CONTRACTOR Wattles Casing Pulling

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL 2000 ^{Approx} FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE 250 FT.
WORKABLE COALS PRESENT AT _____ FT.
_____ FT.
_____ FT.

PRODUCING / INJECTION INTERVALS

FROM N/A TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>Cement 10 sks</u> <small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>	FROM <u>TD</u>	TO <u>1900</u>	FT.
FILLED WITH <u>Mud</u>	FROM <u>1900</u>	TO <u>300</u>	FT.
FILLED WITH <u>Cement 75 sks</u>	FROM <u>300</u>	TO <u>4</u>	FT.
FILLED WITH <u>Soil</u>	FROM <u>4</u>	TO <u>0</u>	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.

RECEIVED
MAY 13 1991
Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"					4'
INTERMEDIATE/MINE STRING / OR LINER						
PRODUCTION	5 1/2"				1200'	800'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

Roy E. Watters
PERMITTEE OR DESIGNEE

ADDRESS

CITY, STATE

ZIP

Kevin Spencer
INSPECTOR WITNESSING PLUGGING

5/2/91
DATE

ILLINOIS DEPARTMENT OF MINES AND MINERALS
OIL AND GAS DIVISION
(217) 782-7756

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

225/119 AL
AN

OG-6 WELL PLUGGING REPORT

COUNTY No. 268

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: Glenn Kirsch REFERENCE NO. 123058

WELL NAME: Augustus Degler #2 PERMIT NO. 1671

COUNTY Coles SECTION 3 TOWNSHIP 12N RANGE 14W 7E
LOCATION: 990 FT. NORTH; OR _____ FT. SOUTH; AND _____ FT. EAST; OR 990 FT. WEST
WEST OF THE SE CORNER OF THE _____ QUARTER OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 5/3/91 DATE PLUGGING COMPLETED 5/3/91

PLUGGING CONTRACTOR Roy Waffles

ADDRESS _____

WELL DATA:

TOTAL DEPTH OF WELL 2000 FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE _____ FT.
WORKABLE COALS PRESENT AT _____ FT.
_____ FT.
_____ FT.

PRODUCING / INJECTION INTERVALS

FROM 1/4 TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement 10 sks FROM TD TO 1900 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH mud FROM 1900 TO 300 FT.
FILLED WITH Cement 75 sks FROM 300 TO 4 FT.
FILLED WITH Soil FROM 4 TO 0 FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

RECEIVED

MAY 13 1991

Department of Mines & Minerals
Oil & Gas Division

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7"					4'
INTERMEDIATE /MINE STRING / OR LINER						
PRODUCTION	5½	Approx 2000			800'	841'

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF:

Roy E. Watters
PERMITTEE OR DESIGNEE

Kevin Spencer
INSPECTOR WITNESSING PLUGGING

ADDRESS

5/2/91
DATE

CITY, STATE

ZIP

3-12N-7E-1

STATE OF ILLINOIS

County of Coles ss.

WELL PLUGGING AFFIDAVIT

C. K. Felix (Tri-State Casing Pull. Co.) and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil & Gas

known as the Degler Digger # 4

(Indicate whether for oil, gas, water or other purposes)

and located as follows: 330 ft. north;

ft. south; 330 ft. east; 330 ft. west

of the SE corner of the SW Quarter

of the NE Quarter of the Quarter of

Section 3, Township 12 (North or South)

Range 7, (East or West), of the

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.

{ Ground ft.

Total depth 1975 Formation

Date permit to drill issued 10-25-56 Permit No. 3940

Permit issued to Opal Henson

Date drilling began October 28, 1956

Date drilling completed November 7, 1956

Kind of drilling tools used Rotary

Date plugging began December 24, 1958

Date plugging completed December 26, 1958

Lessor Degler Bros

Address R.R., Mattoon, Illinois

Lessee Opal Henson

Address Abilene, Texas.

Drilling Contractor Company Tools

Address

DETAILS OF PLUGGING:

Filled with (Rotary Mud, Cement, or Other Materials) From To feet

Kind of Plug Cement From 1975 To 1910 feet

Filled with Mud From 1910 To 110 feet

Kind of Plug Cement From 110 To 80 feet

Filled with Mud From 80 To 15 feet

Kind of Plug Cement From 15 To 2 feet

Filled with Soil From 2 To 0 feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment ☒ ☐ Concrete bases ☒ ☐ Debris ☒ ☐

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	96		none		96		Cemented in
5 1/2	1975		1423		552		Cemented - unable to pull

Opal Henson

(Signature of person, firm or corporation having custody or control of well.)

Per C. K. Felix

Address P. O. Box 353, Fairfield, Illinois

Lowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, Illinois

Subscribed and sworn to before me this 27th day of December A.D. 19 58

My commission expires 1-9-62

Notary Public.

COUNTY NO. 5299 IN BLUE BY
OIL AND GAS DIVISION

JAN - 7 1959

DEPARTMENT OF
MINES AND MINERALS

STATE OF ILLINOIS

County of COLE

SS.

WELL PLUGGING AFFIDAVIT

C. W. Strotman - Tri-State Casing Pilling Co.

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Degler Brothers #7 (X-7) and located as follows: 330 ft. north;000 ft. south; 990 ft. east; 000 ft. westof the SE corner of the 3 Quarterof the 3 Quarter of the 12 Quarter ofSection 3, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLE County, Illinois.Elevation above sea level is { Derrick Floor 000 ft.
Ground 687 ft.Total depth 1968 Formation Pocahontas* Date permit to drill issued 10-10-60 Permit No. 2286-NF 3155Permit issued to Degler BrothersDate drilling began 10-10-60Date drilling completed 10-18-60Kind of drilling tools used RotaryDate plugging began 4-11-75Date plugging completed 4-15-75 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Degler BrothersAddress Mattoon, IllinoisLessee Degler BrothersAddress Mattoon, IllinoisDrilling Contractor M & E Drilling CompanyAddress Casey, Illinois

DETAILS OF PLUGGING:

Filled with Cement From 1968 To 1665 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1665 To 250 feetFilled with Cement From 250 To 110 feetKind of Plug Mud From 110 To 15 feetFilled with Cement From 15 To 03 feetKind of Plug Barth From 03 To 0 feetFilled with Barth From 0 To 0 feetKind of Plug Barth From 0 To 0 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Water input well.

CASING RECORD

* NF-3155 dated 11-7-63
Ashland Oil & Refining Co.

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
<u>3-1/8</u>	<u>125</u>	<u>3</u>	<u>122</u>	<u>Cement circulated when run.</u>
<u>1-1/2</u>	<u>1968</u>	<u>1318</u>	<u>650</u>	

RECEIVED

C. W. Strotman - Tri-State Casing Pilling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature] FEB 23 1975Address Mattoon, Illinois - Mattoon, IllinoisAddress 3500 Grant, Mattoon, IllinoisAddress 3500 Grant, Mattoon, IllinoisAddress 3500 Grant, Mattoon, IllinoisSubscribed and sworn to before me this 17 day of April A.D. 19 75My commission expires 10-28-76

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

C. E. Strotman - Tri-State Drilling Pulling Co. and
E. R. Drifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)
known as the Depler-Brothers #4 (W-4) and located as follows: _____ ft. north;
330 ft. south; 330 ft. east; _____ ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the NW corner of the NE Quarter
of the SE Quarter of the _____ Quarter of
Section 3, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 683 ft.
Ground _____ ft.

Total depth 1973 Formation Basin

Date permit to drill issued 11-15-56 Permit No. 4161

Permit issued to Depler Bros.

Date drilling began 11-15-56

Date drilling completed 11-23-56

Kind of drilling tools used Rotary

Date plugging began 4-11-75

Date plugging completed 4-12-75

Lessor Depler Bros. Address Mattoon, Illinois

Lessee Depler Bros. Address Mattoon, Illinois

Drilling Contractor Henson Drilling Co. Address Abilene, Texas.

P. F. B.

DETAILS OF PLUGGING:

	1973	1940
Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From <u>1940</u>	To <u>1660</u> feet
Kind of Plug <u>Mud</u>	From <u>1660</u>	To <u>250</u> feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u> feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>105</u> feet
Filled with <u>Cement</u>	From <u>105</u>	To <u>75</u> feet
Kind of Plug <u>Mud</u>	From <u>75</u>	To <u>15</u> feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u> feet
Kind of Plug <u>Barth</u>	From <u>03</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production Water Input Well.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	92	-	3	-	39	-	Cement circulated on pump
5-1/2	1593	-	1010	-	983	-	Cemented with 122 sacks when run.

* NF #3154 dated 11-7-63
Ashland Oil & Refining Co.

C. E. Strotman - Tri-State Drilling Pulling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]

Address Mattoon, Illinois Warfield, Illinois.

E. R. Drifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61938

Subscribed and sworn to before me this 12th day of April, A.D. 19 75

My commission expires 10-2-76

[Signature]
Notary Public

STATE OF ILLINOIS,
County of Coles ss.

WELL PLUGGING AFFIDAVIT

Harry M. Kime and

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil or gas

(Indicate whether for oil, gas, water or other purposes)

known as the Geneva J. Wade #1 and located as follows: 332 ft. north; 1706 ft. south; 1706 ft. east; 1706 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SW corner of the NW Quarter of the 3 Quarter of the 12 Quarter of the 3d Range 7, (East 33rd West), of the 3d Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 2097 ft. Ground 693 ft.

Total depth of well is 2097 ft.

Date permit to drill issued 4-21-48

Permit issued to Harry M. Kime

Date drilling began 4-22-48

Date drilling completed 4-30-48

Kind of drilling tools used Rotary

Date plugging began 4-30-48

Date plugging completed 4-30-48

Lessor Geneva J. Wade Address Mattoon, Illinois
Lessee Harry M. Kime Address 1503 N. 19th St., Mattoon,
Drilling Contractor W. P. Kuykendall Address St. Elmo, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>2097</u>	To <u>2047</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>2047</u>	To <u>117</u>	feet
Filled with <u>Cement</u>	From <u>117</u>	To <u>92</u>	feet
Kind of Plug <u>Mud</u>	From <u>92</u>	To <u>27</u>	feet
Filled with <u>Cement</u>	From <u>27</u>	To <u>2</u>	feet
Kind of Plug <u>Earth</u>	From <u>2</u>	To <u>0</u>	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?...	Yes ☐	No ☒
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐
(3) Has surface casing been cut off below plow depth?.....	Yes ☐	No ☒
(4) Has well-site been levelled?.....	Yes ☐	No ☒

If this was a producing well, give date and amount of last production Dry Hole

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	102				102		Cemented

(Signature of person, firm or corporation having custody or control of well.)

Per Harry M. Kime
Address 1503 N. 19th St. Mattoon, Ill.
Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well)
Address Effingham, Illinois, R.F. #1
30th day of April, A. D. 1948

Subscribed and sworn to before me this

My commission expires 2-24-51

Notary Public.

7-12N-7E

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Tri-Star Producing Co., Inc.

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Oblinger Trust #1

and located as follows: _____ ft. north;

_____ 330 ft. south; _____ ft. east; _____ 330 ft. west

of the NE corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 7, Township 12 (North or South)Range 7, (East or West) of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground () 690.9 ft.Total depth 3580 Formation DevonianDate permit to drill issued 7/31/79 Permit No. 7812Permit issued to Tri Star Producing Co., Inc.Date drilling began 8-8-79Date drilling completed 8-16-79Kind of drilling tools used RotaryDate plugging began 9-22-80Date plugging completed 9-23-80

Lessor Central Nat'l Bank (Oblinger Trust #1) Address Mattoon, Illinois - 61938
 Lessee Tri-Star Producing Co., Inc. Address P.O. Box 436H, Springfield, Ill. 62708
 Drilling Contractor Decatur Drilling Co. Address Decatur, Illinois.

PREVIOUS P/B (Cement, Rotary Mud, or Cement)

Filled with	From	To	feet
<u>Rotary mud</u> (Rotary Mud, Cement, or Other Materials)	<u>3580</u>	<u>3494</u>	
Kind of Plug <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Kind of Plug <u>Rotary mud</u>	<u>200</u>	<u>130</u>	feet
Kind of Plug <u>Cement</u>	<u>130</u>	<u>100</u>	feet
Kind of Plug <u>Rotary mud</u>	<u>100</u>	<u>15</u>	feet
Kind of Plug <u>Cement</u>	<u>15</u>	<u>03</u>	feet
Kind of Plug <u>Earth</u>	<u>03</u>	<u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

NON ENCOUNTERED

- (1) Have pits and other excavations been filled? ☐ Yes ☐ No
- (2) Have the following been removed?
- Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
- (4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	119	-	3	-	116	-	Cemented w/ 115 sacks when run.
5-1/2	3561	-	2110	-	1451	-	Cemented w/ 150 sacks when run.

Tri Star Producing Company

(Signature of person, firm or corporation having custody or control of well.)

Per J. B. Baideman
Address Springfield, Illinois.

State Well Inspector

(Signature and title of party supervising plugging of well)

Address 3500 Grant Ave., Mattoon, Illinois 61938
28th September 80

Subscribed and sworn to before me this _____ day of _____, A.D. 19

My commission expires 9/29/81 Renell E. Morris
Notary Public

STATE OF ILLINOIS

County of COLES

SS.

Tri Star Production Company

WELL PLUGGING AFFIDAVIT

S. R. CLIFTON - State Well Inspector

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well

drilled for OIL

known as the Oblinger Trust #2

(Indicate whether for oil, gas, water or other purposes)

and located as follows: 330 ft. north;

ft. south; 990 ft. east; ft. west

of the SW corner of the SE Quarter

of the NE Quarter of the 12 Quarter, of

Section 7, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.

Ground 688.5 ft.

Total depth 3371 Formation Devonian

Date permit to drill issued 6/10/80 Permit No. 10254

Permit issued to Tri Star Producing Co.

Date drilling began 7-24-80

Date drilling completed 8-1-80

Kind of drilling tools used Rotary

Date plugging began 9-23-80

Date plugging completed 9-25-80

Lessor Central Nat'l Bank, (Oblinger Trust Est.) Mattoon, Illinois.

Lessee Tri-Star Producing Company Address Springfield, Illinois.

Drilling Contractor Depoister Drlg. Co. Address Effingham, Illinois.

DETAILS OF PLUGGING:

Filled with Rotary Mud From 3371 To 250 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 250 To 200 feet

Filled with Rotary Mud From 200 To 130 feet

Kind of Plug Cement From 130 To 105 feet

Filled with Rotary mud From 105 To 10 feet

Kind of Plug Cement From 10 To 03 feet

Filled with Earth From 03 To 0 feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE ENCOUNTERED

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? NONE

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production DRY HOLE 8-1-80

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
8-5/8"	120 -	3 -	117 -	Cemented w/ 125 sacks when run.
5-1/2"	3360 -	1825 -	1535 -	Cemented w/ 135 sacks when run

Tri Star Producing Company

(Signature of person, firm or corporation having custody or control of well.)

Per J. R. Bridgman
Address Springfield, Illinois.

S. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois. 61938

26th day of September 80

Subscribed and sworn to before me this 9-29-81 day of September A.D. 1980

My commission expires 9-29-81

Notary Public

10-12N-7E

60# 22417

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing P'ing Co. and

E. R. CLIFTON * State Well Inspector.

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil / Gas

(Indicate whether for oil, gas, water or other purposes)

known as the E. B. Osborn #1

and located as follows: 330 ft. north;

ft. south; ft. east; 330 ft. west

of the SE corner of the NE Quarter

of the Quarter of the Quarter of

Section 10, Township 12 (North South)

Range 7, (East West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 706 ft.

Ground 702 ft.

Total depth 3241 Formation Devonian

Date permit to drill issued 1/30/74 Permit No. 64

Permit issued to Safari Oil Company

Date drilling began 4-25-75

Date drilling completed 5-6-75

Kind of drilling tools used Rotary

Date plugging began 12-2-75

Date plugging completed 12-3-75

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor E. B. Osborn

Address Mattoon, Illinois

Lessee Safari Oil Company

Address Mattoon, Illinois

Drilling Contractor M & E. Drilling Co.

Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with Previous P/B From 3241 To 1820 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1820 To 1700 feet

Filled with Mud From 1700 To 250 feet

Kind of Plug Cement From 250 To 200 feet

Filled with Mud From 100 To 12 feet

Kind of Plug Cement From 12 To 03 feet

Filled with Earth From 03 To 0 feet

Kind of Plug Earth From 0 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8"	127	-	4	-	123	-	Cemented w/ 50 sacks when run
4-1/2	1850	-	1500	-	350	-	Cemented w / 75 sacks when run

DIVISION OF OIL & GAS

Safari Oil Company

(Signature of person, firm or corporation having custody of control of well)

Per [Signature]

Address Mattoon, Illinois - Fairfield, Illinois.

[Signature] State WINE Section

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 6.938

Subscribed and sworn to before me this 6th day of December A.D. 19 75

My commission expires 10-28-76

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVITSafari Oil Company (Texas Plugging Co.) andE. E. CLIFTON

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil/Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Powell-Degler 1-A

and located as follows: _____ ft. north;

990 ft. south; _____ ft. east; 150 ft. west

of the _____ corner of the _____ Quarter

of the NE Quarter of the SE Quarter ofSection 10, Township 12 (North of South)Range 7, (East of West) of the 3rdPrincipal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

Ground 717 ft.Total depth 2020 Formation CYPRESSDate permit to drill issued 7/27/76 Permit No. 2756Permit issued to Safari Oil CompanyDate drilling began 8-20-76Date drilling completed 8-24-76Kind of drilling tools used RotaryDate plugging began 5-3-79Date plugging completed 5-4-79 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)**WELL SITE RESTORED**Lessor Powell-Degler Address Mattoon, IllinoisLessee Safari Oil Company Address Mattoon, IllinoisDrilling Contractor M & E. Drig. Co. Address Casey, Illinois

Previous Plug Back	DETAILS OF PLUGGING:	2020	1995
Filled with <u>Mud</u> (Rotary Mud, Cement, or Other Materials)	From	<u>1995</u>	To <u>1770</u> feet
Kind of Plug <u>Cement</u>	From	<u>1770</u>	To <u>1750</u> feet
Filled with <u>Mud</u>	From	<u>1750</u>	To <u>250</u> feet
Kind of Plug <u>Cement</u>	From	<u>250</u>	To <u>200</u> feet
Filled with <u>Mud</u>	From	<u>200</u>	To <u>130</u> feet
Kind of Plug <u>Cement</u>	From	<u>130</u>	To <u>105</u> feet
Filled with <u>Mud</u>	From	<u>105</u>	To <u>10</u> feet
Kind of Plug <u>Cement</u>	From	<u>10</u>	To <u>03</u> feet
Kind of Plug <u>Earth</u>	From	<u>03</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed?
Equipment ☒ Yes ☐ No NONE Concrete bases ☐ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been leveled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production None (Failed to Produce)**CASING RECORD**

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
7"	<u>111</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>111</u>	<u>-</u>	Cemented w/ 60 bags when run
<u>1 1/2</u>	<u>2015</u>	<u>-</u>	<u>102 5</u>	<u>-</u>	<u>990</u>	<u>-</u>	Cemented w/ 75 sacks when run.

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]Address Mattoon, Illinois.[Signature] State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 7th day of May, A.D. 19 79My commission expires 9-29-81

Notary Public

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 782-7756COUNTY No. 23150524 South Second Street
Springfield, Illinois 62701-1787

OG-6 WELL PLUGGING REPORT

777162

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Charles Armandtrout PERMITTEE NO. 110WELL NAME: Osborne #1-B PERMIT NO. 023908 REFERENCE NO. 128463
(ISSUE DATE IF NO NUMBER) COUNTY Coles SECTION 10
TOWNSHIP 12N RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND
_____ FT. EAST; OR 1650 FT. WEST OF THE SE
CORNER OF THE NE QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION	<u>701</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>2021</u> FT.	FROM <u>1774</u> TO <u>1978</u>
PLUGGED BACK TOTAL DEPTH	<u>1880</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>351</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>N/A</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: <u>packer hung in hole</u>		

DETAILS OF PLUGGING:

FILLED WITH <u>wellbore fluid</u>	FROM <u>1978</u> TO <u>1880</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	
FILLED WITH <u>cement</u>	FROM <u>1880</u> TO <u>1555</u> FT.
FILLED WITH <u>wellbore fluid</u>	FROM <u>1555</u> TO <u>410</u> FT.
FILLED WITH <u>cement</u>	FROM <u>410</u> TO <u>4</u> FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u> TO <u>surface</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	163	125	12 1/4	GL	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	4 1/2	2020	163	7 7/8		1004

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Eric Shegork
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 14 May 97DATE PLUGGING COMPLETED 14 May 97

ADDRESS _____

MAY 27 1997

CITY, STATE _____

ZIP _____

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

(44778-10M-9-72)

10

Safari Oil Company

and

E. B. Clifton - State Well Inspector.

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Osborne #7 and located as follows: 990 ft. north;1650 ft. south; 1650 ft. east; 1650 ft. westof the SE corner of the NE Quarterof the - Quarter of the - Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor - ft.
Ground 701 ft.* Total depth 1994 Formation RosiclereDate permit to drill issued 10-21-71 Permit No. 913Permit issued to Safari Oil CompanyDate drilling began 11-10-71Date drilling completed 11-19-71Kind of drilling tools used RotaryDate plugging began 10-20-73Date plugging completed 10-24-73Lessor E. B. OsborneAddress Mattoon, IllinoisLessee Safari Oil CompanyAddress Mattoon, Illinois.Drilling Contractor Wayne SmithAddress Bluford, Illinois.

* - Previous plug back to produce Weiler 1994-1830 (SLM-1830-10-20-73)

DETAILS OF PLUGGING:

Filled with Pea gravel From 1830 To 1815 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1815 To 1730 feetFilled with Mud From 1730 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Cement Mud From 200 To 110 feetKind of Plug Cement From 110 To 110 feetFilled with Mud From 110 To 25 feetKind of Plug Cement From 25 To 03 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? Yes No
(2) Have the following been removed? Yes NoEquipment Yes No Concrete bases Yes No Debris Yes No(3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been levelled? Yes NoIf this was a producing well, give date and amount of last production October 1973

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8</u>	<u>126</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>123</u>	<u>-</u>	<u>Top 3' cut off.</u>
<u>5-1/2</u>	<u>1290</u>	<u>-</u>	<u>1291</u>	<u>-</u>	<u>699</u>	<u>-</u>	

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Raymond C. BangertAddress Clay City, Illinois.E. B. Clifton State Well Inspector.

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois.Subscribed and sworn to before me this 27 day of October, A.D. 19 73My commission expires 10/28/76

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing Pulling Co. and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Water-Supply

(Indicate whether for oil, gas, water or other purposes)

known as the Powell-Deqler #2 - W.S. and located as follows:

300 ft. south; 330 ft. east; 330 ft. west

of the NE corner of the SE Quarter

of the NE Quarter of the SE Quarter of

Section 10, Township 12 (North or South),

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 720 ft.
Ground 719 ft.

Total depth 388 Formation Water Sand

Date permit to drill issued 9/30/60 Permit No. 2227

Permit issued to Ashland Oil Co.

Date drilling began 10-2-60

Date drilling completed 10-3-60

Kind of drilling tools used Rotary

Date plugging began 12-4-75

Date plugging completed 12-4-75

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Powell-Deqler Address Mattoon, Illinois

Lessee Ashland Oil & Refining Co. Address Henderson, Ky.

Drilling Contractor M & E. Drilling Co. Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with Cement (Rotary Mud, Cement, or Other Materials) From 388 To 250 feet

Kind of Plug Mud From 250 To 10 feet

Filled with Cement From 10 To 03 feet

Kind of Plug Earth From 03 To 0 feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

None Encountered

(1) Have pits and other excavations been filled? Yes ☒ No ☐

(2) Have the following been removed?

Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been leveled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production Water Supply

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
7"	318	-	4	-	314	-	Cement circulated when run

RECEIVED

Safari Oil Company

DIVISION OF OIL & GAS

(Signature of person, firm or corporation having custody or control of well.)

Per. [Signature] DEC 9 1975

Address Mattoon, Illinois

[Signature] State DEPARTMENT OF

(Signature and title of party supervising plugging MINES & MINERALS

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 6th day of December A.D. 1975

My commission expires 10-28-76

Notary Public

5
720058

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☐ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☒ OTHER WS
PERMITTEE: Charles Armatron PERMITTEE NO. 110
WELL NAME: Russell-Degler #2-WS PERMIT NO. 002227 REFERENCE NO. 301124
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 10
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 300 FT. SOUTH; AND
_____ FT. EAST; OR 330 FT. WEST OF THE NE
CORNER OF THE SE QUARTER OF THE NE
QUARTER OF THE SE QUARTER OF THE _____
QUARTER.

County Coles Sec. 10 Twp. 12N R. 7E

WELL DATA:

SURFACE ELEVATION	_____ FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>388</u> FT.	FROM <u>318</u> TO <u>387</u>
PLUGGED BACK TOTAL DEPTH	<u>NA</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	_____ FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	<u>NA</u> FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH <u>Cement</u> (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM <u>388</u>	TO <u>4</u>	FT.
FILLED WITH <u>top soil</u>	FROM <u>4</u>	TO <u>SURFACE</u>	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.

COMMENTS: _____

RECEIVED
MAY 08 1995

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE						
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>7"</u>	<u>318</u>	<u>NR</u>	<u>NR</u>	<u>GL</u>	<u>4'</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature] DATE PLUGGING BEGAN 3 May 95
PERMITTEE OR DESIGNEE
ADDRESS _____ DATE PLUGGING COMPLETED 3 May 95
CITY, STATE _____ ZIP _____

BEST COPY AVAILABLE

STATE OF ILLINOIS,
County of Coles } ss.

WELL PLUGGING AFFIDAVIT

Joe Dunivan

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Conlin #1 and located as follows: 330 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

SE corner of the NE Quarter of the SW Quarter of the 10 Section, 12 Township, 7 Range, (East or West), of the 3d Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 330 ft.
Ground 712 ft.

Total depth of well is 2100 ft.

Date permit to drill issued November 8, 1945

Permit issued to L. J. Block

Date drilling began November 16, 1945

Date drilling completed December 1, 1945

Kind of drilling tools used Rotary

Date plugging began Dec. 19, 1946

Date plugging completed Dec. 19, 1946

Lessor Conlin Address Mattoon, Illinois
Lessee L. J. Block Address 1385 Riverview, Decatur, Ill.
Drilling Contractor Kuykendall Drilling Co. Address St. Elmo, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>2100</u>	To <u>2000</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>2000</u>	To <u>180</u>	feet
Filled with <u>Cement</u>	From <u>180</u>	To <u>155</u>	feet
Kind of Plug <u>Mud</u>	From <u>155</u>	To <u>25</u>	feet
Filled with <u>Cement</u>	From <u>25</u>	To <u>0</u>	feet
Kind of Plug	From	To	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?...	Yes ☒	No ☐
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐
(3) Has surface casing been cut off below plow depth?.....	Yes ☒	No ☐
(4) Has well-site been levelled?.....	Yes ☒	No ☐

If this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	140				140		Cemented
5 1/2	2020				2020		"

(Signature of person, firm or corporation having custody or control of well.)

Per Lawrence J. Block

Address Centralia, Ill.

Lawrence Landreth

(Signature and title of party supervising plugging of well.)

Address Effingham, Ill. R.R. 1

Subscribed and sworn to before me this 21 day of December, A. D. 194 6

My commission expires May 15, 1950

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVITDon Robson of Tri-State Casing Pulling Co. andRichard Gray

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil & or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Conlin Unit # 1

and located as follows: _____ ft. north;

430 ft. south; _____ ft. east; 330 ft. westof the NE corner of the SW Quarterof the SE Quarter of the _____ Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West), of the ThirdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground 720 ft.Total depth 2010 Formation RosielareDate permit to drill issued 8/12/63 Permit No. 1435Permit issued to James Covington-Bill MyersDate drilling began 8/26/63Date drilling completed 9/3/63Kind of drilling tools used RotaryDate plugging began 10/21/65Date plugging completed 10/22/65 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Lenora ConlinAddress Mattoon, Ill.Lessee Covington & MyersAddress Mattoon, Ill.Drilling Contractor W. L. DillierAddress Casey, Ill.**DETAILS OF PLUGGING:**

Filled with	<u>Cement</u>	From	<u>2010</u>	To	<u>1905</u> feet
(Rotary Mud, Cement, or Other Materials)					
Kind of Plug	<u>Mud</u>	From	<u>1905</u>	To	<u>265</u> feet
Filled with	<u>Cement</u>	From	<u>265</u>	To	<u>205</u> feet
Kind of Plug	<u>Mud</u>	From	<u>205</u>	To	<u>125</u> feet
Filled with	<u>Cement</u>	From	<u>125</u>	To	<u>75</u> feet
Kind of Plug	<u>Mud</u>	From	<u>75</u>	To	<u>26</u> feet
Filled with	<u>Cement</u>	From	<u>26</u>	To	<u>3</u> feet
Kind of Plug	<u>Earth</u>	From	<u>3</u>	To	<u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
 (2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>100</u>		<u>0</u>		<u>100</u>		
<u>4 1/2</u>	<u>2010</u>		<u>1426</u>		<u>514</u>		

James R. Covington

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress 120 S. 17th St., Mattoon, Ill.Richard Gray Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Box 2, Charleston, Ill.Subscribed and sworn to before me this 22nd day of October, A.D. 1965My commission expires 5/16/69

Notary Public.

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing Pulling Co. and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the R. Degler #1

and located as follows: _____ ft. north;

330 ft. south; _____ ft. east; 330 ft. westof the NE corner of the NE Quarterof the SE Quarter of the _____ Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

Ground 710 ft.Total depth 2028 Formation CypressDate permit to drill issued 11/14/45 Permit No. 1851Permit issued to Will I. LewisDate drilling began 11-13-45Date drilling completed 11-22-45Kind of drilling tools used RotaryDate plugging began 5-7-77Date plugging completed 5-9-77Lessor R. DeglerAddress Mattoon, IllinoisLessee W. I. LewisAddress Mt. Vernon, IllinoisDrilling Contractor Unknown

Address _____

P.P.B. (Cement

DETAILS OF PLUGGING:

2028

1790

Filled with CementFrom 1790 To 1700 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug MudFrom 1700 To 250 feetFilled with CementFrom 250 To 200 feetKind of Plug MudFrom 200 To 115 feetFilled with CementFrom 115 To 85 feetKind of Plug MudFrom 85 To 12 feetFilled with CementFrom 12 To 03 feetKind of Plug EarthFrom 03 To 0 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10-3/4	105	-	4	-	101	-	Cement circulated
7"	1933	-	916	-	1017	-	Cemented w/ 150 sacks when run.

Safari Oil Co.

(Signature of person, firm or corporation having custody or control of well.)

Per E. R. CliftonAddress Mattoon, Illinois

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61938Subscribed and sworn to before me this 17th day of May, A.D. 1977My commission expires 1906-24-80

Notary Public

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. A. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil / and or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Ray Degler #2

and located as follows: _____ ft. north;

330 ft. south; _____ ft. east; 1650 ft. westof the NE corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 10, Township 12 (North or South)Range 7 E, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground 708 ft.Total depth 2003 Formation RosiclareDate permit to drill issued 2/10/48 Permit No. 259Permit issued to M. H. RichardsonDate drilling began February 1948Date drilling completed 3-26-48Kind of drilling tools used RotaryDate plugging began 10-23-73Date plugging completed 10-24-73 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)Lessor Ray DeglerAddress Mattoon, IllinoisLessee M. V. RichardsonAddress Mattoon, IllinoisDrilling Contractor Kuykendall Drilg., Co.Address St. Elmo, Illinois.

* Original oil string cementing of casing never drilled out, estimated top cement @ 1950

DETAILS OF PLUGGING:

Filled with Mud and cavings From 1950 To 1764 SIM feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1764 To 1720 feetFilled with Mud From 1720 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 124 feetKind of Plug Cement From 124 To 95 feetFilled with Mud From 95 To 25 feetKind of Plug Cement From 25 To 03 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production 1960

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	114	-	3	-	111	-	Top 3' cut off.
5-1/2"	1964	-	700	-	1264	-	

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Donald C. BangertAddress Clay City, Illinois.E. A. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61936Subscribed and sworn to before me this 27th day of October, A.D. 19 73My commission expires 10/28/76

Notary Public

STATE OF ILLINOIS,

County of Colis

Co #1016

815800

G. 6 (3250-10M-8-45)

WELL PLUGGING AFFIDAVIT

C. J. McComas

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the Wm J. Gover Hires No 1 and located as follows: _____ ft. north

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; _____ ft. east; 330 ft. west

of the NE corner of the SW Quarter

of the SE Quarter of the _____ Quarter of

Section 10, Township 12 (North or South)

Range 7, (East or West), of the 3

Principal Meridian, Colis County, Illinois.

Elevation above sea level is { Derrick Floor 722 ft.
Ground _____ ft.

Total depth of well is 2005 ft.

Date permit to drill issued Jan 14 1946

Permit issued to Ashland Oil & Refining Co

Date drilling began Jan 17 1946

Date drilling completed Jan 29 1946

Kind of drilling tools used Rotary

Date plugging began June 24 1946

Date plugging completed June 26 1946

Lessor Wm J. Gover Hires Address Mattoon Ill

Lessee Ashland Oil & Refining Co Address 514 Citizens Bank Bldg Evansville Ind.

Drilling Contractor Martin Hess Address Mattoon Ill

DETAILS OF PLUGGING:

Filled with Cement From 2005 To 1902 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Rotary mud From 1902 To 120 feet

Filled with Cement From 120 To 180 feet

Kind of Plug Rotary mud From 110 To 27 feet

Filled with Cement From 27 To 2 feet

Kind of Plug Soil From 2 To Surface feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details _____

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>115</u>		<u>2</u>		<u>113</u>		
<u>5 1/2</u>	<u>1833</u>		<u>1513</u>		<u>320</u>		

Acme Casing Pulling Co

(Signature of person, firm or corporation having custody or control of well.)

Per C. J. McComas

Address Grayville Mo

Walter Stewart Investigator

(Signature and title of party supervising plugging of well.)

Address Paris RR 2 Ill.

Subscribed and sworn to before me this 27 day of June, A. D. 1946

My commission expires Nov 30-1947

Madys Stewart
Notary Public.

Colis 12N-7E-10

STATE OF ILLINOIS

County of _____

ss.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Matteson, Illinois

and

E. R. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oil

known as the Highland Court #1 (Indicate whether for oil, gas, water or other purposes) 330
and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

* Original O/B Permit #NF-1067
dated 10-3-60

** Issued to Ashland Oil & Refining Co.
Highland Court

Lessor _____

Lessee M. H. Richardson

Drilling Contractor Kuykendall Drilling Co.

_____ ft. south; _____ ft. east; 350 ft. west
of the SE corner of the SE Quarter
of the SE Quarter of the _____ Quarter of
Section 10, Township 12N (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 735 ft.
Ground _____ ft.

Total depth 1814 Formation Cypress

* Date permit to drill issued 1-23-46 Permit No. 107-NF1067

** Permit issued to M. H. Richardson

Date drilling began 1-23-46

Date drilling completed 1-23-46

Kind of drilling tools used Rotary

Date plugging began 2-8-72

Date plugging completed 2-10-72

Address Mattoon, Illinois

Address Decatur, Illinois

Address St. Charles, Illinois

DETAILS OF PLUGGING:

Filled with PREVIOUS PLUG BACK From 1814 To 1790 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1790 To 1750 feet

Filled with Mud From 1750 To 250 feet

Kind of Plug Cement From 250 To 200 feet

Filled with Mud From 200 To 125 feet

Kind of Plug Cement From 125 To 100 feet

Filled with Mud From 100 To 15 feet

Kind of Plug Cement From 15 To 03 feet
Earth 03 00

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None encountered

(1) Have pits and other excavations been filled? Yes No
(2) Have the following been removed? Yes No

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production Water Input well.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	115	-	4	-	111	-	Top 4' cut off.
7"	1773	-	619	-	1154	-	

RECEIVED
DIVISION OF OIL & GAS

FEB 17 1972

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature] Tool Pusher

Address Mattoon, Illinois

[Signature] State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 1100 Chicago Ave., Matteson, Illinois 61938

Subscribed and sworn to before me this 14th day of February, A.D. 1972

My commission expires 10/28/72

Notary Public.

STATE OF ILLINOIS

County of Colas

ss.

WELL PLUGGING AFFIDAVIT

R. H. Clifton

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the R. H. Colborne #1 and located as follows: 330 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the NE corner of the NE Quarterof the NE Quarter of the NE Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Colas County, Illinois.Elevation above sea level is { Derrick Floor 708 ft.Original U.S. 2055 Ground 708 ft.P/B Total depth 1766 Formation St. LouisDate permit to drill issued 12/13/49 Permit No. 2115Permit issued to The Jones CompanyDate drilling began 12-20-49Date drilling completed 1-3-46Kind of drilling tools used RotaryDate plugging began 8-1-72Date plugging completed 8-2-72 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor R. H. ColborneAddress Wattsburg, IllinoisLessee The Jones CompanyAddress Colas, IllinoisDrilling Contractor Unknown

Address

DETAILS OF PLUGGING:

Filled with Foreign Material From 1766 To 1701 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1701 To 1651 feetFilled with Rotary mud From 1651 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Rotary mud From 200 To 140 feetKind of Plug Cement From 140 To 110 feetFilled with Rotary mud From 110 To 15 feetKind of Plug Cement From 15 To 01 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10-3/4	126	-	4	-	122	-	Top 4' cut off.
7	1040	-	295	-	1051	-	

DIVISION OF OIL & GAS

AUG 9 1972

DEPARTMENT OF
MINES & MINERALSPer James A. Colborne President.

(Signature of person, firm or corporation having custody or control of well.)

Per R. H. Clifton well Inspector.

(Signature and title of party supervising plugging of well.)

Address 1110 W. 1st St., Peoria, IllinoisSubscribed and sworn to before me this 3rd day of August, A.D. 1972My commission expires 10/28/72 Philip E. Starfield

Notary Public.

65 # 1020

WELL PLUGGING AFFIDAVIT

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL (Converted to water input)
(Indicate whether for oil, gas, water or other purposes)

known as the R. B. Osborne #3 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; _____ ft. east; _____ ft. west
of the _____ corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 10, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 692 ft.
Ground _____ ft.

Total depth 1737 Formation Cretaceous

* Date permit to drill issued 9-27-46 Permit No. 1951 NF1065

Permit issued to The Texas Company

Date drilling began 10-3-46

Date drilling completed 10-9-46

Kind of drilling tools used Rotary

Date plugging began 12-6-74

Date plugging completed 12-7-74

Lessor R. B. Osborne Address Mattoon, Illinois.
Lessee The Texas Company Address Tulsa, Oklahoma
Drilling Contractor _____ Address _____

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>1737</u>	<u>1680</u>	
Kind of Plug <u>Mud</u>	<u>1680</u>	<u>250</u>	feet
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Kind of Plug <u>Mud</u>	<u>200</u>	<u>130</u>	feet
Filled with <u>Cement</u>	<u>130</u>	<u>100</u>	feet
Kind of Plug <u>Mud</u>	<u>100</u>	<u>12</u>	feet
Filled with <u>Cement</u>	<u>12</u>	<u>03</u>	feet
Kind of Plug <u>Barite</u>	<u>03</u>	<u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production Water Input.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	120	-	3	-	117	-	Log 3' cut off - cement circulated when run.
7"	1723	-	1164	-	559	-	Cemented with 75 sacks

* Conversion permit #NF-1065 dated 10-3-1960 to Ashland Oil & Refining Co. Henderson, Ky.

Safari Oil Company - Tri-State Casing Pulling Co.
(Signature of person, firm or corporation having custody or control of well.)
Per [Signature]
Address Mattoon, Illinois - Fairfield, Illinois.
[Signature] Well Inspector.
(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois - 61936

Subscribed and sworn to before me this 11th day of December, A.D. 1974
My commission expires 10-28-76
[Signature]
Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Geologic Drilling Co. and
E. R. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL (converted to water input well)

(Indicate whether for oil, gas, water or other purposes)

known as the E. R. Osborne #1 and located as follows: _____ ft. north;

_____ 330 ft. south; _____ ft. east; _____ 330 ft. west

of the NE corner of the SW Quarterof the NE Quarter of the _____ Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West) of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor 699 ft.
Plug Jack Ground _____ ft.Total depth 1804 Formation Cypress* Date permit to drill issued 11-18-46 Permit No. 2250 NF 1007Permit issued to The Texas CompanyDate drilling began 11-20-46Date drilling completed 11-26-46Kind of drilling tools used RotaryDate plugging began 12-7-74Date plugging completed 12-10-74

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor E. R. OsborneAddress Mattoon, Illinois.Lessee The Texas CompanyAddress Tulsa, Oklahoma

Drilling Contractor _____

Address _____

Plug back Total Depth

DETAILS OF PLUGGING:

Plug back Total Depth	DETAILS OF PLUGGING:	1804	1750
Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From _____ To _____ feet	1750	1700
Kind of Plug <u>Mud</u>	From _____ To _____ feet	1700	250
Filled with <u>Cement</u>	From _____ To _____ feet	250	200
Kind of Plug <u>Mud</u>	From _____ To _____ feet	200	110
Filled with <u>Cement</u>	From _____ To _____ feet	110	110
Kind of Plug <u>Mud</u>	From _____ To _____ feet	110	12
Filled with <u>Cement</u>	From _____ To _____ feet	12	03
Kind of Plug <u>Earth</u>	From _____ To _____ feet	03	0

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered.

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Water input.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
18-3/4"	129	-	3	-	127	-	Top 3' cut off - cement circulated when run.
7"	1736	-	977	-	759	-	Cemented with 100 sacks when run.

* Conversion Permit # NP-106 dated10-3-1960 toApplied Oil & Refining Co.Henderson, Ky.Safari Oil & Company - Tri-State Geologic Drilling Co.

(Signature of person, firm or corporation having custody or control of well)

Per [Signature]Address Mattoon, Illinois - Windsor, Illinois.E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 11th day of DecemberA.D. 1974My commission expires 10-28-76

Notary Public

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Osborne #5 and located as follows: _____ ft. north;

330 ft. south; 330 ft. east; _____ ft. west

of the NW corner of the _____ Quarter

of the NE Quarter of the NE Quarter of

Section 10, Township 12 (North of South)

Range 7E, (East of West), of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 691 ft.

* Total depth 1974 Formation Ste. Genevieve

Date permit to drill issued 4-5-48 Permit No. 516

Permit issued to The Texas Company

Date drilling began March 1948

Date drilling completed April 1948

Kind of drilling tools used Rotary

Date plugging began 10-24-73

Date plugging completed 10-25-73

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor E. B. Osborne Address Mattoon, Illinois

Lessee The Texas Company Address Box 2420, Tulsa, Oklahoma

Drilling Contractor Unknown Address _____

* Previous P/D, Anchor for shot 1970-1745 SW (SW 1745-10-24-73)

DETAILS OF PLUGGING:

Filled with Cement From 1745 To 1720 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1720 To 250 feet

Filled with Cement From 250 To 200 feet

Kind of Plug Mud From 200 To 140 feet

Filled with Cement From 140 To 125 feet

Kind of Plug Mud From 125 To 25 feet

Filled with Cement From 25 To 03 feet

Kind of Plug Earth From 03 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed? ☐ Yes ☒ No

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production August 1973

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	130	-	127	-	127	-	Top 3' cut off.
7"	1736	-	396	-	1340	-	

MAY 20 1974

Safari Oil Company - Bengert Casing Pulling Corp.

DEPARTMENT OF MINES & MINERALS (Signature of person, firm or corporation having custody or control of well.)
Bengert Casing Pulling Corp.

Address Clay City, Illinois

(Signature and title of party supervising plugging of well.)
State Well Inspector

Address 3500 Grant Ave., Mattoon, Illinois 61938

Subscribed and sworn to before me this 27th day of October, A.D. 19 73

My commission expires 10/28/76 Notary Public

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Water Input

(Indicate whether for oil, gas, water or other purposes)

known as the Osborne #6 and located as follows: 160 ft. north;510 ft. south; 510 ft. east; ft. westof the SW corner of the NE Quarterof the Quarter of the Quarter ofSection 10, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 698 ft.Total depth 1830 Formation CypressDate permit to drill issued 10/3/60 Permit No. 2235Permit issued to Ashland Oil CompanyDate drilling began 10-10-60Date drilling completed 10-17-60Kind of drilling tools used RotaryDate plugging began 10-19-73Date plugging completed 10-24-73Lessor E. B. OsborneAddress Mattoon, IllinoisLessee Ashland Oil CompanyAddress P.O. Box #6, Henderson Ky.Drilling Contractor M & E. Drilling Co.Address Casey, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1830</u>	To <u>1795</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>1795</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>130</u>	feet
Filled with <u>Cement</u>	From <u>130</u>	To <u>105</u>	feet
Kind of Plug <u>Mud</u>	From <u>105</u>	To <u>25</u>	feet
Filled with <u>Cement</u>	From <u>25</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No(2) Have the following been removed? ☐ Yes ☒ NoEquipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8</u>	<u>120</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>117</u>	<u>-</u>	<u>Top 3' cutt off.</u>
<u>11-1/2</u>	<u>1812</u>	<u>-</u>	<u>987</u>	<u>-</u>	<u>825</u>	<u>-</u>	

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Ronald C. BangertAddress Clay City, Illinois

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61938Subscribed and sworn to before me this 27 day of October A.D. 1973My commission expires 10/28/76

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing Plugging Co.

and

E. R. CLINTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Wm. Powell #1 and located as follows: ft. north;

990 ft. south; ft. east; 330 ft. west

of the NE corner of the SE Quarter

of the Quarter of the Quarter of

Section 10, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 720 ft.

{ Ground 719 ft.

Total depth 2007 Formation McClosky

Date permit to drill issued 10/5/45 Permit No. 1577

Permit issued to M.H. Richardson

Date drilling began 10-9-45

Date drilling completed 10-15-45

Kind of drilling tools used Rotary

Date plugging began 12-3-75

Date plugging completed 12-4-75

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Wm. Powell Address Mattoon, Illinois

Lessee M. H. Richardson Address Decatur, Illinois

Drilling Contractor Address

DETAILS OF PLUGGING:

Filled with	PREVIOUS PLG BACK	From	2007	To	1818	feet
	(Rotary Mud, Cement, or Other Materials)					
Kind of Plug	Cement	From	1818	To	1700	feet
Filled with	Mud	From	1700	To	250	feet
Kind of Plug	Cement	From	250	To	90	feet
Filled with	Mud	From	90	To	15	feet
Kind of Plug	Cement	From	15	To	03	feet
Filled with	Earth	From	03	To	0	feet
Kind of Plug		From		To		feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
- (2) Have the following been removed?
Equipment	☒ Yes ☐ No	Concrete bases	☒ Yes ☐ No	Debris	☒ Yes ☐ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
8-5/8	108	-	4	-	104	-	Cement Circulated
5-1/2	1974	-	1320	-	654	-	Cemented

Safari Oil Company
(Signature of person, firm or corporation having custody or control of well.)
Per *[Signature]* DEPARTMENT OF
Address Mattoon, Illinois - Fairfield, MINES & MINERALS
[Signature] State Well Inspector
(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 6th day of December A.D. 1975
My commission expires 10/28/76
[Signature]
Notary Public

DEC 9 1975

RECEIVED
DIVISION OF OIL & GAS

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

S. H. Clifton

James L. Scheafer - Safari Oil Company
well Inspector

and

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for oil

known as the N. Powell #2

(Indicate whether for oil, gas, water or other purposes)

and located as follows: _____ ft. north;

_____ ft. south; _____ ft. east; _____ ft. west

of the _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 10, Township 12 (North or South)Range 7, (East or West), of the _____Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 720 ft.
Ground 717 ft.

Total depth 2024 Formation ResidualDate permit to drill issued 11-12-45 Permit No. 1903Permit issued to M. H. RichardsonDate drilling began 12-1-45Date drilling completed 12-5-45Kind of drilling tools used RotaryDate plugging began 10-20-71Date plugging completed 10-21-71

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor N. PowellAddress Mattoon, IllinoisLessee M. H. RichardsonAddress Decatur, IllinoisDrilling Contractor M. & T. Drilling CompanyAddress Decatur, Illinois

DETAILS OF PLUGGING: (Prev. P/B 2024-1760.)

Filled with Bridge Plug and pea gravel From 1730 To 1739 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1739 To 1759 feet

Filled with Mud From 1759 To 250 feet

Kind of Plug Cement From 250 To 200 feet

Filled with Mud From 200 To 126 feet

Kind of Plug Cement From 126 To 100 feet

Filled with Mud From 100 To 15 feet

Kind of Plug Cement From 15 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth)

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed? ☐ Yes ☒ No

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	116	-	4	-	112		Top 4' cut off
7"	1957	-	520	-	1437

James L. Scheafer - Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]
Address Fairfield, Illinois(Signature and title of party supervising plugging of well.)
[Signature] Well Inspector
Address 1103 Champaign Ave., Mattoon, Illinois.Subscribed and sworn to before me this 22 day of Oct., A.D. 1971My commission expires Oct. 28, 1974

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. E. Clifton, State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Powell #3

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

1650 ft. south; _____ ft. east; 330 ft. west
of the NE corner of the SE Quarter
of the _____ Quarter of the _____ Quarter of
Section 10, Township 12 (North of ~~South~~)
Range 7E, (East of ~~West~~) of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Original TD 1807 } Ground 724 ft.
Total depth P/B 1764 Formation Cypress

Date permit to drill issued 11-27-45 Permit No. 1958Permit issued to H. H. RichardsonDate drilling began 12-7-45Date drilling completed 12-14-45Kind of drilling tools used RotaryDate plugging began 2-5-72Date plugging completed 2-7-72Lessor H. PowellAddress Mattoon, IllinoisLessee H. H. RichardsonAddress 1401 So. 18th St., Mattoon, Ill.Drilling Contractor Kaykendall Drilling Co.Address St. Elmo, Illinois.

DETAILS OF PLUGGING:

Filled with <u>PREVIOUS PLUG BACK</u>	From <u>1807</u>	To <u>1764</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Bridge plug & Pos Gravel</u>	From <u>1764</u>	To <u>1695</u> feet
Filled with <u>Cement</u>	From <u>1695</u>	To <u>1637</u> feet
Kind of Plug <u>Mud</u>	From <u>1637</u>	To <u>250</u> feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u> feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>125</u> feet
Filled with <u>Cement</u>	From <u>125</u>	To <u>100</u> feet
Kind of Plug <u>Mud</u>	From <u>100</u>	To <u>15</u> feet
Kind of Plug <u>Cement</u>	From <u>15</u>	To <u>3</u> feet
<u>Earth</u>	From <u>3</u>	To <u>0</u>

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None-encountered

(1) Have pits and other excavations been filled? ☐ Yes ☒ No
(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface?

☒ Yes ☐ No

(4) Has well-site been levelled?

☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	115	-	4	-	111	-	Top 4' cut off.
7	1749	-	517	-	1232	-	

DIVISION OF OIL & GAS

FEB 14 1972

DEPARTMENT OF
MINES & MINERALS

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Ken Colman Tool PusherAddress Mattoon, Illinois

State Well Inspector.

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign Ave., Mattoon, Illinois 61938Subscribed and sworn to before me this 9th day of February, A.D. 1972My commission expires 10/28/72

Notary Public.

STATE OF ILLINOIS

County of COLES

SS.

COUNTY NO. 1026
1826

COUNTY NO. 1026

(59115-10M-4-74) 10

WELL PLUGGING AFFIDAVIT

Safari Oil Company Tri-State Casing Pulling Co. and

E. R. Clifton State Well Inspector.

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil / Gas

(Indicate whether for oil, gas, water or other purposes)

known as the H. Powell #1

and located as follows: _____ ft. north;

1650 ft. south; _____ ft. east; 290 ft. westof the NE corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 10, Township 12 (North or South)Range 7, (East or West) of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor 723 ft.
Ground _____ ft.Total depth 1820 Formation RosiclareDate permit to drill issued 11/27/45 Permit No. 1959Permit issued to M. H. RichardsonDate drilling began 11-27-45Date drilling completed 12-5-45Kind of drilling tools used RotaryDate plugging began 8-5-75Date plugging completed 8-6-75 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor H. PowellAddress Mattoon, IllinoisLessee M. H. RichardsonAddress Decatur, IllinoisDrilling Contractor KukendallAddress St. Elmo, Illinois

DETAILS OF PLUGGING:

Filled with Mud From 1820 To 1750 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1750 To 1700 feetFilled with Mud From 1700 To 250 feetKind of Plug Cement From 250 To 110 feetFilled with Mud From 110 To 12 feetKind of Plug Cement From 12 To 03 feetFilled with Earth From 03 To 0 feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been leveled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	127	-	3	-	124	-	Cement circulated when run.
5-1/2	1766	-	600	-	1166	-	Cemented w/ 200 sacks when run.

RECEIVED
DIVISION OF OIL & GAS

AUG 13 1975

DEPARTMENT OF
MINES & MINERALSubscribed and sworn to before me this 9th day of August A.D. 19 75
My commission expires 10-28-76

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]Address Mattoon, Illinois - Fairfield, IllinoisE. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61938

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing Pulling Co. and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Water Supply

(Indicate whether for oil, gas, water or other purposes)

known as the H. Powell #3 - W.S. and located as follows: 180 ft. north; ft. south; ft. east; 330 ft. westof the SE corner of the NW Quarterof the SE Quarter of the SE Quarter ofSection 10, Township 12 (North or South)Range 7E, (East or West) of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 725 ft.Total depth 400 Formation Water SandDate permit to drill issued 9/29/61 Permit No. 2030Permit issued to ASHland Oil & Refining Co.Date drilling began 10-2-61Date drilling completed 10-7-61Kind of drilling tools used RotaryDate plugging began 8-7-75Date plugging completed 8-8-75 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor H. Powell Address Mattoon, Illinois
 Lessee ASHland Oil & Refining Co. Address Henderson, Ky.
 Drilling Contractor M & E. Drilling Co. Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Mud</u>	From <u>400</u>	To <u>328</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>328</u>	To <u>200</u>	feet
Filled with <u>Mud</u>	From <u>200</u>	To <u>60</u>	feet
Kind of Plug <u>Cement</u>	From <u>60</u>	To <u>03</u>	feet
Filled with <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u>	feet
Filled with <u> </u>	From <u> </u>	To <u> </u>	feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered

(1) Have pits and other excavations been filled? None Yes ☐ No ☐
 (2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been leveled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production Water Supply

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
7"	328	-	115	-	183	-	Cemented w/ 50 sacks when run.

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Address Mattoon, Illinois - Fairfield, Illinois

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 9th day of August, A.D. 19 75My commission expires 10-28-76

Notary Public

RECEIVED
DIVISION OF OIL & GAS

AUG 13 1975

DEPARTMENT OF
MINES & MINERALS

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

James Schafer - Safari Oil Company

and

E. R. Clifton - Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Powell-Deigler #3 and located as follows: _____ ft. north;990 ft. south; _____ ft. east; 1650 ft. westof the NE corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 10, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 720 ft.
Ground _____ ft.Total depth 1820 Formation WellerDate permit to drill issued 2-20-48 Permit No. 321* Permit issued to M. H. RichardsonDate drilling began 2-20-48Date drilling completed 2-27-48Kind of drilling tools used RotaryDate plugging began 10-25-71Date plugging completed 10-26-71Lessor D. Deigler Address Mattoon, IllinoisLessee M. H. Richardson Address Decatur, IllinoisDrilling Contractor W. R. Kuykendall Drig. Co. Address St. Anne, Illinois

DETAILS OF PLUGGING:

Filled with Mud From 1820 To 1757 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Plug & Peg Gravel From 1757 To 1725 feetFilled with Cement From 1725 To 1677 feetKind of Plug Mud From 1677 To 250 feetFilled with Cement From 250 To 200 feetKind of Plug Mud From 200 To 125 feetFilled with Cement From 125 To 95 feetKind of Plug Cement From 95 To 15 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Water Input

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	113	-	4	-	109	-	Top 4' cut off.
5-1/2	1777	-	1009	-	768	-

James L. Schafer - Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per James L. Schafer Tool PusherAddress Mattoon, IllinoisE. R. Clifton Well Inspector

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign Ave., Mattoon, Illinois.Subscribed and sworn to before me this 27th day of October, A.D. 19 71My commission expires 10/28/72 James L. Schafer Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

E. R. Clifton being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Powell-Young Cown #1 and located as follows: 365 ft. north;

ft. south; ft. east; 990 ft. west

of the SE corner of the Quarter

of the Quarter of the Quarter of the

Section 10, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 729 ft.

Ground ft.

Original T.D. 2021P/D 1801

Total depth 1801 Formation noniculate

Date permit to drill issued 12-29-45 Permit No. 2216

Permit issued to H. H. Richardson

Date drilling began ?

Date drilling completed 3-1-46

Kind of drilling tools used Rotary

Date plugging began 7-31-72

Date plugging completed 8-1-72

Lessor Powell - Young Address Mattoon, Illinois

Lessee H. H. Richardson Address Mattoon, Illinois

Drilling Contractor ? Address ?

DETAILS OF PLUGGING:

Filled with Cement From 1801 To 1700 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Rotary mud From 1700 To 250 feet

Filled with Cement From 250 To 200 feet

Kind of Plug Rotary mud From 200 To 140 feet

Filled with Cement From 140 To 110 feet

Kind of Plug Rotary mud From 110 To 15 feet

Filled with Cement From 15 To 03 feet

Kind of Plug Earth From 03 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None Encountered

(1) Have pits and other excavations been filled? Yes ☒ No ☐

(2) Have the following been removed? Yes ☒ No ☐

Equipment ☐ ☒ Concrete bases ☐ ☒ Debris ☐ ☒

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been levelled? Yes ☐ No ☒

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	127	"	3	"	124	"	Top 3' cut off.
7"	1775	113	213	"	962	"

James Scheaffer - Safaril Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per H. H. RichardsonAddress Mattoon, Illinois

E. R. Clifton Well Inspector.

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign, Mattoon, Illinois

Subscribed and sworn to before me this 3rd day of August

My commission expires 10/28/72

Lybil E. Stanford
Notary Public.

11-12N-6E

STATE OF ILLINOIS

County of Moultrie

ss.

COUNTY No. 195

O. G. 6 (78647-10M-5-49)

WELL PLUGGING AFFIDAVIT

C.R. Lewis admr. to collect Estate of Paul Doran andHaldon Mooredo depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Edwards #1 and located as follows: _____ ft. north; Locate well accurately on plat of section
(Scale one inch—2,000 ft.)_____ ft. south; 330 ft. east; _____ ft. westof the NW corner of the NE Quarterof the NE Quarter of the _____ Quarter ofSection 11, Township 12 (North of XXXX)Range 6, (East of XXXX), of the 3Principal Meridian, Moultrie County, Illinois.Elevation above sea level is { Derrick Floor 663 ft.

{ Ground _____ ft.

Total depth of well is 2110 ft.Date permit to drill issued 3-24-50 Permit No. 567Permit issued to C.R. Lewis admr. to collectDate drilling began 3-28-50Date drilling completed 4-5-50Kind of drilling tools used RotaryDate plugging began 4-6-50Date plugging completed 4-6-50Lessor John EdwardsAddress Gays, Ill.Lessee C.R. Lewis admr. to collect (Doran) Address Vandalia, Ill.Drilling Contractor Paul Doran Drilling Co. Address Vandalia, Ill.

DETAILS OF PLUGGING:

Filled with Rotary Mud From 2110 To 30 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 30 To 2 feetFilled with Earth From 2 To 0 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) No coal encountered.

(1) Have pits, cellar and other excavations been filled? _____

Yes

No

☐☒

(2) Have equipment, concrete bases and debris been removed? _____

Yes

No

☐☒

(3) Has surface casing been cut off below plow depth? _____

Yes

No

☒☐

(4) Has well-site been levelled? _____

Yes

No

☐☒If this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
	<u>None</u>						

C.R. Lewis admr. to collect

(Signature of person, firm or corporation having custody or control of well.)

Per Haldon MooreAddress Vandalia, Ill.Haldon Moore Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Moweaqua, Ill.Subscribed and sworn to before me this 7 day of April, A.D. 1950My commission expires Feb. 24 1954

Notary Public.

11-12N-7E

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Walter Duncan & Acme Casing Pulling Company

and

Richard Hansen

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil and/or Gasknown as the Gorton Taylor #7 (Indicate whether for oil, gas, water or other purposes) and located as follows: 330 ft. north; Locate well accurately on plat of section
(Scale one inch—2,000 ft.)
330 ft. south; 990 ft. east; 990 ft. west
of the NE corner of the NE Quarter
of the Quarter of the Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.
Elevation above sea level is { Derrick Floor 694 ft.
Ground ft.Total depth 3160 Formation Date permit to drill issued 6/14/48 Permit No. 1093Permit issued to Walter DuncanDate drilling began 6/2/48Date drilling completed 6/26/48Kind of drilling tools used RotaryDate plugging began 11/3/69Date plugging completed 11/4/69Lessor Gorton Taylor Address Mattoon, IllinoisLessee Walter Duncan Address LaSalle, IllinoisDrilling Contractor Dee Miller Drig Co. Address Lawrenceville, Illinois

DETAILS OF PLUGGING:

Filled with P.F.B. and Cement From 3160 To 1745 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1745 To 1704 feetFilled with Mud From 1704 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 101 feetKind of Plug Cement From 101 To 76 feetFilled with Mud From 76 To 30 feetKind of Plug Cement From 30 To 0 feetKind of Plug Earth From 0 To 0 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Signed(1) Have pits and other excavations been filled? Yes No(2) Have the following been removed? Yes NoEquipment Yes No Concrete bases Yes No Debris Yes No(3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been levelled? Yes NoIf this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>91</u>		<u>3</u>		<u>92</u>		
<u>54</u>	<u>3160</u>		<u>405</u>		<u>2655</u>		

RECEIVED
DIVISION OF OIL & GAS
DEC 2 1969
DEPARTMENT OF
MINES & MINERALS

Walter Duncan

(Signature of person, firm or corporation having custody or control of well.)

Per Richard HansenAddress Box 158, Grayville, IllinoisInspector Richard Hansen

(Signature and title of party supervising plugging of well.)

Address Box 177, Newman, IllinoisSubscribed and sworn to before me this 5th day of Nov, A.D. 1969My commission expires July 26, 1973 Dee Miller

Notary Public.

WELL PLUGGING AFFIDAVIT

SS. Charles Armantrout and
E. R. CLIFTON - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Herkimer #1-A and located as follows: - ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west
of the NE corner of the NW Quarter
of the NE Quarter of the - Quarter of
Section 11, Township 12 (North of 61/56606)
Range 7, (East of 104th), of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor - ft.
Ground 694 ft.

Total depth 3154 Formation Carper

Date permit to drill issued 12-14-81 Permit No. 17372

Permit issued to Charles Armantrout

Date drilling began 12-14-81

Date drilling completed 12-18-81

Kind of drilling tools used Rotary

Date plugging began 10-15-87

Date plugging completed 10-15-87

Lessor M. Herkimer Address Mattoon, Illinois.
Lessee Charles Armantrout Address Mattoon, Illinois.
Drilling Contractor N.R. A. Address -

DETAILS OF PLUGGING:

Filled with <u>P. P. B.</u>	From <u>3254</u>	To <u>2330</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>2330</u>	To <u>300 C.I.P.</u>	feet
Filled with <u>Cement</u>	From <u>300</u>	To <u>06</u>	feet
Kind of Plug <u>Earth</u>	From <u>06</u>	To <u>0</u>	feet
Filled with <u>-</u>	From <u>-</u>	To <u>-</u>	feet
Kind of Plug <u>-</u>	From <u>-</u>	To <u>-</u>	feet
Filled with <u>-</u>	From <u>-</u>	To <u>-</u>	feet
Kind of Plug <u>-</u>	From <u>-</u>	To <u>-</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
- (2) Have the following been removed?
Equipment	☒ Yes ☐ No	Concrete bases	☐ Yes ☐ No	Debris	☒ Yes ☐ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production Failed to produce

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
8-5/8	100	-	6	-	94	-	
4-1/2	3150	-	6	-	3146	-	300 sacks

Charles Armantrout
(Signature of person, firm or corporation having custody or control of well.)
Per E. R. Clifton
Address Box 217 Mattoon, Illinois - 61938
E. R. Clifton State Well Inspector
(Signature and title of party supervising plugging of well.)
Address Box 206, Louisville, Illinois 62858

Subscribed and sworn to before me this 19th day of October, A.D. 19 87
My commission expires 5-29-89 Betty Stanford
Notary Public

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

James R. Covington

and

H. B. Nohlit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Harkinskr # 10 and located as follows: _____ ft. north;

330 ft. south; 330 ft. east; _____ ft. west

of the NW corner of the NE Quarter

of the _____ Quarter of the _____ Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the _____

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 690 ft.

Total depth 3172 Formation _____

Date permit to drill issued 12/1/70 Permit No. 1132

Permit issued to James R. Covington

Date drilling began 12/1/70

Date drilling completed _____

Kind of drilling tools used Rotary

Date plugging began 12/7/81

Date plugging completed 7/10/81

Lessor _____ Address _____
Lessee James R. Covington Address 1100 So. 15th. St. Mattoon, Illinois
Drilling Contractor Depoister Drilling Co. Address Effingham, Illinois

P.P.B. From 3172-1780 DETAILS OF PLUGGING: Cast Iron Plug Set 1740

Filled with Cement From 1740 To 1700 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1700 To 225 feet

Filled with Cement From 225 To 75 feet

Kind of Plug Mud From 75 To 15 feet

Filled with Cement From 15 To 03 feet

Kind of Plug Earth From 03 To 0 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None

(1) Have pits and other excavations been filled? _____ Yes ☐ No ☒

(2) Have the following been removed? _____

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? _____ Yes ☒ No ☐

(4) Has well-site been leveled? _____ Yes ☒ No ☐

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
44	2780	1200	1580	100 Sacks W/Run
	293031

James R. Covington
(Signature of person, firm or corporation having custody or control of well.)
Per J. B. Bridgman (For) J. R. Covington
Address Mattoon Illinois
H. B. Nohlit Well Inspector
(Signature and title of party supervising plugging of well.)
Address 402 S. Central Casey, Illinois

Subscribed and sworn to before me this 13 day of July, A.D. 1981

My commission expires 6-24-82

Notary Public

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Frank ZakowskiMattoon andWinston Wade

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for Oil or Gas NW NW NE

(Indicate whether for oil, gas, water or other purposes)

known as the Herknermer # 5

and located as follows: _____ ft. north;

330 ft. south; 330 ft. east; _____ ft. westof the NW corner of the NE Quarter

of the _____ Quarter of the _____ Quarter of

Section 11, Township 12 (North or South)Range 7 E, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 928 ft.

{ Ground _____ ft.

Total depth 3171 Formation DevonianDate permit to drill issued 2-25-52 Permit No. 219Permit issued to Harry S. AdamsDate drilling began 3-18-52Date drilling completed 4-2-52Kind of drilling tools used RotaryDate plugging began 6-1-53Date plugging completed 6-4-53Lessor HerknermerAddress Mattoon, IllLessee Harry J. AdamsAddress Terre Haute, IndDrilling Contractor T & H Corp.Address Terre Haute, Ind.

DETAILS OF PLUGGING:

Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From <u>3171</u>	To <u>3110</u> feet
Kind of Plug <u>Gravel</u>	From <u>3110</u>	To <u>2880</u> feet
Filled with <u>Cement</u>	From <u>2880</u>	To <u>2820</u> feet
Kind of Plug <u>Mud</u>	From <u>2820</u>	To <u>120</u> feet
Filled with <u>Cement</u>	From <u>120</u>	To <u>95</u> feet
Kind of Plug <u>Aquagel</u>	From <u>95</u>	To <u>30</u> feet
Filled with <u>Cement and Cap</u>	From <u>30</u>	To <u>2</u> feet
Kind of Plug <u>Earth</u>	From <u>2</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No coal encountered

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
- (2) Have the following been removed? ☐ Yes ☒ No
- Equipment ☐ Concrete bases ☐ Debris ☐
- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 1/2</u>	<u>3171</u>		<u>1821</u>		<u>1350</u>		
<u>10</u>	<u>110</u>				<u>110</u>		

Frank Zakowski and Son

(Signature of person, firm or corporation having custody or control of well.)

Per Frank ZakowskiAddress Casey, IllinoisWinston Wade

Oil well inspector

(Signature and title of party supervising plugging of well.)

Address R.R. #3 Paris, Illinois.Subscribed and sworn to before me this 6th day of June, A.D. 1953My commission expires March 1957Betty Rigdon
Notary Public

Notary Public

S
to
go

WELL PLUGGING AFFIDAVIT

Charles Armentout
E. R. CLIFTON State Well Inspector

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Mary Hermiker # 6 and located as follows: 660 ft. north; 330 ft. south; 330 ft. east; - ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the NW corner of the NE Quarter
of the - Quarter of the - Quarter of
Section 11, Township 12 (North of South)
Range 7, (East of West), of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor - ft.
Ground 698 ft.

Total depth 3188 Formation Devonion

Date permit to drill issued 5-12-85 Permit No. N.R.A. 1957

Permit issued to N. R. A. Harry Adams

Date drilling began 5-12-55

Date drilling completed 5-22-85

Kind of drilling tools used Rotary

Date plugging began 10-15-87

Date plugging completed 10-15-87

Lessor Mary Hermiker

Address Mattoon, Illinois

Lessee Harry Adams

Address Tere Haute, Ind.

Drilling Contractor Dillard/Kniernan

Address Caey, Illinois

DETAILS OF PLUGGING:

Filled with P. P. B. From 3188 To 2800 C IP feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Cement From 2800 To 2806 feet
Filled with Earth From 06 To 0 feet
Kind of Plug - From - To - feet
Filled with - From - To - feet
Kind of Plug - From - To - feet
Filled with - From - To - feet
Kind of Plug - From - To - feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production N. R. A.

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10-3/4	140	-	6	-	134	-	Cement circ.
5-1/2	3155	-	6	-	3149	-	

"OFFICIAL SEAL"
BETTY D. STANFORD
Notary Public, State of Illinois
My Commission Expires 5/29/89

Charles Armentout

(Signature of person, firm or corporation having custody or control of well.)

Per

Address Mattoon, Illinois 62839

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 206, Louisville, Illinois -6 2858

Subscribed and sworn to before me this 19 day of October, A.D. 1987

My commission expires 5-29-89

Betty Stanford
Notary Public

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

322771

OG-6 WELL PLUGGING REPORT

COUNTY No. 1030

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

WELL NAME: Herkimer #6-A

PERMIT NO. 9741

(ISSUE DATE IF NO NUMBER)

f765 PERMITTEE: Schaefer Oil Co.

REFERENCE NO. 112582

COUNTY Coles SECTION 11 TOWNSHIP 12N RANGE 7E
LOCATION: 330 FT. NORTH; OR _____ FT. SOUTH; AND 990 FT. EAST; OR _____ FT. WEST
OF THE SW CORNER OF THE NE QUARTER OF _____ QUARTER OF
THE _____ QUARTER.

DATE PLUGGING BEGAN 4/14/92 DATE PLUGGING COMPLETED 4/14/92

PLUGGING CONTRACTOR Bangert Casing Pulling

ADDRESS Box 441

Clay City IL 62824

WELL DATA:

TOTAL DEPTH OF WELL		PRODUCING / INJECTION INTERVALS	
3175	FT.	FROM 3129	TO 3138
PLUGGED BACK TOTAL DEPTH	FT.	FROM	TO
BASE OF FRESHWATER ZONE	147 FT.	FROM	TO
WORKABLE COALS PRESENT AT	FT.	FROM	TO
	FT.	FROM	TO

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH	FROM	TO	FT.
Cement (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	3150	3020	
Mud	3020	250	
Cement	250	04	
Earth	04	GL	

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	130	N/A	12 1/4	Surface	4
INTERMEDIATE / MINE STRING / OR LINER	7"	1905	N/A	10 3/4	Surface	4
PRODUCTION	4 1/2	3170	100	6 1/4	2400	2114

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Sammy F. [Signature]
PERMITTEE OR DESIGNEE

INSPECTOR WITNESSING PLUGGING

Clay City IL 62824

4/14/92

DATE

CITY, STATE

ZIP

RECEIVED

APR 21 1992

Department of Mines & Minerals
Oil & Gas Division

SS.

WELL PLUGGING AFFIDAVIT

Charles Armantrout

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the M^B Herkimer #3

and located as follows: _____ ft. north;

330 ft. south; 330 ft. east; _____ ft. west

of the NW corner of the SE Quarter

of the NW Quarter of the NE Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the _____

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 691 ft.

Total depth 3172 Formation Devonian

Date permit to drill issued 1-5-44 Permit No. #17

Permit issued to National Consld Oil Co.

Date drilling began 1-08-46

Date drilling completed 2-03-46

Kind of drilling tools used Rotary

Date plugging began 10-15-87

Date plugging completed 10-15-87

Lessor M. Herkimaer

Address Mattoon, Illinois

Lessee Nat'l Cons. Oil

Address N.R. A.

Drilling Contractor N.R.A.

Address _____

DETAILS OF PLUGGING:

Filled with <u>P.P.B.</u>	From <u>3172</u>	To <u>1891</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Cement</u>	From <u>1891</u>	To <u>06</u> feet
Filled with <u>Earth</u>	From <u>06</u>	To <u>0</u> feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production N.R.A.

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
10-3/4	75 -	6 -	69 -	
5-1/2	3122 -	6 -	3112 -

Charles Armantrout

(Signature of person, firm, or corporation having custody or control of well.)

Per _____

Address Mattoon, Illinois.

E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 206, Louisville, Illinois 62858

Subscribed and sworn to before me this 19th day of October, A.D. 1987

My commission expires 5-29-89

Betty D. Stanford
Notary Public

60#632 Mattoon
(66050-10M-10-57)

WELL PLUGGING AFFIDAVIT

STATE OF ILLINOIS

County of COLES

ss.

D. J. ALLEN

and

WINSTON WADE

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

known as the

HOMANN #1E/2 NESW

(Indicate whether for oil, gas, water or other purposes)

and located as follows: _____ ft. north;

660 ft. south; _____ ft. east; 330 ft. westof the NE corner of the SW Quarter

of the _____ Quarter of the _____ Quarter of

Section 11, Township 12 (North of 900th)Range 7, (East of West), of the 3rd.Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

{ Ground 714 ft.Total depth 3247 Formation DEVONIANDate permit to drill issued 5-12-58 Permit No. 795Permit issued to HILL PROD. CO.Date drilling began 5-14-58Date drilling completed 5-28-58Kind of drilling tools used ROTARYDate plugging began 5-28-58Date plugging completed 5-28-58ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONLessor HOMANN

Address _____

Lessee HILL PROD. CO.Address MATTOON, ILLINOISDrilling Contractor HOMER LUTTRELLAddress EFFINGHAM, ILLINOIS

DETAILS OF PLUGGING:

Filled with <u>R. Mud</u> (Rotary Mud, Cement, or Other Materials)	From <u>3247</u>	To <u>1960</u> feet
Kind of Plug <u>Cement</u>	From <u>1960</u>	To <u>1910</u> feet
Filled with <u>R. Mud</u>	From <u>1910</u>	To <u>1800</u> feet
Kind of Plug <u>Cement</u>	From <u>1800</u>	To <u>1750</u> feet
Filled with <u>R. Mud</u>	From <u>1750</u>	To <u>110</u> feet
Kind of Plug <u>Cement</u>	From <u>110</u>	To <u>80</u> feet
Filled with <u>R. Mud</u>	From <u>80</u>	To <u>7</u> feet
Kind of Plug <u>Cement</u>	From <u>7</u>	To <u>2</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NO COAL

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production DRY

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	100				100		

RECEIVED
DIVISION OF OIL & GAS
JUN - 6 1958

HILL PRODUCTION CO.

(Signature of person, firm or corporation having custody or control of well.)

Per D. J. AllenAddress BOX 159 MATTOON, ILLINOISWinston Wade INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOIS

DEPARTMENT OF
MINES AND METALS

Subscribed and sworn to before me this 2nd day of June, A.D. 1958My commission expires 3-9-61

Betty Rigdon
Notary Public

WELL PLUGGING AFFIDAVIT

James R. Covington

and

H. A. CLIFTON - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL AND / OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the Tay. or #1 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; _____ ft. east; 890 ft. west
of the NE corner of the NW Quarter
of the _____ Quarter of the _____ Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West) of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 691.5 ft.

Total depth 3170 Formation Devonian

Date permit to drill issued 11/16/79 Permit No. 1080

Permit issued to James R. Covington

Date drilling began 11/14/79

Date drilling completed 11/24/79

Kind of drilling tools used Rotary

Date plugging began 4/17/80

Date plugging completed 4/17/80

Lessor Gordon Taylor Address Mattoon, Illinois
Lessee James R. Covington Address 1100 S. 15th, Mattoon, Illinois - 61938
Drilling Contractor Sledge Drilling Co. Address Mr. Varnon, Illinois.

DETAILS OF PLUGGING:

Filled with PREVIOUS p/b From 3170 To 3100 feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Cast Iron Plug From 3100 To 25 feet
Filled with Mud From 3100 To 25 feet
Kind of Plug Cement From 25 To 03 feet
Filled with Earth From 03 To 0 feet
Kind of Plug _____ From _____ To _____ feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production 1-1-77-79 5 MCFD

CASING RECORD

	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8</u>	<u>120</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>120</u>	<u>-</u>	<u>Cemented when run</u>
<u>4-1/2"</u>	<u>3165</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>3165</u>	<u>-</u>	<u>Cemented w/ 200 sacks when run.</u>

James R. Covington

(Signature of person, firm or corporation having custody or control of well.)

Address 1100 S. 15th, Mattoon, Illinois - 61938

H. A. Clifton State Well Inspector
(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 21 day of April, A.D. 1980

My commission expires 3/8/83

Notary Public

WELL PLUGGING AFFIDAVIT

James R. Covington

E. R. CLIFTON - State Well Inspector

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL AND OR GAS

known as the Gordon Taylor #2 and located as follows: 430 ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

ft. south; 330 ft. east; 330 ft. west
of the SE corner of the NW Quarter
of the 11 Quarter of the 12 Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West) of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 695 ft.

Total depth 3170 Formation CEDAR VALLEY

Date permit to drill issued 4/7/71 Permit No. 219

Permit issued to James R. Covington

Date drilling began 4/7/71

Date drilling completed 4/17/71

Kind of drilling tools used Rotary

Date plugging began 6/28/81

Date plugging completed 6/28/81

Lessor Gordon Taylor (Deceased)

Address Mattoon, Illinois

Lessee James R. Covington

Address 400 So. 15th, Mattoon, Illinois - 61938

Drilling Contractor Sledge Drilling Co.

Address Mt. Vernon, Illinois.

DETAILS OF PLUGGING:

Filled with PREVIOUS PLUG BACK From CAST IRON PLUG To 0 3100 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 3100 To 03 feet

Filled with Earth From 03 To 0 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE ENCOUNTERED

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production 50 MCF Dec. 1978

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8/5/8	106	--	--	--	106	--	
4-1/2	3170	--	--	--	3170	--	

James R. Covington

(Signature of person, firm or corporation having custody or control of well.)

Per Mattoon, Illinois.

Address State Well Inspector

(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 28th day of June, A.D. 1981

My commission expires 9/29/81
Notary Public

WELL PLUGGING AFFIDAVIT

SS. Charles Armantrout and
E. R. CLIFTON - State Well Inspector
being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Herkimer #B-1 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

430 ft. south; _____ ft. east; 330 ft. west
of the NE corner of the NW Quarter
of the NE Quarter of the _____ Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the COLES
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 694 ft.

Total depth 2408 Formation Osage

Date permit to drill issued 12-6-85 Permit No. 37551

Permit issued to Charles Armantrout

Date drilling began 12-16-85

Date drilling completed 12-20-85

Kind of drilling tools used Rotary

Date plugging began 10-15-87

Date plugging completed 10-15-87

Lessor M. Herkimer Address Mattoon, Illinois.
Lessee Charles Armantrout Address Mattoon, Illinois.
Drilling Contractor N. R. A. Address _____

DETAILS OF PLUGGING:

Filled with P.P.B. From 2408 To 300 C.I.B. feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Cement From 300 To 96 feet
Filled with Earth From 96 To 0 feet
Kind of Plug _____ From _____ To _____ feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production N. R. A.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	218	-	6	-	212	-	200 200 Sacks
4-1/2	2407	-	6	-	2401	-	75 sacks

Charles Armantrout
(Signature of person, firm or corporation having custody or control of well.)
Per _____
Address Box 217 Mattoon Illinois 7- 62839
E. R. Clifton State Well Inspector
(Signature and title of party supervising plugging of well)
Address Box 206, Louisville, Illinois 6- 62858

Subscribed and sworn to before me this 19 day of October, A.D. 19 87
My commission expires 5-29-89

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Charles Armentrout

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Taylor #1

and located as follows: 330 ft. north;

ft. south; 990 ft. east; ft. west

of the SW corner of the NW Quarter

of the Quarter of the Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.

Ground 701.6 ft.

Total depth 1995 Formation Rosiclare

Date permit to drill issued 10/12/79 Permit No. 8387

Permit issued to Charles Armentrout

Date drilling began 10-19-79

Date drilling completed 10-21-79

Kind of drilling tools used Rotary

Date plugging began 10-22-79

Date plugging completed 10-22-79

Address Mattoon, Illinois.

Lessor

First Nat 'l Bank Mattoon
Trust for Gordon Taylor

Lessee

Charles Armentrout

Address

Mattoon, Illinois.

Drilling Contractor

Depoister Drilling Co.

Address

Effingham, Illinois.

DETAILS OF PLUGGING:

Filled with Cement From 1995 To 1970 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Rotary Mud From 1970 To 250 feet

Filled with Cement From 250 To 200 feet

Kind of Plug Rotary mud From 200 To 125 feet

Filled with Cement From 125 To 100 feet

Kind of Plug Rotary mud From 100 To 30 feet

Filled with Cement From 30 To 03 feet

Kind of Plug RAT HOLE: Earth Rotary Mud From TD-30', cement 30-03 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production DRY HOLE 10-21-79

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8"	111	-	*				

(Signature of person, firm or corporation having custody or control of well.)

Per

Address P.O. Box 217, Mattoon, Illinois - 61938

Address State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grand Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this

23rd day of October, 1979

A.D. 19 79

My commission expires

9/29/81

Notary Public

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

COUNTY No. 23018

Bancort Casing Pulling Corp for Charles Armantrout
Kevin Spencer

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

known as the Taylor #5 (Indicate whether for oil, gas, water or other purposes)
and located as follows: _____ ft. north;
_____ ft. south; _____ ft. east; _____ ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the NW corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 11, Township 12 (North ~~South~~)
Range 7E, (East ~~West~~), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 693 ft.
Ground 690 ft.

Total depth 1978 Formation Rosiclare

Date permit to drill issued 5/8/81 Permit No. 14187

Permit issued to Charles Armantrout

Date drilling began 8/30/81

Date drilling completed 9/2/81

Kind of drilling tools used Rotary

Date plugging began 6/22/89

Date plugging completed 6/23/89

Lessor Gorton W. Taylor Address Mattoon IL

Lessee Charles Armantrout Address Mattoon IL

Drilling Contractor Depoister Drig Address Effingham IL

DETAILS OF PLUGGING:

Filled with <u>Mud</u> (Rotary Mud, Cement, or Other Materials)	From <u>1978</u>	To <u>1941</u>	feet
Kind of Plug <u>Cement</u>	From <u>1941</u>	To <u>1890</u>	feet
Filled with <u>Mud</u>	From <u>1890</u>	To <u>300</u>	feet
Kind of Plug <u>Cement</u>	From <u>300</u>	To <u>4</u>	feet
Filled with <u>Soil</u>	From <u>4</u>	To <u>0</u>	feet
Kind of Plug _____	From _____	To _____	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
- (2) Have the following been removed?
- Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>167</u>		<u>4</u>		<u>163</u>		<u>150 Sacks</u>
<u>4 1/2</u>	<u>1978</u>		<u>1102</u>		<u>876</u>		<u>200 Sacks</u>

OFFICIAL SEAL
SHARON SMITH
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires Dec. 26, 1992

Signature of person, firm or corporation having custody or control of well)
Per Kevin Spencer
Address Clay City IL
Signature and title of party supervising plugging of well)
Kevin Spencer Well Insp. I
Address Box 449 Martinsville IL 62442

Subscribed and sworn to before me this 13 day of July, A.D. 19 89
My commission expires _____

WELL PLUGGING AFFIDAVIT

County of Coles Banger Casing Pulling for Charles Armentrout and Kevin Spencer being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil (Indicate whether for oil, gas, water or other purposes)

known as the Taylor #9 and located as follows: 890 ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

ft. south; 330 ft. east; SE corner of the SENE Quarter of the NW Quarter of the 11 Quarter of Section 11, Township 12 (North of South) Range 7, (East of West), of the Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 701 ft.

Total depth 2016 Formation Peculiar

Date permit to drill issued 5-4-82 Permit No. 18716

Permit issued to Charles Armentrout

Date drilling began 5-4-82

Date drilling completed 5-8-82

Kind of drilling tools used Rotary

Date plugging began 6/23/89

Date plugging completed 6/26/89

Lessor Gorton W Taylor Address Mattoon IL
Lessee Charles Armentrout Address Mattoon IL
Drilling Contractor Depoister Inc Address Effingham IL

DETAILS OF PLUGGING:

Filled with	From	To
<u>Mud</u> (Rotary Mud, Cement, or Other Materials)	<u>2016</u>	<u>1982</u> feet
Kind of Plug <u>Cement</u>	<u>1982</u>	<u>1932</u> feet
Filled with <u>mud</u>	<u>1932</u>	<u>300</u> feet
Kind of Plug <u>Cement</u>	<u>300</u>	<u>4</u> feet
Filled with <u>Soil</u>	<u>4</u>	<u>0</u> feet
Kind of Plug		feet
Filled with		feet
Kind of Plug		feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete base ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three or more feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
<u>8 5/8</u>	<u>120</u>	<u>4</u>	<u>116</u>	<u>150 Sacks</u>
<u>4 1/2</u>	<u>2016</u>	<u>977</u>	<u>1035</u>	<u>250 Sacks</u>

Signature of person, firm or corporation having custody or control of well: Clay City IL
Signature and title of party supervising plugging of well: Box 449 Mattoonville IL 62442
JUL 19 1989
DEPT. MINES & MINERALS
OIL & GAS DIV.

Subscribed and sworn to before me _____

My commission expires _____

A.D. 19 89

WELL PLUGGING AFFIDAVIT

County of Coles } SS. J.L. Schaefer and
H.L. Noblit State Well Inspector
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

known as the Homann # 4 (Indicate whether for oil, gas, water or other purposes)
and located as follows: _____ ft. north;
_____ ft. south; _____ ft. east; _____ ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

_____ ft. north;
_____ ft. south; _____ ft. east; _____ ft. west
of the NE corner of the SW Quarter
of the _____ Quarter of the _____ Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 709 ft.
Total depth 1960 Formation Rosiclare
Date permit to drill issued 5/11/79 Permit No. 349
Permit issued to Schaefer Oil Co.
Date drilling began N.A.
Date drilling completed N.A.
Kind of drilling tools used Rotary
Date plugging began 10/11/83
Date plugging completed 10/11/83

Lessor Homann Address _____
Lessee Schaefer Oil Co. Address Box # 35 Mattoon, IL.
Drilling Contractor Sledge Drlg. CO. Address Mt. Vernon, IL.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1960</u>	To <u>1900</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud & Cavings</u>	From <u>1900</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>03</u>	feet
Kind of Plug <u>Soil</u>	From <u>03</u>	To <u>0</u>	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been leveled? ☒ Yes ☐ No
If this was a producing well, give date and amount of last production Abanded

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
10"	100		3		97		
4"	1960		1455		505		

Schaefer Oil Co.
(Signature of person, firm or corporation having custody or control of well.)
Per J.L. Schaefer
Address Mattoon, IL.
Well Inspector
(Signature and title of party supervising plugging of well.)
Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 12th day of October, A.D. 1983
My commission expires August 27, 1985
Marble Noblit
Notary Public
My Commission Expires August 27, 1985

County of Coles

SS

WELL PLUGGING AFFIDAVIT

COUNTY No. 23160

Bangert Casing Pulling Corp. for Charles Armantrout
Kevin Spencer being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

known as the Taylor #10 and located as follows: 990 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

ft. south; 990 ft. east; 1 ft. west
of the SW corner of the NWSE Quarter
of the 11 Quarter of the 12 Quarter of
Section 11, Township 12 (North Coles)
Range 7, (East Coles), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 694 ft.
Ground 690 ft.

Total depth 1970 Formation Cypress

Date permit to drill issued 7/5/83 Permit No. 24869

Permit issued to Charles Armantrout

Date drilling began 7/6/83

Date drilling completed 7/9/83

Kind of drilling tools used Rotary

Date plugging began 6/22/89

Date plugging completed 6/23/89

Lessor Gorton W Taylor Address Mattoon IL
Lessee Charles Armantrout Address Mattoon IL
Drilling Contractor Depoister Drlg Address Effingham IL

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>mud</u> (Rotary Mud, Cement, or Other Materials)	<u>1970</u>	<u>1849</u>	
Kind of Plug <u>Bridge Plug</u>	<u>1849</u>	<u>1830</u>	feet
Filled with <u>mud</u>	<u>1830</u>	<u>1735</u>	feet
Kind of Plug <u>Bridge Plug</u>	<u>1735</u>	<u>1730</u>	feet
Filled with <u>Cement</u>	<u>1730</u>	<u>1680</u>	feet
Kind of Plug <u>mud</u>	<u>1680</u>	<u>300</u>	feet
Filled with <u>Cement</u>	<u>300</u>	<u>4</u>	feet
Kind of Plug <u>Soil</u>	<u>4</u>	<u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production None

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>165</u>		<u>4</u>		<u>161</u>		<u>150 Sacks</u>
<u>4 1/2</u>	<u>1970</u>		<u>1000</u>		<u>970</u>		<u>150 Sacks</u>

(Signature of person, firm or corporation having custody or control of well.)

Per Kevin Spencer

Address Clay City IL

(Signature and title of party supervising plugging of well.)

Address Box 449 Martinsville IL

Subscribed and sworn to before me this 13 day of July, A.D. 1989

My commission expires Dec 25 1992

JUL 19 1989

MINERALS

STATE OF ILLINOIS

COLES

SS.

County of

WELL PLUGGING AFFIDAVIT

Safari Oil Company - Tri-State Casing Pulling Co. and

E. R. CLIFTON * State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well

drilled for Oil/Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Homann #3-A

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)430 ft. south; 990 ft. east; ft. west
of the NW corner of the SW Quarter

of the Quarter of the Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 710 ft.

Total depth 2256 Formation Salem

Date permit to drill issued 11-30-75 Permit No. 3814 (Salem)

Permit issued to Safari Oil Company

Date drilling began 3-11-77

Date drilling completed 3-18-77

Kind of drilling tools used Rotary

Date plugging began 3-5-77

Date plugging completed 3-6-77

Lessor O. Homann et al

Address

Lessee Safari Oil Co.

Address Mattoon, Illinois

Drilling Contractor M & E Drilling Co.

Address Casey, Illinois

P.P.B. (Cement)

DETAILS OF PLUGGING:

	Cement	From	To	feet
Filled with	Cement	2256	2007	1885
Kind of Plug	Mud	1885	250	feet
Filled with	Cement	250	100	feet
Kind of Plug	Mud	100	12	feet
Filled with	Cement	12	03	feet
Kind of Plug	Earth	03	0	feet
Filled with				feet
Kind of Plug				feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

Non-encountered

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed?

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production

Dry Hole - Abandoned

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
7"	115 -	4 -	111 -	Cement circulated
4-1/2"	2012 -	1578 -	434	Cemented w/ 80 sacks.

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per E. R. Clifton
Address Mattoon, Illinois.

E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 12th day of May, 1977

My commission expires 12-31-80

Notary Public

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1029

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

45999

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER _____

PERMITTEE: James Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414

WELL NAME: Conrad Comm. #1 PERMIT NO. 66 REFERENCE NO. 124034
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 11
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 330 FT. SOUTH; AND
_____ FT. EAST; OR 330 FT. WEST OF THE NE
CORNER OF THE SE QUARTER OF THE SW
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>719</u>	FT.		PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>N/A</u>	FT.		FROM <u>N/A</u> TO <u>N/A</u>
PLUGGED BACK TOTAL DEPTH	<u></u>	FT.		FROM <u></u> TO <u></u>
BASE OF FRESHWATER ZONE	<u>169</u>	FT.		FROM <u></u> TO <u></u>
WORKABLE COALS PRESENT AT	<u></u>	FT.		FROM <u></u> TO <u></u>
DESCRIBE PREVIOUS PLUGBACK PROCEDURE:				

DETAILS OF PLUGGING:

FILLED WITH	Well Bore Fluid	FROM	TD	TO	1705	FT.
	(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)					
FILLED WITH	CIBP & Cement	FROM	1705	TO	1689	FT.
FILLED WITH	Well Bore Fluid	FROM	1689	TO	259	FT.
FILLED WITH	Cement	FROM	259	TO	04	FT.
FILLED WITH	Earth	FROM	04	TO	GL	FT.
FILLED WITH		FROM		TO		FT.
FILLED WITH		FROM		TO		FT.

COMMENTS: CIBP Set @ 1705 With Cement on top. Casing was shot at 259 and circulated to surface behind long string. Casing also full from 259 to surface. (NO PIPE RECOVERY) Pumped 140 SX to circulate to surface. From 259 ft.

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	119	N/A	N/A	N/A	4
INTERMEDIATE /MINE STRING / OR LINER						
PRODUCTION	5 1/2	1870	N/A	N/A	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT AND COMPLETE.

SIGNATURE OF: *Jim Ordner*
 PERMITTEE OR DESIGNEE
950 Sunset RD. PO Box 402
 ADDRESS
Clay City IL.62824
 CITY, STATE ZIP

DATE PLUGGING BEGAN 4/11/96
DEPT. OF NATURAL RESOURCES
DATE PLUGGING COMPLETED 4/12/96

APR 19 1996

RECEIVED

IL 472-0198 (Rev 8/93)

(OVER)

OFFICE OF MINES & MINERAL TECHNOLOGY
OIL AND GAS DIVISION
APR 25 1996
Printed on Recycled Paper
GEOLOGIC RECORDS

County of Coles

WELL PLUGGING AFFIDAVIT

Bangert Casing Pulling Corp. For Charles Armantrout and Kevin Spencer being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Taylor #6 and located as follows: _____ ft. north;

1650 ft. south; 1650 ft. east; _____ ft. west

of the NW corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 11, Township 12 (North ~~or South~~)

Range 7, (East ~~or West~~), of the _____

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 702 ft.

Ground 699 ft.

Total depth 1995 Formation Spar Mountain

Date permit to drill issued 5-8-81 Permit No. 14188

Permit issued to Charles Armantrout

Date drilling began 9/4/81

Date drilling completed 9/6/81

Kind of drilling tools used Rotary

Date plugging began 6/23/89

Date plugging completed 6/24/89

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Gorton W Taylor Address Mattoon IL

Lessee Charles Armantrout Address Mattoon IL

Drilling Contractor Depoister Drig Address Effingham IL

DETAILS OF PLUGGING:

Filled with Mud From 1995 To 1971 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1971 To 1900 feet

Filled with mud From 1900 To 300 feet

Kind of Plug Cement From 300 To 4 feet

Filled with SGI From 4 To 0 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 3/4</u>	<u>154</u>		<u>4</u>		<u>150</u>		<u>150 Sacks</u>
<u>4 1/2</u>	<u>1995</u>		<u>979</u>		<u>1016</u>		<u>200 Sacks</u>

Subscribed and sworn to before me this 13 day of July, A.D. 1989

(Signature of person, firm or corporation having custody or control of well)

Per Kevin Spencer

Address Clay City IL

Kevin Spencer Well Inspector, MINES & MINERALS

(Signature and title of party supervising plugging of well)

Address Box 449 Martinsville IL 62442

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY No. 1068300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

756385

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Bill J. SledgePERMITTEE NO. 2209WELL NAME: VanLaningham-Bates
Comm #2PERMIT NO. 000130

(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 112708 COUNTY Coles SECTION 11
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 990 FT. SOUTH; AND
990 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE SW QUARTER OF THE SW
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.Mattoon

WELL DATA:

SURFACE ELEVATION 734 FT.
TOTAL DEPTH OF WELL 1985 FT.
PLUGGED BACK TOTAL DEPTH 1969 FT.
BASE OF FRESHWATER ZONE 184 FT.
WORKABLE COALS PRESENT AT NA FT.

PRODUCING / INJECTION INTERVALS

FROM 1736 TO 1969
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement FROM 1969 TO 1618 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH Wellbore fluid FROM 1618 TO 250 FT.
FILLED WITH Cement FROM 250 TO 4 FT.
FILLED WITH top soil FROM 4 TO SURFACE FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

COMMENTS: _____

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>125</u>	<u>NR</u>	<u>NR</u>		<u>4'</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>5 1/2</u>	<u>1945</u>	<u>NR</u>	<u>7 7/8</u>		<u>300</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Bill J. Sledge
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 7 Aug 96DEPT. OF MINES AND MINERALS
DATE PLUGGING COMPLETED 7 Aug 96

ADDRESS _____

CITY, STATE _____

ZIP _____

AUG 15 1996

File in **STATE OF ILLINOIS**
Coles
 County of **DOUGLAS**

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector and
Walter Duncan by Irv Portschell being first duly sworn,
 do depose and say the following is a true and correct statement of the details of the plugging of a certain
 well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)
 known as the Gorton W. Taylor # 8 and located as follows: _____ ft. north;
 _____ ft. south; _____ ft. east; _____ ft. west

Locate well accurately on plat of section
 (Scale one inch—2,000 ft.)

of the NW corner of the _____ Quarter
 of the _____ Quarter of the _____ Quarter of
 Section 11, Township 12 (North or South)
 Range 7, (East or West), of the 3rd
 Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
 Ground 691 ft.

Total depth 1745 Formation Rosiclare

Date permit to drill issued 10/29/68 Permit No. 1386

Permit issued to Walter Duncan

Date drilling began 11/7/68

Date drilling completed 11/11/68

Kind of drilling tools used Rotary

Date plugging began 11/12/68

Date plugging completed 11/12/68

Lessor Gorton W. Taylor Address Mattoon, Illinois

Lessee Walter Duncan Address LaSalle, Illinois

Drilling Contractor W.L. Dillier Address Cassey, Illinois

DETAILS OF PLUGGING:

Filled with Cement From 1745 To 1705 feet
 (Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1705 To 192 feet

Filled with Cement From 192 To 140 feet

Kind of Plug Mud From 140 To 25 feet

Filled with Cement From 25 To GL -3 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
 EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
 1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed? ☐ Yes ☒ No

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No

(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production D & A

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8"	1	67			167		Surface casing

Walter Duncan

(Signature of person, firm or corporation having custody or control of well.)

Per Irv Portschell MINES & MINERALS

Address Cassey, Illinois

Richard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, Illinois

Subscribed and sworn to before me this 14th day of November, A.D. 1968

My commission expires 5/10/71 Camilla R. Hanson

Notary Public.

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the M. B. Herkimer #3 and located as follows: _____ ft. north;

330 ft. south; _____ ft. east; 1650 ft. west

of the NE corner of the SE Quarter

of the NE Quarter of the _____ Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

Ground 693 ft.

Total depth 1967 Formation McClosky

Date permit to drill issued 11/19/45 Permit No. 1891

Permit issued to Lillian S. Baker

Date drilling began 1-08-46

Date drilling completed NR

Kind of drilling tools used Rotary

Date plugging began 11-01-86

Date plugging completed 11p01-86

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Mary B. Herkimer Address Mattoon, Illinois.
Lessee Lillian S. Baker Address Box 97, Mattoon, Illinois.
Drilling Contractor N. R. Address _____

DETAILS OF PLUGGING:

Filled with Previous P.B. From 1967 To 300 feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Cast Iron From _____ To 300 feet
Filled with Cement From 300 To 05 feet
Kind of Plug Earth From 05 To 0 feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

- (1) Have pits and other excavations been filled? ☐ Yes ☐ No
(2) Have the following been removed? ☐ Yes ☐ No
Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production N. R. Possibly 1980

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
19-3/4	88	-	5	-	83	-	
7"	1916	-	5	-	1911	-	

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Beverly Sledge
Address Mattoon, Illinois.

E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 206, Louisville, Illinois 62858

Subscribed and sworn to before me this 3rd day of 5-29-86, A.D. 1986

My commission expires 5-29-89 Betty Stanford
Notary Public

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company - Tri-State Casing Pulling Co. and

E. R. Clifton - State Well Inspector

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil (Converted to Water Input well) (Permit #527 dated 6-17-69) (Schaefer Oil Co.)

(Indicate whether for oil, gas, water or other purposes)

known as the Mary B. Herkimer #10 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

_____ 330 ft. south; _____ ft. east; _____ 220 ft. west
of the NE corner of the NW Quarter
of the SE Quarter of the _____ Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 6 704 ft.
Ground _____ ft.

Total depth 1975 Formation Rosiclare

* Date permit to drill issued 12/22/45 Permit No. 2176

Permit issued to L. S. Baker

Date drilling began 12-23-46

Date drilling completed 1-4-46

Kind of drilling tools used Rotary

Date plugging began 8- 9-75

Date plugging completed 8- 9-75

Lessor Mary B. Herkimer

Address Mattoon, Illinois

Lessee L. S. Baker

Address Mattoon, Illinois

Drilling Contractor R & F. Drilling Company Address _____

Fluid _____

Bridge Plug set @ _____

Filled with Cement (Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud

Filled with Cement

Kind of Plug Mud

Filled with Cement

Kind of Plug Mud

Filled with Cement

Kind of Plug Earth

DETAILS OF PLUGGING:

	1975	1850
From	1850	1850
To	1800	1800
		feet
From	1800	250
To	250	200
		feet
From	200	115
To	115	85
		feet
From	85	12
To	12	03
		feet
From	03	0
To		
		feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Non encountered

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production Water Input

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
10-3/4	104 -	3 -	101 -	Cement circulated when run.
7"	1920 -	3 --	1917 -	Cement circulated when run.

RECEIVED
DIVISION OF OIL & GAS

AUG 13 1975

DEPARTMENT OF
MINES & MINERALS

Subscribed and sworn to before me this 9th day of August, A.D. 19 75

My commission expires 10-28-76

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per _____

Address Mattoon, Illinois - Fairfield, Illinois
State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Notary Public

SS.

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company - Tri-State Casing Pulling Co. and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Herklauer #11 and located as follows: 330 ft. north;ft. south; 330 ft. east; ft. westof the SW corner of the NW Quarterof the SE Quarter of the Quarter ofSection 11, Township 12 (North or South)Range 7, (East of West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.{ Ground ft.Total depth 1974 Formation RosiclareDate permit to drill issued 1-26-47 Permit No. 2183Permit issued to B. A. BakerDate drilling began 1-8-46Date drilling completed 1-16-46Kind of drilling tools used RotaryDate plugging began 4-1-75Date plugging completed 4-1-75 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Herklauer Address Mattoon, IllinoisLessee B. A. Baker Address Mattoon, IllinoisDrilling Contractor Foster Drilling Company Address Mt. Vernon, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1974</u>	To <u>1890</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>1890</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>145</u>	feet
Filled with <u>Cement</u>	From <u>145</u>	To <u>115</u>	feet
Kind of Plug <u>Mud</u>	From <u>115</u>	To <u>15</u>	feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
1 0-3/4"	133	-	3	-	130	-	
7"	1924		700	-	1224	-	

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]Address Mattoon, IllinoisE. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 6th day of AprilMy commission expires 10-28-76

DEPARTMENT OF A.D. 1975

Notary Public

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

COUNTY No. 1049

National Consumers Oil Co. Inc.

and

Haldon Moore

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Mary B Herkimer # 2 (4)

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

990 ft. south; 330 ft. east; _____ ft. west
of the NW corner of the NE Quarter
of the _____ Quarter of the _____ Quarter of
Section 11, Township 12 (North of South)
Range 7, (East or West), of the 8
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground not known ft.

Total depth of well is 3158 ft.Date permit to drill issued 11-17-45 Permit No. 1903Permit issued to National Conn. Oil Co. Inc.Date drilling began 1-10-46Date drilling completed 1-22-46Kind of drilling tools used RotaryDate plugging began 1-2-52Date plugging completed 1-8-52Lessor Mary B HerkimerAddress Mattoon, Ill.Lessee National Conn Oil Co. Inc.Address Terra Haute, Ind.Drilling Contractor Victor Drilling Co.Address Mattoon, Ill.

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>2119</u>	<u>2069</u>	
Kind of Plug <u>Rotary mud</u>	<u>2069</u>	<u>135</u>	feet
Filled with <u>Cement</u>	<u>135</u>	<u>110</u>	feet
Kind of Plug <u>Mud & Aquagel</u>	<u>110</u>	<u>25</u>	feet
Filled with <u>Cement & Cap</u>	<u>25</u>	<u>2</u>	feet
Kind of Plug <u>Earth</u>	<u>2</u>	<u>0</u>	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) No Coal encountered

(1) Have pits, cellar and other excavations been filled? ☐ Yes ☒ No
(2) Have equipment, concrete bases and debris been removed? ☐ Yes ☒ No
(3) Has surface casing been cut off below plow depth? ☒ Yes ☐ No
(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Dry

DEPARTMENT
MINES AND MINERALS
RECEIVED

JAN 15 1952

DIVISION OF

OIL and GAS CONSERVATION

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	125						Plug back from 3158 to
7	1927		886		1048		2119 with lane well plug.
4	3150		1641		1509		

Vickers & Blowers Casing Pulling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per. Rubie EdwardsAddress Centerville, Ill.Haldon Moore Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Nowataqua, Ill.Subscribed and sworn to before me this 12 day of January, A.D. 1952My commission expires 2-24-54

Notary Public

Sheet 9
Jad
7

County of COLES } SS.

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for **OIL**

(Indicate whether for oil, gas, water or other purposes)

known as the **Mary B. Herminer #4** and located as follows: **990** ft. north;

ft. south; **330** ft. east; ft. west

of the **SW** corner of the **N2** Quarter

of the Quarter of the Quarter of

Section **11**, Township **12N** (North or South)

Range **7**, (East or West), of the **3rd**

Principal Meridian, **COLES** County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground **695** ft.

Total depth **1561** Formation **Boscliar**

Date permit to drill issued **11/7/45** Permit No. **1802**

Permit issued to **Lillian S. Baker**

Date drilling began **N. R.**

Date drilling completed **11-25-45**

Kind of drilling tools used **Rotary**

Date plugging began **11-01-86**

Date plugging completed **11-01-86**

Mattoon, Illinois.

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor **Mary B. Herminer**

Address

Lessee **Lillian S. Baker**

Address **Billings Montana**

Drilling Contractor **NR.**

Address

DETAILS OF PLUGGING:

Filled with **P. P. B** From **1961** To **300** feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug **CAST IRON PLUG** From **XX** To **6300'** feet

Filled with **Cement** From **300** To **05** feet

Kind of Plug **Barth** From **05** To **0** feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment Yes No Concrete bases Yes No Debris Yes No

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been leveled? Yes No

If this was a producing well, give date and amount of last production **No record Est. about 1980**

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	123				118		
7"	1902		5		1997		

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per **Bill Schaefer**

Address **Mattoon, Illinois - 62458**

E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well)

Address **Box 205, Louisville, Illinois - 62658**

Subscribed and sworn to before me this **3rd** day of **November**, A.D. **1986**

My commission expires **5-29-89**

Betty Stanford
Notary Public

STATE OF ILLINOIS

County of COLES

SS.

COUNTY No. 432

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Herkimer #5 and located as follows: 330 ft. north;- ft. south; 330 ft. east; - ft. westof the SW corner of the NE Quarterof the - Quarter of the - Quarter ofSection 11, Township 12 (North ~~of South~~)Range 7, (East ~~of West~~), of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor - ft.
Ground 700 ft.Total depth 1943 Formation RosiclareDate permit to drill issued 6-17-69 Permit No. 525Permit issued to Schaefer Oil CompanyDate drilling began 11-27-45 - Original P#1810 11/7/45Date drilling completed N.R.Kind of drilling tools used RotaryDate plugging began 11-01-86Date plugging completed 11-1-86 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor William S. Herkimer Address Mattoon
 Lessee Schaefer Oil Company Address Mattoon, Illinois.
 Drilling Contractor N.R. Address -

DETAILS OF PLUGGING:

Filled with PREVIOUS P. R. From 1943 To 300 feet
 (Rotary Mud, Cement, or Other Materials)
 Kind of Plug Cast Iron From - To @ 300 feet
 Filled with Cement From 300 To 05 feet
 Kind of Plug Barth From 05 To 0 feet
 Filled with - From - To - feet
 Kind of Plug - From - To - feet
 Filled with - From - To - feet
 Kind of Plug - From - To - feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
 (2) Have the following been removed?
 Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No
 (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
 (4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production N. R.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	102	-	5	-	97	-	
7"	1906	-	5	-	1901	-	

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Bice SledgeAddress Box 35 Mattoon, Illinois - 61936E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 206, Louisville, Illinois 62858Subscribed and sworn to before me this 3rd day of November, A.D. 1986My commission expires 5-29-89Betty Stanford
Notary Public

SS. **WELL PLUGGING AFFIDAVIT**

WOODELL LOGGING CO. FOR JIM SCHAEFER

KEVIN SPENCER

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the MARY B. HERKIMER#9 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; _____ ft. east; 330 ft. west
of the NE NE corner of the NW Quarter
of the SE Quarter of the _____ Quarter of
Section 11, Township 12 (North ~~or~~ South)
Range 7, (East ~~or~~ West), of the
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 709 ft.

Total depth 1957 Formation ROSICLARE

Date permit to drill issued 2/26/46 Permit No. 2184

Permit issued to L.S. BAKER

Date drilling began 5/13/47

Date drilling completed 5/21/47

Kind of drilling tools used CABLE

Date plugging began 11/30/89

Date plugging completed SAME

Lessor MARY HERKIMER Address MATTOON IL

Lessee L.S. BAKER Address MATTOON IL

Drilling Contractor C.E. CRICK Address MATTOON IL

DETAILS OF PLUGGING:

Filled with MUD From T.D. To 380 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug CEMENT From 380 To 4 feet

Filled with SOIL From 4 To 0 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EM-
PLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) none encountered

(1) Have pits and other excavations been filled? Yes ☒ No ☐
(2) Have the following been removed?

Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been leveled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4"</u>	<u>106.5</u>		<u>4</u>		<u>102.5</u>		<u>Circulated Cement</u>
<u>2"</u>	<u>1957</u>		<u>4</u>		<u>1953</u>		<u>circulate cement</u>

RECEIVED
DEC 18 1989

DEPT. MINES & MINERALS
OIL & GAS DIV.

(Signature of person, firm or corporation having custody or control of well.)

Per Woodell Logging

Address _____

Kevin Spencer Well Equip
(Signature and title of party supervising plugging of well.)

Address Box 449 Martinsville IL 62447

Subscribed and sworn to before me this _____ day of _____, A.D. 19 _____

My commission expires _____

Notary Public

STATE OF ILLINOIS

County of Colas

ss.

WELL PLUGGING AFFIDAVIT

James L. Shafer - Safari Oil Company

and

E. A. Clifton - Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oilknown as the Holman Estate #1 (Indicate whether for oil, gas, water or other purposes) and located as follows: 330 ft. north; Locate well accurately on plat of section
(Scale one inch=2,000 ft.)
330 ft. south; 330 ft. east; 330 ft. west
of the SW corner of the 330 Quarter
of the 330 Quarter of the 330 Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Colas County, Illinois.

Elevation above sea level is { Derrick Floor 719 ft.
Ground 719 ft.
Total depth 1802 Formation WellerDate permit to drill issued 10-31-45 Permit No. 1739Permit issued to Luttrell-Thompson-LegnerDate drilling began 11-1-45Date drilling completed 11-2-45Kind of drilling tools used RotaryDate plugging began 10-21-71Date plugging completed 10-22-71Lessor Holman Est. Address Watson, IllinoisLessee Homer Luttrell Address Olney, IllinoisDrilling Contractor Luttrell Drig Co. Address Olney, Illinois

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Rotary Mud, Cement, or Other Materials</u>	<u>1802</u>	<u>1760</u>	
Kind of Plug <u>Bridge Plug and Two Gravel</u>	<u>1760</u>	<u>1725</u>	feet
Filled with <u>Cement</u>	<u>1725</u>	<u>1677</u>	feet
Kind of Plug <u>Mud</u>	<u>1677</u>	<u>250</u>	feet
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Kind of Plug <u>Mud</u>	<u>200</u>	<u>110</u>	feet
Filled with <u>Cement</u>	<u>110</u>	<u>60</u>	feet
Kind of Plug <u>Mud</u>	<u>60</u>	<u>15</u>	feet
Kind of Plug <u>Cement</u>	<u>15</u>	<u>3</u>	feet

If WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above

None 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	100	-	-	-	20	-	Top 4" cut off
8-1/2"	1772	-	1140	-	632	-	

James L. Shafer - Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per James L. ShaferAddress Watson, Illinois

(Signature and title of party supervising plugging of well)

Address Watson, IllinoisSubscribed and sworn to before me this 22 day of Oct., A.D. 19 71My commission expires Oct 28, 1974

Notary Public.

County of Coles

SS.

60#1768
WELL PLUGGING AFFIDAVIT

Jim L. Schaefer and
H.L. Noblit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil and/or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Homann # 1 and located as follows: 330 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west
of the SE corner of the NE Quarter
of the SW Quarter of the SW Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 713 ft.

Total depth 1976 Formation Rosiclare

Date permit to drill issued 11/8/63 Permit No. 2144

Permit issued to Schaefer Oil Company

Date drilling began 11/16/63

Date drilling completed 11/25/63

Kind of drilling tools used Rotary

Date plugging began 4/27/82

Date plugging completed 4/27/82

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Ch. 96 1/2, IL Rev. Stat. 1979. Disclosure of this information is VOLUNTARY. This form has been approved by the State Forms Management Center.

Lessor Oscar Homann Address

Lessee Schaefer Oil Company Address Mattoon, IL.

Drilling Contractor N.A. Baldridge Drlg. Co. Address Ashley, IL.

Perf. 1932-1952

DETAILS OF PLUGGING:

Filled with Cement From 1976 To 1920 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud & Cavings From 1920 To 250 feet

Filled with Cement From 250 To 03 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production No Record

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	117		3		114		
4 1/2	1975		1609		366		

Jim L. Schaefer
(Signature of person, firm or corporation having custody or control of well.)

Per

Address Box 35 Mattoon, IL.

Well Inspector
(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 27th day of April A.D. 1982

My commission expires My Commission Expires 27 1985 Marble Noblit
Notary Public

WELL PLUGGING AFFIDAVIT

County of Coles

SS.

Safari Oil Company

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Homann #2

and located as follows: 330 ft. north;

ft. south; 330 ft. east; 330 ft. west

of the SE corner of the NW Quarter

of the NW Quarter of the SW Quarter of

Section 11, Township 12 (North of South)

Range 7, (East of West), of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 712 ft.

Total depth 1800 Formation Weiler

Date permit to drill issued 12-13-45 Permit No. 1838

Permit issued to Homer Luttrell & C. J. Simpson

Date drilling began Unknown

Date ~~drilling completed~~ of Completion 12-21-45

Kind of drilling tools used Rotary

Date plugging began 10-18-73

Date plugging completed 10-18-73

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Oscar Homann

Address Mattoon, Illinois

Lessee Homer Luttrell

Address Effingham, Illinois.

Drilling Contractor Homer Luttrell

Address Effingham, Illinois.

DETAILS OF PLUGGING:

Filled with	<u>Cement</u>	From	<u>1800</u>	To	<u>1750</u> feet
(Rotary Mud, Cement, or Other Materials)					
Kind of Plug	<u>Mud</u>	From	<u>1750</u>	To	<u>250</u> feet
Filled with	<u>Cement</u>	From	<u>250</u>	To	<u>200</u> feet
Kind of Plug	<u>Mud</u>	From	<u>200</u>	To	<u>115</u> feet
Filled with	<u>Cement</u>	From	<u>115</u>	To	<u>90</u> feet
Kind of Plug	<u>Mud</u>	From	<u>90</u>	To	<u>25</u> feet
Filled with	<u>Cement</u>	From	<u>25</u>	To	<u>03</u> feet
Kind of Plug	<u>Earth</u>	From	<u>03</u>	To	<u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No
Equipment ☒ Concrete bases ☒ Debris ☒

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production 1970

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
10-3/4	105 -	3 -	102	
7"	1764 -	928 -	836	

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]

Address Mattoon, Illinois - Clay Cit., Illinois.

[Signature] State Well Inspector.

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 27 day of October A.D. 19 73

My commission expires 10/28/76

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company

and

B. F. CLIFTON State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Homann #2

and located as follows: _____ ft. north;

_____ 330 ft. south; _____ ft. east; _____ 330 ft. west

of the NE corner of the SW Quarter

of the _____ Quarter of the _____ Quarter of

Section 11, Township 12 (North or South)Range 7, (East or West) of the 3rdPrincipal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 707 ft.

Total depth 1967 Formation RosiclareDate permit to drill issued 11/25/64 Permit No. 2059Permit issued to Schaefer Oil CompanyDate drilling began 11-24-64Date drilling completed 12-2-64Kind of drilling tools used RotaryDate plugging began 8-19-80Date plugging completed 8-21-80

Locate well accurately on plat of section
(Scale one inch--2,000 ft.)

Lessor Oscar HomannAddress Mattoon, Illinois 61938Lessee Schaefer Oil CompanyAddress Mattoon, Illinois - 61938Drilling Contractor N. A. SeldridgeAddress Ashley, Illinois.

Field with	Cement	DETAILS OF PLUGGING:	1967	1950
Filled with	<u>Rotary mud</u>	From	<u>1950</u>	To <u>1780</u> feet
(Rotary Mud, Cement, or Other Materials)				
Kind of Plug	<u>Cement</u>	From	<u>1780</u>	To <u>1755</u> feet
Filled with	<u>Rotary mud</u>	From	<u>1755</u>	To <u>250</u> feet
Kind of Plug	<u>Cement</u>	From	<u>250</u>	To <u>200</u> feet
Filled with	<u>Rotary mud</u>	From	<u>200</u>	To <u>125</u> feet
Kind of Plug	<u>Cement</u>	From	<u>125</u>	To <u>100</u> feet
Filled with	<u>Rotary mud</u>	From	<u>100</u>	To <u>15</u> feet
Kind of Plug	<u>Cement</u>	From	<u>15</u>	To <u>03</u> feet
	<u>Earth</u>	From	<u>03</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE ENCOUNTERED

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface?

☒ Yes ☐ No
☐ Yes ☒ No

(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production September 1979

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>3-5/8</u>	<u>115</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>112</u>	<u>-</u>	<u>Cemented w/ 50 sacks when run.</u>
<u>4-1/2</u>	<u>1966</u>	<u>-</u>	<u>1120</u>	<u>-</u>	<u>546</u>	<u>-</u>	<u>Cemented w/ 75 sacks when run.</u>

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per [Signature]
Address Mattoon, Illinois. 61938[Signature] State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant, Mattoon, Illinois - 61938

Subscribed and sworn to before me this

22nd day ofAugustA.D. 19 80

My commission expires

9-29-81[Signature]
Notary Public

STATE OF ILLINOIS

County of Calder

ss.

WELL PLUGGING AFFIDAVIT

James L. Schafer - Safari Oil Company

and

E. R. Clifton - Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oilknown as the Hamann Heirs (Indicate whether for oil, gas, water or other purposes)

and located as follows:

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)* Permit #1061 NF dated 10-3-60
Issued to Ashland Oil & Refining Co.

_____ ft. north;
330 ft. south; _____ ft. east; 330 ft. west
 of the NE corner of the NW Quarter
 of the SW Quarter of the _____ Quarter of
 Section 11, Township 12 (North or South)
 Range 7, (East or West), of the 3rd
 Principal Meridian, Calder County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
 Original 2025 Ground 707 ft.
 Total depth 1782 Formation _____

* Date permit to drill issued 11-15-45 Permit No. 1967 NF/1061Permit issued to Luttrell-SimpsonDate drilling began 11-16-45Date drilling completed 11-22-45Kind of drilling tools used RotaryDate plugging began 10-22-71Date plugging completed 10-23-71Lessor Hamann HeirsAddress Mattoon, IllinoisLessee Luttrell-SimpsonAddress Olney, IllinoisDrilling Contractor Homer Luttrell Oil Co.Address Olney, Illinois

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Mud</u> (Rotary Mud, Cement, or Other Materials)	<u>1782</u>	<u>1760</u>	
Kind of Plug <u>Bridge Plug and Pea Gravel</u>	<u>1760</u>	<u>1735</u>	feet
Filled with <u>Cement</u>	<u>1735</u>	<u>1705</u>	feet
Kind of Plug <u>Mud</u>	<u>1705</u>	<u>250</u>	feet
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Kind of Plug <u>Mud</u>	<u>200</u>	<u>126</u>	feet
Filled with <u>Cement</u>	<u>126</u>	<u>96</u>	feet
Kind of Plug <u>Cement</u>	<u>96</u>	<u>15</u>	feet
Filled with <u>Earth</u>	<u>15</u>	<u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? Yes ☒ No ☐
- (2) Have the following been removed? Yes ☒ No ☐
- Equipment ☐ ☒ Concrete bases ☐ ☒ Debris ☐ ☒
- (3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
- (4) Has well-site been levelled? Yes ☐ No ☒
- If this was a producing well, give date and amount of last production Water Input

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	116		4	-	112	-	Top 4' cut off
7"	1940	-	933	-	1007	-	

RECEIVED
DIVISION OF OIL & GAS
NOV 1 1971
DEPARTMENT OF
MINES & MINERALS

James L. Schafer - Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Robert A. Schafer Tool PusherAddress Fairfield, IllinoisE. R. Clifton Well Inspector

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign Ave., Mattoon, IllinoisSubscribed and sworn to before me this 27th day of October, A.D. 19 71My commission expires 10/28/72

Notary Public.

County of Coles

SS.

60 #1051
WELL PLUGGING AFFIDAVIT

Jim L. Schaefer

and

H. L. Noblit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the xx8 Homann # 7 and located as follows: 330' ft. north;

1650 ft. south; 1650 ft. east; 1650 ft. west

of the SW corner of the XX NW Quarter

of the SW Quarter of the SW Quarter of

Section 11, Township 12 (North or South)

Range 7, (East or West), of the

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.

Ground 718 ft.

Total depth 1975 Formation Rosiclare

Date permit to drill issued 1-29-46 Permit No. 129

Permit issued to Simpson & Luttrell

Date drilling began

Date drilling completed

Kind of drilling tools used Rotary

Date plugging began 4/26/82

Date plugging completed 4/26/82

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Oscar Homann Address

Lessee Schaefer Oil Company Address Mattoon, IL.

Drilling Contractor Bangert Address Clay City, IL.

Plugging Cont.

DETAILS OF PLUGGING:

Filled with Cement From 1975 To 1915 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud & Cavings From 1915 To 250 feet

Filled with Cement From 250 To 03 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production No Record

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
10 3/4	102	3	99	
5 1/2	1930	6 1/2	1299	

James L. Schaefer
(Signature of person, firm or corporation having custody or control of well.)

Per

Address Box 35 Mattoon, IL.

H. L. Noblit Well Inspector
(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 27th day of April A.D. 19 82

My commission expires My Commission Expires August 27, 1985 Maible Noblit
Notary Public

STATE OF ILLINOIS

County of COLES

SS.

COUNTY No. 1052

WELL PLUGGING AFFIDAVIT

Safari Oil Company (Wooddell) and
E. R. CLIFTON - State Well Inspector

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL

OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Homann #8and located as follows: 330 ft. north;ft. south; 330 ft. east; _____ ft. westof the SW corner of the SE Quarterof the NW Quarter of the SW Quarter ofSection 11, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground 718 ft.Total depth 1069 Formation RosiclareDate permit to drill issued 2-20-46 Permit No. 284Permit issued to LUTTRELL & SimpsonDate drilling began 12-11-45Date drilling completed 2-23-46Kind of drilling tools used RotaryDate plugging began 10-07-88Date plugging completed 10-07-88 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Oscar Holmann Address Mattoon, Illinois
 Lessee Luttrell & Simpson Address Mattoon, Illinois.
M & E. Drig, Co. Address Casey, Illinois.
 Drilling Contractor _____ Address _____

DETAILS OF PLUGGING:

Filled with Cement From 1969 To 04 feet
 (Rotary Mud, Cement, or Earth Materials)
 Kind of Plug _____ From 04 To 0 feet
 Filled with _____ From _____ To _____ feet
 Kind of Plug _____ From _____ To _____ feet
 Filled with _____ From _____ To _____ feet
 Kind of Plug _____ From _____ To _____ feet
 Filled with _____ From _____ To _____ feet
 Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
 (2) Have the following been removed?
 Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☒ Yes ☐ No
 (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
 (4) Has well-site been leveled? ☒ Yes ☐ No
 If this was a producing well, give date and amount of last production N. R. A.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	100	-	4		96	-	
5-1/2	1030		4		1926

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Box 35, Mattoon, Illinois 61938Address State Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 206, Louisville, Illinois 62858Subscribed and sworn to before me this 7th day of October, A.D. 1988My commission expires Nov. 9, 1991

Notary Public

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

No. 1056Joe Blalack & Acme Casing Pulling Co. andWalter Welsh

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the J. Swanson # 1

and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; 330 ft. east; _____ ft. westof the N.W. corner of the S.E. Quarterof the S.W. Quarter of the _____ Quarter ofSection 11, Township 12 (North of XXXX)Range 7, (East of XXXX) of the 3 rd.Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

{ Ground 725 ft.Total depth of well is 1970 ft.Date permit to drill issued 12/20/45 Permit No. 2161Permit issued to Joe BlalackDate drilling began 12/20/45Date drilling completed 1/7/46Kind of drilling tools used RotaryDate plugging began 2/16/51Date plugging completed 2/17/51Lessor J. SwansonAddress Mattoon, Illinois.Lessee Joe BlalackAddress Mt. Vernon, Illinois.Drilling Contractor W.R. WalterAddress Mt. Vernon, Illinois.

DETAILS OF PLUGGING:

Filled with _____ From _____ To _____ feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1970 To 1920 feetFilled with Mud From 1920 To 140 feetKind of Plug Cement From 140 To 115 feetFilled with Mud From 115 To 25 feetKind of Plug Cement From 25 To 3 feetFilled with Cement Cap From 3 To 2 feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth). See affidavit on reverse side.

(1) Have pits, cellar and other excavations been filled? _____

Yes ☐No ☒

(2) Have equipment, concrete bases and debris been removed? _____

Yes ☐No ☒

(3) Has surface casing been cut off below plow depth? _____

Yes ☒No ☐

(4) Has well-site been levelled? _____

Yes ☐No ☒

If this was a producing well, give date and amount of last production _____

12/1/50 -- 1 bbl. per day.

DEPARTMENT
MINES AND MINERALS
RECEIVED

FEB 23 1951

DIVISION OF

OIL and GAS CONSERVATION

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	130		0		130		
5 1/2	1960		1422		538		

Joe Blalack & Acme Casing Pulling Co.

(Signature of person, firm of corporation having custody or control of well.)

Per James A. StoneAddress Grayville, Illinois.Walter Welsh Inspector at Large.

(Signature and title of party supervising plugging of well.)

Address 419 E. North Ave. Flora, Illinois.Subscribed and sworn to before me this 20 day of Feb, A.D. 1951My commission expires Aug 31-1954

Notary Public.

STATE OF ILLINOIS,
County of Coles } ss.

815827
WELL PLUGGING AFFIDAVIT

J. B. Blalack

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of oil well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Swanson #2

and located as follows: _____ ft. north;

_____ ft. south; _____ ft. east; _____ ft. west

of the SW corner of the SE Quarter

of the SW Quarter of the _____ Quarter of

Section 11, Township 12 (North of Range

Range 7, (East or West of the 3d

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 730 ft.

{ Ground _____ ft.

Total depth of well is 1974 ft.

Date permit to drill issued January 5, 1946

Permit issued to Blalack & Walter

Date drilling began January 8, 1946

Date drilling completed January 29, 1946

Kind of drilling tools used Rotary

Date plugging began July 19, 1947

Date plugging completed July 22, 1947

Lessor Swanson Address Mattoon, Illinois

Lessee Blalack & Walter Address Mt. Vernon, Illinois

Drilling Contractor Blalack and Walter Address Mt. Vernon, Illinois

DETAILS OF PLUGGING:

Filled with Cement From 1974 To 1874 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1874 To 126 feet

Filled with Cement From 126 To 101 feet

Kind of Plug Mud From 101 To 28 feet

Filled with Cement From 28 To 0 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth. (Affidavit on back)

Other details:

If this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
<u>8</u>	<u>106</u>		<u>106</u>	<u>Cemented</u>
<u>5</u>	<u>1842</u>			

Blalack & Walter

(Signature of person, firm or corporation having custody or control of well.)

Per J. B. Blalack

Address 1114 S 10th Mt Vernon Ill

Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham Illinois, 19. 09. #1

Subscribed and sworn to before me this 24th day of July, A. D. 1947

My commission expires May 15, 1950

La Pearl Richey
Notary Public

STATE OF ILLINOIS

CO #

1058

WELL PLUGGING AFFIDAVIT

County of ColesJim GillilandLawrence Landrethbeing first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Gorton W. Taylor #1and located as follows: 230 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SW corner of the NE Quarterof the 11 Quarter of the 12 North Quarter ofSection 11, Township 12 North (North or South)Range 7 East, (East or West), of the 3dPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 705 ft.{ Ground 705 ft.Total depth of well is 2032 ft.Date permit to drill issued 11-21-45Permit issued to Walter DuncanDate drilling began 11-21-45Date drilling completed 11-28-45Kind of drilling tools used RotaryDate plugging began 11-24-48Date plugging completed 11-26-48Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Gorton W. TaylorAddress Mattoon, Ill.Lessee Walter DuncanAddress Box 306, Mt. Vernon, Ill.Drilling Contractor N. V. DuncanAddress Fairfield, Ill.

DETAILS OF PLUGGING:

Filled with Cement From 2032 To 1815 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1815 To 110 feetFilled with Cement From 110 To 85 feetKind of Plug Mud From 85 To 27 feetFilled with Cement From 27 To 2 feetKind of Plug Earth From 2 To 0 feetFilled with From To feetKind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD

EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000

feet in depth) Affidavit on back(1) Have pits, cellar and other excavations been filled? Yes ☐ No ☒ PERMIT NO. 1911(2) Have equipment, concrete bases and debris been removed? Yes ☒ No ☐(3) Has surface casing been cut off below plow depth? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☒ No ☐If this was a producing well, give date and amount of last production This well never did produce

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10-3/4</u>	<u>106</u>				<u>106</u>		<u>Cement</u>
<u>7</u>	<u>1923</u>		<u>1592</u>		<u>331</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per Jim GillilandAddress Garfield, Ill.

(Signature and title of party supervising plugging of well.)

Address Effingham, Illinois, P. O. #1Subscribed and sworn to before me this 27th day of NovemberMy commission expires 2-24-51

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Walter Duncan & Acme Casing Pulling Company

and

Richard Hansen

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Taylor # 2and located as follows: 994 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SW SE corner of the SE Quarterof the NW Quarter of the 11 Quarter ofSection 11, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 698 ft.
Ground ft.Total depth 1967 Formation 12/10/45Date permit to drill issued 12/10/45 Permit No. 2076Permit issued to Walter DuncanDate drilling began 12/10/45Date drilling completed 12/16/45Kind of drilling tools used RotaryDate plugging began 10/30/69Date plugging completed 10/31/69 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Corten TaylorAddress Mattoon, IllinoisLessee Walter DuncanAddress LaSalle, IllinoisDrilling Contractor W. V. Duncan Drilling Co. Address Fairfield, Illinois

DETAILS OF PLUGGING:

Filled with P.F.B.-Pea Gravel & Cement From 1967 To 1904 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1904 To 250 feetFilled with Cement From 250 To 200 feetKind of Plug Mud From 200 To 30 feetFilled with Cement From 30 To 3 feetKind of Plug Earth From 3 To 0 feetFilled with From To feetKind of Plug From To feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Signed(1) Have pits and other excavations been filled? Yes No
(2) Have the following been removed? Yes NoEquipment Yes No Concrete bases Yes No Debris Yes No(3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been levelled? Yes NoIf this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4	123		3		120		
7"	1029		1023		906

Walter Duncan
(Signature of person, firm or corporation having custody or control of well.)Per Walter Duncan
Address Box 158, Grayville, IllinoisInspector Richard Hansen
(Signature and title of party supervising plugging of well.)Address Box 177, Newman, IllinoisSubscribed and sworn to before me this 5th day of Nov, A.D. 19 69My commission expires July 26, 1973

Notary Public.

STATE OF ILLINOIS,
County of Coles ss.

WELL PLUGGING AFFIDAVIT

Jim Gilliland

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil or Gas

known as the Gorden W. Taylor #3 and located as follows: 330 ft. north; 330 ft. south; 330 ft. east; 330 ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the SE corner of the NW Quarter of the 11 Quarter of the 12 Section 7, Township 12 (North or South) Range 7, (East or West), of the 3d Principal Meridian, Coles County, Illinois.
Elevation above sea level is { Derrick Floor 701 ft.
Ground 2000 ft.
Total depth of well is 12-26-45 ft.
Date permit to drill issued 12-26-45
Permit issued to Walter Duncan
Date drilling began 12-26-45
Date drilling completed 1-10-46
Kind of drilling tools used Rotary
Date plugging began 11-22-48
Date plugging completed 11-23-48

Lessor Gorden W. Taylor Address Mattoon, Ill.
Lessee Walter Duncan Address Box 206, Mt. Vernon, Ill.
Drilling Contractor N. V. Duncan Address Fairfield, Illinois

DETAILS OF PLUGGING:

	Cement	2000	1728	
Filled with	(Rotary Mud, Cement, or Other Materials)	From	To	feet
Kind of Plug	<u>Mud</u>	From	To	feet
Filled with	<u>Cement</u>	From	To	feet
Kind of Plug	<u>Mud</u>	From	To	feet
Filled with	<u>Cement</u>	From	To	feet
Kind of Plug	<u>Earth</u>	From	To	feet
Filled with		From	To	feet
Kind of Plug		From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?... Yes ☐ No ☒
(2) Have equipment, concrete bases and debris been removed? Yes ☒ No ☐
(3) Has surface casing been cut off below plow depth?... Yes ☒ No ☐
(4) Has well-site been levelled?... Yes ☐ No ☒
If this was a producing well, give date and amount of last production Dry hole

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	104				104		Cemented
7	1970		987		983		

Walter Duncan
(Signature of person, firm or corporation having custody or control of well.)
Per Jim Gilliland
Address Garyville, Ill.
Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well.)
Address Effingham, Illinois, P. R. #1
Subscribed and sworn to before me this 24th day of November, A. D. 1948
My commission expires 2-24-51
Dolores A. Stark
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

60 #1061
WELL PLUGGING AFFIDAVIT

Walter Duncan and Acme Casing Pilling Company and
Richard Hansen being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Taylor # 4 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; 330 ft. east; _____ ft. west
of the NW corner of the NW Quarter
of the NW Quarter of the _____ Quarter
Section 11, Township 12 (North or South)
Range 7, (East or West) of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 692 ft.
Ground _____ ft.

Total depth 1763 Formation _____Date permit to drill issued 10/28/46 Permit No. 2062Permit issued to Walter DuncanDate drilling began 11/1/46Date drilling completed 12/7/46Kind of drilling tools used RotaryDate plugging began 10/27/46 69Date plugging completed 10/31/49Lessor Taylor Address Mattson, IllinoisLessee Walter Duncan Address LaSalle, IllinoisDrilling Contractor Hedallier & Bersful Address _____**DETAILS OF PLUGGING:**Filled with 2.5% Dry Gravel & Cement From 1763 To 1700 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1700 To 250 feetFilled with Cement From 250 To 200 feetKind of Plug Mud From 200 To 143 feetFilled with Cement From 143 To 118 feetKind of Plug Mud From 118 To 30 feetFilled with Cement From 30 To 3 feetKind of Plug Earth From 3 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) _____ Signed _____

(1) Have pits and other excavations been filled? ☐ Yes ☒ No
(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4"</u>	<u>133</u>		<u>3</u>		<u>130</u>		
<u>7"</u>	<u>1717</u>		<u>704</u>		<u>1013</u>

Walter Duncan Acme Casing Pilling Co. Walter Duncan
(Signature of person, firm or corporation having custody or control of well.)

Per Richard HansenAddress Box 158, Grayville, IllinoisInspector Richard Hansen
(Signature and title of party supervising plugging of well.)Address Box 177, Newman, IllinoisSubscribed and sworn to before me this 5th day of Nov, A.D. 19 69My commission expires July 26, 1973 Davis
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Richard Hansen

Walter Duncan and Acme Casing Pulling Company and

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oilknown as the Taylor # 5 (Indicate whether for oil, gas, water or other purposes) and located as follows: 965 ft. north; 330 ft. south; 330 ft. east; ft. west Locate well accurately on plat of section
(Scale one inch—2,000 ft.)of the NW corner of the Quarter of the Quarter of the Quarter of Section 12, Township 12 (North or South) Range 7, (East or West), of the 3rd Principal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 695 ft. Ground ft.Total depth 1776 Formation Date permit to drill issued 12/6/46 Permit No. 2390Permit issued to Walter DuncanDate drilling began 12/8/46Date drilling completed 12/13/46Kind of drilling tools used RotaryDate plugging began 10/28/69Date plugging completed 10/29/69Lessor G Taylor Address Mattoon, IllinoisLessee Walter Duncan Address LaSalle, IllinoisDrilling Contractor General Geophysical Address

DETAILS OF PLUGGING:

Filled with <u>P.P.B. and Cement</u>	From <u>1776</u>	To <u>1703</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>1703</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>157</u>	feet
Filled with <u>Cement</u>	From <u>157</u>	To <u>132</u>	feet
Kind of Plug <u>Mud</u>	From <u>132</u>	To <u>30</u>	feet
Filled with <u>Cement</u>	From <u>30</u>	To <u>3</u>	feet
Kind of Plug <u>Earth</u>	From <u>3</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Signed

- (1) Have pits and other excavations been filled? Yes ☐ No ☒
- (2) Have the following been removed? Yes ☐ No ☒
- Equipment ☐ Concrete bases ☐ Debris ☐
- (3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
- (4) Has well-site been levelled? Yes ☐ No ☒

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	147		3		144		
7"	1725		691		1034		

RECEIVED
DIVISION OF OIL & GAS

DEC 2 1969

DEPARTMENT OF
MINES & MINERALSSubscribed and sworn to before me this 5th day of Nov, A.D. 19 69My commission expires July 26, 1973Walter Duncan and Acme Casing Pulling Co. X Walter Duncan
(Signature of person, firm or corporation having custody or control of well.)Per Address Box 158, Grayville, Illinois Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177, Newman, Illinois

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Walter Duncan and Acme Casing Pulling Company

and

Richard Hansen

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for 011

(Indicate whether for oil, gas, water or other purposes)

known as the Taylor # 6 and located as follows: ft. north;330 ft. south; 890 ft. east; ft. westof the NW corner of the NW Quarterof the NW Quarter of the QuarterSection 11, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 691 ft.
Ground ft.Total depth 1775 Formation 5/6/48Date permit to drill issued 5/6/48 Permit No. 753Permit issued to Walter DuncanDate drilling began 5/12/48Date drilling completed 5/18/48Kind of drilling tools used RotaryDate plugging began 10/29/69Date plugging completed 10/30/69Lessor G Taylor Address Mattoon, IllinoisLessee Walter Duncan Address LaSalle, IllinoisDrilling Contractor Dee Miller Drig Co. Address Lawrenceville, Illinois

DETAILS OF PLUGGING:

	From	To	feet
Filled with <u>P.P.B. and Cement</u>	<u>1775</u>	<u>1712</u>	<u>1712</u>
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	<u>1712</u>	<u>250</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>200</u>	<u>126</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>126</u>	<u>100</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>100</u>	<u>30</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>30</u>	<u>3</u>	<u>feet</u>
Kind of Plug <u>Earth</u>	<u>3</u>	<u>0</u>	<u>feet</u>

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Signed

- (1) Have pits and other excavations been filled? Yes No
- (2) Have the following been removed? Yes No
- Equipment Yes No Concrete bases Yes No Debris Yes No
- (3) Has surface casing been cut off three feet below ground surface? Yes No
- (4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	116		3		113		
7"	1737		1403		334		

Walter Duncan Walter Duncan

(Signature of person, firm or corporation having custody or control of well.)

Per Walter DuncanAddress Box 158, Grayville, IllinoisRichard Hansen Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177, Newman, IllinoisSubscribed and sworn to before me this 5th day of Nov, A.D. 19 69My commission expires July 26, 1973

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Turner Consolidated #1 and located as follows: _____ ft. north;330 ft. south; 330 ft. east; _____ ft. westof the NW corner of the SW Quarterof the SW Quarter of the _____ Quarter ofSection 11, Township 12 (North of South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 726 ft.

Ground _____ ft.

Total depth 2022 Formation Hosiclar* Date permit to drill issued 11-26-45 Permit No. 1956-NF/062Permit issued to Walter DuncanDate drilling began 11-28-45Date drilling completed 12-7-45Kind of drilling tools used RotaryDate plugging began 2-9-72Date plugging completed 2-11-72

Locate well accurately on plat of section

(Scale one inch=2,000 ft.)

* P, B Permit # NP-1062 dated 10-3-60
Issued to Ashland Oil & Refining Co.Lessor TurnerAddress Mattoon, IllinoisLessee Walter DuncanAddress Mattoon, IllinoisDrilling Contractor N.V. Duncan Drilling Co.Address Fairfield, Illinois.

PREVIOUS PLUG BACK

DETAILS OF PLUGGING:

Filled with Tubing Packers (2) From 1764 To 1696 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1696 To 1645 feetFilled with Mud From 1645 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 120 feetKind of Plug Cement From 120 To 95 feetFilled with Mud From 95 To 15 feetKind of Plug Cement From 15 To 03 feetKind of Plug Earth From 03 To 0 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Non encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Water Input

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10-3/4</u>	<u>110</u>	<u>-</u>	<u>5</u>	<u>-</u>	<u>105</u>	<u>-</u>	<u>Top 5' cut off.</u>
<u>7"</u>	<u>1777</u>	<u>-</u>	<u>1156</u>	<u>-</u>	<u>611</u>	<u>-</u>	
<u>2 1/2"</u>	<u>1764</u>	<u>-</u>	<u>1696</u>	<u>-</u>	<u>68</u>	<u>-</u>	<u>Including two packers set at 1722 & 1764</u>

Safari Oil Company

RECEIVED
DIVISION OF OIL & GAS

FEB 17 1972

DEPARTMENT OF

MINES & MINERALS

(Signature of person, firm or corporation having custody or control of well.)

Per Walter Duncan 1001 Pusher
Address Fairfield, Illinois

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign, Mattoon, Illinois 61930Subscribed and sworn to before me this 14th day of February, A.D. 1972My commission expires 10/28/72

Notary Public.

WELL PLUGGING AFFIDAVIT

C. K. Felix

and

Richard Gray

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil & Gasknown as the Turner # 2 (Indicate whether for oil, gas, water or other purposes)

and located as follows:

Locate well accurately on plat of section
(Shale one inch=2,000 ft.)

990 ft. south; 330 ft. east; _____ ft. west
of the NW corner of the SW Quarter
of the SW Quarter of the _____ Quarter of
Section 11, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 734 ft.
Ground _____ ft.

Total depth 2013 Formation McCloskyDate permit to drill issued 12/15/45 Permit No. 2124Permit issued to Walter DuncanDate drilling began 12/15/45Date drilling completed 12/28/45Kind of drilling tools used RotaryDate plugging began 8/9/62Date plugging completed 8/10/62Lessor Mr. TurnerAddress Mattoon, Ill.Lessee Walter DuncanAddress Mt. Vernon, Ill.Drilling Contractor Dee Miller Drilling Co. Address Lawrenceville, Ill.

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>2013</u>	<u>1900</u>	
Kind of Plug <u>Mud</u>	<u>1900</u>	<u>167</u>	feet
Filled with <u>Cement</u>	<u>167</u>	<u>142</u>	feet
Kind of Plug <u>Mud</u>	<u>142</u>	<u>25</u>	feet
Filled with <u>Cement</u>	<u>25</u>	<u>3</u>	feet
Kind of Plug <u>Earth</u>	<u>3</u>	<u>0</u>	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production 12/1/61-1 bbl.

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>157</u>		<u>0</u>		<u>157</u>		
<u>7</u>	<u>1944</u>		<u>1124</u>		<u>820</u>		

Tri-State Casing Pulling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per C. K. FelixAddress Box 353, Fairfield, Ill.

Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address P. O. Box 2, Charleston, Ill.Subscribed and sworn to before me this 14th day of August, A.D. 1962My commission expires 5/16/65

Hazel Gray
Notary Public.

14-12N-7E

8-8

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY NO. 1851900 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

756511

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Charles Armantrout PERMITTEE NO. 110WELL NAME: T.C. RR Unit #1 PERMIT NO. 001167 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 128459

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: 1406 FT. NORTH; OR 1398 FT. EAST; OR 1398 FT. WEST OF THE SW QUARTER OF THE SE QUARTER OF THE SE QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION 730 FT.
 TOTAL DEPTH OF WELL 3257 FT.
 PLUGGED BACK TOTAL DEPTH NONE FT.
 BASE OF FRESHWATER ZONE 180 FT.
 WORKABLE COALS PRESENT AT NONE FT.

PRODUCING / INJECTION INTERVALS
 FROM 3202 TO 3204
 FROM 1960 TO 1965
 FROM TO
 FROM TO

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH Cement FROM 3257 TO 3079 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
 FILLED WITH wellbore fluid FROM 3079 TO 2025 FT.
 FILLED WITH Cement FROM 2025 TO 1900 FT.
 FILLED WITH wellbore fluid FROM 1900 TO 340 FT.
 FILLED WITH Cement FROM 340 TO 4 FT.
 FILLED WITH top soil FROM 4 TO SURFACE FT.
 FILLED WITH FROM TO FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	142	75	NR	62	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	4 1/2	3205	350	7 7/8	1668	1102

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Pizza Recol
PERMITTEE OR DESIGNEE

ADDRESS

CITY, STATE

ZIP

DATE PLUGGING BEGAN 07 Aug 96
 DEPT. OF NATURAL RESOURCES
 SPRINGFIELD
 DATE PLUGGING COMPLETED 08 Aug 96
 AUG 10 1996

OFFICE OF MINES & MINERALS
OIL AND GAS DIVISION Printed on Recycled Paper

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Paul V. Harris for The Continental Ins. Co.

and

S. H. Clifton - Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oilknown as the Beckner #1 (Indicate whether for oil, gas, water or other purposes)

and located as follows: _____ ft. north;

192 ft. south; 182 ft. east; _____ ft. west

of the _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 14, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.Total depth 2010 Formation RockcastleDate permit to drill issued 3-22-46 Permit No. 422Permit issued to J. C. Potter

Date drilling began _____

Date drilling completed 5-10-46

Kind of drilling tools used _____

Date plugging began 10-21-71Date plugging completed 10-21-71 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor _____ Address _____

Lessee J. C. Potter Address Salem, IllinoisDrilling Contractor Chesfeld-Hunter-Kitch Address Salem, Illinois

DETAILS OF PLUGGING:

Filled with Cement From 2010 To 1960 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1960 To 250 feetFilled with Cement From 250 To 200 feetKind of Plug Mud From 200 To 25 feetFilled with Cement From 25 To 3 feetKind of Plug Earth From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?Equipment ☒ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	

DIVISION OF OIL & GAS Paul V. Harris for Continental Ins., Co.

(Signature of person, firm or corporation having custody or control of well.)

Per Paul V. HarrisAddress 212 N. Main 365, Olney, Illinois

(Signature and title of party supervising plugging of well.)

Address 1108 Champaign Ave., Mattoon, Illinois.Subscribed and sworn to before me this 22 day of Oct., A.D. 1971My commission expires Oct. 22, 1974 Fulton Bailey

Notary Public.

4-24-96

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1079

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: PRF-96-3- Mattoon (Mattoon) Old Hole

PERMITTEE NO. _____

WELL NAME: Mattoon Old Hole

PERMIT NO. 422
(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 604656

O.S. Beckner #1

COUNTY Coles SECTION 14
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 192 FT. SOUTH; AND
_____ FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION 730 FT.
TOTAL DEPTH OF WELL 2010 FT.
PLUGGED BACK TOTAL DEPTH _____ FT.
BASE OF FRESHWATER ZONE 180 FT.
WORKABLE COALS PRESENT AT _____ FT.

PRODUCING / INJECTION INTERVALS

FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH cement FROM 2010 TO 1960 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH wellbore fluid FROM 1960 TO 256 FT.
FILLED WITH cement FROM 256 TO 04 FT.
FILLED WITH earth FROM 04 TO GL FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.
FILLED WITH _____ FROM _____ TO _____ FT.

COMMENTS:

Well was plugged 10-21-71. Drilled out top to replug, drilled to 261, was drilling on cement, shot the pipe at 256, circulated around back side, casing full of cement from 256 to surface. Used 147 sks cement

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4	N/A	N/A	N/A	N/A	4
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	7"	N/A	N/A	N/A	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: _____

PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 4-24-96

950 Sunser Rd. P.O. Box 402
ADDRESS

DATE PLUGGING COMPLETED 4-24-96

Clay City, IL 62824
CITY, STATE

ZIP

RECEIVED

4-18-96

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1080

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER 746777PERMITTEE: James Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414WELL NAME: E.E. Brown #1 PERMIT NO. 1543 REFERENCE NO. 124033
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: _____ FT NORTH; OR 870 FT SOUTH; AND
251 FT EAST; OR _____ FT WEST OF THE NW
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>725</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>N/A</u> FT.	FROM <u>N/A</u> TO <u>N/A</u>
PLUGGED BACK TOTAL DEPTH	_____ FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>175</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH	<u>Well Bore Fluid</u>	FROM	<u>TD</u>	TO	<u>1700</u> FT.
<small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>					
FILLED WITH	<u>CIBP & Cement</u>	FROM	<u>1700</u>	TO	<u>1684</u> FT.
FILLED WITH	<u>Well Bore fluid</u>	FROM	<u>1684</u>	TO	<u>250</u> FT.
FILLED WITH	<u>Cement</u>	FROM	<u>250</u>	TO	<u>04</u> FT.
FILLED WITH	<u>Earth</u>	FROM	<u>04</u>	TO	<u>GL</u> FT.
FILLED WITH	_____	FROM	_____	TO	_____ FT.
FILLED WITH	_____	FROM	_____	TO	_____ FT.

COMMENTS: 74 Rods 1850 FT. Shot well @ 250 And circulated
62 Joints Tubing 1860 Ft. to surface around backside.
140 Sx Cement to Circulate. Casing also full inside from 250
 to surface. (NO PIPE RECOVERY)

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	N/A	N/A	N/A	N/A	4
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1952	N/A	N/A	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Jim Eickberg DATE PLUGGING BEGAN 4/18/96
 PERMITTEE OR DESIGNEE
950 Sunset Rd. PO Box 402 DEPT. DATA PLUGGING COMPLETED 4/18/96
 ADDRESS Clay City IL 62824 SPRINGFIELD
 CITY, STATE ZIP

APR 23 1996

RECEIVED

4-16-96

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

COUNTY No. 1083

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: James Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414

WELL NAME: Dallas #1 PERMIT NO. 1415 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 124035

COUNTY Coles SECTION 14
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 486 FT. SOUTH; AND
585 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	729	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	N/A	FT.	FROM N/A TO N/A
PLUGGED BACK TOTAL DEPTH		FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	179	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT		FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH	Well Bore Fluid	FROM	TD	TO	1707	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)						
FILLED WITH	CIBP & Cement	FROM	1707	TO	1691	FT.
FILLED WITH	Well Bore Fluid	FROM	1691	TO	248	FT.
FILLED WITH	Cement	FROM	248	TO	04	FT.
FILLED WITH	Earth	FROM	04	TO	CL	FT.
FILLED WITH		FROM		TO		FT.
FILLED WITH		FROM		TO		FT.

COMMENTS: Shot Well @ 248. Circulated around backside to surface. Casing also full from 248 to surface. Circulated with 140 SX.
(NO PIPE RECOVERY)

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	104	N/A	N/A	N/A	4
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1950	N/A	7 7/8	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Jim Anderson
PERMITTEE OR DESIGNEE
950 Sunset RD. PO Box 402
ADDRESS
Clay City IL 62824
CITY, STATE
ZIP

DATE PLUGGING BEGAN 4/15/96
RECEIVED
DATE OF PLUGGING COMPLETED 4/16/96
SPRINGFIELD

APR 19 1996

RECEIVED

4-11-96

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1090

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: James Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414

WELL NAME: Johnson Unit #1-20 PERMIT NO. 197 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 124066

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: _____ FT. NORTH; OR 1305 FT. SOUTH; AND
 _____ FT. EAST; OR 1415 FT. WEST OF THE NE
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>730</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>N/A</u>	FT.	FROM <u>N/A</u> TO <u>N/A</u>
PLUGGED BACK TOTAL DEPTH	_____	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>180</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____	FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH	<u>Well Bore fluid</u>	FROM	<u>TD</u>	TO	<u>1700</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)						
FILLED WITH	<u>CIBP & Cement</u>	FROM	<u>1700</u>	TO	<u>1684</u>	FT.
FILLED WITH	<u>Well Bore Fluid</u>	FROM	<u>1684</u>	TO	<u>250</u>	FT.
FILLED WITH	<u>Cement</u>	FROM	<u>250</u>	TO	<u>04</u>	FT.
FILLED WITH	<u>Earth</u>	FROM	<u>04</u>	TO	<u>GL</u>	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.

COMMENTS: Shot casing @ 250 could not circulate ran 1" down back side.
 And circulated to surface. Cemented inside casing from 250 to surface.
 (NO PIPE RECOVERY) Pumped 42 SX to circulate to surface
 From 250 to surface.

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	N/A	N/A	N/A	N/A	4
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1965	N/A	N/A	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: Jim Eickberg
PERMITTEE OR DESIGNEE990 Sunset RD. P.O. Box 402
ADDRESSClay City IL 62824
CITY, STATE

ZIP

DATE PLUGGING BEGAN 4/10/96DEPT. OF NATURAL RESOURCES
DATE PLUGGING COMPLETED 4/11/96

APR 19 1996

RECEIVED

APR 25 1996

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1091

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER _____

PERMITTEE: James Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414

WELL NAME: Murray #1 PERMIT NO. ~~000000~~ 2119 REFERENCE NO. 124068
(ISSUE DATE IF NO NUMBER)

A 4x4 grid with a central '14' and quadrant labels 'NW', 'NE', 'SW', 'SE'. A dot is in the top-left quadrant.

COUNTY Coles SECTION 14
TOWNSHIP 12N RANGE 7E
LOCATION: _____ FT. NORTH; OR 1251 FT. SOUTH; AND
586 FT. EAST; OR _____ FT. WEST OF THE NW
CORNER OF THE _____ QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>729</u>	FT.	PRODUCING / INJECTION INTERVALS	
TOTAL DEPTH OF WELL	<u>N/A</u>	FT.	FROM <u>N/A</u>	TO <u>N/A</u>
PLUGGED BACK TOTAL DEPTH	<u></u>	FT.	FROM <u></u>	TO <u></u>
BASE OF FRESHWATER ZONE	<u>179</u>	FT.	FROM <u></u>	TO <u></u>
WORKABLE COALS PRESENT AT	<u></u>	FT.	FROM <u></u>	TO <u></u>
DESCRIBE PREVIOUS PLUGBACK PROCEDURE:				

DETAILS OF PLUGGING:

FILLED WITH	Well Bore Fluid (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM	TD	TO	1700	FT.
FILLED WITH	CIBP & Cement	FROM	1700	TO	1684	FT.
FILLED WITH	Well Bore fluid	FROM	1684	TO	250	FT.
FILLED WITH	Cement	FROM	250	TO	04	FT.
FILLED WITH	Earth	FROM	04	TO	GL	FT.
FILLED WITH		FROM		TO		FT.
FILLED WITH		FROM		TO		FT.

COMMENTS: Set CIBP @ 1700 With cement on top. Also ran bond log Cement at 1140. Shot pipe @ 250 and circulated around backside. Casing full from 250 to surface inside. (NO PIPE RECOVERY) Pumped 160 SX to Circulate 1875 ft. 5/8 rods. 1890 ft. 2 3/8 tubing.

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	None	N/A	N/A	N/A	N/A	None
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION		N/A	N/A	N/A	N/A	4

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: John Prater
PERMITEE OR DESIGNEE

DATE PLUGGING BEGAN 4/17/96

950//Sunset RD PO Box 402
ADDRESS

DATE PLUGGING COMPLETED 4/17/96
SPRINGFIELD RECEIVED

Clay City IL 62824
CITY STATE ZIP

APR 19 1936

APR 25 1996
Printed on Recycled Paper

4-9-96

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY No. 1093

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Janes Eickberg (PRF-96-3-Mattoon) PERMITTEE NO. 414WELL NAME: Ralph Strohl #1 PERMIT NO. 617 REFERENCE NO. 124076
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: _____ FT. NORTH; OR 445 FT. SOUTH; AND
 _____ FT. EAST; OR 1334 FT. WEST OF THE NE
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

Mattoon

WELL DATA:

SURFACE ELEVATION	<u>729</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>N/A</u> FT.	FROM <u>N/A</u> TO <u>N/A</u>
PLUGGED BACK TOTAL DEPTH	_____ FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>179</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____		

DETAILS OF PLUGGING:

FILLED WITH	<u>Well Bore Fluid</u>	FROM	<u>TD</u>	TO	<u>1700</u> FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)					
FILLED WITH	<u>CIBP & Cement</u>	FROM	<u>1700</u>	TO	<u>1689</u> FT.
FILLED WITH	<u>Well Bore fluid</u>	FROM	<u>1689</u>	TO	<u>250</u> FT.
FILLED WITH	<u>Cement</u>	FROM	<u>250</u>	TO	<u>04</u> FT.
FILLED WITH	<u>Earth</u>	FROM	<u>04</u>	TO	<u>GL</u> FT.
FILLED WITH	_____	FROM	_____	TO	_____ FT.
FILLED WITH	_____	FROM	_____	TO	_____ FT.

COMMENTS: Peforated Casing @ 250 and squeezed to surface around back side. Also casing full from 250 to surface. No pipe recovery. Pumped 140 SX to circulate to surface. From 250 to surface.

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	<u>10 3/4</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>0</u>
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	<u>7"</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>4</u>

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature]
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 4/8/96

950 Sunset RD. PO Box 402
 ADDRESS
Clay City IL 62824

DATE PLUGGING COMPLETED 4/9/96
 DEPT. OF MINES & MINERALS
 SPRINGFIELD

CITY, STATE

ZIP

APR 19 1996

APR 25 1996

12/19/97

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY No. 314300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

789754

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: PRF-98- Emergency (James R. Eickberg) PERMITTEE NO. 414WELL NAME: Neal Ammons PERMIT NO. 920 REFERENCE NO. 124032
(ISSUE DATE IF NO NUMBER)

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: 1023 FT. NORTH; OR _____ FT. SOUTH; AND
977 FT. EAST; OR _____ FT. WEST OF THE SW
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>749</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1780</u>	FT.	FROM <u>1780</u> TO _____
PLUGGED BACK TOTAL DEPTH	_____	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>199</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u>	FROM <u>1780</u>	TO <u>1520</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)			
FILLED WITH <u>wellbore fluid</u>	FROM <u>1520</u>	TO <u>256</u>	FT.
FILLED WITH <u>cement</u>	FROM <u>256</u>	TO <u>4</u>	FT.
FILLED WITH <u>dirt</u>	FROM <u>4</u>	TO <u>0</u>	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.
FILLED WITH _____	FROM _____	TO _____	FT.

COMMENTS:

shot pipe at 256', circulated cement on inside and outside of 5½ pipe

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	7			7 7/8		4' cutoff
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5½	1780		7 7/8		4' cutoff

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: _____

PERMITTEE OR DESIGNEE

DATE PLUGGING BEGAN 12-18-97

ADDRESS _____

DATE PLUGGING COMPLETED 12-19-97

CITY, STATE _____

ZIP _____

RECEIVED

DEC 31 1997

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STATE OF ILLINOIS,
County of Coles } ss.

COUNTY No. 1082 O. G. 6 (67419-5M-10-48) Mattoon 9
WELL PLUGGING AFFIDAVIT

Blalack and Walters and
Gilbert H. Selby being first duly sworn, do depose and
say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil
(Indicate whether for oil, gas, water or other purposes)
known as the Fred Crooks #1 and located as follows: 1176 ft. north;
ft. south; 201 ft. east; ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the SW corner of the Quarter
of the Quarter of the Quarter of
Section 14, Township 12 (North or South)
Range 7, (East or West) of the 3rd
Principal Meridian, Coles County, Illinois.
Elevation above sea level is { Derrick Floor ft.
Ground 723 ft.
Total depth of well is 1956 ft.
Date permit to drill issued May 3, 1946 Permit No.
Permit issued to Blalack and Walters
Date drilling began May 10, 1946
Date drilling completed May 20, 1946
Kind of drilling tools used Rotary
Date plugging began 7-20-1949
Date plugging completed 7-22-1949

Lessor Fred Crooks Address Mattoon, Illinois
Lessee Blalack and Walters Address Gladewater, Texas
Drilling Contractor Blalack and Walters Address Gladewater, Texas

DETAILS OF PLUGGING:

Filled with	From	To	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>1956</u>	To <u>1904</u>	feet
Filled with <u>Mud</u>	From <u>1904</u>	To <u>175</u>	feet
Kind of Plug <u>Cement</u>	From <u>175</u>	To <u>100</u>	feet
Filled with <u>Mud</u>	From <u>100</u>	To <u>30</u>	feet
Kind of Plug <u>Cement</u>	From <u>30</u>	To <u>2</u>	feet
Filled with	From <u>2</u>	To <u>0</u>	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth)

(1) Have pits, cellar and other excavations been filled?...	Yes ☒	No ☐
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐
(3) Has surface casing been cut off below plow depth?.....	Yes ☒	No ☐
(4) Has well-site been levelled?.....	Yes ☒	No ☐

If this was a producing well, give date and amount of last production 1 bbl. per day 7-13-49

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
Size of hole	7	7/8"					
Casing 5 1/2"	1944'		927		1017		
S.P. 8"	156'				156		

Marvin D Underwood Casing pulling
(Signature of person, firm or corporation having custody or control of well.)

Per James Davis
Address 135 East Main Central City Ill.
Gilbert H. Selby Oil Well Inspector
(Signature and title of party supervising plugging of well.)

Address R.R. #5, Newton, Illinois

Subscribed and sworn to before me this 27 day of July, A. D. 1949
My commission expires 1 May 1953

Robert Mayhew
Notary Public

12/2/97

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756COUNTY NO. 1082300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

780753

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: PRF-98-Emergency (James R. Eickberg) PERMITTEE NO. 414WELL NAME: Stoker #1 PERMIT NO. 1820 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 124075

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: 1176 FT. NORTH; OR _____ FT. SOUTH; AND
201 FT. EAST; OR _____ FT. WEST OF THE SW
 CORNER OF THE _____ QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>749</u> FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1805</u> FT.	FROM <u>1779</u> TO <u>1790</u>
PLUGGED BACK TOTAL DEPTH	<u>1805</u> FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>199</u> FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____ FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH <u>cement</u> (ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)	FROM <u>1805</u> TO <u>1550</u> FT.
FILLED WITH <u>wellbore fluid</u>	FROM <u>1550</u> TO <u>275</u> FT.
FILLED WITH <u>shot at 275 cement</u>	FROM <u>275</u> TO <u>4</u> FT.
FILLED WITH <u>dirt</u>	FROM <u>4</u> TO <u>0</u> FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.
FILLED WITH _____	FROM _____ TO _____ FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10 3/4					4' cutoff
INTERMEDIATE / MINE STRING / OR LINER	5 1/2					pulled
PRODUCTION	3 1/2					4' cutoff

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature]
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 12-2-97

ADDRESS _____

DATE PLUGGING COMPLETED 12-2-97

CITY, STATE _____ ZIP _____

RECEIVED

DEC 31 1997

12/16/97

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140COUNTY No. 1084

OG-6 WELL PLUGGING REPORT

789102

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER _____PERMITTEE: PRF - 98- Emergency (James R. Eickberg) PERMITTEE NO. 414WELL NAME: Leslie Dole #1 PERMIT NO. 2215 (ISSUE DATE IF NO NUMBER) REFERENCE NO. 124036

COUNTY Coles SECTION 14
 TOWNSHIP 12N RANGE 7E
 LOCATION: _____ FT. NORTH; OR 1000 FT. SOUTH; AND
746 FT. EAST; OR _____ FT. WEST OF THE NW
 CORNER OF THE SW QUARTER OF THE _____
 QUARTER OF THE _____ QUARTER OF THE _____
 QUARTER.

WELL DATA:

SURFACE ELEVATION	<u>748</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1770</u>	FT.	FROM <u>1770</u> TO _____
PLUGGED BACK TOTAL DEPTH	_____	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>198</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____	FT.	FROM _____ TO _____
DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____			

DETAILS OF PLUGGING:

FILLED WITH	<u>cement</u>	<u>25</u> sks	FROM <u>1770</u>	TO <u>1550</u>	FT.
<small>(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)</small>					
FILLED WITH	<u>wellbore fluid</u>		FROM <u>1550</u>	TO <u>260</u>	FT.
FILLED WITH	<u>cement</u>		FROM <u>260</u>	TO <u>4</u>	FT.
FILLED WITH	<u>dirt</u>		FROM <u>4</u>	TO <u>0</u>	FT.
FILLED WITH	_____		FROM _____	TO _____	FT.
FILLED WITH	_____		FROM _____	TO _____	FT.
FILLED WITH	_____		FROM _____	TO _____	FT.

COMMENTS:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	93		12 1/4		4' cutoff
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	5 1/2	1770		7 7/8		260

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: [Signature] DATE PLUGGING BEGAN 12-15-97

PERMITTEE OR DESIGNEE

DATE PLUGGING COMPLETED 12-16-97

ADDRESS _____

CITY, STATE _____

ZIP _____

STATE OF ILLINOIS,

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

J. E. Page

O. G. 6 (3250-10M-45)

MINES AND MINERAL
DEPARTMENT
RECEIVED
JUN 1 1950

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for
Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Campbell #1 and located as follows: 202 ft. north;
ft. south; 2546 ft. east; ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the S.W. corner of the S.W. Quarter
of the _____ Quarter of the _____ Quarter of
Section 14, Township 12N (North or South)
Range 7E, (East or West), of the 3
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 712 ft.
Ground _____ ft.

Total depth of well is 1953 ft.

Date permit to drill issued 6-5-46

Permit issued to J. C. Potter

Date drilling began 6-5-46

Date drilling completed 6-11-46

Kind of drilling tools used Rotary

Date plugging began 6-11-46

Date plugging completed 6-11-46

Lessor Blalock

Address Centralia, Ill.

Lessee Reeves & Dixon

Address Salem, Ill.

Drilling Contractor Schoenfeldt Hunter & Kitch

Address Salem, Ill.

DETAILS OF PLUGGING:

Filled with	From	To	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>1953</u>	To <u>1875</u>	feet
Filled with <u>Rotary Mud</u>	From <u>1875</u>	To <u>150</u>	feet
Kind of Plug <u>Cement</u>	From <u>150</u>	To <u>125</u>	feet
Filled with <u>Mud</u>	From <u>125</u>	To <u>25</u>	feet
Kind of Plug <u>Cement</u>	From <u>25</u>	To <u>0</u>	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details _____

If this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 1/2</u>	<u>127</u>	<u>0</u>			<u>127</u>	<u>0</u>	<u>Cemented</u>

(Signature of person, firm or corporation having custody or control of well.)

Per _____

Address _____

(Signature and title of party supervising plugging of well.)

Address _____

Subscribed and sworn to before me this 15 day of _____

My commission expires Feb. 28, 1950

June

A. D. 194 6

Notary Public.

STATE OF ILLINOIS,
County of Coles

WELL PLUGGING AFFIDAVIT

Jim Gilliland

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Gucker #1 - Unit #21 and located as follows: 871 ft. north; 1900 ft. south; 1900 ft. east; 1900 ft. west

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

of the NE corner of the NE Quarter of the 14 Quarter of the 12 Quarter of Section 14, Township 12 (North or South) Range 7, (East or West), of the 3d Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 654 ft.
Ground 1973 ft.

Total depth of well is 1973 ft.

Date permit to drill issued May 26, 1947

Permit issued to Joe Blalock

Date drilling began May 27, 1947

Date drilling completed April 5, 1948

Kind of drilling tools used Rotary

Date plugging began November 19, 1948

Date plugging completed November 20, 1948

Lessor Gucker Address Mattoon, Illinois
Lessee Blalock and Walters Address 117 1/2 S. 10th, Mt. Vernon, Ill.
Drilling Contractor Blalock and Walters Address 117 1/2 S. 10th, Mt. Vernon, Ill.

DETAILS OF PLUGGING:

Filled with	Cement	From	To	feet
(Rotary Mud, Cement, or Other Materials)		1973	1913	
Kind of Plug	<u>Mud</u>	1913	800	feet
Filled with	<u>Cement</u>	800	696	feet
Kind of Plug	<u>Mud</u>	696	110	feet
Filled with	<u>Cement</u>	110	27	feet
Kind of Plug	<u>Cement</u>	27	2	feet
Filled with	<u>Earth</u>	2	0	feet
Kind of Plug				feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal Seam 750 cemented

(1) Have pits, cellar and other excavations been filled?...	Yes ☒	No ☐
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐
(3) Has surface casing been cut off below plow depth?.....	Yes ☐	No ☐
(4) Has well-site been levelled?.....	Yes ☒	No ☐

If this was a producing well, give date and amount of last production Last production 11/14/48
1/4 bbl. per day

CASING RECORD Permit #757

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10	105				105		Cemented

ACME CASING PULLING CO.
GRAYVILLE, ILL.

Blalock and Walters
(Signature of person, firm or corporation having custody or control of well.)
Per Blalock and Walters Jim Gilliland
Address Grayville, Ill.
Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well.)
Address Effingham, Illinois, P. O. #1
Subscribed and sworn to before me this 22nd day of November, A. D. 1948
My commission expires 2-24-51
Delores A. Stock
Notary Public.

STATE OF ILLINOIS

COUNTY No. 10877

(22792-10M-7-70) 10

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Paul V. Harris for Continental Insurance Co. andE. R. Clifton - Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Fred Harris #2and located as follows: 334 ft. north;210 ft. south; 210 ft. east; ft. westof the SW corner of the Quarterof the Quarter of the Quarter ofSection 14, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground ft.Total depth 1952 Formation MississippianDate permit to drill issued 4-4-45 Permit No. 524Permit issued to J. C. PotterDate drilling began Date drilling completed 5-10-45Kind of drilling tools used Date plugging began 10-21-71Date plugging completed 10-21-71Lessor Address Lessee Address Drilling Contractor Tex Harvey Oil Co. Address Dallas, Texas

DETAILS OF PLUGGING:

Filled with Cement From 1952 To 1902 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1902 To 250 feetFilled with Cement From 250 To 200 feetKind of Plug Mud From 200 To 25 feetFilled with Cement From 25 To 3 feetKind of Plug Earth From 3 To 0 feetFilled with From To feetKind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? Yes ☒ No ☐
(2) Have the following been removed? Yes ☒ No ☐Equipment Yes ☐ No ☐ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☐(3) Has surface casing been cut off three feet below ground surface? Yes ☐ No ☒(4) Has well-site been levelled? Yes ☐ No ☒If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	

(Signature of person, firm or corporation having custody or control of well.)

Per Paul V. Harris
Address P. O. Box 365 Olney, Illinois(Signature and title of party supervising plugging of well.)
Address E. R. Clifton Well Inspector
1108 Champaign Ave., Matteson, Ill.Subscribed and sworn to before me this 22 day of Oct., A.D. 1971My commission expires Oct. 28, 1974

Notary Public.

STATE OF ILLINOIS,
County of Coles } ss.

COUNTY No. 1086
WELL PLUGGING AFFIDAVIT

O. G. 6 (67419-5M-10-48)

J.C. Potter

and

Gilbert H. Selby being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Fred Harris #1

and located as follows: 280 ft. north;

823 ft. south; 823 ft. east; WE ft. west

of the SW corner of the SW Quarter

of the Quarter of the Quarter of

Section 14, Township 12 (North or ~~South~~)

Range 7, (East or ~~West~~) of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 717 ft.

Total depth of well is 1956 ft.

Date permit to drill issued 3-11-46 Permit No. 356

Permit issued to J.C. Potter, Salem, Ill.

Date drilling began 3-11-46

Date drilling completed 3-29-46

Kind of drilling tools used Rotary

Date plugging began 7-20-49

Date plugging completed 7-21-49

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Fred Harris et al

Address Mattoon, Illinois

Lessee J.C. Potter

Address Salem, Illinois

Drilling Contractor Tex Harvey

Address Salem, Illinois

DETAILS OF PLUGGING:

Filled with (Rotary Mud, Cement, or Other Materials) From To feet

Kind of Plug Cement From 1956 To 1900 feet

Filled with Mud From 1900 To 175 feet

Kind of Plug Cement From 175 To 100 feet

Filled with Mud From 100 To 30 feet

Kind of Plug Cement From 30 To 0 feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness and 1,000 feet in depth) Information derived from report 93 State Geological Survey

(1) Have pits, cellar and other excavations been filled?...

Yes ☒ No ☐

(2) Have equipment, concrete bases and debris been removed?

Yes ☒ No ☐

(3) Has surface casing been cut off below plow depth?....

Yes ☒ No ☐

(4) Has well-site been levelled?.....

Yes ☒ No ☐

If this was a producing well, give date and amount of last production 4-11-47 1 bbl. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
S.P. 10 3/4"	156				156		
Casing 7"	1956		833		1123		

Tri-State Casing Pulling Company

(Signature of person or firm or corporation having custody or control of well.)

Per R. S. Barwell

Address Fairfield Ill
Gilbert H. Selby Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address R.R. #5, Newton, Illinois

Subscribed and sworn to before me this 26 day of July

A. D. 194 9

My commission expires 5-9-50

Notary Public.

WELL PLUGGING AFFIDAVIT

_____ **Tom E. Grace** and
_____ **H.L. Noblit State Well Inspector** being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil and/or Gas
(Indicate whether for oil, gas, water or other purposes)

known as the ARTHUR HARVEY # 1 and located as follows: 275 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; 1610 ft. east; _____ ft. west
of the SW corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 14, Township 12 (North or ~~South~~)
Range 7, (East or ~~West~~) of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.

Total depth 1951 Formation Rosiclare

Date permit to drill issued 4/27/48 Permit No. 689

Permit issued to J.C. Potter

Date drilling began ?

Date drilling completed ?

Kind of drilling tools used Rotary

Date plugging began 9/4/84

Date plugging completed 9/4/84

Lessor _____ Address _____

Lessee Tom E. Grace Address Box 457 Mattoon, IL.

Drilling Contractor ? Address _____

Drilled out of 7" @145' DETAILS OF PLUGGING:

Filled with 100 Sacks Cement down 7" From _____ To _____ feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug _____ From _____ To _____ feet

Filled with 15 Sacks Cement down 10 3/4 From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Hole in 7"

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>130</u>		<u>0</u>		<u>130</u>		<u>Well was squeezed drilled out of 7" @145' trying to drill out plug</u>
<u>7"</u>	<u>1912</u>		<u>0</u>		<u>1912</u>		

Tom E. Grace
(Signature of person, firm or corporation having custody or control of well.)

Per _____

Address Box 457 Mattoon, IL. -61938

H.L. Noblit Well Inspector
(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 5th day of September, A.D. 19 84

My commission expires My Commission Expires August 27, 1985

Markle Noblit
Notary Public

STATE OF ILLINOIS

County of McDONALD

SS.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson - Oil Well Inspector

and

Charles Armstrong

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oilknown as the I.C.R.R. No. and located as follows: 1250 ft. north;000 ft. south; 2000 ft. east; 000 ft. westof the 00 corner of the 00 Quarterof the 00 Quarter of the 00 Quarter ofSection 14, Township 12 (North or South)Range 7, (East or West), of the 00Principal Meridian, 0000 County, Illinois.Elevation above sea level is { Derrick Floor 00 ft.
Ground 700 ft.Total depth 2000 Formation 00, 00, 00Date permit to drill issued 11/1/66 Permit No. 1708Permit issued to Richard L. ArmstrongDate drilling began 11/1/66Date drilling completed 11/1/66Kind of drilling tools used RotaryDate plugging began 6/12/66Date plugging completed 6/12/66 Locate well accurately on plat of section
(Shale one inch=2,000 ft.)Lessor Illinois Central Railroad Address Matteson, IllinoisLessee Richard L. Armstrong Address Matteson, IllinoisDrilling Contractor Tip-Top Drilling Co. Address Olney, Illinois

DETAILS OF PLUGGING:

Filled with Cement (Rotary Mud, Cement, or Other Materials) From 2000 TD To 2000 feetKind of Plug Rotary mud From 2000 To 167 feetFilled with Cement From 167 To 117 feetKind of Plug Rotary mud From 117 To 30 feetFilled with Cement From 30 To 00-2 feetKind of Plug 00 From 00 To 00 feetFilled with 00 From 00 To 00 feetKind of Plug 00 From 00 To 00 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed(1) Have pits and other excavations been filled? Yes ☐ No ☒(2) Have the following been removed? Yes ☐ No ☒Equipment ☐ Concrete bases ☐ Debris ☒(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☐ No ☒If this was a producing well, give date and amount of last production 6/12/66 2 Bbls. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL	
	Feet	Inches	Feet	Inches	Feet	Inches
<u>8 5/8"</u>	<u>142</u>		<u>3</u>		<u>130</u>	
<u>4 1/2"</u>	<u>2004</u>		<u>1522</u>		<u>742</u>	

Richard L. Armstrong

(Signature of person, firm or corporation having custody or control of well.)

Per Charles L. ArmstrongAddress Matteson, IllinoisRichard L. Hanson Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Box 177 Newman, IllinoisSubscribed and sworn to before me this 29th day of May, A.D. 1967My commission expires 5-10-1971 Cashilla R. Hanson
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Charles Armentrout

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the I. C. R. R. No. 1-Aand located as follows: 1052 ft. north; ft. south; 1025 ft. east; ft. westof the SW corner of the Quarterof the Quarter of the Quarter ofSection 14, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.Original T.D. 2050 Ground 721 ft.P/B Total depth 1970 Formation BoisclaireDate permit to drill issued 8/2/66 Permit No. 1147Permit issued to Elshart & ArmentroutDate drilling began 7-25-66Date drilling completed 8-2-66Kind of drilling tools used RotaryDate plugging began 7-28-72Date plugging completed 7-28-72 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor I. C. Railroad CompanyAddress Lessee Elshart & ArmentroutAddress Mattoon, IllinoisDrilling Contractor N. A. BaldrigeAddress Ashley, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From <u>1970</u>	To <u>1700</u>	feet
Kind of Plug <u>Rotary Mud</u>	From <u>1700</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Rotary Mud</u>	From <u>200</u>	To <u>140</u>	feet
Filled with <u>Cement</u>	From <u>140</u>	To <u>110</u>	feet
Kind of Plug <u>Rotary mud</u>	From <u>110</u>	To <u>15</u>	feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? Yes ☐ No ☒

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☐ No ☒ UnknownIf this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10-3/4</u>	<u>130</u>	<u>-</u>	<u>3'</u>	<u>-</u>	<u>127</u>	<u>-</u>	<u>Top 3' cut off</u>
<u>4-1/2</u>	<u>2043</u>	<u>-</u>	<u>1042</u>	<u>-</u>	<u>601</u>	<u>-</u>	<u>Cemented with 150 sacks when</u>
							<u>rote</u>

RECEIVED

DIVISION OF OIL & GAS

(Signature of person, firm or corporation having custody or control of well.)

Per

AUG 31

Address

DEPARTMENT OF

MINES & MINING

Address

(Signature and title of party supervising plugging of well.)

Address Subscribed and sworn to before me this day of A.D. 19 72My commission expires 10/28/72

Notary Public

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

Bangert Casing Pulling Corporation

and

Richard Hanson

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Hopkins Community # 1 and located as follows: _____ ft. north;524 ft. south; _____ ft. east; 2721 ft. westof the NE corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 14, Township 12 (North 61 South)Range 7, (East of West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 733 ft.Ground 728 ft.Total depth 1847 Formation RosiclareDate permit to drill issued 8-13-63 Permit No. 1437Permit issued to David F. HerleyDate drilling began 8-19-1963Date drilling completed 8-21-1963Kind of drilling tools used RotaryDate plugging began 10-5-1968Date plugging completed 10-5-1968Lessor Stella Hopkins, et alAddress Mattoon, IllinoisLessee David F. HerleyAddress Salem, IllinoisDrilling Contractor Canter Drilling CompanyAddress Mt. Vernon, Illinois

DETAILS OF PLUGGING:

Filled with Previous Plug Back - Cement From 1989 To 1847 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1847 To 1732 feetFilled with Mud From 1732 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 137 feetKind of Plug Cement From 137 To 107 feetFilled with Mud From 107 To 17 feetKind of Plug Cement From 17 To 3 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production 1/1/68 - 1/2 bbl

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>127</u>		<u>-0-</u>		<u>127</u>		<u>Surface</u>
<u>4 1/2</u>	<u>1970</u>		<u>-0-</u>		<u>1970</u>		<u>Longstring</u>

BANGERT CASING PULLING CORPORATION

(Signature of person, firm or corporation having custody or control of well.)

Per John O. BangertAddress Box # 441 - Clay City, Illinois

Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 - Newman, IllinoisSubscribed and sworn to before me this 8th day of October, A.D. 1968My commission expires 5/10/71

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Bangert Casing Pulling Corporation

and

Richard Hanson

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Rumold Community # 1 and located as follows: _____ ft. north; Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

486 ft. south; _____ ft. east; 2004 ft. west
of the NE corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 14, Township 12 (North of South)
Range 7, (East of West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 735 ft.
Ground 731 ft.

Total depth 1916 Formation RosiclareDate permit to drill issued 8-13-63 Permit No. 1436Permit issued to David F. HerleyDate drilling began 8-25-1963Date drilling completed 8-31-1963Kind of drilling tools used RotaryDate plugging began 10-5-1968Date plugging completed 10-5-1968Lessor Rumold, et al Address Mattoon, IllinoisLessee David F. Herley Address Salem, IllinoisDrilling Contractor Carter Drilling Company Address Mt. Vernon, Illinois

DETAILS OF PLUGGING:

Filled with Previous Plug Back - Cement From 1978 To 1916 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1916 To 1732 feetFilled with Mud From 1732 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 137 feetKind of Plug Cement From 137 To 107 feetFilled with Mud From 107 To 17 feetKind of Plug Cement From 17 To 3 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None Encountered

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production 1/1/68 - 1/2 bbl oil

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
<u>8 5/8</u>	<u>127</u>		<u>0</u>		<u>127</u>		<u>Surface</u>
<u>4 1/2</u>	<u>1970</u>		<u>0</u>		<u>1970</u>		<u>Longstring</u>

BANGERT CASING PULLING CORPORATION
(Signature of person, firm or corporation having custody or control of well.)

Per John O. BangertAddress Box # 441 - Clay City, Illinois

Richard Hanson
(Signature and title of party supervising plugging of well.)
Oil Well Inspector

Address Box # 177 - Newman, IllinoisSubscribed and sworn to before me this 8th day of October, A.D. 1968My commission expires 5/10/71 Camilla R. Hanson

Notary Public.

14-12N-7E-1

STATE OF ILLINOIS
County of Coles } ss

WELL PLUGGING AFFIDAVIT

Blalack & Walters and
Haldon Moore being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for oil (Indicate whether for oil, gas, water or other purposes)

known as the Rounold Comm. # 1 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

486 ft. south; _____ ft. east; 2043 ft. west
of the NE corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 14, Township 12 (North or South)
Range 7, (East or West) of the 3
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 731 ft.

Total depth of well is 3-17-46 ft. 394

Date permit to drill issued not known Permit No. not known

Permit issued to Blalack & Walters

Date drilling began 3-17-46

Date drilling completed 4-2-46

Kind of drilling tools used Rotary

Date plugging began 6-7-51

Date plugging completed 6-9-51

Lessor Rounold Comm. Address Mattoon, Ill.
Lessee Blalack & Walters Address Mt Vernon, Ill.
Drilling Contractor Blalack Drilling Co. Address Mt Vernon, Ill.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1978</u>	To <u>1928</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Rotary mud</u>	From <u>1928</u>	To <u>136</u> feet
Filled with <u>Cement</u>	From <u>136</u>	To <u>111</u> feet
Kind of Plug <u>Aquagel</u>	From <u>111</u>	To <u>27</u> feet
Filled with <u>Cement</u>	From <u>27</u>	To <u>2</u> feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) _____

(1) Have pits, cellar and other excavations been filled?	Yes ☐ No ☒
(2) Have equipment, concrete bases and debris been removed?	Yes ☐ No ☒
(3) Has surface casing been cut off below plow depth?	Yes ☒ No ☐
(4) Has well-site been levelled?	Yes ☐ No ☒

If this was a producing well, give date and amount of last production 1 bbl. per day.

CASING RECORD

PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	

RECEIVED
JUN 13 1951
DIVISION OF
NATURAL RESOURCES
CONSERVATION

15-12N-7E

8-22-89
Form 004
STATE OF ILLINOIS
County of Coles

COUNTY No. 2333

WELL PLUGGING AFFIDAVIT

Elton Botts

and

Kevin Spencer

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Wittenberg Estate Comm and located as follows: _____ ft. north;

385 ft. south; _____ ft. east; 405 ft. west

of the NE corner of the NE Quarter

of the NE Quarter of the NE Quarter of

Section 15, Township 12 (North or South)

Range 7, (East or West), of the _____

Principal Meridian, Coles County, Illinois.

Elevation above sea level is 733 ft.

Derrick Floor 730 ft.

Total depth 3200 Formation Devonian

Date permit to drill issued 8/12/72 Permit No. 715

Permit issued to Elton Botts Mattoon

Date drilling began 8/29/72

Date drilling completed 9/5/72

Kind of drilling tools used Rotary

Date plugging began 8/22/89

Date plugging completed 8/22/89

Lessor Communitized

Address Mattoon IL

Lessee Elton Botts

Address Mattoon IL

Drilling Contractor Depoister Drlg

Address Effingham IL

DETAILS OF PLUGGING:

Filled with Cement From 2550 To 2500 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 2500 To 300 feet

Filled with Cement From 300 To 4 feet

Kind of Plug Soil From 4 To 0 feet

Filled with packer w/60 Jts 2 3/4 Tubing From 2565 To _____ feet

Kind of Plug Cement Annulus between From 114 To 4 feet

Filled with Longstring & Surface From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed? ☐ Yes ☒ No

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 3/8</u>	<u>114</u>		<u>4</u>	<u>00</u>	<u>110</u>		<u>RECEIVED</u> <u>AUG 28 1989</u>
<u>4 1/2</u>	<u>3200</u>		<u>4</u>		<u>2996</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per Operator

Address 2901 WESTERN AVE. MATTOON, IL

Kevin Spencer Well Insp I

(Signature and title of party supervising plugging of well.)

Address Box 449 Martinsville IL 62449

Subscribed and sworn to before me this

17 day of Sept, A.D. 1989

STATE OF ILLINOIS,

County of Colas

ss.

WELL PLUGGING AFFIDAVIT

COUNTY No 316

Walter Stewart being first duly sworn, deposes and says the following is a true and correct statement of the details of the plugging of a certain well situated in

(Indicate whether for oil, gas, water or other purposes)

known as the Ed Gucker no 1 and located as follows:

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

ft. north; 321 ft. south; 321 ft. east; 321 ft. west
of the SW corner of the 15 Quarter of the 12 Township 12 (North or South)
Range 7 (East or West), of the 2
Principal Meridian, Colas County, Illinois.

Elevation above sea level is { Derrick Floor 715 ft.
Ground 715 ft.

Total depth of well is 2130 ft.Date permit to drill issued Oct 27 - 1945Permit issued to Perry FulkDate drilling began Oct 27 - 1945Date drilling completed Nov 2 - 1945Kind of drilling tools used RotaryDate plugging began Nov 2 1945

Date plugging completed

Lessor Ed GuckerLessee Perry FulkDrilling Contractor Don SlapeAddress Mattoon RR 311Address Mattoon RR 311Address Mattoon RR 311

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>2130</u>	<u>2070</u>	
Kind of Plug <u>Rotary mud</u>	<u>2070</u>	<u>955</u>	
Filled with <u>Cement</u>	<u>955</u>	<u>855</u>	
Kind of Plug <u>Rotary mud</u>	<u>855</u>	<u>485</u>	
Filled with <u>Cement</u>	<u>485</u>	<u>385</u>	
Kind of Plug <u>Rotary mud</u>	<u>385</u>	<u>122</u>	
Filled with <u>Cement</u>	<u>122</u>	<u>72</u>	
Kind of Plug <u>Rotary mud</u>	<u>72</u>	<u>27</u>	

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth and three feet or more in thickness below 1,000 feet in depth.) Plugged off coal at 955 to 855 and from 485 to 385 according to the State Geological Survey

Other details R H Anderson said he would make an affidavit there was no sand that might produce but was just 60 feet of cement in bottom of hole. I have no affidavit for the above.
If this was a producing well, give date and amount of last production.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>120</u>		<u>2</u>		<u>118</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per Don SlapeAddress Mattoon RR 311

(Signature and title of party supervising plugging of well.)

Address Mattoon RR 311

Subscribed and sworn to before me this

3

day of

Nov.A. D. 194 5

My commission expires

Nov. 30 - 1947

Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Marion Heady

and

Don Robson

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the C.C.C. & St. Louis Railroad Co. and located as follows: 790 ft. north; Locate well accurately on plat of section
(Scale one inch—2,000 ft.)ft. south; 989 ft. east; 989 ft. westof the S.E. corner of the Quarterof the Quarter of the QuarterSection 15, Township 12 (North or South)Range 7, (East or West) of the Principal MeridianColes County, Illinois.Elevation above sea level is { Derrick Floor 715 ft.
Ground ft.Total depth 2005 Formation RosiclareDate permit to drill issued 5-23-46 Permit No. 848Permit issued to Ashland Oil and Refining Co.Date drilling began 5-23-46Date drilling completed 5-30-46Kind of drilling tools used RotaryDate plugging began 6-8-71Date plugging completed 6-8-71Lessor C.C.C. & St. Louis Railroad Co. Address St. Louis, MissouriLessee Ashland Oil and Refining Co. Address Evansville, IndianaDrilling Contractor M.H. Hess Address Unknown

DETAILS OF PLUGGING:

Filled with <u>Plugged back</u> (Rotary Mud, Cement, or Other Materials)	From <u>2005</u>	To <u>1830</u> feet
Kind of Plug <u>Cement</u>	From <u>1830</u>	To <u>1730</u> feet
Filled with <u>Mud</u>	From <u>1730</u>	To <u>250</u> feet
Kind of Plug <u>Cement</u>	From <u>250</u>	To <u>200</u> feet
Filled with <u>Mud</u>	From <u>200</u>	To <u>128</u> feet
Kind of Plug <u>Cement</u>	From <u>128</u>	To <u>100</u> feet
Filled with <u>Mud</u>	From <u>100</u>	To <u>85</u> feet
Kind of Plug <u>Cement</u>	From <u>85</u>	To <u>4</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	118				114		four feet cut off
5 1/2	1950		1157		793

Subscribed and sworn to before me this 10th day of June, A.D. 19 71My commission expires 8/10/74 Walter B. Pham
Notary Public.E. C. Reeves

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress Fairfield, IllinoisMarion Heady Insp.

(Signature and title of party supervising plugging of well.)

Address P.O. Box # 1, Newton, Illinois 62448

STATE OF ILLINOIS

County of Coles } ss.

WELL PLUGGING AFFIDAVIT

Mattoon

Acme Casing Pulling Co. & Walter Duncan and

Haldon Moore

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for oil 340 SL 1113 EL SE

(Indicate whether for oil, gas, water or other purposes)

known as the Gano Cons. # 1 and located as follows: 340 ft. north; Locate well accurately on plat of section
(Scale one inch—2,000 ft.)ft. south; 1113 ft. east; 1113 ft. westof the SE corner of the Quarterof the Quarter of the QuarterSection 15, Township 12 (North 3080000)Range 7, (East 3000000), of the 3Principal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.{ Ground ft.Total depth of well is 1997 ft.Date permit to drill issued 12-4-45 Permit No. 1950Permit issued to Walter DuncanDate drilling began 12-6-45Date drilling completed 12-21-45Kind of drilling tools used RotaryDate plugging began 1-24-51Date plugging completed 1-25-51Lessor Gano Cons.Address Mattoon, Ill.Lessee Walter DuncanAddress LaSalle, Ill.Drilling Contractor Des MillerAddress Mt. Carmel, Ill.

DETAILS OF PLUGGING:

Filled with Cement From 1997 To 1947 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1947 To 165 feetFilled with Cement From 165 To 140 feetKind of Plug Mud From 140 To 25 feetFilled with Cement From 25 To 3 feetKind of Plug Earth From 3 To 0 feetFilled with ft. From ft. To ft.Kind of Plug ft. From ft. To ft.IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No coal encountered(1) Have pits, cellar and other excavations been filled? Yes ☐ No ☒(2) Have equipment, concrete bases and debris been removed? Yes ☐ No ☒(3) Has surface casing been cut off below plow depth? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☐ No ☒If this was a producing well, give date and amount of last production 1 bbl. 1-4-51

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>154</u>		<u>0</u>		<u>154</u>		
<u>7</u>	<u>1994</u>		<u>1115</u>		<u>879</u>		

Acme Casing Pulling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per James C. DuncanAddress Grayville, Ill.Haldon Moore Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Moweaqua, Ill.Subscribed and sworn to before me this 29 day of January, A.D. 1951My commission expires 2-24-54

Notary Public

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Marion Heady

and

Don Robson

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Gano Cons. and located as follows: 340 ft. north;ft. south; 1113 ft. east; ft. westof the S.E. corner of the Quarterof the Quarter of the QuarterSection 15, Township 12 (North of ~~South~~ XXXX)Range 7, (East of ~~West~~ XXXX), of thePrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.
Ground ft.Total depth 2003 Formation RosiclareDate permit to drill issued 10-23-57 Permit No. 2686Permit issued to Joe BlalackDate drilling began 12-16-57Date drilling completed 12-20-57Kind of drilling tools used RotaryDate plugging began 6-7-71Date plugging completed 6-8-71Lessor Gano Address Mattoon, IllinoisLessee Joe Blalack Address Long View, TexasDrilling Contractor Joe Blalack Address Long View, Texas

DETAILS OF PLUGGING:

Kind of Plug	From	To	feet
Filled with <u>Plugged back</u>	<u>2003</u>	<u>1807</u>	<u>feet</u>
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>1807</u>	To <u>1707</u>	<u>feet</u>
Filled with <u>Mud</u>	From <u>1707</u>	To <u>250</u>	<u>feet</u>
Kind of Plug <u>Cement</u>	From <u>250</u>	To <u>200</u>	<u>feet</u>
Filled with <u>Mud</u>	From <u>200</u>	To <u>164</u>	<u>feet</u>
Kind of Plug <u>Cement</u>	From <u>164</u>	To <u>139</u>	<u>feet</u>
Filled with <u>Mud</u>	From <u>139</u>	To <u>15</u>	<u>feet</u>
Kind of Plug <u>Cement</u>	From <u>15</u>	To <u>4</u>	<u>feet</u>

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
- (2) Have the following been removed?
Equipment ☐ Yes ☒ No	Concrete bases ☒ Yes ☐ No	Debris ☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been levelled? ☐ Yes ☒ No
- If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	154				150		Four feet cut off
7"	879				879		7" set at 1115 to 1994
4 1/2"	1579		1209		370		

E.C. Reeves

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress Fairfield, IllinoisMarion Heady Insp.

(Signature and title of party supervising plugging of well.)

Address P.O. Box # 1, Newton, Illinois 62448Subscribed and sworn to before me this 10th day of June, A.D. 19 71My commission expires 8/1/76 74 Walter B. Chancy

Notary Public.

RECEIVED
DIVISION OF OIL & GAS

JUN 30 1971

STATE OF ILLINOIS
County of Coles ss.

WELL PLUGGING AFFIDAVIT *Mattoon*

Acme Casing Pulling Co. & Walter Duncan and
Haldon Moore being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for ~~XXXXXX~~ Oil 496 SE 493 EL SE
(Indicate whether for oil, gas, water or other purposes)

known as the Ivory Cons. # 1 and located as follows: 494 ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

ft. south; 494 ft. east; 494 ft. west
of the SE corner of the Quarter
of the Quarter of the Quarter of
Section 15, Township 12 (North ~~XXXXXX~~)
Range 7, (East ~~XXXXXX~~), of the 3
Principal Meridian, Coles County, Illinois.
Elevation above sea level is { Derrick Floor 717 ft.
Ground ft.
Total depth of well is 1997 ft.
Date permit to drill issued 3-1-46 Permit No. 316
Permit issued to Walter Duncan
Date drilling began 3-1-46
Date drilling completed 3-7-46
Kind of drilling tools used Rotary
Date plugging began 2-10-51
Date plugging completed 2-13-51

Lessor Ivory Cons. Address Mattoon, Ill.
Lessee Walter Duncan Address Mt Vernon, Ill.
Drilling Contractor Dee Miller Address Mt Carmel, Ill.

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>1997</u>	<u>1947</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>1947</u>	<u>152</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>152</u>	<u>127</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>127</u>	<u>25</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>25</u>	<u>0</u>	<u>feet</u>
Kind of Plug			<u>feet</u>
Filled with			<u>feet</u>
Kind of Plug			<u>feet</u>

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No Coal encountered

- (1) Have pits, cellar and other excavations been filled? Yes ☐ No ☒
(2) Have equipment, concrete bases and debris been removed? Yes ☐ No ☒
(3) Has surface casing been cut off below plow depth? Yes ☒ No ☐
(4) Has well-site been levelled? Yes ☐ No ☒
If this was a producing well, give date and amount of last production 1 bbl. Nov, 1950

DEPARTMENT
MINES AND MINERALS
RECEIVED
FEB 15 1951
DIVISION OF
OIL and GAS CONSERVATION

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>142</u>				<u>142</u>		
<u>7</u>	<u>1994</u>		<u>789</u>		<u>1205</u>		

Acme Casing Pulling Co.
(Signature of person, firm or corporation having custody or control of well.)
Per R. P. Sackett
Address Grayville, Ill.
Haldon Moore Oil Well Inspector
(Signature and title of party supervising plugging of well.)
Address Moweaqua, Ill.

Subscribed and sworn to before me this 13 day of February, A.D. 1951
My commission expires 2-24-54
Zola Moore
Notary Public.

County of Coles

ss.

60# 317

WELL PLUGGING AFFIDAVIT

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the Safayette Daily No 1 and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west

of the NE corner of the NW Quarter

of the Quarter of the Quarter of the

Section 15, Township 12 (North or South)

Range 7, (East or West), of the 3

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 727 ft.

{ Ground ft.

Total depth of well is 2119 ft.

Date permit to drill issued Oct 31 - 1945

Permit issued to George & Weather Drilling Co

Date drilling began Oct 27 - 1945

Date drilling completed Nov 4 - 1945

Kind of drilling tools used Rotary

Date plugging began Nov 4 - 1945

Date plugging completed Nov 4 - 1945

Lessor Safayette Daily

Address Mutton RR 1 Ill

Lessee George & Weather Drilling Co

Address Rx 152 Mt Carmel Ill

Drilling Contractor Same as above

Address Same as above

DETAILS OF PLUGGING:

Filled with Cement (Rotary Mud, Cement, or Other Materials) From 2119 To 2059 feet

Kind of Plug Rotary mud From 2059 To 1000 feet

Filled with Cement From 1000 To 900 feet

Kind of Plug Rotary mud From 900 To 532 feet

Filled with Cement From 532 To 432 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000

feet in depth and three feet or more in thickness below 1,000 feet in depth.) no trace of coal but

plugged off the two runs one at 482 ft & one at 947 as the State Geological survey shows

Other details Converted this well into a water well left open hole to depth of 432 ft

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>121</u>				<u>121</u>		

George & Weather Drilling Co

(Signature of person, firm or corporation having custody or control of well.)

Per Hugh West

Address Mt Carmel Ill

Walter Stewart Investigator

(Signature and title of party supervising plugging of well.)

Address Paris RR 2 Illinois

Subscribed and sworn to before me this 5 day of

My commission expires Nov. 30 - 1947

Nov, A. D. 194 5

Walter Stewart

Notary Public.

Coles - 12N-7E-15

KK

WELL PLUGGING AFFIDAVIT

_____ and
Bangert Casing Pulling Corporation
E. E. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the W. A. Myers Conn. #1 and located as follows: 1155 ft. north;

_____ ft. south; _____ ft. east; 1015 ft. west
of the SE corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 15, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Elevation above sea level is { Derrick Floor _____ ft.
Ground 716 ft.

Total depth 2010 Formation Aux Vases

Date permit to drill issued 11-8-45 Permit No. 1811

Permit issued to J. Frank Hinkle

Date drilling began 12-8-45 - Est.

Date drilling completed 12-11-45

Kind of drilling tools used Rotary

Date plugging began 10-25-73

Date plugging completed 10-26-73

Lessor W. A. Myers Address Mattoon, Illinois
Lessee J. Frank Hinkle Address Decatur, Illinois
Drilling Contractor Schoenfelt-Hunter-Kitch Address Mattoon, Illinois

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>2010</u>	<u>1930</u>	
Kind of Plug <u>Mud</u>	<u>1930</u>	<u>250</u>	feet
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Kind of Plug <u>Mud</u>	<u>200</u>	<u>148</u>	feet
Filled with <u>Cement</u>	<u>148</u>	<u>123</u>	feet
Kind of Plug <u>Mud</u>	<u>123</u>	<u>25</u>	feet
Filled with <u>Cement</u>	<u>25</u>	<u>03</u>	feet
Kind of Plug <u>Earth</u>	<u>03</u>	<u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
(2) Have the following been removed?
Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No
(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	138	-	3	-	135	-	Top 3' cut off.
7"	1950	-	590	-	1360		

Bangert Casing Pulling Corporation

(Signature of person, firm or corporation having custody or control of well.)

Per Bangert Casing Pulling Corporation

Address Clay City, Illinois

E. E. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant, Mattoon, Illinois - 61938

Subscribed and sworn to before me this 27th day of October A.D. 1973

My commission expires 10/28/76 Lybil C. Stangford Notary Public

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT Mattoon

Acme Casing Pulling Co. and Walter Duncan and

Haldon Moore

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil 1083 SL 495 EL SE

(Indicate whether for oil, gas, water or other purposes)

known as the Noyse A. #1

and located as follows: _____ ft. north;

_____ 1083 _____ ft. south; _____ 495 _____ ft. east; _____ ft. west

of the _____ E _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 15, Township 12 (North ~~of~~ XXXX)

Range 7, (East ~~of~~ XXXX), of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 719 ft.

{ Ground _____ ft.

Total depth of well is 2005 ft.

Date permit to drill issued 12-3-46 Permit No. 497

Permit issued to Walter Duncan

Date drilling began 4-5-46

Date drilling completed 5-11-46

Kind of drilling tools used Rotary

Date plugging began 1-26-51

Date plugging completed 1-27-51

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Noyse

Address Mattoon, Illinois.

Lessee Walter Duncan

Address LaSalle, Illinois.

Drilling Contractor Dee Miller

Address Mt. Carmel, Illinois.

DETAILS OF PLUGGING:

Filled with Cement From 2005 To 1955 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1955 To 142 feet

Filled with Cement From 142 To 117 feet

Kind of Plug Mud From 117 To 25 feet

Filled with Cement From 25 To 3 feet

Kind of Plug Earth From 3 To 0 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) No coal encountered.

(1) Have pits, cellar and other excavations been filled? Yes

Yes ☐ No ☒

(2) Have equipment, concrete bases and debris been removed? Yes

Yes ☐ No ☒

(3) Has surface casing been cut off below plow depth? Yes

Yes ☒ No ☐

(4) Has well-site been levelled? Yes

Yes ☐ No ☒

If this was a producing well, give date and amount of last production 1 bbl 12-27-50

DEPARTMENT
MINES AND MINERALS
RECEIVED
JAN 30 1951
DIVISION OF
OIL AND GAS CONSERVATION

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>132</u>				<u>132</u>		
<u>5 1/2</u>	<u>1958</u>		<u>1115</u>		<u>843</u>		

Acme Casing Pulling Co.

(Signature of person, firm or corporation having custody or control of well.)

Per Haldon Moore

Address Grayville, Illinois.

Haldon Moore Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Moweaqua, Illinois.

Subscribed and sworn to before me this 29 day of January, A.D. 1951

My commission expires 2-24-54

Zola Moore
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Walter Duncan--S. M. Condict

and

Winston Wade being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for oil (Indicate whether for oil, gas, water or other purposes)

known as the F. V. Noyse # 1

and located as follows: _____ ft. north;

_____ 116 ft. south; _____ ft. east; 330 ft. west

of the _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 16, Township 12 (North or South)Range 7, (East or West) of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 734 ft.

{ Ground _____ ft.

Total depth 2009 Formation Rosiclare

Date permit to drill issued _____ Permit No. _____

Permit issued to Walter DuncanDate drilling began 1-6-46Date drilling completed 1-23-46Kind of drilling tools used RotaryDate plugging began 11-3-53Date plugging completed 11-4-53Lessor F. V. NoyseAddress Mattoon, IllinoisLessee Walter DuncanAddress Box 211-- LaSalle Ill.Drilling Contractor Dee Miller

Address _____

DETAILS OF PLUGGING:

Filled with Cement From 2009 To 1969 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1969 To 140 feetFilled with Cement From 140 To 110 feetKind of Plug Mud From 110 To 30 feetFilled with Cement and Cap From 30 To 2 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No Coal

(1) Have pits and other excavations been filled? ☐ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Concrete bases ☐ Debris ☐(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☐ NoIf this was a producing well, give date and amount of last production 1 BBL 6-5-53

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>7</u>	<u>1949</u>		<u>947</u>		<u>1002</u>		
<u>10 3/4</u>	<u>127</u>				<u>127</u>		

Walter Duncan (Signature of person or corporation having custody or control of well.)

Per S. M. CondictAddress LaSalle, Ill. Box 211Winston Wade Oil Well InspectorAddress Paris, Illinois R. R. # 6Subscribed and sworn to before me this 10th day of November, A.D. 1953My commission expires 3-10-57

Notary Public.

STATE OF ILLINOIS,

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Bomor Kirk

and

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Roetker #1and located as follows: 59.6 d.n. ft. north;ft. south; 997.31 ft. east; _____ ft. westof the SW corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of the

Section 15, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.

{ Ground _____ ft.

Total depth of well is 2015 ft.Date permit to drill issued July 3, 1946Permit issued to Paul A. ThomasDate drilling began July 27, 1946Date drilling completed August 1, 1946Kind of drilling tools used RotaryDate plugging began November 23, 1947Date plugging completed December 1, 1947Lessor RoetkerAddress Mattoon, Ill.Lessee Paul A. ThomasAddress 159 E. Chicago Ave., Chicago,Drilling Contractor J. W. MenhallAddress Benton, Ill. Ill.

DETAILS OF PLUGGING:

Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From <u>2015</u>	To <u>1915</u>	feet
Kind of Plug <u>Mid</u>	From <u>1915</u>	To <u>140</u>	feet
Filled with <u>Cement</u>	From <u>140</u>	To <u>115</u>	feet
Kind of Plug <u>Mid</u>	From <u>115</u>	To <u>27</u>	feet
Filled with <u>Cement</u>	From <u>27</u>	To <u>0</u>	feet
Kind of Plug _____	From _____	To _____	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?...

Yes

No

☒☐

(2) Have equipment, concrete bases and debris been removed?

Yes

No

☒☐

(3) Has surface casing been cut off below plow depth?

Yes

No

☒☐

(4) Has well-site been levelled?

Yes

No

☒☐

If this was a producing well, give date and amount of last production. This well has never produced any oil. - DRY.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	120				120		Cemented dry.
5-1/2	1957		900		1057		

Copy for my file

(Signature of person, firm or corporation having custody or control of well.)

Per B. Bomor KirkAddress Shippville, Ill.

Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well.)

Address Ephraim, Illinois, R. R. #1Subscribed and sworn to before me this 1st day of December, A. D. 1947My commission expires February 24, 1951

Dolores A. Stock
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

O. E. Kinnard (O.L. Henson Drlg. Co.) and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain
Oil and Gasknown as the F.P. Rose #1

(Indicate whether for oil, gas, water or other purposes)

and located as follows: 330 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SE corner of the SW Quarterof the NE Quarter of the SW Quarter ofSection 15, Township 12 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.{ Ground ft.Total depth 2175 Formation Date permit to drill issued 9-17-56 Permit No. 3440Permit issued to O. L. HensonDate drilling began September 18, 1956Date drilling completed September 27, 1956Kind of drilling tools used RotaryDate plugging began October 6, 1956Date plugging completed October 6, 1956 Locate well accurately on plat of section
(Scale one inch--2,000 ft.)Lessor RoseLessee O. L. HensonDrilling Contractor O. L. HensonAddress Address 2070 Butternut, Abilene, TexasAddress 2070 Butternut, Abilene, Texas

DETAILS OF PLUGGING:

Filled with Rotary Mud From 2175 To 2000 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 2000 To 1950 feetFilled with Rotary Mud From 1950 To 1810 feetKind of Plug Cement From 1810 To 1754 feetFilled with Rotary Mud From 1754 To 91 feetKind of Plug Cement From 91 To 51 feetFilled with Rotary Mud From 51 To 8 feetKind of Plug Cement From 8 To 3 feetIF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Drilled Dry

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
8 5/8	81		none		81		Cemented

O. L. Henson

(Signature of person, firm or corporation having custody or control of well.)

Per O. E. KinnardAddress Mattoon, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 10th day of October, A.D. 19 56My commission expires 10th July 1957Guendalyne Bennett
Notary PublicADDITIONS IN BLUE BY
OIL AND GAS DIVISION

STATE OF ILLINOIS

County of Coles

COUNTY No. 11071
WELL PLUGGING AFFIDAVIT

Walter Duncan S. W. Condict and

being first duly sworn,
 do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
 for oil
 (Indicate whether for oil, gas, water or other purposes)

known as the Roytek # 1 and located as follows: 1316 ft. north;

Locate well accurately on plat of section
 (Scale one inch—2,000 ft.)

ft. south; 310 ft. east; 310 ft. west
 of the SE corner of the SE Quarter
 of the NE Quarter of the SE Quarter of
 Section 15, Township 12 (North or South)
 Range 7, (East or West), of the 3rd
 Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 787 ft.
 Ground ft.

Total depth 2040 Formation Rotolore

Date permit to drill issued Permit No.

Permit issued to Mark Wagner

Date drilling began 12-1-45

Date drilling completed 12-6-45

Kind of drilling tools used Rotary

Date plugging began 11-4-53

Date plugging completed 11-5-53

Lessor Roytek Address Mattoon, Illinois.

Lessee Mark Wagner Address

Drilling Contractor Address

DETAILS OF PLUGGING:

Filled with (Rotary Mud Cement, or Other Materials) From 2040 To 2010 feet

Kind of Plug Mud From 2010 To 135 feet

Filled with Cement From 135 To 105 feet

Kind of Plug Mud From 105 To 50 feet

Filled with Cement and Cap From 50 To 2 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
 EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
 feet in depth) No Coal

(1) Have pits and other excavations been filled? Yes ☐ No ☐

(2) Have the following been removed? Yes ☐ No ☐

Equipment Yes ☐ No ☐ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☐

(3) Has surface casing been cut off three feet below ground surface? Yes ☐ No ☐

(4) Has well-site been levelled? Yes ☐ No ☐

If this was a producing well, give date and amount of last production 1 1/2 BBL 8-10-53

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4	119				119		
7	1971		614		1357		

(Signature of person or corporation having custody or control of well.)
 Per W. M. Condict
 Address La Salle Ill. Box 211
W. M. Condict Oil Well Inspector
 (Signature and title of party supervising plugging of well.)
 Address R. R. 6 Paris, Illinois.
 Subscribed and sworn to before me this 10th day of November, A.D. 1953
 My commission expires 3-10-57
Betty R. Gordon
 Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Tom McKibben

and

Marion Heady

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil

known as the Day Ryan # 1 Fee (Indicate whether for oil, gas, water or other purposes) and located as follows: 951 ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

ft. south; 193 ft. east; 193 ft. west
of the SE corner of the Quarter
of the Quarter of the Quarter of the
Section 15, Township 12 (North 34 South)
Range 7, (East or West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground ft.

Total depth 1989 Formation Rosiclare

Date permit to drill issued 1-17-46 Permit No. 13

Permit issued to Glenwood Oil Co.

Date drilling began 3-3-46

Date drilling completed 3-8-46

Kind of drilling tools used Rotary

Date plugging began 1-18-73

Date plugging completed 1-18-73

Lessor Day Ryan

Address Mattoon, Illinois

Lessee Glenwood Oil Co.

Address Centralia, Illinois

Drilling Contractor Joe Dunbar

Address Salem, Illinois

DETAILS OF PLUGGING:

Filled with Mud From 1989 To 250 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 250 To 3 feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? Yes ☒ No ☐

(2) Have the following been removed?

Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐

(3) Has surface casing been cut off three feet below ground surface?

Yes ☒ No ☐

(4) Has well-site been levelled? Yes ☒ No ☐

Yes ☒ No ☐

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 1/4	180				177		3' cut off
5 1/2	1948				1945		3' cut off

RECEIVED
DIVISION OF OIL & GAS

JAN 25 1973

DEPARTMENT OF
MINES & MINERALS

Tom McKibben Land owner

(Signature of person, firm or corporation having custody or control of well.)

Per Tom McKibben

Address 3300 Marshall, Mattoon, Ill.

(Signature and title of party supervising plugging of well.)

Address Newton, Illinois 62448

Subscribed and sworn to before me this 24th day of January, A.D. 19 73

My commission expires 8/10/74

Walter B. Chaney

Notary Public

STATE OF ILLINOIS

County of DOUGLAS

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector

and

Don Robson -- Tri-State Casing Pulling Co., being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oil

known as the E.E. Tonkinson # 1 (Indicate whether for oil, gas, water or other purposes) and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch--2,000 ft.)

360 ft. south; _____ ft. east; 1040 ft. west
of the NE corner of the _____ Quarter
of the _____ Quarter of the _____ Quarter of
Section 15, Township 12 (North or ~~South~~)
Range 7, (East or ~~West~~), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 729 ft.

Total depth 1806 Formation Cypress

Date permit to drill issued 5/23/50 Permit No. 1107

Permit issued to W.H. Strickler

Date drilling began 6/28/50

Date drilling completed 7/3/50

Kind of drilling tools used Rotary

Date plugging began 2/24/68

Date plugging completed 2/24/68

Lessor E.E. Tonkinson Address Mattoon, Illinois

Lessee Schaefer Oil Co. Address Mattoon, Illinois

Drilling Contractor Homer Luttrell Address Effingham, Illinois

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>1806</u>	<u>1695</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>1695</u>	<u>250</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>250</u>	<u>200</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>200</u>	<u>95</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>95</u>	<u>65</u>	<u>feet</u>
Kind of Plug <u>Mud</u>	<u>65</u>	<u>30</u>	<u>feet</u>
Filled with <u>Cement</u>	<u>30</u>	<u>GL - 3</u>	<u>feet</u>
Kind of Plug _____	From _____	To _____	<u>feet</u>

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) Coal affidavit signed.

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
- (2) Have the following been removed? ☐ Yes ☒ No
- Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
- (4) Has well-site been levelled? ☐ Yes ☒ No
- If this was a producing well, give date and amount of last production 2/15/68 1 Bbl. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8"</u>	<u>78</u>		<u>3</u>		<u>75</u>		<u>Surface casing</u>
<u>5 1/2"</u>	<u>1779</u>		<u>1285</u>		<u>494</u>		

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress Mattoon, IllinoisRichard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, IllinoisSubscribed and sworn to before me this 23rd day of March, A.D. 1968My commission expires 5/10/71

Notary Public.

WELL PLUGGING AFFIDAVIT

SS. BANGERT CASING PULLING CORP. FOR JIM IKEBERG and
KEVIN SPENCER

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)

known as the WITTENBERG #1 and located as follows: ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

373 ft. south; 330 ft. east; 330 ft. west
of the NE corner of the NE Quarter
of the NE Quarter of the Quarter of
Section 15, Township T2 (North or South)
Range 7, (East or West) of the
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 628 ft.
Ground ft.

Total depth 2015 Formation

Date permit to drill issued 7-2-57 Permit No. 1562

Permit issued to GORTON W TAYLOR

Date drilling began

Date drilling completed 7/13/57

Kind of drilling tools used ROTARY

Date plugging began 11/14/89

Date plugging completed 11/15/89

Lessor WITTENBERG Address MATTOON IL
Lessee GORTON W TAYLOR Address
Drilling Contractor MYREL EDISON DRLG Address Mt. VERNON IL.

DETAILS OF PLUGGING:

Filled with CEMENT	From 2015	To 1950	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug MUD	From 1950	To 300	feet
Filled with CEMENT	From 300	To 4	feet
Kind of Plug SOIL	From 4	To 0	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE ENCOUNTERED

- (1) Have pits and other excavations been filled? Yes ☒ No ☐
(2) Have the following been removed?
Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐
(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
(4) Has well-site been leveled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	?		4				
5 1/2	?		400				

(Signature of person, firm or corporation having custody or control of well.)

Per. *Kevin Spencer*

Address BOX 411, CLAY CITY IL

(Signature and title of party supervising plugging of well.)

Address BOX 449, MARTINSVILLE IL. 62442

Subscribed and sworn to before me this day of A.D. 19

My commission expires

Notary Public

RECEIVED
NOV 27 1990

DEPT. OF REVENUE

STATE OF ILLINOIS, Co #1106

County of Coles

8158723
WELL PLUGGING AFFIDAVIT

Jim Gilliland

Lawrence Landreth

being first duly sworn to depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

oil

(Indicate whether for oil, gas, water or other purposes)

known as the Zellers #1

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

812 ft. south; 1015 ft. east; 1015 ft. west

of the NE corner of the SE Quarter

of the Quarter of the Quarter of the

Section 15, Township 12 (North or South)

Range 7, (East or West) of the 3d

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 721 ft.

{ Ground ft.

Total depth of well is 2015 ft.

Date permit to drill issued 12-1-45

Permit issued to R.H. Troop & Ray Sanders

Date drilling began Year 1945

Date drilling completed " 1945

Kind of drilling tools used Rotary

Date plugging began 5-11-48

Date plugging completed 5-13-48

Lessor Zellers

Address Mattoon, Illinois

Lessee R. H. Troop and Ray Sanders

Address 219 S. 19th St., Mt. Vernon, Ill.

Drilling Contractor R.H. Troop

Address St. Elmo, Ill.

DETAILS OF PLUGGING:

Filled with Cement From 2015 To 1965 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1965 To 435 feet

Filled with Cement From 435 To 315 feet

Kind of Plug Mud From 315 To 142 feet

Filled with Cement From 142 To 117 feet

Kind of Plug Mud From 117 To 27 feet

Filled with Cement From 27 To 2 feet

Kind of Plug Earth From 2 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled? Yes ☐ No ☒(2) Have equipment, concrete bases and debris been removed? Yes ☒ No ☐(3) Has surface casing been cut off below plow depth? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☐ No ☒

If this was a producing well, give date and amount of last production March 1947, less than 1/2 per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	127				127		Cemented
7"	2015		806		1209		"

Anna Casing Pulling Co.
Bryant, Ill.R.H. Troop and Ray Sanders
(Signature of person, firm or corporation having custody or control of well.)Per Jim Gilliland
Address Bayville, Ill.Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well.)

Address Effingham, Ill. R.R. 1.

Subscribed and sworn to before me this 13th day of May, A. D. 1948

My commission expires 2-24-51

Solomon A. Stock
Notary Public.

STATE OF ILLINOIS,

County of Coles

ss.

60 # 8758738
1105 WELL PLUGGING AFFIDAVIT

O. G. S. (43594-10M-9-47)

Robert Branham

and

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for oil or gas

(Indicate whether for oil, gas, water or other purposes)

known as the Zellers #1A and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

_____ ft. south; _____ ft. east; 990 ft. westof the NE corner of the SE Quarter

of the _____ Quarter of the _____ Quarter of

Section 15, Township 12 (North or South)Range 7, (East or West) of the 3dPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 631 ft.

{ Ground _____ ft.

Total depth of well is 1816 ft.Date permit to drill issued 6-14-48Permit issued to F. Frank HinkleDate drilling began 6-16-48Date drilling completed 6-23-48Kind of drilling tools used RotaryDate plugging began 6-23-48Date plugging completed 6-23-48Lessor Zellers Address Mattoon, Ill.Lessee F. Frank Hinkle Address 439 Standard Bldg. Decatur, Ill.Drilling Contractor Kuykendall Drlg. Co. Address St. Elmo, Ill.

DETAILS OF PLUGGING:

Filled with	<u>Cement</u>	From	<u>1816</u>	To	<u>1756</u> feet
	(Rotary Mud, Cement, or Other Materials)				
Kind of Plug	<u>Mud</u>	From	<u>1756</u>	To	<u>435</u> feet
Filled with	<u>Cement</u>	From	<u>435</u>	To	<u>315</u> feet
Kind of Plug	<u>Mud</u>	From	<u>315</u>	To	<u>115</u> feet
Filled with	<u>Cement</u>	From	<u>115</u>	To	<u>90</u> feet
Kind of Plug	<u>Mud</u>	From	<u>90</u>	To	<u>27</u> feet
Filled with	<u>Cement</u>	From	<u>27</u>	To	<u>2</u> feet
Kind of Plug	<u>Earth</u>	From	<u>2</u>	To	<u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?...	Yes ☐	No ☒	PERMIT NO. 1074
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐	
(3) Has surface casing been cut off below plow depth?.....	Yes ☐	No ☒	
(4) Has well-site been levelled?.....	Yes ☐	No ☒	

If this was a producing well, give date and amount of last production Dry hole

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	101				101		Cemented

F. Frank Hinkle
(Signature of person, firm or corporation having custody or control of well.)

Per. Robert BranhamAddress St Elmo Ill.

Lawrence Landreth, Inspector
(Signature and title of party supervising plugging of well.)

Address Effingham, Illinois, P. O. #1Subscribed and sworn to before me this 24th day of June, A. D. 1948My commission expires 2-24-51

Deane A. Stock
Notary Public.

15-12N-7E-1

3-24-05

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 557-6379One Natural Resources Way
Springfield, Illinois 62702/1271
COUNTY No. 1756

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: Merle ReevesPERMITTEE #: 555WELL NAME: Frank Rose #1PERMIT #: 001434REFERENCE #: 503574

(ISSUE DATE IF NO NUMBER)

COUNTY ColesSECTION 15 TWP 12N RANGE 07ELOCATION: _____ FT. NORTH; OR 1065FT. SOUTH, AND _____ FT. EAST; OR 1650FT. WEST OF THE NE CORNER OF THE NE

QUARTER OF THE _____ QUARTER OF THE

_____ QUARTER OF THE _____ QUARTER.

WELL DATA:

SURFACE ELEVATION:	<u>700</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1832</u>	FT.	FROM <u>1777</u> TO <u>1800</u>
PLUGGED BACK TOTAL DEPTH		FT.	FROM <u>1821</u> TO <u>1825</u>
BASE OF FRESHWATER ZONE	<u>150</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT		FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH:	<u>well bore fluid</u>	FROM <u>1832</u>	TO <u>1820</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)				
FILLED WITH	<u>cement</u>	FROM <u>1820</u>	TO <u>1570</u>	FT.
FILLED WITH	<u>well bore fluid</u>	FROM <u>1570</u>	TO <u>210</u>	FT.
FILLED WITH	<u>cement</u>	FROM <u>210</u>	TO <u>05</u>	FT.
FILLED WITH		FROM _____	TO _____	FT.
FILLED WITH		FROM _____	TO _____	FT.
FILLED WITH		FROM _____	TO _____	FT.
FILLED WITH		FROM _____	TO _____	FT.

Comments:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	No	Surface				
INTERMEDIATE/ MINE STRING/OR LINER						
PRODUCTION	4.50	1830	150	7.88	1208	300

Under penalties of perjury, I declare that I have examined this form including accompanying statements and documents, and to the best of my knowledge, it is true, correct and complete.

Maurice A. Judy
Signature of Permittee or Designee

3-23-05

Date Plugging began

3-24-05

Date Plugging Completed

Address

City, State, Zip

☒ Inspector present during plugging operations

Gail L Matlock

Inspector Signature

Gail L Matlock

Inspector Signature

Inspector Signature

Cementing bottom

Activity

Cementing top

Activity

Activity

3-23-05

Date

3-24-05

Date

Date

☐ Inspector not present during plugging operations

Authorization for Inspector not being present

Manager Signature

Date

☐ Plugging information sent to District Office

☐ Inspector site visit to pick up plugging information

Inspector

Date

APR 12 2005

TOLOGIC RECORDS

3-28-05

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 557-6379COUNTY No. 1904One Natural Resources Way
Springfield, Illinois 62702/1271

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ GAS STORAGE ☐ REPLUG ☐ OTHER _____PERMITTEE: Merk ReevesPERMITTEE #: 555WELL NAME: FRANK Rose B-1PERMIT #: 000546REFERENCE #: 503575

(ISSUE DATE IF NO NUMBER)

COUNTY ColesSECTION 15 TWP 12N RANGE 07ELOCATION: _____ FT. NORTH; OR 0135FT. SOUTH, AND 0085 FT. EAST; OR _____FT. WEST OF THE NW CORNER OF THE SWQUARTER OF THE SE QUARTER OF THENE QUARTER OF THE _____ QUARTER.

WELL DATA:

SURFACE ELEVATION:	<u>700</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>1900</u>	FT.	FROM _____ TO _____
PLUGGED BACK TOTAL DEPTH	_____	FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>150</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT	_____	FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH	<u>well bore fluid</u>	FROM	<u>1900</u>	TO	<u>1850</u>	FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)						
FILLED WITH	<u>Cement</u>	FROM	<u>1850</u>	TO	<u>1550</u>	FT.
FILLED WITH	<u>well bore fluid</u>	FROM	<u>1550</u>	TO	<u>210</u>	FT.
FILLED WITH	<u>Cement</u>	FROM	<u>210</u>	TO	<u>05</u>	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.
FILLED WITH	_____	FROM	_____	TO	_____	FT.

Comments:

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	10.75	not known				5
INTERMEDIATE/ MINE STRING/OR LINER						
PRODUCTION	4.50	1900 - +		7.88		600

Under penalties of perjury, I declare that I have examined this form including accompanying statements and documents, and to the best of my knowledge, it is true, correct and complete.

Maurice A. Judy
Signature of Permittee or Designee

3-25-05

Date Plugging began

3-28-05

Date Plugging Completed

Address

City, State, Zip

☒ Inspector present during plugging operations

Gail L Matlock

Inspector Signature

Gail L Matlock

Inspector Signature

Inspector Signature

cementing bottom

Activity

cementing top

Activity

Activity

3-25-05

Date

3-28-05

Date

Date

☐ Inspector not present during plugging operations

Authorization for Inspector not being present

Manager Signature

Date

☐ Plugging information sent to District Office

☐ Inspector site visit to pick up plugging information

Inspector

Date

22-12N-7E

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Thomas B. Mask - Bengert Casing Pulling Co. and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil / Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Robert Fuqua #1 and located as follows: 660 ft. north;

ft. south; 430 ft. east;

of the SE corner of the Quarter

of the Quarter of the Quarter of

Section 22, Township 12 (North 88 South)

Range 7, (East of West) of the 3rd

Principal Meridian, COLES County, Illinois.

Elevation above sea level is } Derrick Floor ft.

Ground 717 ft.

Total depth 3175 Formation Devonian

Date permit to drill issued 11/16/71 Permit No. 1030

Permit issued to Thomas B. Mask

Date drilling began 11-19-71

Date drilling completed 11-29-71

Kind of drilling tools used Rotary

Date plugging began 8-24-77

Date plugging completed 8-27-77

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Robert Fuqua Address Mattoon, Illinois

Lessee Thomas B. Mask Address Mr. Pleasant, Michigan

Drilling Contractor C. E. Billingsley Address Lawrenceville, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>3175</u>	To <u>3150</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>3150</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Rotary mud</u>	From <u>200</u>	To <u>130</u>	feet
Filled with <u>Cement</u>	From <u>130</u>	To <u>90</u>	feet
Kind of Plug <u>Rotary mud</u>	From <u>90</u>	To <u>15</u>	feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

None encountered

(1) Have pits and other excavations been filled? None Yes ☐ No ☒

(2) Have the following been removed?

Equipment Yes ☐ No ☒ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☒

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐

(4) Has well-site been leveled? Yes ☐ No ☒

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8</u>	<u>115</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>110</u>	<u>-</u>	
<u>4-1/2</u>	<u>3175</u>	<u>-</u>	<u>1009</u>	<u>-</u>	<u>2166</u>	<u>-</u>	

Thomas B. Mask

(Signature of person, firm or corporation having custody or control of well.)

Per Mason J. Gudner

Address Mr. Pleasant, Michigan

E. R. Clifton State Well Inspector
(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 21 day of August, A.D. 1977

My commission expires 9/24/81
Notary Public

WELL PLUGGING AFFIDAVIT

Thomas B. Mask - Tri-State Casing & Pilling Co. and
E. R. Clifton - State Well Inspector, being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for GAS (Indicate whether for oil, gas, water or other purposes)

known as the D. W. Jones Comm #1 and located as follows: 660 ft. north;
ft. south; 330 ft. east; 330 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SE corner of the NE Quarter
of the SE Quarter of the Quarter of
Section 22, Township 12 (North of South)
Range 7, (East of West) of the 3rd
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 707 ft.

Total depth 3215 Formation Devonian

Date permit to drill issued 8/21/72 Permit No. 736

Permit issued to Thomas B. Mask

Date drilling began 8-23-72

Date drilling completed 9-11-72

Kind of drilling tools used Rotary

Date plugging began 1-7-75

Date plugging completed 1-10-75

Lessor D. W. Jones Address Mattoon, Illinois.

Lessee Thomas B. Mask Address Mr. Pleasant, Mich.

Drilling Contractor Calvert Drilling Co. Address Olney, Illinois

PREVIOUS PLUG BACK		DETAILS OF PLUGGING:	
Filled with <u>Tubing and Pecker</u> (Rotary Mud, Cement, or Other Materials)		From <u>3215</u>	To <u>3152</u> feet
Kind of Plug <u>Cement</u>		From <u>3050</u>	To <u>2850</u> feet
Filled with <u>Mud</u>		From <u>2850</u>	To <u>1900</u> feet
Kind of Plug <u>Cement</u>		From <u>1900</u>	To <u>1700</u> feet
Filled with <u>Mud</u>		From <u>1700</u>	To <u>250</u> feet
Kind of Plug <u>Cement</u>		From <u>250</u>	To <u>100</u> feet
Filled with <u>Mud</u>		From <u>100</u>	To <u>12</u> feet
Kind of Plug <u>Cement</u>		From <u>12</u>	To <u>03</u> feet
		From <u>03</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None Encountered

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
- (2) Have the following been removed?
Equipment	☐ Yes ☒ No	Concrete bases	☐ Yes ☐ No	Debris	☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Dry - Failed to produce

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8"</u>	<u>138</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>135</u>	<u>-</u>	<u>Top 3' cut off, cemented with 100 sacks when run.</u>
<u>4-1/2"</u>	<u>3215</u>	<u>-</u>	<u>1700</u>	<u>-</u>	<u>1518</u>	<u>-</u>	<u>Cemented with 125 sacks.</u>
<u>2"</u>	<u>102</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>102</u>	<u>-</u>	<u>With Packer set @ 3050</u>

Thomas B. Mask - Tri-State Casing & Pilling Co.
(Signature of person, firm or corporation having custody or control of well.)

Per Dr. E. R. Clifton
Address Mr. Pleasant Mich. - Fairfield, Illinois.
State Well Inspector
(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois- 61938

Subscribed and sworn to before me this 18th day of January A.D. 19 75

My commission expires 10/28/76

Notary Public

WELL PLUGGING AFFIDAVIT

T. Blake Dirckson

and

Haldon Moore

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Anna Strong #1and located as follows: 330 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SE corner of the Quarterof the Quarter of the Quarter ofSection 22, Township 12 (North of)Range 7, (East of), of the 3Principal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 720 ft.{ Ground ft.Total depth of well is 1480 ft.Date permit to drill issued 11-11-45 Permit No. 232Permit issued to T. Blake DircksonDate drilling began 11-14-45Date drilling completed 11-21-45Kind of drilling tools used RotaryDate plugging began 6-3-51 6-1-51Date plugging completed 6-3-51 6-1-51

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Anna StrongAddress Mattoon, Ill.Lessee T. Blake DircksonAddress Mattoon, Ill.Drilling Contractor S.H.K. Drilling Co.Address Tulsa, Okla.

DETAILS OF PLUGGING:

Filled with Aquagel From 1480 To 130 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 130 To 105 feetFilled with Water disposal well From 105 To 27 feetKind of Plug Aquagel From 105 To 27 feetFilled with Cement From 27 To 2 feetKind of Plug Earth From 2 To 0 feetFilled with Water disposal well From To feetKind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No coal encountered

(1) Have pits, cellar and other excavations been filled?.....

Yes

No

(2) Have equipment, concrete bases and debris been removed?

Yes

No

(3) Has surface casing been cut off below plow depth?.....

Yes

No

(4) Has well-site been levelled?.....

Yes

No

If this was a producing well, give date and amount of last production 1/2 bbl per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	120		0		120		
7	1740		715		925		

T. Blake Dirckson Vickers & Blowers

(Signature of person, firm or corporation having custody or control of well.)

Per T. Blake DircksonAddress Mattoon, Ill.Haldon Moore Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Moweaqua, Ill.Subscribed and sworn to before me this 9 day of June, A.D. 1951My commission expires 2-24-54Zola Moore
Notary Public.

ILLINOIS DEPARTMENT OF MINES AND MINERALS

OIL AND GAS DIVISION
(217) 782-7756

COUNTY NO. 2175

300 W. JEFFERSON - SUITE 300
P.O. BOX 10140
SPRINGFIELD, IL 62791-0140

OG-6 WELL PLUGGING REPORT

759174

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ OBSERVATION ☐ GAS STORAGE ☐ REPLUG ☐ OTHER

PERMITTEE: DGL Development Fund

PERMITTEE NO. 2226

WELL NAME: Tinsley Hrs #1

PERMIT NO. 000575

(ISSUE DATE IF NO NUMBER)

REFERENCE NO. 121214

COUNTY Coles SECTION 22
TOWNSHIP 12N RANGE 7E
LOCATION: 843 FT. NORTH; OR _____ FT. SOUTH; AND
_____ FT. EAST; OR 330 FT. WEST OF THE SE
CORNER OF THE NE QUARTER OF THE _____
QUARTER OF THE _____ QUARTER OF THE _____
QUARTER. Mattoon

WELL DATA:

SURFACE ELEVATION 707 FT.
TOTAL DEPTH OF WELL 3200 FT.
PLUGGED BACK TOTAL DEPTH NA FT.
BASE OF FRESHWATER ZONE 157 FT.
WORKABLE COALS PRESENT AT NA FT.

PRODUCING / INJECTION INTERVALS

FROM 2168 TO 2183
FROM 3125 TO 3135
FROM _____ TO _____
FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE: _____

DETAILS OF PLUGGING:

FILLED WITH Cement FROM 3200 TO 2940 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)
FILLED WITH wellbore fluid FROM 2940 TO 2250 FT.
FILLED WITH Cement FROM 2250 TO 2000 FT.
FILLED WITH wellbore fluid FROM 2000 TO 220 FT.
FILLED WITH Cement FROM 220 TO 4 FT.
FILLED WITH top soil FROM 4 TO surface FT.
FILLED WITH _____ FROM _____ TO _____ FT.

COMMENTS: _____

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8 5/8	106	NR	NR	GL	4'
INTERMEDIATE / MINE STRING / OR LINER						
PRODUCTION	4 1/2	3200	500	NR	?	220

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS FORM INCLUDING ACCOMPANYING STATEMENTS AND DOCUMENTS, AND TO THE BEST OF MY KNOWLEDGE, IT IS TRUE, CORRECT, AND COMPLETE.

SIGNATURE OF: James Frank
PERMITTEE OR DESIGNEEDATE PLUGGING BEGAN 12 Sept 96

ADDRESS _____

RECEIVED
DEPT. OF NATURAL RESOURCES
SPRINGFIELD

RECEIVED

CITY, STATE _____

ZIP _____

SEP 24 1996

SEP 30 1996

WELL PLUGGING AFFIDAVIT

John Botts and
H.L. Noblit State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for Oil and/or Gas
(Indicate whether for oil, gas, water or other purposes)

known as the Tinsley Heirs # 2 and located as follows: 1643 ft. north;
ft. south; 380 ft. east; 380 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SE corner of the NE Quarter
of the Quarter of the Quarter of
Section 22, Township 12 (North or ~~South~~)
Range 7, (East or ~~West~~) of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 710.47 ft.

Total depth 3206 Formation Devonian

Date permit to drill issued 2/2/73 Permit No. 37

Permit issued to Elton M. Botts

Date drilling began ?

Date drilling completed ?

Kind of drilling tools used Rotary

Date plugging began 1/28/82

Date plugging completed 1/28/82

Lessor Tinsley Heirs Address ?

Lessee Elton M. Botts Address Mattoon, IL.

Drilling Contractor Deposter Drilling Co. Address Birmingham, IL.

P.P.B. 2002T.D.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>2002</u>	To <u>1800</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>1800</u>	To <u>880</u>	feet
Filled with <u>Cement</u>	From <u>880</u>	To <u>03</u>	feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u>	feet
Filled with <u> </u>	From <u> </u>	To <u> </u>	feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u>	feet
Filled with <u> </u>	From <u> </u>	To <u> </u>	feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
- (2) Have the following been removed? ☐ Yes ☒ No
- Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
- (4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	123		0		123		
4 1/2	2002		0		2002		

Elton M. Botts

(Signature of person, firm or corporation having custody or control of well.)

Per John Botts

Address Mattoon, IL.

H.L. Noblit Well Inspector

(Signature and title of party supervising plugging of well.)

Address 402 S. Central Casey, IL.

Subscribed and sworn to before me this 29 day of January, A.D. 19 82

My commission expires My Commission Expires August 27, 1985

Notary Public

STATE OF ILLINOIS

County of Coles } SS.

WELL PLUGGING AFFIDAVIT

Elton M. Botts and
E. N. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for OIL

(Indicate whether for oil, gas, water or other purposes)
known as the Tinsley Heirs D. O. #2 and located as follows: 990 ft. north;
 ft. south; ft. east; 2260 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SE corner of the NE Quarter
of the Quarter of the Quarter of
Section 22, Township 12 (North of South)
Range 7, (East of West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 705.6 ft.

Total depth 3225 Formation Devonian

Date permit to drill issued 9/9/73 Permit No. 731

Permit issued to Elton M. Botts

Date drilling began 11-28-73

Date drilling completed 12-6-73

Kind of drilling tools used Rotary

Date plugging began 12-6-73

Date plugging completed 12-7-73

Lessor Tinsley Heirs (Gordon Craig) Address Mattoon, Illinois

Lessee Elton M. Botts Address Mattoon, Illinois

Drilling Contractor Illinois Drilling Company Address Springfield, Illinois

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>3225</u>	To <u>3165</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>3165</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Kind of Plug <u>Mud</u>	From <u>200</u>	To <u>140</u>	feet
Filled with <u>Cement</u>	From <u>140</u>	To <u>110</u>	feet
Kind of Plug <u>Mud</u>	From <u>110</u>	To <u>25</u>	feet
Filled with <u>Cement</u>	From <u>25</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment Concrete bases Debris

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production Dry Hole

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
<u>8-5/8</u>	<u>131</u> <u>-</u>	<u>3</u> <u>-</u>	<u>128</u> <u>-</u>	<u>Top 3' cut off.</u>

Elton M. Botts

(Signature of person, firm or corporation having custody or control of well.)

Per Elton M. Botts

Address Mattoon, Illinois

State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois 61938

Subscribed and sworn to before me this 8th day of December, A.D. 1973

My commission expires 10-28-76

Lybil E. Stanford
Notary Public

COUNTY No. 2408

County of Coles

WELL PLUGGING AFFIDAVIT

Bangert Casing Pulling for Charles Armantrout and Kevin Spencer being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

known as the Fuqua #1 and located as follows: 660 ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; 330 ft. east; ft. west
of the SW corner of the SE Quarter
of the SE Quarter of the Quarter of
Section 22, Township 12 (North of)
Range 7, (East of), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 719 ft.
Ground 715 ft.

Total depth 2393 Formation

Date permit to drill issued 12/31/84 Permit No. 33287

Permit issued to Charles Armantrout

Date drilling began 1-2-85

Date drilling completed 1-7-85

Kind of drilling tools used Rotary

Date plugging began 6/16/89

Date plugging completed 6/19/89

Lessor Fuqua Address

Lessee Charles Armantrout Address Mattoon IL

Drilling Contractor Depoister Drig Address E. F. Fingham

DETAILS OF PLUGGING:

Filled with Cement From 2393 To 2297 feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Mud From 2297 To 300 feet
Filled with Cement From 300 To 4 feet
Kind of Plug Soil From 4 To 0 feet
Filled with From To feet
Kind of Plug From To feet
Filled with From To feet
Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 3/8</u>	<u>164'</u>	<u> </u>	<u>4</u>	<u> </u>	<u>160</u>	<u> </u>	<u>200 Sacks</u>
<u>4 1/2</u>	<u>2393</u>	<u> </u>	<u>1351</u>	<u> </u>	<u>1042</u>	<u> </u>	<u>225 Sacks</u>

(Signature of person, firm or corporation having custody or control of well)
Per Kevin Spencer
Address Clay City IL
Kevin Spencer Well Ins.
(Signature and title of party supervising plugging of well)
Address Box 449 Martinsville IL 62442

Subscribed and sworn to before me this 13 day of July A.D. 19 89

RECEIVED
JUL 19 1989
DEPT. MINES & MINERALS
OIL & GAS DIV.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Don Robson of Tri-State Casing Pulling Co. andRichard Graybeing first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oilknown as the Jones # 1

(Indicate whether for oil, gas, water or other purposes)

and located as follows: 330 ft. north;ft. south; ft. east; 330 ft. westof the SE corner of the NE Quarterof the SE Quarter of the Quarter ofSection 22, Township 12 (North or South)Range 7, (East or West), of the ThirdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 710 ft.Total depth 2001 Formation RensselaireDate permit to drill issued 10/20/59 Permit No. 2207Permit issued to E. H. KaufmanDate drilling began 12/5/59Date drilling completed 12/10/59Kind of drilling tools used RotaryDate plugging began 10/21/65Date plugging completed 10/21/65 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)Lessor J. M. JonesAddress Mattoon, Ill.Lessee E. H. KaufmanAddress Decatur, Ill.Drilling Contractor M. H. RichardsonAddress Decatur, Ill.

DETAILS OF PLUGGING:

Filled with Cement From 2001 To 1712 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1712 To 250 feetFilled with Cement From 250 To 175 feetKind of Plug Mud From 175 To 30 feetFilled with Cement From 30 To 3 feetKind of Plug Earth From 3 To 0 feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
 (2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL	
	Feet	Inches	Feet	Inches	Feet	Inches
10 3/4"	197		0		197	
7"	1936		425		1511

E. H. Kaufman

(Signature of person, firm or corporation having custody or control of well.)

Per Don RobsonAddress 65 Montgomery Place, Decatur, Ill.Richard Gray Oil Well Inspector
(Signature and title of party supervising plugging of well.)Address Box 2, Charleston, Ill.Subscribed and sworn to before me this 21st day of October, A.D. 1965My commission expires 5/16/69

Notary Public.

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

Mattoon 9

WINSTON WADE

and

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for OIL OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the JONES #1and located as follows: 330 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SE corner of the NE Quarterof the SE Quarter of the Quarter of the QuarterSection 22, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.{ Ground ROSLARE ft.Total depth 1983 Formation ROSLAREDate permit to drill issued 1983 Permit No. 1983Permit issued to E. P. JARVISDate drilling began 10-26-45Date drilling completed 10-26-45Kind of drilling tools used ROTARYDate plugging began 7-24-54Date plugging completed 7-24-54Lessor J. W. JONESLessee E. P. JARVISAddress MATTOON, ILLINOISAddress DECATUR, ILLINOIS

Drilling Contractor

Address

DETAILS OF PLUGGING:

Filled with CEMENT From 1983 To 1950 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug MUD From 1950 To 135 feet

Filled with CEMENT From 135 To 110 feet

Kind of Plug MUD From 110 To 5 feet

Filled with CEMENT From 5 To 2 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) NO COAL

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed?

Equipment Yes No Concrete bases Yes No Debris Yes No(3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been levelled? Yes NoIf this was a producing well, give date and amount of last production 1/2 BBL 7-14-54

DEPARTMENT
MINES AND MINERALS
RECEIVED
AUG 3 1954
DIVISION OF
OIL AND GAS CONSERVATION

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>120</u>				<u>120</u>		
<u>7</u>	<u>1983</u>		<u>422</u>		<u>1561</u>		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress ME. CARMEL, ILLINOISWinston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOIS

28th.

day of

July

A.D. 19

54

Subscribed and sworn to before me this

My commission expires 3-10-57

Notary Public.

STATE OF ILLINOIS,

County of Coles

ss.

8158338
WELL PLUGGING AFFIDAVIT

Jim Gilliland

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Salt Water Disposal

(Indicate whether for oil, gas, water or other purposes)

known as the Jones #2 and located as follows: Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west

of the NE corner of the NE Quarterof the NE Quarter of the SE Quarter ofSection 22, Township 12 North (North or South)Range 7 East, (East or West), of the 3dPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 713 ft.
Ground 709 ft.Total depth of well is 1898 ft.Date permit to drill issued 11-10-45 Permit No. 197004Permit issued to E. P. JarvisDate drilling began 11-9-45Date drilling completed 11-15-45Kind of drilling tools used RotaryDate plugging began 11-27-48Date plugging completed 12-1-48Lessor JonesAddress Mattoon, IllinoisLessee E. P. JarvisAddress 526 Standard Bldg., Decatur, Ill.Drilling Contractor E. D. JarvisAddress Decatur, Ill.

DETAILS OF PLUGGING:

Filled with Cement From 1255 To 1170 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1170 To 170 feetFilled with Cement From 170 To 145 feetKind of Plug Mud From 145 To 27 feetFilled with Cement From 27 To 2 feetKind of Plug Earth From 2 To 0 feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Affidavit on back

(1) Have pits, cellar and other excavations been filled?...	Yes ☐	No ☒
(2) Have equipment, concrete bases and debris been removed?	Yes ☒	No ☐
(3) Has surface casing been cut off below plow depth?...	Yes ☐	No ☐
(4) Has well-site been levelled?...	Yes ☐	No ☒

If this was a producing well, give date and amount of last production This was a salt water well now plug with cement

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4	160				160		Cemented
7	1936		612		1324		

ACME CASING PULLING COMPANY

GRAYVILLE, ILLINOIS

(Signature of person, firm or corporation having custody or control of well.)

Per Jim GillilandAddress Grayville, Ill.Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address E. Hingham, Illinois, R. P. #1LST day of DecemberA. D. 194 8

Subscribed and sworn to before me this

My commission expires 2-24-51Dolores A. Stock

Notary Public.

STATE OF ILLINOIS,
County of Coles ss.

WELL PLUGGING AFFIDAVIT

A. J. France

and

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the

and located as follows

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west
of the NE corner of the NE Quarter
of the NE Quarter of the SE Quarter of the
Section 22, Township 12 (North or South)
Range 7, (East or West), of the 3d
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 713 ft.
Ground 709 ft.
1998

Total depth of well is 1998 ft.

Date permit to drill issued June 23, 1947

Permit issued to Jarvis Bros. and Marcel

Date drilling began Nov. 9, 1945

Date drilling completed Nov. 15, 1945

Kind of drilling tools used Rotary

Date plugging began July 3, 1947

Date plugging completed July 7, 1947

Lessor Jones

Address

Lessee Jarvis Bros. & Marcel

Address 526 Standard Bldg, Decatur, Ill.

Drilling Contractor S. D. Jarvis

Address Albion, Illinois, Box 67

DETAILS OF PLUGGING:

Filled with	From	To	feet
7" casing cement	1998	1850	
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug	From	To	feet
Bridge cement	1850	1400	
Filled with	From	To	feet
Calseal	1400	1270	
Kind of Plug	From	To	feet
Perforating casing	1270	1255	
Filled with	From	To	feet
Kind of Plug	From	To	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details This well being left for salt water disposal

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	160				160		cemented
7	1936				1936		cemented

(Signature of person, firm or corporation having custody or control of well.)

Per J. S. Claypool 1401 So 18th St.

Address Mattoon, Ill.

Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham, Illinois, R. 1, 7th day of July

Subscribed and sworn to before me this

May 15, 1950

day of

A. D. 194

My commission expires

Notary Public.

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for OIL OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the JONES #3 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; _____ ft. east; _____ ft. west
of the NW corner of the NE Quarter
of the SE Quarter of the _____ Quarter of
Section 22, Township 12 (North or South)
Range 7, (East of West), of the 3rd.
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 711 ft.
Ground _____ ft.

Total depth 1942 Formation Rockclare

Date permit to drill issued _____ Permit No. _____

Permit issued to E. P. JARVIS

Date drilling began _____

Date drilling completed 11-29-45Kind of drilling tools used ROTARYDate plugging began 7-21-54Date plugging completed 7-22-54Lessor J. W. JONES Address MATTOON, ILL.Lessee E. P. Jarvis Address DECATUR, ILL.

Drilling Contractor _____ Address _____

DETAILS OF PLUGGING:

Filled with CEMENT From 1942 To 1910 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug MUD From 1910 To 170 feetFilled with CEMENT From 170 To 145 feetKind of Plug MUD From 145 To 5 feetFilled with CEMENT From 5 To 2 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

If workable coal beds were encountered in this hole, describe the method employed to protect same. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NO COAL(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production

1/2 BBL 7/14/54

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>156</u>				<u>156</u>		
<u>7</u>	<u>1942</u>		<u>396</u>		<u>1546</u>		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress MT. CARMEL, ILLINOISWinston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOISSubscribed and sworn to before me this 28th day of July, A.D. 19 54My commission expires 3-10-57

Notary Public

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the JONES #4and located as follows: 330 ft. north;990 ft. south; 990 ft. east; 990 ft. westof the SW corner of the NE Quarterof the SE Quarter of the 12 Quarter ofSection 22, Township 12 (North or South)Range 7, (East or West), of the 3RDPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor 714 ft.{ Ground 714 ft.Total depth 1956 Formation ROSIOLAREDate permit to drill issued 11-19-45 Permit No. 1887Permit issued to E. P. JarvisDate drilling began 12-8-45Date drilling completed 12-8-45Kind of drilling tools used ROTARYDate plugging began 7-20-54Date plugging completed 7-20-54Lessor J. W. JONESAddress MATTOON, ILLINOISLessee E. P. JARVISAddress DECATUR, ILLINOIS

Drilling Contractor

Address

DETAILS OF PLUGGING:

Filled with CEMENT From 1956 To 1930 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug MUD From 1930 To 175 feetFilled with CEMENT From 175 To 145 feetKind of Plug MUD From 145 To 5 feetFilled with CEMENT From 5 To 2 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD

EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000

feet in depth) NO COAL(1) Have pits and other excavations been filled? Yes ☒ No ☐(2) Have the following been removed? Yes ☒ No ☐Equipment ☒ Concrete bases ☒ Debris ☒(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☒ No ☐If this was a producing well, give date and amount of last production 3 1/2 BBL 7-14-54

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>158</u>				<u>158</u>		
<u>5</u>	<u>1956</u>		<u>407</u>		<u>1549</u>		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress MT. CARMEL, ILLINOISWinston Wade OILWELL INSPECTOR

(Signature and title of party supervising plugging of well.)

PARIS, ILLINOIS3-10-57 AddressSubscribed and sworn to before me this 28th day of July, A.D. 19 54My commission expires Betty Regdon

Notary Public.

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for OIL OR GAS 330 IN. 380 W. 1/2 N.E. SE

(Indicate whether for oil, gas, water or other purposes)

known as the JONES # 3A

and located as follows: _____ ft. north;

_____ ft. south; _____ ft. east; _____ ft. west

of the _____ corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 22, Township 12 (North of 66th)Range 7, (East of West), of the 2nd.Principal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor 711 ft.
Ground _____ ft.Total depth 2010 Formation _____

Date permit to drill issued _____ Permit No. _____

Permit issued to E. P. JARVIS

Date drilling began _____

Date drilling completed 12-4-46Kind of drilling tools used ROFARYDate plugging began 7-21-54Date plugging completed 7-21-54Lessor J. W. JONESAddress MATTOON, ILLINOISLessee E. P. JARVISAddress DECATUR, ILLINOIS

Drilling Contractor _____

Address _____

DETAILS OF PLUGGING:

Filled with CEMENT From 2010 To 1755 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug MUD From 1755 To 160 feetFilled with CEMENT From 160 To 130 feetKind of Plug MUD From 130 To 5 feetFilled with CEMENT From 5 To 2 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NO COAL(1) Have pits and other excavations been filled? Yes ☒ No ☐(2) Have the following been removed? Yes ☒ No ☐Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production

1/2 BBL 7/14/54

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>146</u>				<u>146</u>		
<u>5 1/2</u>	<u>1783</u>		<u>800</u>		<u>983</u>		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress MT. CARMEL, ILLINOISWinston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOISSubscribed and sworn to before me this 28th day of July, A.D. 19 54My commission expires 3-10-57Betty Regdon
Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for OIL OR GAS 3305L 180 W 1/2 SE

(Indicate whether for oil, gas, water or other purposes)

known as the JONES 4 A and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; _____ ft. east; _____ ft. west
of the SE SW corner of the NE NE Quarter
of the SE Quarter of the _____ Quarter of
Section 22, Township 12 (North of 34th)
Range 7, (East of W 1/2), of the 3rd,
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.

Total depth 1986 Formation ROSICLARE

Date permit to drill issued _____ Permit No. _____

Permit issued to E. P. JARVISDate drilling began 1946Date drilling completed 1946Kind of drilling tools used ROTARYDate plugging began 7-19-54Date plugging completed 7-19-54Lessor J. W. JONESAddress MATTOON, ILLINOISLessee E. P. JARVISAddress DECATUR, ILLINOIS

Drilling Contractor _____ Address _____

DETAILS OF PLUGGING:

Filled with CEMENT From 1986 To 1960 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug MUD From 1960 To 175 feetFilled with CEMENT From 175 To 140 feetKind of Plug MUD From 140 To 5 feetFilled with CEMENT From 5 To 2 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) NO COAL

(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production 1/2 BBL 7-14-54

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>158</u>				<u>158</u>		
<u>5</u>	<u>1986</u>		<u>527</u>		<u>1459</u>		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress MT. CARMEL, ILLINOISWinston Wade OIL WELL INSPECTOR
(Signature and title of party supervising plugging of well.)Address PARIS, ILLINOISSubscribed and sworn to before me this 30th day of July, A.D. 1954.My commission expires 3-10-57.

Notary Public

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for OIL OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the JONES # 5 and located as follows: 330 ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

ft. south; 1650 ft. east; 1650 ft. west
of the SE corner of the NE Quarter
of the SE Quarter of the SE Quarter of
Section 22, Township 12 (North of South)
Range 7, (East of West), of the 3 RD.
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor 710 ft.
Ground ft.

Total depth 2002 Formation ROSICLAREDate permit to drill issued 1-2-46 Permit No. 1Permit issued to E. P. JARVISDate drilling began Date drilling completed 2-3-46Kind of drilling tools used ROTARYDate plugging began 7-22-54Date plugging completed 7-22-54Lessor J. W. JONES Address MATTOON, ILLINOISLessee E. P. JARVIS Address DECATUR, ILLINOISDrilling Contractor Address

DETAILS OF PLUGGING:

Filled with CEMENT From 2002 To 1810 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug MUD From 1810 To 175 feetFilled with CEMENT From 175 To 145 feetKind of Plug MUD From 145 To 5 feetFilled with CEMENT From 5 To 2 feetKind of Plug From To feetFilled with From To feetKind of Plug From To feetKind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) NO COAL

(1) Have pits and other excavations been filled? Yes ☒ No ☐(2) Have the following been removed? Yes ☒ No ☐Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☒ No ☐If this was a producing well, give date and amount of last production 1/2 BBL 7-14-54

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4	158				158		
7	2002		428		1574		

RAY WILLIS

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar KirkAddress Mt. Carmel, IllinoisWinston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOIS

28th. July A.D. 19 54

Subscribed and sworn to before me this

My commission expires 3-10-57

Notary Public.

WELL PLUGGING AFFIDAVIT

E. P. Jarvis

COUNTY NO. 1117

and

say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and/or gas

(Indicate whether for oil, gas, water or other purposes)

known as the

J. W. Jones #6

and located as follows:

330 ft. south; 1650 ft. east;

of the NE corner of the SE Quarter

of the Quarter of the Quarter of

Section 22, Township 12 North (North or South)

Range 7 East, (East or West), of the

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.

{ Ground 708 ft.

Total depth of well is 1985 ft.

Date permit to drill issued 1-2-46 Permit No. 2

Permit issued to E. P. Jarvis & J. W. Jones

Date drilling began 2-12-46

Date drilling completed 2-19-46

Kind of drilling tools used Rotary

Date plugging began Plug bottom 12-27-46

Date plugging completed 11-29-48

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor J. W. Jones

Address Mattoon, Ill.

Lessee E. P. Jarvis & J. W. Jones

Address 526 Standard Bldg., Decatur, Ill.

Drilling Contractor C. D. Davis

Address Mattoon, Ill.

DETAILS OF PLUGGING:

Filled with Cement (Rotary Mud, Cement, or Other Materials) From 1985 To 1885 feet

Kind of Plug Mud From 1885 To 170 feet

Filled with Cement From 170 To 155 feet

Kind of Plug Mud From 155 To 27 feet

Filled with Cement From 27 To 2 feet

Kind of Plug Earth From 2 To 0 feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

Affidavit on back

(1) Have pits, cellar and other excavations been filled? Yes ☒ No ☐

(2) Have equipment, concrete bases and debris been removed? Yes ☒ No ☐

(3) Has surface casing been cut off below plow depth? Yes ☒ No ☐

(4) Has well-site been levelled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production 1946 - 1/8 bbl. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-3/4	165				165		
7	1928		759		1169		

ACME CASING PULLING COMPANY

GRAYVILLE, ILLINOIS

E. P. Jarvis

(Signature of person, firm or corporation having custody or control of well.)

Per J. W. Jones

Address Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address Springfield, Illinois, R. R. #1

Subscribed and sworn to before me this

30th day of November

A. DUNN 8, 2000

My commission expires 2-24-51

Notary Public.

RECORDS

6#1114
STATE OF ILLINOIS, }
County of Colas } ss.

8158898
WELL PLUGGING AFFIDAVIT

O. G. 6 (3250-10M-8-45)

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil
(Indicate whether for oil, gas, water or other purposes)

known as the J H Jones No 7 and located as follows:

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; 330 ft. east; _____ ft. west
of the NW corner of the SE Quarter
of the _____ Quarter of the _____ Quarter of
Section 22, Township 12 (North or South)
Range 7, (East or West), of the 2
Principal Meridian, Colas County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 708 ft.

Total depth of well is 2003 ft.

Date permit to drill issued Feb 26 1946

Permit issued to E P Jarvis & J H Jones

Date drilling began 3/1 - 1946

Date drilling completed 3/6 - 1946

Kind of drilling tools used Rotary

Date plugging began Feb 6 - 1946

Date plugging completed Feb 6 1946

Lessor J H Jones Address Mattoon Ill
Lessee E P Jarvis & J H Jones Address 526 Standard Office Bldg Mattoon Ill
Drilling Contractor E P Jarvis Address Mattoon Ill

DETAILS OF PLUGGING:

Filled with Cement From 2003 To 1930 feet
(Rotary Mud, Cement, or Other Materials)
Kind of Plug Rotary Mud From 1930 To 1890 feet
Filled with Cement From 1890 To 1790 feet
Kind of Plug Rotary Mud From 1790 To 30 feet
Filled with Cement From 30 To 2 feet
Kind of Plug Soil From 2 To Surface feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth. no coal)

Other details _____

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>200</u>		<u>2</u>		<u>198</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per James L. Francis

Address 326 77 4th St. Albion, Ill.

Walter Stewart Investigator

(Signature and title of party supervising plugging of well.)

Address Box RR 2 St Louis

Subscribed and sworn to before me this 7th day of March, A. D. 1946

My commission expires March 2nd 1948

Charles D. Noyes

Notary Public

STATE OF ILLINOIS

County of COLES

COUNTY NO. 1119

SS.

WELL PLUGGING AFFIDAVIT

BOMAR KIRK

and

WINSTON WADE

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL OR GAS

(Indicate whether for oil, gas, water or other purposes)

known as the JONES ~~W~~ ~~S~~ and located as follows: 330 ft. north;

ft. south; 330 ft. east; ft. west

of the SW corner of the NW Quarter

of the SE Quarter of the Quarter of

Section 22, Township 12 (North of 34th)

Range 7, (East of W 1/2), of the 3rd.

Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground ft.

Total depth 1968 Formation Rosiclare

Date permit to drill issued 1-2-46 Permit No. assigned

Permit issued to E. P. JARVIS ~~Holder to Ray Willis~~

Date drilling began 1946

Date drilling completed 1946

Kind of drilling tools used ROTARY

Date plugging began 7-23-54

Date plugging completed 7-23-54

Lessor J. W. JONES

Address MATTOON, ILLINOIS

Lessee E. P. JARVIS *Rasp. Willis*

Address DECATUR, ILLINOIS

Drilling Contractor

Address

DETAILS OF PLUGGING:

Filled with CEMENT From 1968 To 1935 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug MUD From 1935 To 185 feet

Filled with CEMENT From 185 To 155 feet

Kind of Plug MUD From 155 To 5 feet

Filled with CEMENT From 5 To 2 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD

EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000

feet in depth) NO COAL

(1) Have pits and other excavations been filled? Yes No

(2) Have the following been removed? Yes No

Equipment ☒ Concrete bases ☐ Debris ☒

(3) Has surface casing been cut off three feet below ground surface? Yes No

(4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	168				168		
7	1965		427		1538		

Ray Willis

(Signature of person, firm or corporation having custody or control of well.)

Per Bomar Kirk

Address MT. CARMEL, ILLINOIS

Winston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOIS

Subscribed and sworn to before me this 30th day of July, A.D. 1954.

My commission expires 3-10-57.

Betty Rigdon
Notary Public

County Clerk Twp 12N R 7E Sec. 22

County of Coler

ss.

319

WELL PLUGGING AFFIDAVIT

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the H. S. Riddle no 1 and located as follows: 330 ft. north;ft. south; 330 ft. east; 330 ft. westof the SE corner of the NW Quarter

of the _____ Quarter of the _____ Quarter of

Section 22, Township 12 (North or South)Range 7, (East or West), of the 3Principal Meridian, Coler County, Illinois.Elevation above sea level is { Derrick Floor 716 ft.
Ground 970 ft.Total depth of well is 2116 ft.Date permit to drill issued Nov 28 - 1945Permit issued to Glenwood Oil CoDate drilling begun Dec 3 - 1945Date drilling completed Dec 10 - 1945Kind of drilling tools used RotaryDate plugging begun Dec 12 - 1945Date plugging completed Dec 12 - 1945

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor H. S. RiddleAddress Mattoon IllLessee Glenwood Oil CoAddress 428 Linden Ave Centralia IllDrilling Contractor McCulloch Drly CoAddress Tyler Texas

DETAILS OF PLUGGING:

Filled with <u>Cement</u> (Rotary Mud, Cement, or Other Materials)	From <u>2116</u>	To <u>2056</u> feet
Kind of Plug <u>Rotary Mud</u>	From <u>2056</u>	To <u>176</u> feet
Filled with <u>Cement</u>	From <u>176</u>	To <u>126</u> feet
Kind of Plug <u>Rotary Mud</u>	From <u>126</u>	To <u>27</u> feet
Filled with <u>Cement</u>	From <u>27</u>	To <u>2</u> feet
Kind of Plug <u>Soil</u>	From <u>2</u>	To <u>Surface</u> feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth and three feet or more in thickness below 1,000 feet in depth.) no showing of coal

Other details _____

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 3/8</u>	<u>173</u>		<u>2</u>		<u>171</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per W B BarberAddress Tyler TexasWalter Stewart Investigator

(Signature and title of party supervising plugging of well.)

Address Tyler TexasSubscribed and sworn to before me this 13 day of DecMy commission expires Nov. 30 - 1947

Notary Public.

A. D. 1945

Walter Stewart

WELL PLUGGING AFFIDAVIT

Tom Mask - Bangert Casing Pulling Co. and

E. R. Clifton - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Salt Water Disposal #2

(Indicate whether for oil, gas, water or other purposes)

known as the Anna Strong #25WD and located as follows: _____ ft. north;

_____ 330 ft. south; _____ ft. east; _____ 330 ft. west

of the NE corner of the NE Quarter

of the SE Quarter of the SE Quarter of

Section 22, Township 12 (North of South)

Range 7, (East of West), of the 3rd

Principal Meridian, COL S County, Illinois.

Elevation above sea level is } Derrick Floor _____ ft.

Ground 713 ft.

P/B Total depth 1762 Formation Weiler

Date permit to drill issued 9/10/74 Permit No. 854

Permit issued to Tom Mask

Date drilling began 9-12-74 (Est.)

Date drilling completed No record

Kind of drilling tools used Rotary

Date plugging began 8-25-77

Date plugging completed 8-29-77

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor Anna Strong Address Mattoon, Illinois

Lessee Tom Mask Address Mt. Pleasant, Michigan

Drilling Contractor Galvert Drilling Co. Address Olney, Illinois

PREVIOUS p/b

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1762</u>	To <u>1725</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Mud</u>	From <u>1725</u>	To <u>250</u>	feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>100</u>	feet
Kind of Plug <u>Mud</u>	From <u>100</u>	To <u>15</u>	feet
Filled with <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet
Filled with _____	From _____	To _____	feet
Kind of Plug _____	From _____	To _____	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) _____

None encountered

(1) Have pits and other excavations been filled? ☒ Yes ☐ No

(2) Have the following been removed? ☒ Yes ☐ No

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been leveled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

PUT IN WELL			PULLED OUT			LEFT IN WELL			Remarks
Size	Feet	Inches	Feet	Inches		Feet	Inches		
<u>10-3/4</u>	<u>130</u>	<u>-</u>	<u>3</u>	<u>-</u>		<u>127</u>	<u>-</u>		
<u>7"</u>	<u>1924</u>	<u>-</u>	<u>605</u>	<u>-</u>		<u>1319</u>	<u>-</u>		

Tom Mask

(Signature of person, firm or corporation having custody or control of well.)

Per Mason J. Friedman

Address Mt. Pleasant, Michigan

E. R. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)
3500 Grant Ave., Mattoon, Illinois 61938

Address _____

Subscribed and sworn to before me this _____ day of August, A.D. 19 77

My commission expires 9/29/81 _____
Notary Public

STATE OF ILLINOIS,

County of

Coles

ss.

WELL PLUGGING AFFIDAVIT

T. O. Barrick

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the

Anna Strong #3

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

ft. north;
ft. south; ft. east;
of the corner of the Quarter
of the Quarter of the Quarter
Section 22, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is } Derrick Floor ft.
Ground 1981 ft.

Total depth of well is November 14, 1945 ft.

Date permit to drill issued T. Blake Dirickson

Permit issued to November 22, 1945

Date drilling began November 29, 1945

Date drilling completed Rotary

Kind of drilling tools used November 26, 1947

Date plugging began November 28, 1947

Date plugging completed Mattoon, Illinois

Lessor Anna Strong

Address U.S. Grant Hotel, Mattoon, Ill.

Lessee T. Blake Dirickson

Address Tulsa, Oklahoma

Drilling Contractor S. H. K. Drilling Co.

Address

DETAILS OF PLUGGING

Filled with	From	To	feet
Cement	1981	1881	
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug	From 1881	To 140	feet
Filled with Cement	From 140	To 115	feet
Kind of Plug Mud	From 115	To 27	feet
Filled with Cement	From 27	To 0	feet
Kind of Plug	From	To	feet
Filled with	From	To	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth).

Affidavit on back

(1) Have pits, cellar and other excavations been filled?	Yes ☐	No ☐
(2) Have equipment, concrete bases and debris been removed?	Yes ☐	No ☐
(3) Has surface casing been cut off below plow depth?	Yes ☐	No ☐
(4) Has well-site been levelled?	Yes ☐	No ☐

If this was a producing well, give date and amount of last production

August 10, 1947 - Dry
97. Barrels of water and
3. Barrels of Oil per day

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10	120				120		Cemented
7	1955		800		1155		

(Signature of person, firm or corporation having custody or control of well.)

Per T. O. Barrick

Address 504 S. 4th St. Mattoon, Ill.

Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham, Illinois, R. P. #1

Subscribed and sworn to before me this 1st day of December, A. D. 1947

My commission expires February 24, 1951 Released A. Stock

Notary Public.

WELL PLUGGING AFFIDAVIT

Dr. W. E. Nersee

and

E. E. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the A. Strong #6and located as follows: 330 ft. north;330 ft. south; 330 ft. east; ft. westof the corner of the SW Quarterof the SE Quarter of the SE Quarter ofSection 22, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 717 ft.
Ground ft.* Total depth 1960 Formation RockclareDate permit to drill issued 12-12-45 Permit No. 2094Permit issued to T. B. DiricksonDate drilling began Date drilling completed Completion Date: 3-1-46Kind of drilling tools used RotaryDate plugging began 10-16-73Date plugging completed 10-18-73Lessor Anna Strong (Deceased)Address Mattoon, IllinoisLessee T. B. DiricksonAddress Mattoon, IllinoisDrilling Contractor Shonfeld-Hunter-KitchAddress Salem, Illinois

*Previous plug back 1960- to 1770 (estimated) for anchor for shot. Ran SIM-1757 (10-16-73)

DETAILS OF PLUGGING:

Filled with Cement From 1757 To 1740 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1740 To 250 feetFilled with Brush & Pack bridge From 250 To 250 feetKind of Plug Cement From 250 To 200 feetFilled with Mud From 200 To 150 feetKind of Plug Cement From 150 To 125 feetFilled with mud From 125 To 25 feetKind of Plug Cement From 25 To 03 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None(1) Have pits and other excavations been filled? Yes ☐ No ☒(2) Have the following been removed? ☐ ☒Equipment ☒ ☐ Concrete bases ☐ ☒ Debris ☐ ☒(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☐ No ☒If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10-3/4"	140	-	3	-	137	-	Top 3' cut off.
7"	1747	-	621	-	1126	-	

Dr. W. E. Nersee

(Signature of person, firm or corporation having custody or control of well.)

Per Ronald G. BangertAddress Clay City, Illinois

E. E. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 27 day of October, A.D. 19 73My commission expires 10/28/76

Notary Public

COUNTY No. 1130

(44778-10M-9-72)

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WELL PLUGGING AFFIDAVIT

Dr. W. E. Hersee

and

E. R. Clifton - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the A. Strong #7

and located as follows: _____ ft. north;

330 ft. south; 330 ft. east; _____ ft. west

of the NW corner of the SE Quarter

of the SE Quarter of the _____ Quarter of

Section 32, Township 12 (North or South)

Range 7, (East or West), of the 3rd

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 716 ft.

Ground _____ ft.

Total depth FB 1765 Formation Weiler

Date permit to drill issued 12-12-45 Permit No. 2095

Permit issued to T. B. Dirickson

Date drilling began _____

Date drilling completed Completion Date 2-1-46

Kind of drilling tools used Rotary

Date plugging began 10-16-73

Date plugging completed 10-17-73

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor Anna Strong (Deceased)

Address Mattoon, Illinois

Lessee T. B. Dirickson

Address Mattoon, Illinois

Drilling Contractor Schoenfeld-Winter-Kitch

Address Salem, Illinois.

DETAILS OF PLUGGING:

Filled with Cement From 1765 To 1730 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Mud From 1730 To 250 feet

Filled with Brush & sack bridge From _____ To 250 feet

Kind of Plug Cement From 250 To 200 feet

Filled with Mud From 200 To 130 feet

Kind of Plug Cement From 130 To 105 feet

Filled with Mud From 105 To 25 feet

Kind of Plug Cement From 25 To 03 feet

Earth From 03 To 0 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet

in depth) None

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed? ☐ Yes ☒ No

Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No

(4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production Unknown

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10-3/4</u>	<u>120</u>	<u>-</u>	<u>3</u>	<u>-</u>	<u>117</u>	<u>-</u>	<u>Top 3' cut off.</u>
<u>7"</u>	<u>1750</u>	<u>-</u>	<u>318</u>	<u>-</u>	<u>1432</u>	<u>-</u>	

Dr. W. E. Hersee

(Signature of person, firm or corporation having custody or control of well.)

Per Frank G. Kanger

Address Clay City, Illinois

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Ill - 61938

Subscribed and sworn to before me this 27 day of October A.D. 1973

My commission expires 10/28/76

Notary Public

County of Coles

WELL PLUGGING AFFIDAVIT

T. O. Barrick

Lawrence Landruth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled

Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Anna Strong #8

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

330 ft. south; ~~330~~ ft. east; 330 ft. west
of the NE corner of the SW Quarter
of the SE Quarter of the SE Quarter of
Section 22, Township 12 (North or South)
Range 7, (East or West), of the 3d
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 713 ft.
Ground 719 ft.

Total depth of well is 1962 ft.Date permit to drill issued 12-12-1945Permit issued to T. Blake DiricksonDate drilling began 12-31-1945Date drilling completed 1-10-1946Kind of drilling tools used RotaryDate plugging began 12-5-1946Date plugging completed 12-5-1946Lessor Anna Strong Address Mattoon, IllinoisLessee T. Blake Dirickson Address Tulsa, OklahomaDrilling Contractor Schoenfeld Hunter Kitch Address Tulsa, Oklahoma

DETAILS OF PLUGGING:

Filled with Cement From 1962 To 1862 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Mud From 1862 To 28 feetFilled with Cement From 28 To 0 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth).

(1) Have pits, cellar and other excavations been filled? ☒ Yes ☐ No(2) Have equipment, concrete bases and debris been removed? ☒ Yes ☐ No(3) Has surface casing been cut off below plow depth? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ NoIf this was a producing well, give date and amount of last production 9-10-1946 3 bbls. oil95 bbls. water

CASING RECORD

Dry

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	103				103		Cemented
7	1940		490		1450		

R. H. Siegfried Co.

(Signature of person, firm or corporation having custody or control of well.)

Per T. O. BarrickAddress Box 248 Mattoon, Ill.Lawrence Landruth, Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham Illinois, P. O. # 1Subscribed and sworn to before me this 9th day of December, A. D. 194 6My commission expires May 15, 1950

Notary Public.

STATE OF ILLINOIS
County of Colas } ss

WELL PLUGGING AFFIDAVIT

T Blake Dirkson and Haldon Moore being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled
for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Anna Strong # 9 and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

_____ ft. south; 330 ft. east; _____ ft. west
of the NW corner of the SW Quarter
of the SE Quarter of the _____ Quarter of
Section 22, Township 12 (North of 36th)
Range 7, (East of 10th), of the 3
Principal Meridian, Colas County, Illinois.

Elevation above sea level is { Derrick Floor 717 ft.
Ground _____ ft.

Total depth of well is 1981 ft.

Date permit to drill issued 11-31-46 Permit No. 141

Permit issued to T Blake Dirkson

Date drilling began 12-28-46 R. H. Siegfried

Date drilling completed 2-2-47

Kind of drilling tools used Rotary

Date plugging began 6-5-51

Date plugging completed 6-7-51

Lessor Anna Strong Address Mattoon, Ill.

Lessee T Blake Dirkson Address Mattoon, Ill.

Drilling Contractor S.H.K. Drilling Co. Address Tulsa, Okla.

DETAILS OF PLUGGING:

Filled with Cement From 1981 To 1931 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Aquagel From 1931 To 131 feet

Filled with Cement From 131 To 106 feet

Kind of Plug Aquagel From 106 To 27 feet

Filled with Cement From 27 To 2 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000
feet in depth) No coal encountered

- (1) Have pits, cellar and other excavations been filled? ☒ Yes ☐ No
- (2) Have equipment, concrete bases and debris been removed? ☐ Yes ☒ No
- (3) Has surface casing been cut off below plow depth? ☒ Yes ☐ No
- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production 1/8 bbl per day

DEPARTMENT
MINES AND MINERALS
RECEIVED
JUN 10 1951
DIVISION OF
OILS & GAS

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	121		0		121		
7	1957		847		1110		

~~EXHIBIT~~ Vickers & Blowers
(Signature of person, firm or corporation having custody or control of well.)
Per Troy French
Address Mattoon, Ill.
Haldon Moore Oil Well Inspector
(Signature and title of party supervising plugging of well.)
Address Moweaqua, Ill.

Subscribed and sworn to before me this 9 day of June, A.D. 1951

My commission expires 2-24-54
Gola Moore
Notary Public.

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Elton M. Botts

and

E. B. Clifton, State Well Inspector.

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for oil

(Indicate whether for oil, gas, water or other purposes)

known as the Tinsley No. 2, O. #1 and located as follows: 990 ft. north;

0 ft. south; 1000 ft. east; 1000 ft. westof the SE corner of the NE Quarterof the --- Quarter of the --- Quarter ofSection 22, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor --- ft.
Ground 705.63 ft.

Total depth 3185 Formation DevonianDate permit to drill issued 5/7/73 Permit No. 285Permit issued to Elton M. BottsDate drilling began 7-17-73Date drilling completed 7-28-73Kind of drilling tools used RotaryDate plugging began 7-28-73Date plugging completed 7-28-73Lessor Tinsley Noirs (Gorton Taylor)Address RR - Mattoon, Illinois.Lessee Elton M. BottsAddress 2817 Western, Mattoon, Ill.Drilling Contractor Illini Drilling CompanyAddress Springfield, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>3185</u>	To <u>3125</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Rotary Mud</u>	From <u>3125</u>	To <u>250</u> feet
Filled with <u>Cement</u>	From <u>250</u>	To <u>215</u> feet
Kind of Plug <u>Rotary Mud</u>	From <u>215</u>	To <u>117</u> feet
Filled with <u>Cement</u>	From <u>117</u>	To <u>117</u> feet
Kind of Plug <u>Rotary Mud</u>	From <u>117</u>	To <u>25</u> feet
Filled with <u>Cement</u>	From <u>25</u>	To <u>03</u> feet
Kind of Plug <u>Earth</u>	From <u>03</u>	To <u>0</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None encountered

(1) Have pits and other excavations been filled? Yes ☐ No ☒

(2) Have the following been removed?

Equipment Yes ☒ No ☐ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☒

(3) Has surface casing been cut off three feet below ground surface? Yes ☐ No ☒(4) Has well-site been levelled? Yes ☐ No ☒If this was a producing well, give date and amount of last production Dry Hole.

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8	132	---	3	---	129	---	Cemented with 50 sacks.

Elton M. Botts

(Signature of person, firm or corporation having custody or control of well.)

Per Elton M. BottsAddress 2817 Western, Mattoon, Illinois - 61938E. B. Clifton, State Well Inspector.

(Signature and title of party supervising plugging of well.)

Address 1001, 3500 Grant Avenue, Mattoon, Illinois 61938.Subscribed and sworn to before me this 32 day of July, A.D. 19 73My commission expires 10/28/76

Notary Public.

STATE OF ILLINOIS
File in Collins
 County of DOUGLAS

ss.

COUNTY No. 1135

(38475-10M-3-67)169-0

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector

and

Don Hixon -- Texaco Inc.

being first duly sworn,
 do depose and say the following is a true and correct statement of the details of the plugging of a certain
 well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the A.B. Tinsley # 2and located as follows: 330 ft. north;330 ft. south; 330 ft. east; ft. westof the SW corner of the NE Quarterof the NE Quarter of the Quarter ofSection 22, Township 12 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
 Ground 707.5 ft.

Total depth 1990 Formation RosiclareDate permit to drill issued 1/22/46 Permit No. 91Permit issued to The Texas CompanyDate drilling began 1/25/46Date drilling completed 3/2/46Kind of drilling tools used RotaryDate plugging began 6/28/67Date plugging completed 8/29/67Lessor B. TinsleyAddress Mattoon, IllinoisLessee Texaco Inc.Address Tulsa, OklahomaDrilling Contractor Warren-Bradshaw Drilg. Co.Address Tulsa, Oklahoma

DETAILS OF PLUGGING:

Filled with Cavings From 1990 To 1970 feet
 (Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 1970 To 1920 feetFilled with Mud From 1920 To 930 feetKind of Plug Cement From 930 To 880 feetFilled with Mud From 880 To 145 feetKind of Plug Cement From 145 To 95 feetFilled with Mud From 95 To 20 feetKind of Plug Cement From 20 To GL. - 3 feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
 EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
 1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? Yes ☒ No ☐
 (2) Have the following been removed? Yes ☒ No ☐

Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐

(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐(4) Has well-site been levelled? Yes ☒ No ☐If this was a producing well, give date and amount of last production 10/21/66 3 Bbls. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	120		3		117		Surface casing
7"	1930		934		996		

Texaco Incorporated

(Signature of person, firm or corporation having custody or control of well.)

Per Don HixonAddress Effingham, Ill.Richard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, IllinoisSubscribed and sworn to before me this 2nd day of October, A.D. 1967My commission expires 5-10-1971Camille R. Hanson

Notary Public.

STATE OF ILLINOIS
County of DOUGLAS

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector and

Don Hixon -- Texaco Inc.

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oil

known as the A.B. Tinsley #3 (Indicate whether for oil, gas, water or other purposes) and located as follows: 330 ft. north;

Locate well accurately on plat of section
(Scale one inch--3,000 ft.)

ft. south; 330 ft. east; 330 ft. west
of the SE corner of the NE Quarter
of the NE Quarter of the Quarter of
Section 22, Township 12 (North or South)
Range 7, (East or West), of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 707.5 ft.

Total depth 1979 Formation Rosiclare

Date permit to drill issued 1/23/46 Permit No. 102

Permit issued to The Texas Company

Date drilling began 1/24/46

Date drilling completed 2/18/46

Kind of drilling tools used Rotary

Date plugging began 6/29/67

Date plugging completed 9/2/67

Lessor B. Tinsley Address Mattoon, Illinois

Lessee Texaco Inc. Address Tulsa, Oklahoma

Drilling Contractor Schoenfeld-Hunter-Kitch Co. Address

DETAILS OF PLUGGING:

Filled with	Cavings	From	1979	To	1936	feet
	(Rotary Mud, Cement, or Other Materials)					
Kind of Plug	Mud	From	1936	To	1790	feet
Filled with	C.I. Plug & Cement	From	1790	To	1753	feet
Kind of Plug	Mud	From	1753	To	930	feet
Filled with	Cement	From	930	To	820	feet
Kind of Plug	Mud	From	820	To	145	feet
Filled with	Cement	From	145	To	95	feet
Kind of Plug	Mud	From	95	To	20	feet
	Cement	From	20	To	0 ft. - 3	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) Coal affidavit signed

(1) Have pits and other excavations been filled? ☒ Yes ☐ No
(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No

(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production 4/3/64 1 Bbl. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	120		3		117		Surface casing
7"	1913		820		1093		

Texaco Incorporated

(Signature of person, firm or corporation having custody or control of well.)

Per Don Hixon

Address Springfield, Ill.

Richard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, Illinois

Subscribed and sworn to before me this 2nd day of October, A.D. 1967

My commission expires 5-10-1971 Camilla R. Hanson

Notary Public

STATE OF ILLINOIS
 County of DOUGLAS

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector and

Don Hixon -- Texaco Inc. being first duly sworn,
 do depose and say the following is a true and correct statement of the details of the plugging of a certain
 well drilled for Oil - Converted to salt-water disposal W.F.

known as the B. Tinsley # 1 WB (Indicate whether for oil, gas, water or other purposes) and located as follows: _____ ft. north;

Locate well accurately on plat of section
 (Scale one inch—2,000 ft.)

_____ ft. south; _____ ft. east; _____ ft. west
 of the NW corner of the NE Quarter
 of the NE Quarter of the _____ Quarter of
 Section 22, Township 12 (North or South)
 Range 7, (East or West), of the 3rd
 Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
 Ground 709 ft.

Total depth 1990-PB-1955 Formation Rosiclare

Date permit to drill issued 12/22/45 2171 Oil

Permit issued to The Texas Company Permit No. 4607 SWD

Date drilling began 12/26/45

Date drilling completed 2/4/46

Kind of drilling tools used Rotary

Date plugging began 6/28/67

Date plugging completed 9/5/67

Lessor B. Tinsley Address Mattoon, Illinois

Lessee Texaco Inc. Address Tulsa, Oklahoma

Drilling Contractor Warren-Bradshaw Drilg. Co. Address _____

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Cement</u> (Rotary Mud, Cement, or Other Materials)	<u>1955</u>	<u>1905</u>	
Kind of Plug <u>Mud</u>	<u>1905</u>	<u>815</u>	
Filled with <u>Cement</u>	<u>815</u>	<u>765</u>	
Kind of Plug <u>Mud</u>	<u>765</u>	<u>145</u>	
Filled with <u>Cement</u>	<u>145</u>	<u>95</u>	
Kind of Plug <u>Mud</u>	<u>95</u>	<u>20</u>	
Filled with <u>Cement</u>	<u>20</u>	<u>GL - 3</u>	
Kind of Plug _____	_____	_____	

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) Coal affidavit signed

- (1) Have pits and other excavations been filled? Yes ☒ No ☐
- (2) Have the following been removed?
 Equipment Yes ☒ No ☐ Concrete bases Yes ☒ No ☐ Debris Yes ☒ No ☐
- (3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
- (4) Has well-site been levelled? Yes ☒ No ☐

If this was a producing well, give date and amount of last production 3/18/54 2 Bbls. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4"</u>	<u>120</u>		<u>3</u>		<u>117</u>		<u>Surface casing</u>
<u>7"</u>	<u>1928</u>		<u>817</u>		<u>1111</u>		

Texaco Incorporated

(Signature of person, firm or corporation having custody or control of well.)

Per Don Hixon

Address Elmhurst, Ill.

Richard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, Illinois

Subscribed and sworn to before me this 2nd day of October, A.D. 1967

My commission expires 5-10-1971

Notary Public.

STATE OF ILLINOIS

County of DOUGLAS

ss.

WELL PLUGGING AFFIDAVIT

Richard L. Hanson -- Oil Well Inspector

and

Kenneth Chambers -- Acme Casing Pulling Co. being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for Oil

known as the B. Tinsley # 4 (Indicate whether for oil, gas, water or other purposes)
and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; _____ ft. east; 330 ft. west
of the NE corner of the NE Quarter
of the NE Quarter of the _____ Quarter of
Section 22, Township 12 (North or ~~South~~)
Range 7, (East or ~~West~~) of the 3rd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 711.5 ft.

Total depth 1990 Formation Rosiclare

Date permit to drill issued 2/13/46 Permit No. 204

Permit issued to The Texaco Company

Date drilling began 2/16/46

Date drilling completed 3/15/46

Kind of drilling tools used Rotary

Date plugging began 6/27/67

Date plugging completed 6/28/67

Lessor B. Tinsley Address Mattoon, Illinois

Lessee Texaco Inc. Address Tulsa, Oklahoma

Drilling Contractor Schoenfeld-Hunter-Kitch Co. Address _____

DETAILS OF PLUGGING:

Filled with <u>Cavings</u> (Rotary Mud, Cement, or Other Materials)	From <u>1990</u>	To <u>1963</u> feet
Kind of Plug <u>P. Gravel</u>	From <u>1963</u>	To <u>1900</u> feet
Filled with <u>Gel Mud</u>	From <u>1900</u>	To <u>1899</u> feet
Kind of Plug <u>Cement</u>	From <u>1899</u>	To <u>1850</u> feet
Filled with <u>Mud</u>	From <u>1850</u>	To <u>240</u> feet
Kind of Plug <u>Cement</u>	From <u>240</u>	To <u>150</u> feet
Filled with <u>Mud</u>	From <u>150</u>	To <u>20</u> feet
Kind of Plug <u>Cement</u>	From <u>20</u>	To <u>GL. = 3</u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) Coal affidavit signed

- (1) Have pits and other excavations been filled? ☒ Yes ☐ No
- (2) Have the following been removed?
Equipment ☒ Yes ☐ No	Concrete bases ☒ Yes ☐ No	Debris ☒ Yes ☐ No
- (3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No
- (4) Has well-site been levelled? ☒ Yes ☐ No
- If this was a producing well, give date and amount of last production 10/17/66 1 Bbl. per day

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4"	177		3		174		Surface casing
7"	1920		803		1117		

Texaco Incorporated

(Signature of person, firm or corporation having custody or control of well.)

Per Kenneth ChambersAddress Grayville, IllinoisRichard L. Hanson Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Box 177 Newman, Illinois

Subscribed and sworn to before me this 2nd day of October, A.D. 19 67

My commission expires 5-10-1971 Camilla R. Hanson

Notary Public.

23-12N-7E-1

STATE OF ILLINOIS,
County of Calas ss.

8159088
WELL PLUGGING AFFIDAVIT
H O Chastain
Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for
oil

(Indicate whether for oil, gas, water or other purposes)
known as the Glenn O Redman No 2 and located as follows: 1650 ft. north;
ft. south; 330 ft. east; ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SW corner of the NE NW Quarter
of the SW Quarter of the Quarter of
Section 23, Township 12 (North or South)
Range 4, (East or West), of the 3
Principal Meridian, Calas County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 709 ft.

Total depth of well is 1984 ft.

Date permit to drill issued Dec 14 - 1945

Permit issued to Walter Duncan

Date drilling begun Dec 14 - 1945

Date drilling completed Dec 21 1945

Kind of drilling tools used Rotary

Date plugging begun Dec 22 1945

Date plugging completed Dec 22 1945

Lessor Glenn O Redman No 2 Address Mattoon Ill
Lessee Walter Duncan Address Mid Vernon Ill
Drilling Contractor Lee Miller Drilling Co Address Lawrenceville Ill

DETAILS OF PLUGGING:

Filled with <u>Cement</u>	From <u>1984</u>	To <u>1884</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Rotary Mud</u>	From <u>1884</u>	To <u>163</u> feet
Filled with <u>Cement</u>	From <u>163</u>	To <u>120</u> feet
Kind of Plug <u>Rotary Mud</u>	From <u>120</u>	To <u>27</u> feet
Filled with <u>Cement</u>	From <u>27</u>	To <u>2</u> feet
Kind of Plug <u>Soil</u>	From <u>2</u>	To <u>Surface</u> feet
Filled with	From	To feet
Kind of Plug	From	To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth and three feet or more in thickness below 1,000 feet in depth.)

Other details

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	160		2		158		

Walter Duncan
(Signature of person having custody or control of well.)

Per H O Chastain

Address Box 251 Elara Ill

Walter Stewart Investigator
(Signature and title of party supervising plugging of well.)

Address Paris RR 2 Illinois

Subscribed and sworn to before me this 22 day of Dec, A. D. 194 5

My commission expires Nov 30 - 1947 Walter Stewart
Notary Public.

26-13N-7E

STATE OF ILLINOIS

County of CLAY

ss.

WELL PLUGGING AFFIDAVIT

RYAN CONSOLIDATED PETROLEUM, COMPANY

and

HARRY JOHNSON

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL AND GAS 330 NL, 1650 WL, SW
(Indicate whether for oil, gas, water or other purposes)known as the ELLIOT # 1

and located as follows:

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)330 ft. south; 1650 ft. east; _____ ft. westof the N.W. corner of the S.W. Quarter

of the _____ Quarter of the _____ Quarter of

Section 26, Township 13 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

{ Ground _____ ft.

Total depth 1990 Formation _____Date permit to drill issued 10-25-58 Permit No. 2719Permit issued to RYAN CONSOLIDATED PETROLEUM, COMPANYDate drilling began 12-2-1958Date drilling completed 12-6-1958Kind of drilling tools used ROTARYDate plugging began 12-6-1958Date plugging completed 12-6-1958Lessor ELLIOTLessee ELLIOT CONSOLIDATED PETROLEUM, CO.Address MATTOON, ILLINOIS.Address 3100 REPUBLIC BANK BLDG, DALLAS 1 TEXAS?Drilling Contractor M & T DRILLING CO.Address DECATUR, ILLINOIS.

DETAILS OF PLUGGING:

Filled with ROTARY MUD From 1990 To 135 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug CEMENT From 135 To 100 feetFilled with MUD From 100 To 15 feetKind of Plug CEMENT From 15 To 3 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) NONE(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production DRILLED DRY

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8 5/8	124		00		124		

M & T, DRILLING CO.

(Signature of person, firm or corporation having custody or control of well.)

Per W.H. KeatingAddress EDENWOOD, ILLINOIS.Harry Johnson INSPECTOR

(Signature and title of party supervising plugging of well.)

Address EDENWOOD, ILLINOIS.Subscribed and sworn to before me this 6 TH day of DECEMBER, A.D. 19 58My commission expires JAN 15, 1961

Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONRECEIVED
DIVISION OF OIL & GAS
DEC 11 1958DEPARTMENT OF
MINES AND MINERALS

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company (M & E. Drilling Co.) and

E. E. OLIFTON - State Well Inspector being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL
(Indicate whether for oil, gas, water or other purposes)

known as the Nolte #1 and located as follows: 330 ft. north;
ft. south; 990 ft. east; ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SW corner of the Quarter
of the Quarter of the Quarter of
Section 26, Township 13 (North of South)
Range 7, (East of West) of the 3rd
Principal Meridian, COLES County, Illinois.
Elevation above sea level is } Derrick Floor ft.
Ground 673.6 ft.
Total depth 1980 Formation Residual
Date permit to drill issued 7/27/78 Permit No. 6068
Permit issued to Schaefer Oil Company
Date drilling began 8-9-78
Date drilling completed 8-14-78
Kind of drilling tools used Rotary
Date plugging began 8-14-78
Date plugging completed * 8-14-78

Lessor Albert Nolte Address Mattoon, Illinois
Lessee Schaefer Oil Company Address Mattoon, Illinois.
Drilling Contractor M & E. Drilling Co. Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with	From	To	feet
<u>Mud</u> (Rotary Mud, Cement, or Other Materials)	<u>1980</u>	<u>250</u>	feet
Kind of Plug <u>Cement</u>	<u>250</u>	<u>200</u>	feet
Filled with <u>Mud</u>	<u>200</u>	<u>95</u>	feet
Kind of Plug <u>Cement</u>	<u>95</u>	<u>60</u>	feet
Filled with <u>Mud</u>	<u>60</u>	<u>15</u>	feet
Kind of Plug <u>Cement</u>	<u>15</u>	<u>03</u>	feet
Filled with <u>Earth</u>	<u>03</u>	<u>0</u>	feet
Kind of Plug <u>Cement (Rathole)</u>	<u>30</u>	<u>03</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

None encountered

(1) Have pits and other excavations been filled? Yes ☐ No ☒
(2) Have the following been removed?
Equipment Yes ☐ No ☒ Concrete bases Yes ☐ No ☐ Debris Yes ☐ No ☒

(3) Has surface casing been cut off three feet below ground surface? Yes ☐ No ☒

(4) Has well-site been leveled? Yes ☐ No ☒
If this was a producing well, give date and amount of last production DRY HOLE 8-14-78

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8"</u>	<u>01</u>	<u>*</u>	<u>*</u>				

* Top 3' to be cut off later and mushroomed cement cap installed & top 3' of hole filled w/ earth.

Schaefer Oil Company
(Signature of person, firm or corporation having custody or control of well.)

Per Tom Skillewell
Address Mattoon, Illinois.

E. E. Olifton State Well Inspector
(Signature and title of party supervising plugging of well.)
Address 3500 Grant Ave., Mattoon, Illinois - 61938

Subscribed and sworn to before me this 15th day of August A.D. 1978

My commission expires 9/29/81
Ronald E. Morris
Notary Public

STATE OF ILLINOIS,
County of Colo ss.

WELL PLUGGING AFFIDAVIT

Ed O'Neill

Lawrence Landrath being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Dr. R. J. Tivnan #1 and located as follows: 330 ft. north;

330 ft. south; 330 ft. east; 330 ft. west

of the SW corner of the SW Quarter

of the SW Quarter of the SW Quarter of

Section 25, Township 13 (North or South)

Range 7, (East or West, of the

Principal Meridian, Colo County, Illinois

Elevation above sea level is { Derrick Floor 574 ft.

{ Ground 660 ft.

Total depth of well is 1960 ft.

Date permit to drill issued

Permit issued to H. C. Hageman

Date drilling began Jan. 1, 1945

Date drilling completed Jan. 10, 1945

Kind of drilling tools used Rotary

Date plugging began Nov. 29, 1946

Date plugging completed Dec. 4, 1946

Lessor Dr. R. J. Tivnan Address St. Carmel, Ill.

Lessee H. C. Hageman (Hageman & Ford) Address Evansville, Indiana

Drilling Contractor George A. Krethor Address St. Carmel, Ill.

DETAILS OF PLUGGING:

Filled with Red (Rotary Mud, Cement, or Other Materials) From 1960 To 23 feet

Kind of Plug Cement From 23 To 0 feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

(1) Have pits, cellar and other excavations been filled? Yes ☐ No ☐

(2) Have equipment, concrete bases and debris been removed? Yes ☐ No ☐

(3) Has surface casing been cut off below plow depth? Yes ☐ No ☐

(4) Has well-site been levelled? Yes ☐ No ☐

If this was a producing well, give date and amount of last production Dry

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
10 3/4"	90		90	<u>Cemented</u>
7"	1918	700	1218	

ILLINOIS CASING PULLING COMPANY

(Signature of person, firm or corporation having custody or control of well.)

Per Ed O'Neill

Address Grayville, Illinois

Lawrence Landrath - Inspector

(Signature and title of party supervising plugging of well.)

Address Springfield, Illinois, P. O. #1

Subscribed and sworn to before me this 16th day of December, A. D. 1946

My commission expires May 15, 1950

Notary Public.

27-13N-7E

STATE OF ILLINOIS

County of COLES

ss.

WELL PLUGGING AFFIDAVIT

J. M. ABORN

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for OIL

known as the W. H. TRACEY #1 (Indicate whether for oil, gas, water or other purposes)
and located as follows: _____ ft. north;

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

_____ ft. south; _____ ft. east; _____ ft. west
of the NE corner of the SE Quarter
of the SW Quarter of the _____ Quarter of
Section 27, Township 13 (North of South)
Range 7, (East of West), of the 3rd.
Principal Meridian, COLES County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 672 ft.

Total depth 1980 Formation McCLOSKEYDate permit to drill issued 10-28-57 Permit No. 2732Permit issued to INDIANA FARM BUREAUDate drilling began 10-31-57Date drilling completed 11-7-57Kind of drilling tools used ROTARYDate plugging began 11-7-57Date plugging completed 11-7-57Lessor W. H. TRACEYAddress MATTOON, ILLINOISLessee INDIANA FARM BUREAUAddress MT. VERNON, INDIANADrilling Contractor BEARD-GULLICKSON DRUG. CO. Address MT. CARMEL, ILLINOIS

DETAILS OF PLUGGING:

Filled with <u>R. MUD</u> (Rotary Mud, Cement, or Other Materials)	From <u>1980</u>	To <u>100</u> feet
Kind of Plug <u>CEMENT</u>	From <u>100</u>	To <u>70</u> feet
Filled with <u>R. MUD</u>	From <u>70</u>	To <u>7</u> feet
Kind of Plug <u>CEMENT</u>	From <u>7</u>	To <u>2</u> feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) NO COAL

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
- (2) Have the following been removed? ☐ Yes ☒ No
- Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☒ No Debris ☐ Yes ☒ No
- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No
- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>87</u>				<u>87</u>		

INDIANA FARM BUREAU COOP ASS'N

(Signature of person, firm or corporation having custody or control of well.)

Per J. M. AbornAddress BOX #271 MT. VERNON, INDIANAWinston Wade OIL WELLINSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOISSubscribed and sworn to before me this 20th. day of November, A.D. 19 57My commission expires 3-9-61.

Betty R. Gordon
Notary Public

ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Schaefer Oil Company (M & E, Inc. Co.) andE. E. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well

drilled for OTL

(Indicate whether for oil, gas, water or other purposes)

known as the A hbrook #1 and located as follows: 330 ft. north;ft. south; 330 ft. east;of the SE corner of the NE Quarterof the SE Quarter of the Quarter ofSection 27, Township 13 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 674 ft.Total depth 1953 Formation MissouriDate permit to drill issued 5/8/79 Permit No. 7300Permit issued to Schaefer Oil CompanyDate drilling began 5-11-79Date drilling completed 5-16-79Kind of drilling tools used RotaryDate plugging began 5-17-79Date plugging completed 5-17-79 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor L. Ashbrook Address San Antonio, TexasLessee Schaefer Oil Company Address Mattoon, Illinois.Drilling Contractor M & E, Inc. Co. Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Mud</u>	From <u>1953</u>	To <u>250</u>	feet
(Rotary Mud, Cement, or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Filled with <u>Mud</u>	From <u>200</u>	To <u>95</u>	feet
Kind of Plug <u>Cement</u>	From <u>95</u>	To <u>70</u>	feet
Filled with <u>Mud</u>	From <u>70</u>	To <u>15</u>	feet
Kind of Plug <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Filled with <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet
Kind of Plug <u>Rot hole filled w/ Mud TD-30</u>	From <u>30</u>	To <u>03</u>	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None encountered(1) Have pits and other excavations been filled? Yes ☐ No ☒(2) Have the following been removed?
Equipment ☒ Yes ☐ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? Yes ☐ No ☒(4) Has well-site been leveled? Yes ☐ No ☒If this was a producing well, give date and amount of last production DRY HOLE 5-16-79

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
8-5/8"	83	-	3	-	80	-	

Schaefer Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per Jim StidwellAddress Mattoon, Illinois.E. E. Clifton State Well Inspector

(Signature and title of party supervising plugging of well.)

Address 3500 Cant Ave., Mattoon, Illinois.Subscribed and sworn to before me this 18 day of May, A.D. 19 79My commission expires 9-29-81 Donald E. Morris Notary Public

34-13N-7E

STATE OF ILLINOIS,
County of Coles ss.

8164478
WELL PLUGGING AFFIDAVIT

Carl Vanhooser

Lawrence Landreth

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the Daniel Burtischie #1 and located as follows:

330 ft. south; 330 ft. east; 330 ft. west
of the NE corner of the SE Quarter
of the 34 Quarter of the 13 Quarter of the
Section 34, Township 13 (North or South)
Range 7, (East or West), of the 3rd.
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor 714 ft.
Ground 2067 ft.

Total depth of well is 2067 ft.

Date permit to drill issued June 5, 1946

Permit issued to Kingwood Oil Company

Date drilling began June 27, 1946

Date drilling completed July 4, 1946

Kind of drilling tools used Rotary

Date plugging began July 5, 1946

Date plugging completed July 5, 1946

Lessor Daniel Burtischie Address Mattoon, Illinois

Lessee Kingwood Oil Company Address Box 1084, Jackson, Miss.

Drilling Contractor Kingwood Oil Company Address Same

DETAILS OF PLUGGING:

Filled with	From	To
<u>Mud</u>	<u>2067</u>	<u>954</u>
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Cement</u>	<u>954</u>	<u>830</u>
Filled with <u>Mud</u>	<u>830</u>	<u>146</u>
Kind of Plug <u>Cement</u>	<u>146</u>	<u>121</u>
Filled with <u>Mud</u>	<u>121</u>	<u>29</u>
Kind of Plug <u>Cement</u>	<u>29</u>	<u>0</u>
Filled with		
Kind of Plug		

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth. Coal from 830-894)

STATE OF ILLINOIS
COLES COUNTY ss. No. 160142

Other details

This instrument was filed for record in
Recorder's office of Coles County at Mattoon

on the 10 day of July

A.D. 1946 at 9:40 o'clock A.M.

If this was a producing well, give date and amount of last production Dry and recorded in Book 273 at Page 244

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 1/2</u>	<u>126</u>		<u>None</u>		<u>126</u>		<u>Cemented</u>

(Signature of person, firm or corporation having custody or control of well.)

Per Carl Vanhooser

Address Box 421 Mt Vernon Ill

Lawrence Landreth Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham Ill. R R #1

Subscribed and sworn to before me this 6th day of July, A. D. 1946

My commission expires May 15, 1950

Notary Public.

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

Safari Oil Company

and

E. R. CLIFTON - State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

OIL

(Indicate whether for oil, gas, water or other purposes)

known as the Burtschi #1 and located as follows: _____ ft. north;

_____ 990 ft. south; _____ ft. east; _____ 330 ft. west

of the NE corner of the SE Quarterof the 34 Quarter of the 34 Quarter of theSection 34, Township 13 (North of 86th)Range 7, (East or West), of the 3rdPrincipal Meridian, COLES County, Illinois.

Elevation above sea level is } Derrick Floor _____ ft.

Ground 681.35 ft.Total depth 1960 Formation ResiclareDate permit to drill issued 6/7/78 Permit No. 5783Permit issued to Safari Oil CompanyDate drilling began 6-9-78Date drilling completed 6-15-78Kind of drilling tools used RotaryDate plugging began 6-15-78Date plugging completed 6-15-78 Locate well accurately on plat of section
(Scale one inch=2,000 ft.)Lessor Burtschi Heirs Address Mattoon, IllinoisLessee Safari Oil Co. Address Mattoon, IllinoisDrilling Contractor M & E. Drilling Co. Address Casey, Illinois.

DETAILS OF PLUGGING:

Filled with <u>Rotary mud</u>	From <u>1960</u>	To <u>250</u>	feet
(Rotary Mud, Cement or Other Materials)			
Kind of Plug <u>Cement</u>	From <u>250</u>	To <u>200</u>	feet
Filled with <u>Mud</u>	From <u>200</u>	To <u>105</u>	feet
Kind of Plug <u>Cement</u>	From <u>105</u>	To <u>90</u>	feet
Filled with <u>Mud</u>	From <u>90</u>	To <u>15</u>	feet
Kind of Plug <u>Cement</u>	From <u>15</u>	To <u>03</u>	feet
Filled with <u>Earth</u>	From <u>03</u>	To <u>0</u>	feet
Kind of Plug	From	To	feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

None encountered(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment	Yes	No	Concrete bases	Yes	No	Debris	Yes	No
☒	☐	☐	☐	☐	☐	☒	☐	☒

(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production DRY HOLE - 6-15-78

CASING RECORD

PUT IN WELL			PULLED OUT		LEFT IN WELL		Remarks
Size	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8"</u>	<u>27</u>	<u>-</u>	<u>4</u>	<u>-</u>	<u>93</u>	<u>-</u>	<u>Contd w/ 75 sacks when run.</u>

Safari Oil Company

(Signature of person, firm or corporation having custody or control of well.)

Per John E. SchaeferAddress Mattoon, Illinois

(Signature and title of party supervising plugging of well.)

Address 3500 Grant Ave., Mattoon, Illinois - 61938Subscribed and sworn to before me this 17th day of June, A.D. 1978My commission expires 10-28-80

Notary Public

STATE OF ILLINOIS

County of Coles

SS.

COUNTY No. 23371

WELL PLUGGING AFFIDAVIT

Harold E. Cox M & E Drilling

and

Don Richards, State Well Inspector

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the DONNELL FARMS #1 and located as follows: 330 ft. north;330 ft. south; 330 ft. east; _____ ft. westof the SW corner of the _____ Quarter

of the _____ Quarter of the _____ Quarter of

Section 34, Township 13 (North or South)Range 7, (East or West), of the 3rdPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground 689 ft.Total depth 2068 Formation McCloskyDate permit to drill issued 2-31-87 Permit No. 39923Permit issued to Harold E. CoxDate drilling began 4-2-87Date drilling completed 4-6-87Kind of drilling tools used RotaryDate plugging began 4-6-87Date plugging completed 4-6-87Lessor Donnell FarmsAddress R.R. 1, Mattoon, IL 61938Lessee Harold E. CoxAddress 413 Illinois, Mattoon, IL 61938Drilling Contractor M & E DrillingAddress Casay, IL

DETAILS OF PLUGGING:

Filled with Mud From 2068 To 250 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 250 To 0 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with Rathole Cemented From 30 To 0 feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth)

Coal Affidavit Signed(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been leveled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production D & A

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8-5/8</u>	<u>153.70</u>		<u>NONE</u>				

Harold E. Cox

(Signature of person, firm or corporation having custody or control of well.)

Per Robt. H. Henduse

Address _____

Don Richards

(Signature and title of party supervising plugging of well.)

Address 204 Orchard Dr., Newton, IL 62448Subscribed and sworn to before me this 6th day of April A.D. 19 87

My commission expires _____

January 29, 1989

Sharon L. Richards

Notary Public

MATTOON

60# 540
(42462-7500-8-56)

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

E. F. Anderson

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Burtschi # 1 and located as follows: _____ ft. north;

_____ 330 ft. south; 330 ft. east; _____ ft. west

of the NW corner of the SE Quarterof the SE Quarter of the _____ Quarter ofSection 34, Township 13 (North or ~~South~~)Range 7, (East or West), of the _____Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.

{ Ground _____ ft.

Total depth 1972 Formation _____Date permit to drill issued 12-20-56 Permit No. 36Permit issued to H. F. RobinsonDate drilling began December 18, 1956Date drilling completed December 24, 1956Kind of drilling tools used RotaryDate plugging began November 4, 1957Date plugging completed November 8, 1957Lessor Daniel BurtschiAddress Mattoon, IllinoisLessee H. F. RobinsonAddress Box 272, Vandalia, IllinoisDrilling Contractor H. F. RobinsonAddress Box 272, Vandalia, IllinoisADDITIONS IN BLUE BY
OIL AND GAS DIVISION

DETAILS OF PLUGGING:

Filled with _____ From _____ To _____ feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 1972 To 1889 feetFilled with Mud From 1889 To 60 feetKind of Plug Cement From 60 To 29 feetFilled with Mud From 29 To 8 feetKind of Plug Cement From 8 To 3 feetFilled with Soil From 3 To 0 feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☒ Yes ☐ No(2) Have the following been removed? ☒ Yes ☐ NoEquipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☒ Yes ☐ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4	44		none		44		Cemented in
4 1/2	1971		1311		660		Cemented

H. F. Robinson

(Signature of person, firm or corporation, having custody or control of well.)

Per E. F. AndersonAddress B. O. Box 62, Mattoon, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 8 day of Nov, A.D. 1957My commission expires 8-7-60Dean Kammrath
Notary PublicDEPARTMENT
MINES AND MINERALS
RECEIVED
NOV 13 1957
DIVISION OF
OIL AND GAS CONSERVATION

STATE OF ILLINOIS,

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

O. G. 6 (3250-10M-8-45)

DEPARTMENT
MINES AND RECLAMATION
DIVISION OF
GAS CONSERVATION

Walter Stewart being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

(Indicate whether for oil, gas, water or other purposes)

known as the Donnell No 1 and located as follows: 330 ft. north;ft. south; 330 ft. east; 330 ft. westof the SE corner of the SW Quarter

of the _____ Quarter of the _____ Quarter of

Section 34, Township 13 (North or South)Range 7, (East or West), of the 3Principal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 6 ft.
Ground 691 ft.Total depth of well is 2002 ft.Date permit to drill issued November 12 - 1945Permit issued to Ben H. NationDate drilling began Dec 14 - 1945Date drilling completed Dec 30 - 1945Kind of drilling tools used RotaryDate plugging began April 30 - 1946Date plugging completed May 3 - 1946Lessor Richard Donnell Address Mattoon IllLessee Ben H. Nation Address Fairfield IllDrilling Contractor Lunker Dily Co Address Salmon Ill

DETAILS OF PLUGGING:

Filled with Cement From 2002 To 1902 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Rotary Mud From 1902 To 85 feetFilled with Cement From 85 To 60 feetKind of Plug Rotary Mud From 60 To 27 feetFilled with Cement From 27 To 2 feetKind of Plug Soil From 2 To Surface feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details _____

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>81</u>		<u>2</u>		<u>79</u>		
<u>8 1/2</u>	<u>1987</u>		<u>1505</u>		<u>482</u>		

(Signature of person, firm or corporation having custody or control of well.)

Per C. F. McComasAddress Box 645 Grayville IllWalter Stewart Investigator

(Signature and title of party supervising plugging of well.)

Address Paris RR 2 IllinoisSubscribed and sworn to before me this 3 day of May, A. D. 1946My commission expires Nov 30 - 1947

Notary Public.

Coles 13N - 7E - 34

35-13N-7E

STATE OF ILLINOIS,
County of Cole ss.

8164518

O. G. 6 (3250-10M-8-45)

WELL PLUGGING AFFIDAVIT

Joe Dixon

and

Lawrence Landreth being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil

(Indicate whether for oil, gas, water or other purposes)

known as the Bareithen # 1

and located as follows: 330 ft. north;

ft. south; 990 ft. east; ft. west

of the SW corner of the NW Quarter

of the Quarter of the Quarter of

Section 35, Township 13 (North of South)

Range 7, (East of West), of the 3rd

Principal Meridian, Cole County, Illinois.

Derrick Floor 692 ft.

Elevation above sea level is { Ground 683 ft.

Total depth of well is 3193 ft.

Date permit to drill issued 8/16/46

Permit issued to Tex Harvey Oil Co.

Date drilling began 8/16/46

Date drilling completed 8/26/46

Kind of drilling tools used Rotary

Date plugging began 8/26/46

Date plugging completed 8/26/46

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

Lessor D. Barcither

Address Mattoon Ill

Lessee Tex Harvey Oil Co.

Address Salem Ill

Drilling Contractor Company Tools

Address Same

DETAILS OF PLUGGING:

Filled with mud From Surface To 3193 feet
(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 3193 To 3093 feet

Filled with Mud From 3093 To 145 feet

Kind of Plug Cement From 145 To 120 feet

Filled with Mud From 120 To 28 feet

Kind of Plug Cement From 28 To 0 feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details

If this was a producing well, give date and amount of last production

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
10 3/4	120				120		Cemented

(Signature of person, firm or corporation having custody or control of well.)

Per

Address

Lawrence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address

Effingham Illinois, R. R. # 1

Subscribed and sworn to before me this

28

day of

August

A. D. 1946

My commission expires 2-28-1950

Notary Public.

County of _____ } ss. **WELL PLUGGING AFFIDAVIT**
Capitol Indemnity for R.H.B. & Associates and

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain well
drilled for _____

known as the Corbin #1 (Indicate whether for oil, gas, water or other purposes) and located as follows: 330' ft. north;

Locate well accurately on plat of section
(Scale one inch—2,000 ft.)

ft. south; 990' ft. east; 990' ft. west
of the SE corner of the SW Quarter
of the _____ Quarter of the _____ Quarter of
Section 35, Township 13 (North or South)
Range 7, (East or West), of the
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor _____ ft.
Ground 693.6' ft.

Total depth 3150' Formation unknown

Date permit to drill issued 4/11/78 Permit No. 5487

Permit issued to Telford Oil & Gas Co.

Date drilling began 5/29/78

Date drilling completed 11/14/78

Kind of drilling tools used _____

Date plugging began 7/20/89

Date plugging completed 7/21/89

Lessor _____ Address _____

Lessee _____ Address _____

Drilling Contractor _____ Address _____

DETAILS OF PLUGGING:

Filled with Cement From 3150' To 3050' feet
(Rotary Mud, Cement, or Other Materials) Drilling Mud
Kind of Plug _____ From 3050' To 350' feet
Filled with Cement From 350' To 04' feet
Kind of Plug Earth From 04' To 0' feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet
Filled with _____ From _____ To _____ feet
Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) _____

(1) Have pits and other excavations been filled? Yes ☒ No ☐
(2) Have the following been removed? Yes No Yes No Yes No
Equipment ☒ ☐ Concrete bases ☒ ☐ Debris ☒ ☐
(3) Has surface casing been cut off three feet below ground surface? Yes ☒ No ☐
(4) Has well-site been leveled? Yes ☒ No ☐
If this was a producing well, give date and amount of last production N/A

CASING RECORD

Size	PUT IN WELL Feet Inches	PULLED OUT Feet Inches	LEFT IN WELL Feet Inches	Remarks
8 5/8	121'	100'		100 Sacks Cement
4 1/2	3150' 0"	1518'	1632'

(Signature of person, firm or corporation having custody or control of well) Richard J. Hayes
Per _____

Address _____
Kevin Spencer Insp I
(Signature and title of party supervising plugging of well.)

Address _____

Subscribed and sworn to before me this 21st day of July A.D. 19 89
My commission expires 7/8/92 Pamela S. Holdrieth
Notary Public

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

Ronnie Morris (Kuykendall Drlg. Co.)

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for Oil and/or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Dan Bariether # 1and located as follows: 330 ft. north;330 ft. south; 330 ft. east; 330 ft. westof the SW corner of the NW Quarterof the 35 Quarter of the 13 Quarter of theSection 35, Township 13 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.{ Ground ft.Total depth 2010 Formation Date permit to drill issued 12-12-56 Permit No. 4454Permit issued to Leo C. DeTray-Walter L. ScheckDate drilling began December 13, 1956Date drilling completed December 19, 1956Kind of drilling tools used RotaryDate plugging began December 20, 1956Date plugging completed December 20, 1956Lessor Dan BarietherAddress 8527 South Loomis, Chicago 20, Ill.Lessee Leo C. DeTray-Walter L. ScheckAddress St. Elmo, Illinois, Box 363Drilling Contractor Kuykendall Drlg. Co.Address

DETAILS OF PLUGGING:

Filled with Rotary Mud From 2010 To 70 feet

(Rotary Mud, Cement, or Other Materials)

Kind of Plug Cement From 70 To 40 feetFilled with Rotary Mud From 40 To 8 feetKind of Plug Cement From 8 To 3 feetFilled with Soil From 3 To 0 feetKind of Plug From To feetFilled with From To feetKind of Plug From To feet From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above

None

1,000 feet in depth)

(1) Have pits and other excavations been filled? Yes No(2) Have the following been removed? Yes NoEquipment Yes No Concrete bases Yes No Debris Yes No(3) Has surface casing been cut off three feet below ground surface? Yes No(4) Has well-site been levelled? Yes NoIf this was a producing well, give date and amount of last production Drilled Dry

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4	58		none		58		Cemented in

Leo C. DeTray-Walter L. Scheck

(Signature of person, firm or corporation having custody or control of well.)

Per Leo C. DeTray-Walter L. ScheckAddress Mattoon, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 3rd day of January, A.D. 19 57My commission expires 10th July 1957

Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONRECEIVED
JAN 8 1957
DIVISION OF OIL AND GAS
RECEIVED

STATE OF ILLINOIS

County of COLES

SS.

WELL PLUGGING AFFIDAVIT

HUGO AUSTIN

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for OIL AND GAS

(Indicate whether for oil, gas, water or other purposes)

known as the CORBIN #1 and located as follows: 330 ft. north;330 ft. south; 330 ft. east; _____ ft. westof the SW corner of the NW Quarterof the SW Quarter of the _____ Quarter ofSection 35, Township 13 (North or ~~South~~)Range 7, (East or ~~West~~), of the 3rdPrincipal Meridian, COLES County, Illinois.Elevation above sea level is { Derrick Floor _____ ft.
Ground _____ ft.Total depth 1977 Formation ROSIGLAREDate permit to drill issued 3-20-57 Permit No. 646Permit issued to JAMES L. SCHAEFERDate drilling began 3-21-57Date drilling completed 3-27-57Kind of drilling tools used ROTARYDate plugging began 3-27-57Date plugging completed 3-27-57

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

Lessor CORBIN Address MATTOON, ILLINOIS
 Lessee JAMES L. SCHAEFER Address MATTOON, ILLINOIS
 Drilling Contractor JOHN UNGER Address CARLISLE, INDIANA

DETAILS OF PLUGGING:

Filled with <u>ROTARY MUD</u>	From <u>1977</u>	To <u>90</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>CEMENT</u>	From <u>80</u>	To <u>50</u> feet
Filled with <u>ROTARY MUD</u>	From <u>50</u>	To <u>7</u> feet
Kind of Plug <u>CEMENT</u>	From <u>7</u>	To <u>2</u> feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet
Filled with _____	From _____	To _____ feet
Kind of Plug _____	From _____	To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) NO COAL

- (1) Have pits and other excavations been filled? ☐ Yes ☒ No
 (2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☐ Yes ☐ No Debris ☐ Yes ☒ No

- (3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No

- (4) Has well-site been levelled? ☐ Yes ☒ No

If this was a producing well, give date and amount of last production _____

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
8 5/8	63				63		

JAMES L. SCHAEFER

(Signature of person, firm or corporation having custody or control of well.)

Per Hugo AustinAddress Box #35, MATTOON, ILLINOISWinston Wade OIL WELL INSPECTOR

(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOISSubscribed and sworn to before me this 8th day of April, A.D. 1957My commission expires 3-9-61

Betty Rigdon
Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

OIL AND GAS DIVISION
DIVISION OF
OIL AND GAS CONSERVATION
1957
RECEIVED

STATE OF ILLINOIS

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

R. E. Dunivan (Arnett Drilling Company)

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain
Oil and/or Gasknown as the Ruby E. Corbin Etal # 1 (Indicate whether for oil, gas, water or other purposes)

and located as follows:

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

330 ft. south; 330 ft. east; 330 ft. west
of the NE corner of the SW Quarter
of the SW Quarter of the SW Quarter of
Section 35, Township 13 (North or South)
Range 7, (East or West), of the 2nd
Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground 683.1 ft.

Total depth 1993 Formation Date permit to drill issued 10-22-56 Permit No. 3889Permit issued to Ashland Oil & Refining CompanyDate drilling began October 22, 1956Date drilling completed October 30, 1956Kind of drilling tools used RotaryDate plugging began October 30, 1956Date plugging completed October 30, 1956Lessor Ruby E. CorbinAddress Lessee Ashland Oil & Refining CompanyAddress P.O. Drawer # 6, Henderson, Ky.Drilling Contractor Arnett Drilling CompanyAddress Salem, Illinois

DETAILS OF PLUGGING:

Filled with <u>Rotary Mud</u>	From <u>1993</u>	To <u>1973</u> feet
(Rotary Mud, Cement, or Other Materials)		
Kind of Plug <u>Cement</u>	From <u>1973</u>	To <u>1912</u> feet
Filled with <u>Rotary Mud</u>	From <u>1912</u>	To <u>72</u> feet
Kind of Plug <u>Cement</u>	From <u>72</u>	To <u>41</u> feet
Filled with <u>Rotary Mud</u>	From <u>41</u>	To <u>8</u> feet
Kind of Plug <u>Cement</u>	From <u>8</u>	To <u>3</u> feet
Filled with <u> </u>	From <u> </u>	To <u> </u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) None

(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Drilled Dry

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
<u>8 5/8</u>	<u>61</u>		<u>none</u>		<u>61</u>		<u>Cemented</u>

Ashland Oil & Refining Company

(Signature of person, firm or corporation having custody or control of well.)

Per R.E. DunivanAddress Centralia, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 19th day of November, A.D. 19 56My commission expires 10th July 1957Ewendolyn Bennett
Notary Public.

MINES AND MINERAL
DEPARTMENT
RECEIVED
NOV 26 1956
DIVISION OF
GEOLOGY

35-13N-7E-1

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Bonnie Morris (Kuykendall Drig. Co.) and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and/or Gas NE SW NW

(Indicate whether for oil, gas, water or other purposes)

known as the Dan Bariether # 2 and located as follows: 990 ft. north;ft. south; 990 ft. east; _____ ft. westof the SW corner of the NW Quarter

of the _____ Quarter of the _____ Quarter of

Section 35, Township 13 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor 684 ft.{ Ground 682 ft.Total depth 1964 Formation _____Date permit to drill issued 2-7-57 Permit No. 535Permit issued to Leo C. DeTray & Walter L. ScheckDate drilling began March 8, 1957Date drilling completed March 13, 1957Kind of drilling tools used RotaryDate plugging began March 13, 1957Date plugging completed March 13, 1957Lessor Dan Bariether

Address _____

Lessee Leo C. DeTray & Walter L. ScheckAddress 8527 S. Loomis Blvd. Chicago, Ill.Drilling Contractor Kuykendall Drig. Co.Address St. Elmo, Illinois

DETAILS OF PLUGGING:

Filled with Rotary Mud From 1964 To 68 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 68 To 3 feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

Filled with _____ From _____ To _____ feet

Kind of Plug _____ From _____ To _____ feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☐ Yes ☒ No Concrete bases ☒ Yes ☐ No Debris ☐ Yes ☒ No(3) Has surface casing been cut off three feet below ground surface? ☒ Yes ☐ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Drilled Dry

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>10 3/4</u>	<u>58</u>		<u>none</u>		<u>58</u>		<u>Cemented in</u>

Leo C. DeTray & Walter L. Scheck

(Signature of person, firm or corporation having custody or control of well.)

Per Bonnie MorrisAddress Mattoon, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 4th day of March, A.D. 19 57My commission expires 10th July 1957

Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONRECEIVED
DIVISION OF
OIL AND GAS
APR 10 1957

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8164528

O. G. 6 (3250-10M-8-45)

STATE OF ILLINOIS,

County of Coles

ss.

WELL PLUGGING AFFIDAVIT

G.K. Burton

LAURENCE LANDRETH

being first duly sworn, do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

oil

(Indicate whether for oil, gas, water or other purposes)

known as the Harry Corbin # 1

and located as follows: 330 ft. north;

ft. south; 330 ft. east;

of the S. W. corner of the Quarter

of the Quarter of the Quarter of

Section 35, Township 13 (North or South)

Range 7, (East or West), of the

Principal Meridian, Coles County, Illinois.

Elevation above sea level is { Derrick Floor ft.

{ Ground 685 ft.

Total depth of well is 1986 ft.

Date permit to drill issued Oct. 9, 1946

Permit issued to Joseph A. Kull

Date drilling began 10/6/46

Date drilling completed 10/17/46

Kind of drilling tools used W/T/T rotary

Date plugging began 6/25/47

Date plugging completed 6/25/47

Lessor Harry Corbin

Address Mattoon, Ill.

Lessee Joseph A. Kull

Address Mattoon, Ill.

Drilling Contractor W.R. Kurkendall

Address " " "

DETAILS OF PLUGGING:

Filled with mud (Rotary Mud, Cement, or Other Materials) From 1986 To 105 feet

Kind of Plug cement From 105 To 80 feet

Filled with mud From 80 To 28 feet

Kind of Plug cement From 28 To 3 feet

Filled with surface soil From 3 To 0 feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth.)

Other details.

If this was a producing well, give date and amount of last production dry

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
10 3/4"	85				85		cemented 100 sacks
5 1/2"	1905		1042		863		" 300 "

(Signature of person, firm or corporation having custody or control of well.)

Per G.K. Burton

Address Centralia, Ill.

Laurence Landreth, Inspector

(Signature and title of party supervising plugging of well.)

Address Effingham, Illinois, R.R. #1

Subscribed and sworn to before me this 2nd day of JULY, A. D. 1947

My commission expires Jan. 25, 1951

Notary Public.

STATE OF ILLINOIS

County of Coles

SS.

WELL PLUGGING AFFIDAVIT

Lee Grisson (W. L. Dillier Drlg. Co.)

and

Lowell E. Bennett

being first duly sworn,

do depose and say the following is a true and correct statement of the details of the plugging of a certain well drilled for

Oil and/or Gas

(Indicate whether for oil, gas, water or other purposes)

known as the Gilbert Micheals # 1 and located as follows: 330 ft. north;ft. south; 330 ft. east; ft. westof the SW corner of the NW Quarterof the NE Quarter of the Quarter ofSection 35, Township 13 (North or South)Range 7, (East or West), of the 2ndPrincipal Meridian, Coles County, Illinois.Elevation above sea level is { Derrick Floor ft.
Ground 681 ft.Total depth 1975 FormationDate permit to drill issued 4-17-57 Permit No. 862Permit issued to Robert EhrhartDate drilling began April 17, 1957Date drilling completed April 23, 1957Kind of drilling tools used RotaryDate plugging began April 23, 1957Date plugging completed April 23, 1957 Locate well accurately on plat of section
(Scale one inch—2,000 ft.)Lessor Gilbert Micheals # 1Address Mattoon, IllinoisLessee Robert EhrhartAddress Mattoon, IllinoisDrilling Contractor W. L. DillierAddress Casey, Illinois

DETAILS OF PLUGGING:

Filled with Rotary Mud From 1975 To 90 feet
(Rotary Mud, Cement, or Other Materials)Kind of Plug Cement From 90 To 42 feetFilled with Rotary Mud From 42 To 32 feetKind of Plug Cement From 32 To 3 feet

Filled with From To feet

Kind of Plug From To feet

Filled with From To feet

Kind of Plug From To feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above 1,000 feet in depth) None(1) Have pits and other excavations been filled? ☐ Yes ☒ No

(2) Have the following been removed?

Equipment ☒ Yes ☐ No Concrete bases ☒ Yes ☐ No Debris ☒ Yes ☐ No(3) Has surface casing been cut off three feet below ground surface? ☐ Yes ☒ No(4) Has well-site been levelled? ☐ Yes ☒ NoIf this was a producing well, give date and amount of last production Drilled Dry

CASING RECORD

Size	PUT IN WELL Feet	Inches	PULLED OUT Feet	Inches	LEFT IN WELL Feet	Inches	Remarks
<u>8 5/8</u>	<u>80</u>		<u>None</u>		<u>80</u>		<u>Cemented</u>

Robert Ehrhart

(Signature of person, firm or corporation having custody or control of well.)

Per Lee GrissonAddress Casey, IllinoisLowell E. Bennett Oil Well Inspector

(Signature and title of party supervising plugging of well.)

Address Martinsville, IllinoisSubscribed and sworn to before me this 3rd day of May, A.D. 1957My commission expires 10th July 1957

Notary Public.

ADDITIONS IN BLUE BY
OIL AND GAS DIVISIONDEPARTMENT OF REVENUE
MINES AND MINERALS
RECEIVED
MAY 23 1957
R + A

36-13N-6E

STATE OF ILLINOIS

County of MOULTRIE

SS.

WELL PLUGGING AFFIDAVIT

V. L. ARNETT

and

WINSTON WADE

being first duly sworn,
do depose and say the following is a true and correct statement of the details of the plugging of a certain
well drilled for OIL

known as the M. M. GEARHART #1 (Indicate whether for oil, gas, water or other purposes)
and located as follows: 330 ft. north;
ft. south; 330 ft. east; 330 ft. west

Locate well accurately on plat of section
(Scale one inch=2,000 ft.)

of the SE corner of the SW Quarter
of the SE Quarter of the 36 Quarter of
Section 36, Township 13 (North 1/4 of 36)
Range 6, (East of West), of the 3rd.
Principal Meridian, MOULTRIE County, Illinois.

Elevation above sea level is { Derrick Floor ft.
Ground ft.

Total depth 2150 Formation

Date permit to drill issued Permit No.

Permit issued to ARNETT DRIG. CO.

Date drilling began 5-31-56

Date drilling completed 6-8-56

Kind of drilling tools used ROTARY

Date plugging began 6-9-56

Date plugging completed 6-9-56

Lessor M. M. GEARHART

Address

Lessee ARNETT DRIG. CO.

Address SALEM, ILLINOIS

Drilling Contractor ARNETT DRIG. CO.

Address SALEM, ILLINOIS

DETAILS OF PLUGGING:

Filled with <u>ROTARY MUD</u> (Rotary Mud, Cement, or Other Materials)	From <u>2150</u>	To <u>75</u> feet
Kind of Plug <u>CEMENT</u>	From <u>75</u>	To <u>50</u> feet
Filled with <u>ROTARY MUD</u>	From <u>50</u>	To <u>8</u> feet
Kind of Plug <u>CEMENT</u>	From <u>8</u>	To <u>2</u> feet
Filled with <u> </u>	From <u> </u>	To <u> </u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet
Filled with <u> </u>	From <u> </u>	To <u> </u> feet
Kind of Plug <u> </u>	From <u> </u>	To <u> </u> feet

IF WORKABLE COAL BEDS WERE ENCOUNTERED IN THIS HOLE, DESCRIBE THE METHOD
EMPLOYED TO PROTECT SAME. (A workable coal bed is thirty inches or more in thickness above
1,000 feet in depth) NO COAL

- (1) Have pits and other excavations been filled? Yes No
- (2) Have the following been removed? Yes No
- Equipment Yes No Concrete bases Yes No Debris Yes No
- (3) Has surface casing been cut off three feet below ground surface? Yes No
- (4) Has well-site been levelled? Yes No

If this was a producing well, give date and amount of last production DRY

CASING RECORD

Size	PUT IN WELL		PULLED OUT		LEFT IN WELL		Remarks
	Feet	Inches	Feet	Inches	Feet	Inches	
<u>8 5/8</u>	<u>63</u>				<u>63</u>		

ARNETT DRILLING CO.

(Signature of person, firm or corporation having custody or control of well.)

Per W. L. ArnettAddress SALEM, ILLINOIS

Winston Wade OIL WELL INSPECTOR
(Signature and title of party supervising plugging of well.)

Address PARIS, ILLINOIS

Subscribed and sworn to before me this 11th day of June, A.D. 1956

My commission expires 3-10-57

Betty Regdon
Notary Public

ADDITIONS IN BLUE BY
OIL AND GAS DIVISION

9-10-05

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Mines and Minerals

Division of Oil and Gas
(217) 557-6379COUNTY No. 21216One Natural Resources Way
Springfield, Illinois 62702/1271

OG-6 WELL PLUGGING REPORT

TYPE OF WELL: ☒ PRODUCTION ☐ CLASS II ☐ GAS STORAGE ☐ REPLUG ☐ OTHERPERMITTEE: RK Petroleum CorpPERMITTEE #: 701WELL NAME: BANK Trust #1PERMIT #: 057022REFERENCE #: 209464

(ISSUE DATE IF NO NUMBER)

COUNTY MoultrieSECTION 36 TWP 13N RANGE 06ELOCATION: _____ FT. NORTH; OR 0.330FT. SOUTH, AND 0.330 FT. EAST; OR _____FT. WEST OF THE NW CORNER OF THE NEQUARTER OF THE SW QUARTER OF THE

_____ QUARTER OF THE _____ QUARTER.

WELL DATA:

SURFACE ELEVATION:	<u>657</u>	FT.	PRODUCING / INJECTION INTERVALS
TOTAL DEPTH OF WELL	<u>2150</u>	FT.	FROM _____ TO _____
PLUGGED BACK TOTAL DEPTH		FT.	FROM _____ TO _____
BASE OF FRESHWATER ZONE	<u>300</u>	FT.	FROM _____ TO _____
WORKABLE COALS PRESENT AT		FT.	FROM _____ TO _____

DESCRIBE PREVIOUS PLUGBACK PROCEDURE:

DETAILS OF PLUGGING:

FILLED WITH well bore fluid FROM 2150 TO 336 FT.
(ROTARY MUD, WELLBORE FLUID, CEMENT, OR OTHER MATERIALS)FILLED WITH cement FROM 336 TO 05 FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

FILLED WITH _____ FROM _____ TO _____ FT.

Comments: nathole had a joint of drill pipe run down it & circulated cement to surface

WELL DATA:

CASING	SIZE	SETTING DEPTH	SACKS CEMENT	HOLE SIZE	EST. TOP OF CEMENT	AMOUNT OF CASING REMOVED
SURFACE	8.63	306	22.5	12.25	0	
INTERMEDIATE/ MINE STRING/OR LINER						
PRODUCTION	NA					

Under penalties of perjury, I declare that I have examined this form including accompanying statements and documents, and to the best of my knowledge, it is true, correct and complete.

Signature of Permittee or Designee

9-10-05
Date Plugging began

Address

9-10-05
Date Plugging Completed

City, State, Zip

☐ Inspector present during plugging operations

Inspector Signature

Activity

Date

Inspector Signature

Activity

Date

Inspector Signature

Activity

Date

☒ Inspector not present during plugging operations

Authorization for Inspector not being present

Olank W. Walter
Manager Signature

9/15/05
Date

☐ Plugging information sent to District Office

☐ Inspector site visit to pick up plugging information

Inspector

Date

RECEIVED
OCT 13 2005
GEOLOGIC RECORDS

APPENDIX 6-1

Gauge Specifications

Specifications for selected pressure and temperature instrumentation can be found at
<http://www.foxboro-eckardt.com/en-GB/products/>

Specifications for the Weatherford well control system can be found at
[http://www.weatherford.com/Products/Production/FlowMeasurement/CS7XControlSystem/
fm_WFT067378](http://www.weatherford.com/Products/Production/FlowMeasurement/CS7XControlSystem/fm_WFT067378)

APPENDIX 6-2

Mechanical Integrity Testing Procedures

PRESSURE TEST OF ANNULUS INTEGRITY, TUBING AND PACKER (BASELINE)

1. Notify the IL EPA of the plans to perform the annular pressure test and the schedule for the test.
2. Mount calibrated gauge on wellhead to monitor pressure of annular space (i.e., outside the tubing and inside the long casing).
3. Close in tubing valve and rig up to pressurize the annular space by connecting high pressure pump to wing valve corresponding to the described annular space.
4. Add fluid to the annular space to increase the pressure to no less than 100 psi above the maximum regulated pressure for the annular space.
5. Test the mechanical integrity of the annulus by recording the annulus pressure for 1 hour.
5. Reduce the inner annulus pressure back to atmospheric pressure and record the volume of fluid removed from the inner annulus.
6. Corrective action will be taken if any pressure test exceeded a 5% over a 1 hour period.
7. Plot the data gathered (volume versus inner annulus pressure) and determine volume of fluid loss for pressure loss for the inner annulus space.
8. Receive approval from IL EPA that the well passed the annular pressure test.

Note: This procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

PRESSURE TEST OF ANNULUS INTEGRITY, TUBING AND PACKER (DURING INJECTION)

1. Notify the IL EPA of the plans to perform the annular pressure test and the schedule for the test.
2. Stop injection and allow the well to stabilize for 12 hours.
3. Prepare to monitor pressure of annular space (i.e., outside the tubing and inside the long casing) using the annular pressure monitoring system.
4. Close in tubing valve and rig up to pressurize the annular space by connecting high pressure pump to wing valve corresponding to the described annular space.
5. Add fluid to the annular space to increase the pressure to no less than 100 psi above the maximum regulated pressure for the annular space.
5. Test the mechanical integrity of the annulus by recording the annulus pressure for 1 hour.
5. Reduce the inner annulus pressure back to atmospheric pressure.
6. Corrective action will be taken if any pressure test exceeded a 5% over a 1 hour period.
7. Receive approval from IL EPA that the well passed the annular pressure test.

Note: This procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

PROCEDURE FOR RADIOACTIVE TRACER SURVEY

1. Move in and rig up a wireline logging unit, mast unit, and wireline lubricator with grease injector pressure control equipment.
2. Install a Radio-Active Tracer survey (RAT) tool string with upper and lower gamma ray detectors, ejector, and a collar locator (CL) on the wireline. Set up RAT tools and recorder according to the IL EPA guidelines. Note that the radioactive trace must be miscible in CO₂.
3. Lower the RAT tools into the wellbore to total depth (TD). Run a depth correlation test and baseline gamma ray to from TD to approximately 1,000 feet above the packer to include the packer and collars.
4. Correct for any depth discrepancies.
5. Record background checks at desired depth.
6. Start injection of CO₂ at typical rate during normal system operation.
7. Conduct a moving survey from 1,000 feet above the packer to the TD of the well.
 - Move the RAT tool to 1,000 feet above the packer.
 - Eject a slug of radioactive material at 1,000 feet above packer and verify ejection on the lower detector.
 - After verification, lower the tool below the slug and monitor the movement of the slug by making and recording a series of passes across the slug until the slug is no longer detected. Note times and pass numbers on the log. Verify there is no upward movement above the base of the caprock.
8. Repeat the moving survey as above.
9. Conduct a stationary survey above the injection interval to check for upward fluid migration outside the cemented casing.
 - Move the RAT tool to 1,000 feet above the location of the packer. Set the logging computer to record in time-drive mode.
 - Maintain a constant injection rate.
10. Eject a slug of radioactive material at 1,000 feet above packer. Lower the RAT tool into the wellbore and set it at the base of the caprock. Verify the slug passing both detectors. Record on time-drive for an additional 30 minutes after passage of the slug. Verify no upward movement of injected fluid.
11. Stop injection and lower tool to TD. Run a final gamma ray/CL base log from TD to approximately 1,000 feet above the packer.

NOTE: A preliminary analysis of the RTS survey will be conducted on site by the logging company representative and, if present, the IL EPA representative.

12. Remove lubricator from well and prepare for routine injection.

Note: This procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

PROCEDURE FOR PULSED NEUTRON CAPTURE LOGGING

1. Shut down injection and allow well to equilibrate for 24 hours.
2. Move in rig and clear the wellbore of any material that would be corrosive to the logging tools. Remove any downhole equipment from the well and ensure that there are no obstructions that will prevent the passage of the pulsed neutron capture tool.
3. Rig up a blow-out preventer wireline logging unit, mast unit, and wireline lubricator with grease injector pressure control equipment.
4. The pulsed neutron capture log shall be conducted in the sigma mode and in tandem with a gamma-ray log.
5. Place tool in "standby" mode.
6. Run pulsed neutron capture tool to total depth (TD).
7. Turn on pulsed neutron capture tool. Pull tool out of the well and perform logging. The logging depth will be from TD to 1,000 feet above the depth of the packer. The data will be recorded by the logging company.
8. Pull logging tool out of well, and into tool catcher.
9. Obtain field copies of the logging data.
10. Remove blow-out preventer wireline logging unit, mast unit, and wireline lubricator from well.
11. Replace tubing, downhole equipment and wellhead.
12. Move rig off location

Note: This procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

PROCEDURE FOR DIFFERENTIAL TEMPERATURE LOG (BASELINE)

1. Move service rig onto site.
2. Clear the wellbore of any material that would be corrosive to the logging tools and ensure that there are no obstructions that will prevent the passage of the temperature tool.
3. The temperature log must be conducted through the injection tubing to obtain "real condition" data and to be protective of human health and the environment.
4. An appropriate scale for the temperature log must be selected. Frequent shifts in the log will be required if the scale selected is too small which makes the log difficult to interpret. If the scale is too large, the log is again difficult to interpret because temperature changes and gradients are difficult to discern. A scale range of 4°F/inch to 10°F/inch is generally the best.
5. The temperature log shall be conducted in tandem with a collar locator log and a gamma-ray log. A differential temperature curve shall be included.
6. The temperature tool shall be sensitive to temperature changes of at least 0.1°F.
7. The temperature log shall be run going into the well. The logging speed should be between 20-35 feet per minute. The logging speed shall be kept constant for all sequential passes. Stopping the tool during a log run should be avoided.
8. The well shall be shut-in for a minimum of 24 hours to reach "static" conditions prior to running the baseline log.
9. Run the baseline log from total depth to ground surface after the 24-hour shut-in period. Data will be recorded by the logging company.
10. Remove logging tool from well, and place wellhead back on well
11. Move service rig offsite.
12. Report results of differential temperature log to IL EPA.

Note: This procedure may be updated during or after drilling, characterization, and/or testing of the well to account for actual well completion details or site conditions.

ATTACHMENT 3

FutureGen Design Basis Document

FutureGen Design Data

January 16, 2008
Revision D

SPECIFICATION REVISION PAGE

Project Name: FutureGen		Discipline : Project Management			
Client: FutureGen Industrial Alliance, Inc.					
Revision Signatures					
Doug White	1/16/2008	Larry Seedall	1/16/2008		
Prepared by	Date	Approved by (title)	Issue Date		
Checked by	Date	Approved by (if required) (title)	Date		
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IFQ	D	1/16/08	DEW	92	Added site information

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Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACPA	American Concrete Paving Association
ADA	American with Disabilities Act
AEIC	Association of Edison Illuminating Companies
AGRU	acid gas removal unit
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
API	American Petroleum Institute
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASD	Allowable Stress Design
ASME	American Society of Mechanical Engineers
ASU	air separation unit
ATS	automatic transfer switch (for backup power)
AWG	American Wire Gauge
AWS	American Welding Society
BPCS	Basic Process Control System
CCTV	closed circuit television
CMAA	Crane Manufacturers Association of America
CTG	combustion turbine generator
CV	control valve
CW	cooling water
D/P	differential pressure
dBA	Decibels audible
DCS	distributed control system

Div.	division
ECM	engineering construction management (contractor)
ESD	emergency shut down
FAT	factory acceptance test
FCC	Federal Communications Commission
FLA	full load amperes
FM	Factory Mutual
FPS	feet per second
FW	fire water
GT	gas turbine
H	height
HART	Highway Addressable Remote Transducer
HHV	higher heating value
HOA	hand – off – auto
HP	high pressure
hp	horsepower
HRSG	heat recovery steam generator
HS	hand switch
I/O	input/output
IBC	International Building Code
ICDR	initial conceptual design report
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electronics and Electrical Engineers
IFC	International Fire Code
IGCC	integrated gasification combined cycle
IP	intermediate pressure
ISA	Instrumentation, Systems and Automation Society
ISO	International Standards Organization
JB	junction box
k	thousand
lb	pound
LEED	Leadership in Energy and Environmental Design
LHV	lower heating value
LP	low pressure
LRFD	Load and Resistance Factor Design
Max	maximum

MCC	motor control center
Min	minimum
mm	millimeter
MM	million
MMBtu	million British thermal units
mol%	molar percent
MOV	motor operated valve
MP	medium pressure
mph	miles per hour
MWe	megawatt
n/r	not reported
NAAQS	National Ambient Air Quality Standards
NACE	National Association of Corrosion Engineers
NEC	National Electrical Code (NFPA 70)
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NPD	Nominal Flange Diameter
NPT	National Pipe Thread
OD	outside diameter
OS	outside
OSHA	Occupational Safety and Health Administration
PB	push button
PCA	Portland Cement Association
PDC	power distribution center
PDS	Plant Design System
PDS	plant design system – Microstation 3D
ph	phase
PIP	Process Industry Practices
PLC	programmable logic controller
PM	particulate matter
PMS	power management system
ppmv	parts per million-volumetric basis
ppmvd	parts per million-volumetric dry basis
PRB	Power River Basin
PSA	pressure swing adsorption
PSD	prevention of significant deterioration
psf	pounds per square foot

PSV	pressure safety valve
RF	raised face
RIE	remote instrument enclosure
RTD	resistance temperature detector
S&T	shell and tube
SAMA	Scientific Apparatus Makers Association
SCF	standard cubic foot
scfh	standard cubic feet per hour (60°F & 14.696 psia)
scfm	standard cubic feet per minute (60°F & 14.696 psia)
SEI	Structural Engineering Institute
SF	square foot
SIL	Safety Integrity Level
SIS	Safety Instrumented Systems
SJI	Steel Joist Institute
SRU	sulfur recovery unit
SS	stainless steel
STG	steam turbine generator
SWS	sour water system
TBD	to be determined
TCP/IP	Transmission Control Protocol/Internet Protocol
te	metric ton (1 te=2204.62 lbs)
TGCU	tail gas cleanup unit
TPD	tons per day (1 ton=2000 lbs)
TPH	tons per hour (1 ton=2000 lbs)
TPY	tons per year (1 ton=2000 lbs)
UL	Underwriter's Laboratory
UPS	Uninterruptible Power Supply
VAC	volts – alternating current
VDC	volts – direct current
W	width
WGINT	Washington Group International
WGS	water gas shift
ZLD	zero liquid discharge

General project information

Client's Name: FutureGen Alliance

Plant Location: Illinois

Type Of Unit(s): IGCC (integrated gasification combined cycle)
Power Plant Demonstration Unit and Research
Facility with CO₂ Sequestration

The system of engineering units for the project shall be in accordance with the following table:

Process Variable	Engineering Units
Temperature	Deg F
Pressure	
Near Atmosphere	Inches of water
Above Atmosphere	psig
Below Atmosphere	Inches of water absolute
Absolute	psia
Level	
Process	Feet and inches
Storage tanks	Feet and inches
Flow	
Gas Volume	scfm
Gas Mass	lb/hr
Liquid Volume, Process flows	gpm
Liquid Volume, Utility flows	gpm
Liquid Mass	lb/hr
Steam	lb/hr

1. PROCESS DESIGN BASIS

1.1. Overall Project Objectives

Facility-Related

1. IGCC configuration nominally rated at 275 MWe, with the capability to fully load a F-Class gas turbine on at least one coal type
2. Maintain the capability to gasify a range of coal types from subbituminous to bituminous (High Vol Type A).

Emission-Related

3. Separate and capture at least 90% of the carbon in the sour syngas effluent from the gasifier on an instantaneous basis
4. Sequester at least 10^6 Metric Tons CO_2 per year in a deep saline geologic formation with the option for any CO_2 captured beyond 10^6 Metric Tons CO_2 per year to be sent to an alternative use that avoids its release to the atmosphere
5. Remove greater than 90% mercury contained in the coal fed to the gasifier
6. Emit, at the HRSG stack, an amount of nitrogen oxides equal to or less than 0.05 pounds of nitrogen dioxide per million BTU of coal gasified
7. Emit, at the HRSG stack, an amount of particulate matter equal to or less than 0.005 pounds of particulate matter per million BTU of coal gasified
8. Emit, at the HRSG stack, an amount of sulfur equal to or less than 1 % sulfur contained in the coal feed, or produce less than 15 ppmvd in the treated syngas fuel, whichever is greater.
9. Sulfur captured from the syngas shall be recovered as liquid elemental sulfur

1.2. Plant Feed Basis

1.2.1. Coal

Capacity:

Coal will be supplied in sufficient quantity to provide 1920 MMBTU/hr (LHV) of fuel to the combustion turbine for the base case coal (Illinois #6)

Approximate feed rate: 210,000-340,000 lb/hr

Exact feed rate: To be supplied by gasifier vendor

Coal analysis:

	Northern Appalachia Washed Pittsburgh Seam Product Ranges			Illinois Basin Washed Basis Seam III No.6 State of Illinois			Powder River Basin Raw Basis State of Wyoming		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Proximate Analysis, WT%									
As Received									
Total Moisture	6.8	5.8	7.8	14.2	12.5	16.4	27.3	26.3	30.0
Ash	7.62	6.39	8.76	9.5	7.6	11.5	4.5	4.0	6.0
Volatile Matter	35.85	33.86	37.88	34.7	32.1	37.2	32.1	20.0	34.1
Fixed Carbon	49.73	47.88	51.69	41.6	38.7	44.1	36.1	33.8	38.1
Sulfur	2.87	2.12	3.47	3.11	2.5	4.0	0.21	0.18	0.3
Lb. SO ₂ /MMBTU	n/r	n/r	n/r	5.75	4.8	7.2	0.48	0.4	0.8
Equilibrium Moisture	2.00	1.50	2.90	10.4	8.5	12.00	26.3	25.2	27.4
Dry Basis									
Ash	8.17	6.86	9.4	n/r	n/r	n/r	n/r	n/r	n/r
Volatile Matter	38.25	36.33	40.22	n/r	n/r	n/r	n/r	n/r	n/r
Fixed Carbon	53.58	51.80	55.44	n/r	n/r	n/r	n/r	n/r	n/r
Mercury Hg ppm	0.09	0.05	0.15	n/r	n/r	n/r	0.06	0.03	0.09

	Northern Appalachia Washed Pittsburgh Seam Product Ranges			Illinois Basin Washed Basis Seam III No.6 State of Illinois			Powder River Basin Raw Basis State of Wyoming		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Heating Value, Btu/lb									
As Received	12968	12804	13198	10800	10400	11100	8800	8550	9000
Dry	13914	13739	14160	n/r	n/r	n/r	n/r	n/r	n/r
MAFBTU	n/r	n/r	n/r	14158	n/r	n/r	12904	n/r	n/r
Ultimate Analysis (Dry), WT%									
Carbon, C	76.87	75.33	78.41	70.0	67.4	72.9	70.5	69.0	72.5
Hydrogen, H	5.10	4.85	5.35	4.9	4.3	5.6	4.8	4.2	5.4
Nitrogen, N	1.44	1.33	1.55	1.3	0.8	1.5	0.9	0.8	1.0
Chlorine, Cl	0.11	0.07	0.15	0.12	0.05	0.25	<0.01	<0.01	0.01
Sulfur, S	3.08	2.27	3.72	3.62	2.9	4.7	0.29	0.24	0.43
Ash	8.17	6.86	9.40	11.1	8.8	13.3	6.2	5.4	8.4
Oxygen, O	5.23	3.88	6.58	8.96	7.0	11.7	17.31	15.8	18.8
Sulfur Forms (Dry)									
Pyritic	n/r	n/r	n/r	1.12	0.53	1.79	0.01	<0.01	0.03
Sulfate	n/r	n/r	n/r	0.05	<0.01	0.10	<0.01	<0.01	0.01
Organic	n/r	n/r	n/r	2.45	1.80	3.20	0.28	0.21	0.41
Ash Fusion Temperatures									
Reducing, deg F									
Initial Deformation	2058	1988	2128	2020	1920	2180	2155	2070	2240
Softening, H=W	2152	2093	2216	2110	1980	2265	2160	2075	2245
Hemispherical, H=1/2 W	2251	2205	2297	2165	2030	2350	2170	2085	2255
Fluid	2349	2299	2394	2315	2170	2525	2175	2090	2260
Oxidizing, deg F									
Initial Deformation	2400	2294	2547	2325	2200	2450	2220	2135	2305
Softening, H=W	2452	2354	2611	2375	2250	2530	2225	2140	2310
Hemispherical, H=1/2W	2497	2410	2638	2420	2300	2565	2230	2145	2315

	Northern Appalachia Washed Pittsburgh Seam Product Ranges			Illinois Basin Washed Basis Seam III No.6 State of Illinois			Powder River Basin Raw Basis State of Wyoming		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Fluid	2538	2445	2657	2510	2370	2695	2240	2155	2325
Ash composition, WT%									
Silica, SiO ₂	43.58	38.86	49.56	49.6	43.2	55.4	32.7	28.2	38.5
Alumina, Al ₂ O ₃	22.36	20.20	26.10	19.3	16.4	22.2	16.7	14.2	19.4
Titania, TiO ₂	0.97	0.44	1.16	0.9	0.6	1.2	1.3	1.0	1.6
Ferric Oxide, Fe ₂ O ₃	18.59	10.61	24.70	16.3	13.2	22.1	5.6	4.6	6.5
Lime, CaO	5.11	3.71	7.54	5.2	2.6	7.2	24.7	19.0	28.7
Magnesia, MgO	1.00	0.82	1.30	1.0	0.6	1.3	5.8	4.5	6.8
Potassium Oxide, K ₂ O	1.33	1.00	1.66	2.1	1.5	2.5	0.3	0.2	0.5
Sodium Oxide, Na ₂ O	1.06	0.69	1.49	1.2	0.6	1.5	2.0	1.3	2.7
Phosphorous Pentoxide, P ₂ O ₅	0.39	0.14	0.77	0.2	0.1	0.3	1.2	0.8	1.6
Sulfur Trioxide, SO ₃	4.77	1.80	6.75	4.2	2.6	6.4	8.7	6.2	11.8
Strontium Oxide, SrO	n/r	n/r	n/r	<0.1	<0.1	0.1	0.3	0.2	0.4
Barium Oxide, BaO	n/r	n/r	n/r	<0.1	<0.1	0.1	0.7	0.5	0.9
Manganese Dioxide, MnO ₂	n/r	n/r	n/r	<0.1	<0.1	0.1	<0.1	<0.1	0.1
Hardgrove Grindability									
HGI (A)(B)	55	50	61	53	48	58	60	54	68
Free Swelling Index									
FSI	8	6	9	3.0	2.0	4.0	0.0	0.0	0.0
Calculated Values									
Slag Viscosity @ T250 deg F (C)	2417	2282	2625	2450	2290	2634	2175	<2150	2275
Silica Value (fraction)	0.64	0.56	0.76	0.688	0.62	0.75	0.475	0.415	0.566

	Northern Appalachia Washed Pittsburgh Seam Product Ranges			Illinois Basin Washed Basis Seam III No.6 State of Illinois			Powder River Basin Raw Basis State of Wyoming		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Base / Acid Ratio	0.41	0.23	0.52	0.37	0.27	0.50	0.76	0.55	0.93
Alkalis As Na ₂ O	n/r	n/r	n/r	0.29	0.16	0.39	0.14	0.09	0.18
Water Soluble Alkalis (Dry)									
Sodium Oxide	n/r	n/r	n/r	0.094	0.04	0.12	0.059	0.02	0.10
Potassium Oxide	n/r	n/r	n/r	0.005	<0.01	0.01	0.003	<0.01	0.01
Trace Elements (ppm, whole coal, dry basis)									
Arsenic - As	4.30	1.79	11.20	3.00	<1	9.00	<1	n/r	2.00
Antimony - Sb	0.21	0.06	0.44	<1	<1	2.00	<1	n/r	1.00
Barium - Ba	82.97	57.5	122.4	65.00	25.00	200.0	290.0	90.00	490.0
Beryllium - Be	0.57	0.20	1.05	1.20	0.20	2.00	<0.2	n/r	0.50
Boron - B	n/r	n/r	n/r	175	35.00	300.0	34	10.00	60.00
Bromine - Br	n/r	n/r	n/r	25.00	1	50.0	<20	n/r	<20
Cadmium - Cd	0.07	0.02	0.20	0.50	<0.1	2.20	<0.2	n/r	0.20
Chlorine - Cl	n/r	n/r	n/r	1000	400	2500	<50	n/r	<50
Chromium - Cr	13.15	8.52	23.20	28	10.00	50.00	4	2	6.00
Cobalt - Co	2.37	1.80	4.40	3	1	5.00	2	<1	5.00
Copper - Cu	7.34	4.78	11.30	10	5	20.00	10	4	16.00
Fluorine - F	79.06	36.00	207.0	130	30.00	500.0	65	35.00	95.00
Lead - Pb	3.15	1.80	4.90	6	1.00	15.00	3	<1	6.00
Lithium - Li	8.82	6.10	11.48	8	4.00	18.00	3	1.00	6.00
Manganese - Mn	16.57	10.70	27.34	40	15.00	80.00	11	5.00	40.00
Mercury - Hg	0.09	0.05	0.15	0.07	0.04	0.14	0.06	0.03	0.09
Molybdenum - Mo	1.13	0.72	5.00	7.00	2.00	17.00	<2	n/r	4.00
Nickel - Ni	7.52	2.00	16.90	16	5.00	44.00	3	<1	6.00
Selenium - Se	1.30	0.71	2.13	3	1.00	9.00	<1	n/r	2.00
Silver - Ag	n/r	n/r	n/r	<0.2	<0.2	0.60	<0.2	n/r	0.20
Strontium - Sr	n/r	n/r	n/r	29	10.00	60.00	173	100.0	260.0
Thallium - Tl	0.18	0.01	0.31	<1	<1	1.00	<1	n/r	<1
Tin - Sn	0.57	0.31	1.31	<1	<1	1.00	<1	n/r	<1
Thorium - Th	1.40	1.10	1.84	n/r	n/r	n/r	n/r	n/r	n/r

	Northern Appalachia Washed Pittsburgh Seam Product Ranges			Illinois Basin Washed Basis Seam III No.6 State of Illinois			Powder River Basin Raw Basis State of Wyoming		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Uranium - U	0.47	0.32	0.74	n/r	n/r	n/r	n/r	n/r	n/r
Vanadium - V	15.17	9.29	28.37	35	15.00	100.0	13	2.00	23.00
Zinc - Zn	9.05	4.00	16.80	75	10.00	250.0	6	1.00	20.00
Zirconium - Zr	n/r	n/r	n/r	18	12.00	43.00	9	5.00	13.00

Notes: A. For Powder River Basin Coal HGI is reported at 26.6% moisture.

B. For Illinois #6 Coal HGI is reported at 28.5% moisture.

C. Watt - Faraday Method

D. n/r – not reported

1.2.2. Acid Gas (returned from side stream process)

Rate: TBD

Composition: TBD

Conditions: TBD

1.3. Operational Design

1.3.1. Train Arrangement

Gasifier Single Train

Gas clean-up Single Train

ASU Single Train

CO₂ Compression TBD

CTG/STG System: 1 on 1

1.3.2. Fuel Flexibility

Facility will be designed to handle each of the three listed coal types. The respective feed rates will be adjusted to Gasifier limitations when processing the PRB and Northern Appalachian coals.

1.3.3. Capacity

Power (CTG+STG) 275 MWe nominal capacity

1.3.4. Composition

Equipment will be designed to handle impurities based on the mean composition of the design base coal.

1.3.5. Turndown

Unit turndowns are based on the levels required to get 60% of plant power output with any feed.

Gasifier	60%
Sour sift/gas cooling	60%
AGRU	60%
SRU/TGTU	TBD
ASU	60%
CO ₂ Compression	60%
CTG/STG System:	60%

1.3.6. Design Life

Project life:	5 years at full operation
Equipment design life	25 years

1.3.7. Availability

TBD (Two 28 day outages per year are expected)
Must be consistent with CO₂ sequestration of 1,000,000 te/year

1.3.8. Research and Development Philosophy

Accommodate side stream R & D (TBD)
Consider future installation of emerging technologies (TBD)

1.4. Product Specifications

1.4.1. Power

Delivery Voltage:	345 kV (to be confirmed)
Capacity:	The facility will be sized to provide 1920 MMBTU/hr (LHV) of fuel to the combustion turbine for the base case coal (Illinois #6)

1.4.2. Hydrogen

Possible high purity hydrogen co-production: TBD. Hydrogen product will increase syngas production commensurately
Product Purity: As produced from AGRU

Product Rate: TBD
 Product Conditions: As produced from AGRU

1.4.3. Syngas production (for side stream process)

Product composition: As produced from gasifier
 Product Rate: TBD
 Product Conditions: TBD

1.4.4. Carbon Dioxide

CO₂ Delivery Conditions:
 Pressure 2200 psig at Plant limits
 Temperature 100 °F normal
 95 °F min
 130 °F max
 Purity > 95 mol% CO₂
 Moisture <100 ppmv
 Nitrogen <0.5 mol%
 H₂S <100 ppmv
 CO₂ Recovery:
 Specification > 90% Removed on an instantaneous basis
 Basis Carbon to CO₂ pipeline/carbon in gasified coal
 CO₂ Sequestration:
 Minimum rate: 1,000,000 te/year
 Peak send-out rate Maximum instantaneous CO₂ capture (approximately 7000 TPD)

1.4.5. Sulfur

Sulfur purity > 99.9 wt%
 Sulfur Recovery:
 Specification > 99% Removed **or**
 <15 ppmvd in the treated, syngas fuel whichever is greater
 Basis recovery: 1-(sulfur in fuel gas to the CTG /sulfur in coal feed)
 syngas content: Syngas CTG feed excluding water and diluent
 Sulfur State Liquid

1.5. Catalyst

Catalyst	Initial Charge	Expected life
Shift Catalyst	TBD	TBD
Mercury Removal Catalyst:	TBD	TBD
SRU Catalyst, Bed 1	TBD	TBD
SRU Catalyst, Bed 2, 3	TBD	TBD
TGCU Catalyst	TBD	TBD
Flue Gas Catalyst (SCR)	TBD	TBD
Ion Exchange Catalyst	TBD	TBD

1.6. Chemicals

Chemical	Initial Charge	Consumption Rate
Water Treatment Chemicals	TBD	TBD
Solvent for AGRU	TBD	TBD
BFW/Steam System Chemicals	TBD	TBD
Flue Gas Treatment Chemicals (for SCR)	TBD	TBD

1.7. Waste Streams**1.7.1. Air emissions**

Flue gas and vents to atmosphere: See Environmental Targets

1.7.2. Liquid wastes

No liquid waste. Residual wastewater including process runoff and other waste streams will be treated in a Zero Liquid Discharge (ZLD) facility

1.7.3. Solid Wastes

Slag:

Specification: TBD

Rate: TBD

ZLD facility solids:

Specification: TBD

Rate: TBD

1.8. Sparing Philosophy

1.8.1. General Equipment Sparring

Sparing philosophy and driver selection shall be as follows:

Equipment Sparing Philosophy

Prime Movers (Gas and Steam Turbine Generators)	None
Heat Recovery Steam Generators	None
Step Up and auxiliary transformers	None
Boiler Feed Pumps	2x100%
Condensate Pumps	2x100%
Closed Cooling Water Pumps	2x100%
Circulating Water Pumps	2x50%
Miscellaneous other pumps	2x100%

1.8.2. Slurry Feed Gasifier

Gasifier	1 x 100%
Fuel feed coal/water slurry feed (up to 65% solids)	TBD by vendor
Slurry preparation mill (includes slag recycling if applicable)	TBD by vendor
Syngas scrubbing tray (counter-flow)	1 x 100%
Syngas cooling full quench section at the outlet	1 x 100%

1.8.3. Dry Feed Gasifier

Gasifier	1 x 100%
Fuel feed dry coal, inert gas pressurized injection	2 x 60%
Fuel preparation milling and drying	2 x 60%
Syngas wet scrubbing tray (counter-flow)	1 x 100%
Dry solids removal cyclone, filter	1 x 100%

1.8.4. Gas Treating and Power Generation

Air Separation Unit (ASU).	1 x 100%
Water-gas shift fixed bed catalyst	1 x 100%
Mercury removal sulfur Impregnated carbon bed	1 x 100%
Acid Gas Removal Unit (AGRU)	1 x 100%
Sulfur Recovery Unit (SRU)	1 x 100%
Syngas reheat & sweet gas expander (if applicable)	1 x 100%
Flare system	1 x 100%
Tail Gas Clean-up Unit (TGCU)	1 x 100%
Combustion Turbine Generator (CTG)	1 x 100%
Heat Recovery Steam Generator (HRSG)	1 x 100%
Steam Turbine Generator (STG)	1 x 100%

1.9. Process Equipment Design Margins**1.9.1. Heat Exchangers**

The following design margins shall be applied unless specific process requirements demand different values

Exchangers are designed with 10% excess surface

1.9.2. Process Pump

Design at 10% above the maximum expected operating flow rates with dynamic head determined at this rate.

1.9.3. Packed Towers

Max Pressure drop ½" of water per foot of packing

1.9.4. Trayed Towers

Max 80% FRI flooding factor

Minimum 2 ft tray spacing

1.10. Environmental Targets**1.10.1. Air emissions**

Basis	Combustion turbine/HRSG stack to atmosphere
NO _x	<0.05 lb NO ₂ / MMBTU of coal gasified
Particulate matter (PM)	<0.005 lb PM/ MMBTU of coal gasified
Mercury	<0.020 lb Hg/GW-h (0.611 lb /10 ¹² Btu)
SO ₂	<0.032 lb S/ MMBTU of coal gasified
Ammonia	TBD

Mercury removal > 90% (as per section 3.4)

Sulfur removal > 99% (as per section 2.4.5)

1.10.2. Plant Liquid Effluent

Facility Liquid Discharge Rate Zero discharge

1.10.3. Noise Abatement

Internal to the Plant all OSHA standards will be followed

Noise Impact on Surroundings:

TBD - Project shall meet all state and local noise criteria pertaining to the project site.

2. KEY SYSTEM DESIGN FACTORS

2.1. ASU

Type:	Cryogenic Air Separation Unit
Features:	ASU will also supply nitrogen rich purge gas, instrument/plant air and diluent for hydrogen rich gas turbine fuel. Nitrogen rich gas may also be supplied for coal transport and/or drying.
Specifications:	
Oxygen:	
Pressure	Gasifier technology supplier to advise
Temperature	80 °F Minimum
Oxygen	95 mole %
mol% Ar	TBD
mol% N ₂	TBD
Rate	TBD
Nitrogen:	
Pressure	TBD
Temperature	TBD
mol% Ar	3.8 mole % (Typical)
mol% N ₂	1.2 mole % (Typical)
Rate	TBD
Compressor Driver Type	TBD
Storage (liquid):	
Oxygen:	
Storage capacity	TBD
Liquid rate to storage	TBD
Vaporization rate	TBD
Nitrogen:	
Storage capacity	TBD
Liquid rate to storage	TBD
Vaporization rate	TBD

2.2. Gasifier

Type:	As determined by technology evaluation
Features:	Must meet process requirement and fuel flexibility requirements
Performance	> 98% carbon conversion

Storage	(TBD) hours on slurry buffer capacity (if applicable)
Slag/Ash silo capacity	72 hours of full operation (to be confirmed)

2.3. Shift Reactor System

Type	Multistage sour water gas shift reactors with heat recovery
Features	Integrated heat recovery
Performance	Minimum 98% conversion of CO (to be confirmed)
Actual conversion of CO	TBD

2.4. Mercury Removal

Type	TBD
Performance	> 90% mercury removal
Basis	1-(mercury rejected to air/mercury in coal)

2.5. AGRU

Type	An integrated AGRU with high reliability and efficiency is desired
Features	Must remove both CO ₂ and H ₂ S to meet sequestration, carbon capture and sulfur recovery requirements

Minimum performance requirements are:

Sulfur removal efficiency to support specification (section 2.4.4)

Product hydrogen from AGRU contains <15 ppmv of sulfur

Product hydrogen from AGRU contains <TBD ppmv of arsenic

CO₂ recovery to support specification (section 2.4.3)

CO₂ purity to support specification (section 2.4.3)

Storage:

Solvent storage	TBD (based on system inventory and losses)
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2.6. SRU

Type	Claus type unit
Sulfur recovery	TBD (based on once through)

2.7. TGPU

(need for this unit to be confirmed during Concept Design as function of return destination)

Type	SO ₂ reduction unit
Reduction method	TBD, catalytic
Performance	Nominal total conversion of SO ₂

2.8. Steam System

Type	HP Gasifier Syngas cooler (if provided), Heat Recovery HP Steam Generator (HRSG) Horizontal gas flow, drum-type, multi-pressure design with deaerator and process integrated heat recovery (to be confirmed)
Features	For steam levels see Section 5.

2.9. Coal Storage and Handling

Receipt Method	Rail/overland conveyor. Handling includes storage, conveying, drying, grinding and feeding TBD based on site selection and gasifier technology.
Unloading	TBD, approximately 150 rail cars with 100 tons/car
Drying	TBD by gasifier technology
Grinding	TBD by gasifier technology
Storage	1 x 30 day storage piles
Blending	TBD

2.10. Power Island

Type	Steam Turbine Generator (STG)/Combustion Turbine Generator (CTG)
Reheat	TBD
Condenser type	TBD
Features	Combustion Turbine Generator (F class) modified for hydrogen rich fuel gas service. Natural gas or alternate fuel start up
Performance	TBD

2.11. Water Treatment

Performance:	Feed water to meet process requirement. Waste water to meet zero liquid discharge (ZLD)
Storage:	
Waste water	24 hours feed to ZLD unit.
For utility water storage requirements see Section 5.	

3. SITE SPECIFIC DATA

The following data is specific site. All data shown are assumptions for design development only.

3.1. Climatic Data

Average Barometric Pressure 29.38 in Hg

Relative Humidity 72 %

Temperature

Minimum design temperature -22°F

Maximum design temperature 112°F

Summer maximum design temperature (dry bulb) 88 °F

Summer maximum design temperature (wet bulb) 75°F

Wind

Direction of prevailing wind (summer) SSW – 8.01 mph

Direction of prevailing wind (winter) S – 11.2 mph

Maximum recorded velocity (sustained) 61 mph (2 minutes)

Maximum recorded velocity (gusts) 74 mph (5 seconds)

Structural designs shall be based on mph

Hurricane considerations are not required.

Rainfall

Maximum recorded in one hour in

Maximum recorded in 12 hours in

Maximum recorded in 24 hours 6.12 in

Maximum recorded in 24 hours (25 year frequency) 4.5 in

Snow

Maximum snow depth 16 in

Design snow loading factor psf

3.2. Seismic Design Parameters:

Based on IBC 2006 and ASCE7-05, Site Class B

3.3. Site Plan

Site coordinates TBD

Natural drainage from site TBD.

Principal access to site by public road TBD

Nearest railroad siding approximately 600ft.

Clearances to be provided to meet safety requirements, etc., at each boundary of the plot for:

	N	S	E	W
Fired Heaters	_____	_____	_____	_____
Storage Tanks (flammable)	_____	_____	_____	_____
Process Equipment	_____	_____	_____	_____
Buildings (non-hazardous)	_____	_____	_____	_____

Insurance or safety requirement affecting equipment spacing
TBD

Noise limits

Refer to Section 1.10.3

3.4. Site Elevation

Site is approximately 679 to 718 ft above sea level.

Plant elevations are established with reference to (bench mark) (_____) which is at elevation _____ft and is located

Elevations of new unit with reference to above are:

Low point existing grade: _____
 High point existing grade: _____
 High point finished grade: _____
 Low point finished grade: _____

Base line will be at high point of finished paving = elevation 100'-0".

The site (is) (is not) subject to possible flood condition; the maximum 100 year flood level is elevated _____ft and flood design (is) (is not) required.

Finished top of foundations and high point of floors will be at elevation (xx'-0") or (_____).

3.5. Soil Information (Hold)

4. UTILITY INFORMATION

Initial data is for concept development only and not site specific. Data must be updated upon site selection

4.1. Steam (to be confirmed)

	HP Steam	MP Steam	IP1 Steam	IP2 Steam	LP Steam
At plant header					
Normal pressure, psig	1800	635	450	150	50
Saturated temperature, °F	622	495	459	366	298
Minimum pressure, psig					
Superheated temperature, °F	1000	550(1)	TBD	TBD	TBD
Design Pressure, psig	2200	715	500	175	75
Design Temperature, °F	TBD	650	TBD	TBD	TBD

Note 1. Superheat determined by process requirement

4.2. Steam Condensate

Steam condensate return systems shall be provided if feasible

Deaerator pressure TBD

Disposition of recovered condensate from:

Turbine Condensers:	Heated and returned to deaerator
Process Heaters:	Returned to next lowest level
Building Heaters:	Returned to deaerator
Tank Heaters:	Returned to deaerator
Steam Separators:	Returned to appropriate level

4.3. Water

	Potable Water	Raw Water	Cooling Water	Fire Water	Demin. Water
Source		B/L	Cooling Tower	Site Storage	Plant unit
Return to		NA	CT Basin	NA	NA
Design Pressure, psig			75		
Design Temperature, °F			200		
Supply Press. at grade, psig			30		
Return Pressure at grade, psig			20		
Supply Temp, °F for design		60	85		
Return Temp, °F for design			125		
Quantity Available for this project, lb/hr					
Storage required (times and basis to be confirmed)	4 hours	8 hours	4 hours based on makeup	8 hours based on max fire case	12 hours minimum
pH		7.64			
Conductivity (µmhos/cm)		510			<0.1
Analysis		mg/l			ppb

	Potable Water	Raw Water	Cooling Water	Fire Water	Demin. Water
Total Hardness as CaCO ₃					
Calcium as Ca ⁺⁺		46			
Magnesium as Mg ⁺⁺		12			
Total Alkalinity as CaCO ₃					
Sulfate as SO ₄		29			<3
Chloride as Cl ⁻		50			<3
Nitrates as NO ₃		12			
Silica as SiO ₂		3.3			<10
Bicarbonate as HCO ₃		92			
Potassium as K		8.8			
Sodium as Na		33			<5
Iron as Fe		0.16			
Manganese as Mn		0.018			
Phosphate as PO ₄		12			
Oxygen as O ₂					8000
Carbon Dioxide					
Total Organic Carbon		5.3			<300
Total Dissolved Solids		320			
Total Suspended Solids		7			

4.4. Natural Gas

	Fuel Gas
Normal pressure, psig	400
Maximum pressure, psig	450
Minimum pressure, psig	250
Design Pressure, psig	500
Design Temperature, °F	200
Gross (HHV) heating value,	1038 Btu/SCF
Net (LHV) heating value,	936 Btu/SCF
Specific gravity, (relative density with respect to air)	0.59
Normal temperature, °F	100
Total sulfur content, gr/100 scf(1)	4
H ₂ S content, gr/100 scf(1)	0.25
Maximum available, SCFH	TBD
Analysis, Volume %	
Nitrogen	1.01
Carbon Dioxide	0.6
Methane	94.35
Ethane	2.64
Ethylene	0
Propane	0.96
Propylene	0
Isobutane	0.24
Normal Butane	0.2
Note (1) grains/100 standard cubic feet (7000 grains =1 pound)	

4.5. Compressed Gases

	Plant Air	Instrument Air	Utility Nitrogen
Operating Pressure, psig	100	100	100
Operating Temperature, °F	100	100	60
Max. Oper. Pressure, psig			
Min. Oper. Pressure, psig	70	60	70
Design Pressure, psig	150	150	150
Design Temperature, °F	150	150	150
Capacity, SCFH			
Source	ASU	ASU with Compressor backup	ASU

Backup instrument air system must include air dryer. Instrument air dew point is -40 °F.
Maximum oxygen content of the nitrogen is 0.5 mol% dry basis.

4.6. Electric Power

Electric power is generated internally for normal operation

Start-up power is available from the grid

Voltage: 345 kV (to be confirmed)

Import Capacity: TBD MW

5. ECONOMICS

Minimum rate of return for net present value calculations: TBD%

Availability at 100% capacity for economic evaluation: 80%.

Taxes shall not be included. Economic evaluations shall use the following pricing:

Commodity	Price in \$
HP Steam, \$/1000 lb	12.98/9.50 (1,5)
MP Steam, \$/1000 lb	10.00 / 9.10 (1,5)
IP1 Steam, \$/1000 lb	NA/8.88(1,5)
IP2 Steam, \$/1000 lb	NA/6,42(1,5)
LP Steam, \$/1000 lb	NA/3,85(1,5)
Condensate, \$/1000 lb	1.20
Boiler Feed Water, \$/1000 lb	4.60(HP)/TBD (LP) (2)
Plant Water, \$/1000 lb	0.20
Raw Water, \$/1000 lb	0.14
Cooling Water, \$/1000 lb	0.012
Fuel Gas, \$/MMBTU	8.00
Diesel Fuel, \$/MMBTU	11.00
Plant Air	
LP Nitrogen	
Diluent Nitrogen	5.99 (5)
Diluent H ₂ O vapor	10.35 (5)
Inert Gas	
Coal	
WGS catalyst	
AGRU solvent	
Products	
Electric Power, \$/kWh	0.074 (4)

Commodity	Price in \$
Sulfur	
CO ₂	

Basis Notes:

- (1) All steam levels (Superheated/saturated) include cost of condensate (deduct if returned)
- (2) HP BFW includes power and heat to 627 F and 2000 psig
- (3) Steam/Condensate values include capital cost components
- (4) The value of power is for the nth commercial plant
- (5) The values of steam and diluents are based on incremental power that can generated at power island interface conditions (section 5.1) as determined by Gate Cycle runs.
- (6) On a circulating water basis

6. SPECIFICATIONS, ENGINEERING STANDARDS & DESIGN REQUIREMENTS

ASME Boiler & Pressure Vessel Codes
 ANSI Codes for Pressure Piping (B31.3 and 31.8)
 ASTM Standards
 ACI Standards
 AISC Specifications
 TEMA Standards
 IEEE, NEMA & ANSI Standards for Electrical Equipment
 ISA Recommended Practices
 API Standards, Specifications, and Recommended Practices
 NFPA National Fire Codes
 OIA Oil Insurance Association – General Recommendations for Spacing

Specific Codes and Standards used

	Title	Edition
Mechanical		
API 617	Axial and Centrifugal Compressors	7 th Edition 2000
API 613	Special Purpose Gear Units	5 th Edition 2003
API 614	Lubrication, Shaft Sealing and Control Oil Systems	4 th Edition 1999
API 670	Machinery Protection Systems	4 th Edition 2000/2003
API 671	Special Purpose Couplings	3 rd Edition 1998
ASME PTC 10	Type One Performance Test	1997
API 610	Centrifugal Pumps	10 th Edition 2004
API 560	Fired Heaters	4 th Edition 2007
API 682	Shaft Sealing Systems for Centrifugal and Rotary Pumps	3 rd Edition 2004
ASME Sec VIII	Div 1 & 2 Pressure Vessels	2004 Edition
API 650	Welded Steel Tanks for Oil Storage	11 th Edition 2007

	Title	Edition
API 620	Design and construction of Large, Welded, Low Pressure Storage Tanks	10 th Edition 2002
API 660	Shell & Tube Heat Exchangers	7 th Edition 2003
API 661	Air Cooled Heat Exchangers	6 th Edition 2006
API 686	Machinery Installation	April 1996
IBC	International Building Code	2006 Edition
IFC	International Fire Code	2006 Edition
NFPA 10	Standard for Portable Fire Extinguishers	2007 Edition
NFPA 12	Standard on Carbon Dioxide Extinguishing Systems	2005 Edition
NFPA 13	Standard for the Installation of Sprinkler Systems	2007 Edition
NFPA 14	Standard for the Installation of Standpipe and Hose Systems	2007 Edition
NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection	2007 Edition
NFPA 18	Standard on Wetting Agents	2006 Edition
NFPA 20	Standard for the Installation of Stationary Pumps for Fire Protection	2007 Edition
NFPA 22	Standard for Water Tanks for Private Fire Protection	2003 Edition
NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances	2007 Edition
NFPA 30	Flammable and Combustible Liquids Code	2003 Edition
NFPA 37	Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines	2006 Edition
NFPA 54	National Fuel Gas Code	2006 Edition
NFPA 55	Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary	2005 Edition

	Title	Edition
	Containers, Cylinders, and Tanks	
NFPA 68	Guide for Venting of Deflagrations	2007 Edition
NFPA 69	Standard on Explosion Prevention Systems	2007 Edition
NFPA 70	National Electrical Code	2005 Edition
NFPA 70E	Standard for Electrical Safety in the Workplace	2004 Edition
NFPA 72	National Fire Alarm Code	2007 Edition
NFPA 75	Standard for the Protection of Information Technology Equipment	2003 Edition
NFPA 80	Standard for Fire Doors and Other Opening Protectives	2007 Edition
NFPA 85	Boiler and Combustion Systems Hazards Code	2004 Edition
NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems	2002 Edition
NFPA 110	Standard for Emergency and Standby Power Systems	2005 Edition
NFPA 111	Standard on Stored Electrical Energy Emergency and Standby Power Systems	2005 Edition
NFPA 170	Standard for Fire Safety and Emergency Symbols	2006 Edition
NFPA 214	Standard on Water-Cooling Towers	2005 Edition
NFPA 220	Standard on Types of Building Construction (Not applicable where IBC is required)	2006 Edition
NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical	2004 Edition

	Title	Edition
	Process Areas	
NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment	2003 Edition
NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas	2004 Edition
NFPA 654	Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids	2006 Edition
NFPA 655	Standard for Prevention of Sulfur Fires and Explosions	2007 Edition
NFPA 750	Standard on Water Mist Fire Protection Systems	2006 Edition
NFPA 850	Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations	2005 Edition
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems	2004 Edition
Instrumentation and Controls		
IEC 60751	Industrial Platinum Resistance Thermometer Sensors	
IEC 61000-4-2,3, &4	Electromagnetic Compatibility (EMC)	
IEC 61499-1 & 2	Function Blocks for Industrial Process Measurement and Control Systems	
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems	
IEC 61529	Degree of Protection Provided	

	Title	Edition
	By Enclosures (IP Codes)	
IEC 61158-2	Foundation Fieldbus Standard for Use in Industrial Control Systems - Physical Layer Specification and Service Definition	
IEC 61131-3	PLC Programming Languages	
ANSI C37.90	Relays and Relay Systems Associated with Electric Power Apparatus	
ANSI C37.90a	Guide for Surge Withstand Capability (SWC) Tests	
API 554	Process Instrumentation and Control	
IEEE 383	IEEE Standard for Type Test for Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations (Section 2.5, Flame Test, only)	
IEEE 1588	Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems	
ICEA S-61-402	Flame Resisting Test (Section 6.5)	
ICEA S-87-640	Fiber Optic Outside Plant Communications Cable	
ISA 5.1	Instrumentation Symbols and Identification	
ISA 5.2	Binary Logic Diagrams for Process Operations	
ISA 5.4	Instrument Loop Diagrams	
ISA 5.5	Graphic Symbols for Process Diagrams	
ISA RP12.4	Pressurized Enclosure	
ISA 50.02	Fieldbus Standard for Use in Industrial Control Systems	