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OAK RIDGE Y-12 PLANT

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FISCAL YEAR 1995 WELL INSTALLATION PROGRAM SUMMARY Y-12 PLANT, OAK RIDGE, TENNESSEE

September 1995

ENVIRONMENTAL MANAGEMENT DEPARTMENT
HEALTH, SAFETY, ENVIRONMENT, AND
ACCOUNTABILITY ORGANIZATION

Prepared by

Science Applications International Corporation
P.O. Box 2502, 800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830

Under Purchase Order 91B-99069C-Y24

for the

Oak Ridge Y-12 Plant
Oak Ridge, Tennessee

MASTER

Managed by

Lockheed Martin Energy Systems, Inc.
for the
U.S. Department of Energy

Under Contract Number DE-AC05-84OR21400

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ACRONYMS

BGS	below ground surface
Energy Systems	Lockheed Martin Energy Systems, Inc.
ESP	Environmental Surveillance Procedure
FY	fiscal year
GWPP	Groundwater Protection Program
HSEA	Health, Safety, Environment, and Accountability Organization
ID	inside diameter
OD	outside diameter
ORR	Oak Ridge Reservation
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
SAIC	Science Applications International Corporation
TD	total depth
TOFR	top of fresh rock
TOWR	top of weathered rock
UEFPC	Upper East Fork Poplar Creek

EXECUTIVE SUMMARY

This report summarizes the well installation activities conducted during the federal fiscal year (FY) 1995 drilling program at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee (including activities that were performed in late FY 1994, but not included in the FY 1994 Well Installation Program Summary Report). Synopses of monitoring well construction/well development data, well location rationale, geological/hydrological observations, quality assurance/quality control methods, and health and safety monitoring are included.

Three groundwater monitoring wells and two gas monitoring probes were installed during the FY 1995 drilling program. One of the groundwater monitoring wells was installed at Landfill VI, the other two in the Boneyard/Burnyard area. All of the groundwater monitoring wells were constructed with stainless steel screens and casings. The two gas monitoring probes were installed at the Centralized Sanitary Landfill II and were of polyvinyl chloride (PVC) screened construction.

Eleven well rehabilitation/redevelopment efforts were undertaken during FY 1995 at the Y-12 Plant.

All new monitoring wells and wells targeted for redevelopment were developed by either a 2.0-in. diameter swab rig or by hand bailing until nonspecific parameters (pH and specific conductance) attained steady-state levels. Turbidity levels were lowered, if required, to the extent practicable by continued development beyond a steady-state level of pH and conductance.

All well installation was conducted following industry-standard methods and approved procedures in the *Environmental Surveillance Procedures Quality Control Program* (Energy Systems 1988), the *Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document* (EPA 1986), and *Guidelines for Installation of Monitoring Wells at the Y-12 Plant* (Geraghty & Miller 1985).

Health and safety monitoring and field screening of drilling returns and development waters were conducted in accordance with approved Lockheed Martin Energy Systems, Inc. guidelines.

1. INTRODUCTION

In January 1995, Science Applications International Corporation (SAIC) was authorized by Lockheed Martin Energy Systems, Inc. (Energy Systems) to provide hydrogeologic oversight for the Oak Ridge Y-12 Plant Groundwater Protection Program (GWPP) during the installation and rehabilitation of groundwater monitoring wells (the period of performance was originally slated to be from January 16, 1995 through September 30, 1995; this report will include work done as report early as August 1994). As part of this effort, SAIC supervised drilling activities, directed monitoring well construction, and provided well-site health and safety monitoring. The federal fiscal year (FY) 1995 drilling program included the installation and development of three groundwater monitoring wells, the installation of two gas monitoring probes, and the redevelopment of eleven existing groundwater wells (Appendix I).

This report presents a summary of the activities and observations that took place during the FY 1995 drilling program. The report is organized in the following manner:

- general introduction and FY 1995 drilling program summary (Chap. 1);
- general geologic and hydrologic settings of the Y-12 Plant and vicinity, including field observations (Chap. 2);
- discussion of well installations during the FY 1995 drilling program, well construction methods, and waste management practices (Chap. 3) (a Waste Management Plan for Drilling Activities is included in Appendix E); and
- quality assurance/quality control (QA/QC) and health and safety protocols used during the FY 1995 drilling program (Chaps. 4 and 5).

Copies of the well installation Activity/Progress Reports, Lithologic Logs, Well Construction Diagrams, Well Development Data, Waste Management Screening Data, Equipment Decontamination Records, and Well Rehabilitation/Redevelopment Reports are included in Appendixes A, B, C, D, F, G, and H, respectively.

1.1 FISCAL YEAR 1995 WELL INSTALLATION PROGRAM SUMMARY

The FY 1995 drilling program included the installation of three groundwater monitoring wells and the installation of two gas monitoring probes. One of the monitoring wells (GW-827) was installed at Landfill VI to replace a well (GW-545) with insufficient recharge. The other two wells (GW-828 and GW-829) were installed in the Boneyard/Burnyard Area to further define a nitrate plume migrating from the S3 Ponds area.

Well GW-827 was installed in a borehole drilled to a total depth (TD) of 135.0 ft below ground surface (BGS). The top of fresh rock (TOFR) was located at 40.5 ft BGS (no weathered rock was observed at this location). The well monitors a groundwater producing cavity from 127.6 ft to 128.0 ft BGS.

Well GW-828 was ultimately installed in a borehole with a TD of 168.0 ft. The top of weathered rock (TOWR) and TOFR were at 7.5 ft and 38.7 ft BGS, respectively. The well monitors an apparent diffuse groundwater zone between 153.5 ft and 164.0 ft BGS.

Well GW-829 was installed in a borehole that was 115.0 ft deep. The TOWR and TOFR in this well were located at 1.3 ft and 29.0 ft BGS, respectively, with an additional interval of weathered rock located between 34.0 ft and 39.5 ft BGS. The well monitors a diffuse groundwater flow interval from 103.0 ft to 115.0 ft BGS.

The two gas monitoring probes (GW-825 and GW-826) were installed at the Centralized Sanitary Landfill II to monitor methane emissions from the landfill. Both probes, installed on the flanks of the landfill, were placed in 36.0-ft deep boreholes. Neither borehole encountered bedrock, nor did either bore encounter groundwater.

Table 1.1 presents a list of the wells (and probes) installed during the FY 1995 drilling program, and includes location coordinates.

Table 1.1. FY 1995 monitoring wells and functional areas

Well	Functional area	Northing coordinate ^a	Easting coordinate ^a
GW-825	Sanitary Landfill II	26852	52348
GW-826	Sanitary Landfill II	26272	52775
GW-827	Landfill VI ^b	27721	51826
GW-828	Boneyard/Burnyard	30060	49995
GW-829	Boneyard/Burnyard	29953	50036

^aY-12 Plant Grid System

^bConstruction/demolition landfill

2. GENERAL GEOLOGY AND HYDROLOGY

The Y-12 Plant is located in Bear Creek Valley on the U.S. Department of Energy Oak Ridge Reservation (ORR) in the southwestern corner of Anderson County. The ORR, occupying an area of approximately 55 square miles, lies in a portion of the Tennessee section of the Valley and Ridge Physiographic Province (McMaster 1963). This province is characterized by narrow, elongated ridges and valleys trending northeast-southwest. Resistant sandstone, siltstone, and siliceous limestone and dolostone typically form the ridges; valleys are commonly underlain by less resistant shale and soluble carbonates (Rodgers 1953). Bear Creek Valley is bounded by Pine Ridge to the north and Chestnut Ridge to the south (Fig. 2.1). Elevations within the ORR range from approximately 900 ft to just over 1200 ft above mean sea level.

2.1 STRATIGRAPHY

Three major stratigraphic units, classified according to lithology, fossils, and age, underlie the Bear Creek Valley area. From oldest to youngest, these units are the Rome Formation, Conasauga Group, and Knox Group. Figures 2.1 and 2.2 are a generalized geologic cross section and map, respectively, that illustrate the locations and stratigraphic positions of the major stratigraphic groups and formations that occur in the Bear Creek Valley area.

The Rome Formation, which forms Pine Ridge, is Lower Cambrian in age and consists of interbedded sandstone, shale, and siltstone with local beds of dolostone (McMaster 1963).

The Conasauga Group, of the Middle to Upper Cambrian period, has been subdivided into six formations of alternating, predominantly shale and limestone lithologies. The six divisions, from oldest to youngest, are Pumpkin Valley Shale, Rutledge Limestone, Rogersville Shale, Maryville Limestone, Nolichucky Shale, and Maynardville Limestone. Detailed lithologic descriptions of these formations are given in King and Haase (1987). The Conasauga Group formations are overlain by unconsolidated deposits of fill, alluvium, colluvium, and in situ weathered bedrock (residuum) from ground surface to 30 ft. BGS.

Chestnut Ridge, to the south of Bear Creek Valley, is formed from siliceous dolostones of the Knox Group. This upper Cambrian to lower Ordovician-aged unit is divided into five formations that are, from oldest to youngest, the Copper Ridge Dolomite, Chepultepec Dolomite, Longview Dolomite, Kingsport Formation, and Mascot Dolomite. Detailed lithologic descriptions of the Knox Group formations are published in Milici (1973). Unconsolidated deposits overlying the Knox Group on Chestnut Ridge, in the vicinity of the Y-12 Plant, are considerably thicker than the unconsolidated deposits in the adjacent valleys.

Figure 2.3 is a generalized stratigraphic column of the major stratigraphic units and accepted subdivisions of the Y-12 Plant area bedrock formations.

The formations located in and around Bear Creek Valley generally strike N47°E to N67°E. Regional dips are from 30° to 50° to the southeast (King and Haase 1987). Joints are reported to be common features in the strata of Bear Creek Valley. Orientation and spacing in Bear Creek Valley are quite variable. However, three sets of fractures: (1) parallel to lithologic bedding planes and strike, (2) perpendicular to bedding planes and parallel to strike, and (3) perpendicular to lithologic bedding planes and strike have been observed to dominate (Dreier et al. 1987). Small-scale folds, produced from thrust faulting, are common in the Bear Creek Valley formations and contribute to the varied bedding orientations in the area (Rothschild et al. 1984).

Fig. 2.1. Generalized geologic cross-section through the Y-12 Plant area.

Fig. 2.2. Generalized geologic map of the Y-12 Plant area.

Age	Group	Formation	Approximate Thickness (ft)		
			King and Haase 1987	Milici 1973	McMaster 1963
Lower Ordovician	Knox	Mascot Dolomite	Not Determined	400-800	3000 (undivided)
		Kingsport Formation		200-320	
		Longview Dolomite		250-450	
		Chepultepec Dolomite		725-880	
		Copper Ridge Dolomite		900-1000	
Middle & Upper Cambrian	Conasauga	Maynardville Limestone	418-450		1500 (undivided)
		Nolichucky Shale	422-550		
		Maryville Limestone	346-445		
		Rogersville Shale	90-120		
		Rutledge Limestone	90-120		
		Pumpkin Valley Shale	260-320		
Lower Cambrian		Rome	Not Determined		800+

Fig. 2.3. Stratigraphic units in the vicinity of the Y-12 Plant.

2.2 HYDROLOGY

Three distinct hydrologic regimes exist [Bear Creek, Upper East Fork Poplar Creek (UEFPC), and Chestnut Ridge] in the Y-12 Plant vicinity. Within Bear Creek Valley, UEFPC Regime encompasses the UEFPC drainage channel, which controls groundwater flow in most of the Y-12 Plant vicinity and to the east. The Bear Creek Regime encompasses the Bear Creek drainage channel, which controls groundwater flow west of the Y-12 Plant. The flow path systems within the Maynardville Limestone that underlie the streams provide the principal conduits for groundwater movement. Although the surface and subsurface hydrologies have been altered by construction and recontouring of the topography, the original drainage still plays an important role in the subsurface movement of water. Major components of groundwater flow include movement through unconsolidated weathered rock and fill under unconfined conditions, and flow along bedding planes, fractures, and solution channels in the consolidated rock, generally under confined conditions (Kamp 1985). In Bear Creek Valley, recharge occurs predominantly by infiltrating precipitation through unconsolidated material downward to the underlying bedrock. In general, groundwater flow in bedrock appears to be predominantly within solution cavities and fractures in the bedrock.

The third hydrologic regime that influences the Y-12 Plant hydrology is the Chestnut Ridge Regime. This regime contains most of the recharge area to Bear Creek Valley and contributes strike-normal flow to the UEFPC and Bear Creek regimes (Geraghty & Miller 1990). Groundwater flow within this regime is also principally in fractures and cavities within consolidated bedrock or in the weathered bedrock zone under unconfined conditions. Flow in this regime is under substantial topographic influence with the principal pathways normal to strike and discharge primarily to springs in Bear Creek Valley to the north and Bethel Valley to the south.

2.3 FIELD OBSERVATIONS

The wellbore, drilled for the installation of well GW-827, penetrated 40.5 ft of predominantly light brown to moderate yellowish-brown moist clay before encountering bedrock (a halo, 5.5 ft thick, of pale yellowish-brown to yellowish-gray, wet clay preceded bedrock in the borehole). Bedrock in the GW-827 wellbore was of the Knox Group and consisted of 77.3 ft of generally pale yellowish-brown to light brownish-gray, massive, stylolitic, very finely crystalline dolostone underlain by approximately 17 ft of predominantly olive-black dolostone. Several natural, water-bearing cavities were observed in the bedrock interval, the first being located at 49.6 ft BGS.

Both wells, GW-828 and GW-829, were installed in boreholes drilled into the Nolichucky Shale. Wellbore GW-828 penetrated 7.5 ft of dark yellowish-brown topsoil and dark yellowish-orange subsoil before reaching weathered rock. Weathered bedrock, which occurs from 7.5 ft to 38.7 ft BGS, consists of light olive-gray and grayish-red, weathered and stained, thinly laminated shale with a small amount of weathered and stained micrite. Fresh bedrock in GW-828 is medium-dark gray and very dusky red, thinly laminated shale; and brownish-gray to brownish-black, massive, occasionally oolitic, occasionally pelletal micrite with abundant granular calcite veinlets and stringers. The red shale appeared to increase with depth.

Abundant groundwater occurs in the water table interval at GW-828 (the groundwater table at the time of drilling was located at 10.5 ft BGS). Throughout the bedrock interval, groundwater occurrences appear to be distributed between fractures and diffuse zones.

The lithologies in GW-829 were roughly the same as those encountered in GW-828; however, the TOWR and TOFR in GW-829 were located at 1.3 ft and 29.9 ft BGS, respectively. An additional weathered interval of light olive gray shale and moderate brown micrite was observed from 34.0 ft to 39.5 ft BGS.

Unlike GW-828, borehole GW-829 encountered no significant water in the unconsolidated zone. The first water encountered in GW-829 was observed just above the initial weathered bedrock/fresh bedrock interface. Below that, groundwater occurrences in GW-829 seemed to be limited to diffuse zones.

The boreholes drilled for the installation of gas monitoring probes GW-825 and GW-826 (both 36.0 ft deep) were both drilled through typically moderate reddish-brown to light brown clay with residual chert fragments. Both boreholes were drilled in the residuum overlying the Knox Group, and neither boring encountered bedrock or groundwater.

3. FISCAL YEAR 1995 WELL INSTALLATIONS

All of the groundwater monitoring wells installed at the Y-12 Plant during FY 1995 were stainless steel screened wells [the two gas monitoring probes installed at the Centralized Sanitary Landfill II were polyvinyl chloride (PVC) screened wells]. The screened wells were all installed utilizing steel surface casing. There were no open-hole monitoring wells installed at the Y-12 Plant during FY 1995. Highland Drilling Company, Inc. was the sole monitoring well drilling contractor on this project. All FY 1995 monitoring wells were installed in boreholes drilled using an Ingersoll-Rand XL-750 drilling rig.

3.1 WELL INSTALLATION METHODS

Screened wells installed during FY 1995 targeted the water table or groundwater at shallow depths (the gas monitoring probes installed at the Centralized Sanitary Landfill II are special circumstance wells and will be discussed later in their own section). All of the groundwater monitoring wells installed at the Y-12 Plant in FY 1995 were installed in bedrock, with two of the wells utilizing surface casing. The following sections present the standard well installation methods used at the Y-12 Plant.

3.1.1 Screened Wells with Surface Casing

To maintain the integrity of the borehole until well construction/installation was completed and to prevent cross-contamination with surface water and shallow groundwater sources, steel surface casing was used on "deeper" monitoring wells. Figure 3.1 presents a typical schematic of a screened well with surface casing. A pilot bore of 8 7/8- to 10 5/8-in. diameter was usually advanced to approximately 10 ft into competent bedrock to obtain information on the unconsolidated and weathered bedrock horizons. Surface casing set points were ideally located about 3 to 5 ft into competent bedrock. The pilot bore was reamed using a two-stage hole-opener bit to a diameter of 15.0 to 17.0 in. to the set-point depth. A section of steel conductor casing was often used to preserve the borehole collar while drilling/reaming operations progressed. Once the pilot bore had been reamed to the casing set point depth, steel casing [10.0-in. inside diameter (ID), 10.75-in. outside diameter (OD) or 11.0-in. ID, 11.75-in. OD] was installed. The surface casing was cemented in place with a cement grout either by pouring the mixture directly into the annulus or by the tremie method if the annulus was water-filled. This ensured a competent cement seal at the bottom of the casing. Additional cement grout was subsequently poured or tremied into the annulus to ensure that the annulus was sealed to the ground surface where needed. Grout curing time for this phase of well construction was a minimum of 24 hrs. Once an adequate cure time had been achieved, the borehole was advanced to the target zone in 10- to 15-ft increments, with an approximate 0.5-hr observation period after each increment to determine if a water-bearing zone had been intersected. Upon encountering sufficient water for sampling, the borehole was advanced so that the specific transmissive feature would be approximately centered in the screened interval. At TD, the borehole was thoroughly cleaned to remove all cuttings.

Stainless steel screen and riser casings were installed in the borehole. Screen segments were usually 10-ft length, No. 10 (0.01-in.) openings, continuous wire wound, 4.5-in. OD, 4.25-in. ID, 2- or 4-pitch, flush-threaded stainless steel. Riser segments were 10-ft long, Schedule 5, Number 304, 4.5-in. OD, 4.25-in. ID, flush-threaded stainless steel. Stainless steel centralizers were installed on the riser casing at approximately 40-ft intervals. Approximately 1 ft of J-20 high-purity sand was placed in the borehole on which to set the screen.

Fig. 3.1. Typical screened well schematic.

The sand pack, consisting of J-20 high-purity sand, was placed around the screen using PVC tremie pipe and potable water. The sand pack level during installation was monitored by continuous sounding with a weighted tape. The level of the sand was brought up to approximately 1.0 ft above the top of the screen. An approximately 2.0-ft-thick unhydrated bentonite pellet seal was placed on the sand pack by slow pouring with constant sounding by weighted tape to avoid bridging. The seal was allowed to hydrate a minimum of 4 hrs per manufacturer's recommendations, and hydrated thickness was checked to ensure a minimum of 2.0-ft hydrated bentonite seal thickness.

The remaining annulus was grouted using cement grout in several stages. The initial stage consisted of the placement of a 5- to 10-ft (1 to 2 cubic ft) thick grout plug tremied on top of the bentonite seal and allowed to cure for 24 hrs. This initial stage prevented blowouts of the bentonite seal during subsequent grouting with larger volumes of cement.

3.1.2 PVC Screened Gas Monitoring Probes

The construction of the two gas monitoring probes installed at the Centralized Sanitary Landfill II differed only slightly from the groundwater monitoring wells installed during FY 1995.

The borehole was advanced in the same manner, as stated in Sect. 3.1.2, using a drill bit of the appropriate size required.

PVC screen and riser casings were then installed in the borehole. Screen sections were typically 10-ft long, slotted, 2 3/8-in. OD, 2-in. ID PVC. Riser segments were generally 10 ft long, Schedule 40, 2 3/8-in. OD, 2-in. ID PVC.

Upon installation of the well components, the annulus was backfilled by slowly pouring washed "pea" gravel into the borehole while continuously sounding with a weighted tape to avoid bridging.

The remaining annulus was filled with an unhydrated bentonite pellet seal (usually to the ground surface). The seal was allowed to hydrate.

3.1.3 Deviations

Special circumstances sometimes necessitated deviations from the standard drilling and/or well installation programs discussed in Sect. 3.1. All deviations from approved well installation procedures received prior authorization from Energy Systems personnel.

The following is a list of specific deviations that were necessary during the FY 1995 well installation program:

GW-828

Both the temporary and permanent wells installed in boring GW-828 were done so using surface casing. In this case, the surface casing was used merely to maintain the integrity of the borehole and was not cemented in place in case removal was required. No centralizers were used during the construction of well GW-828, making it easier to extract the temporary screen and casing after sampling.

GW-829

The permanent well installed in boring GW-829 was done so using surface casing. In this case the surface casing was used merely to maintain the integrity of the borehole and was not cemented in place in case removal was required (the surface casing used in GW-829 was removed prior to completing the well). No centralizers were used during the construction of well GW-829, making it easier to extract the temporary screen and casing after sampling.

3.2 WELL DEVELOPMENT

Upon completion of well construction, all wells installed at the Y-12 Plant in FY 1995 were developed. Development involves removing all foreign sediment from the well and restoring the groundwater source to its original condition. Wells deeper than 50 ft were generally developed by swabbing. This procedure involved installation of 2.0-in. ID, 2.38-in. OD steel tubing with a bottom check valve to the full depth of the well. A swab tool attached to a stainless steel wire line was then moved repeatedly up and down the length of the tubing evacuating water to the surface through an outlet. Very shallow, unconsolidated zone wells were developed by hand bailing. Development water obtained by both methods was placed in a drum where volumes were noted and field observations made.

Prior to development, a water level was taken in each well and a casing volume was calculated. An excess of one well volume, depending on recharge rates, was removed from each well for several consecutive days. Specific conductance, pH, temperature, and turbidity were monitored daily during development. A minimum total of three well volumes was removed from each well; however, the principal acceptance criteria were stable values for pH and conductance for three consecutive samples. If the nonspecific indicator parameters stabilized but turbidity levels remained high, then the well continued to be developed until no further turbidity improvements were noted. Most wells, therefore, had substantially more than three well volumes removed. Appendix D contains well development data for each of the FY 1995 monitoring wells. Table 3.1 summarizes the development data from the wells installed in FY 1995.

Table 3.1. FY 1995 well development data summary

Well	Water level (ft BGS)	TD ^a (ft BGS)	Well volume (gal)	Development water		Development method	Aquifer
				(gal)	(well volumes)		
GW-825 ^b	-NA-	36.0	-NA-	-NA-	-NA-	-NA-	U
GW-826 ^b	-NA-	36.0	-NA-	-NA-	-NA-	-NA-	U
GW-827	37.9	135.0	71.2	420	5.9	Swab	B
GW-828	7.1	168.0	117.0	295	2.5	Swab	B
GW-829	16.6	115.0	72.2	148	2.1	Swab	B

^aDepth to bottom of open interval or screen.

^bMethane gas monitoring probe.

The temporary wells installed in exploratory borings GW-828 and GW-829 were not developed; however, the wells were purged of approximately 1 casing volume of water prior to sampling.

The gas monitoring probes (GW-825 and GW-826) were installed in dry holes and not developed.

3.3 WELL INSTALLATION SUMMARIES

This section presents a brief summary of each of the FY 1995 monitoring wells, including pertinent drilling data, geologic and hydrologic observations, and rationale for the well location. The descriptions are presented in numerical order, grouped by functional areas. Details of well installation activities, lithology, and well construction elements may be found in Appendixes A through C. Table 3.2 presents a data summary for the FY 1995 drilling program.

Table 3.2. FY 1994 well construction data summary

Well number	Ground elevation (ft)	Top of casing elevation (ft)	Unconsolidated/weathered bedrock thickness (ft)	Depth of surface casing (ft BGS)	Construction type	Interval monitored	Total depth (ft BGS)	Collar/target formation
GW-825	1088.55	1091.24	>36.0/-NA-	-NA-	Screened	4.6-34.9	36.0	OCk/OCk
GW-826	1062.59	1065.50	>36.0/-NA-	-NA-	Screened	5.2-35.5	36.0	OCk/OCk
GW-827	1048.13	1051.39	40.5/-NA-	43.4	Screened	124.1-134.2	135.0	OCk/OCk
GW-828 ^a	^b	^b	7.5/31.2	19.2	Screened	72.3-82.7	82.7	Cnl/Cnl
GW-828	979.08	982.92	7.5/31.2	19.2	Screened	155.5-165.9	168.0	Cnl/Cnl
GW-829 ^a	^b	^b	1.3/27.7	-NA-	Screened	19.6-29.5	30.0	Cnl/Cnl
GW-829	981.92	985.78	1.3/27.7	-NA-	Screened	104.7-114.6	115.0	Cnl/Cnl

^aTemporary well at this depth; well screen and riser extracted from borehole and borehole deepened (see next entry).

^bTemporary well; no permanent completion (pad, locking cap, etc.).

OCk: Knox Group

Cnl: Nolichucky Shale

3.3.1 Centralized Sanitary Landfill II

Two wells were installed at the Centralized Sanitary Landfill II during FY 1995. These wells, referred to as gas monitoring probes, were installed on the flanks of the landfill itself, but outside of the closure cap for the purpose of monitoring methane emissions from the landfill. Neither well encountered groundwater; therefore, these wells were not developed.

GW-825

Gas monitoring probe GW-825 is located north of the landfill, east of the facility trailers. A 6 1/4-in. diameter tricone roller bit was used to drill the wellbore to a total depth of 36.0 ft BGS. The wellbore was drilled through moist, stiff clay and clay fill material over its entire length. This boring did not encounter bedrock, however, the underlying formation is of the Knox Group. Thirty feet of 2 3/8-in. OD slotted PVC screen plus a cap were installed in the borehole from 34.9 ft to 4.6 ft BGS. A section of 2 3/8-in. OD, Schedule 40 PVC casing threaded onto the top of the screen brought the wellhead above the ground surface. The annulus was backfilled with washed pea gravel to 2.0 ft BGS. The remaining annulus was filled with a bentonite pellet seal to the ground surface.

GW-826

Gas monitoring probe GW-826 is located on the eastern flank of Centralized Sanitary Landfill II, southeast of probe GW-825. A 6 1/4-in. diameter tricone roller bit was used to drill the wellbore to a total depth of 36.0 ft. The wellbore was drilled through moist, stiff clay and clay fill with occasional large chert fragments over its entire length. This boring did not encounter bedrock; however, the underlying formation is of the Knox Group. Thirty feet of 2 3/8-in. OD, slotted PVC screen and cap, along with a 10-ft section of 2 3/8-in. OD, Schedule 40 PVC, casing were installed in the borehole. The screened interval occurs from 35.5 ft to 5.2 ft BGS. The annulus was backfilled with washed pea gravel to 2.0 ft BGS. The remaining annulus was filled with a bentonite pellet seal to the ground surface.

3.3.2 Landfill VI

Well GW-827 was installed on the northwest side of Landfill VI, beyond the landfill perimeter. The well was a replacement for well GW-545, the recharge of which had been inadequate for sampling purposes.

GW-827

Well GW-827 is located on the northwest side of Landfill VI, approximately 100 ft from GW-545. Well GW-827 was a replacement for well GW-545, which had inadequate recharge for sampling. A 10 5/8-in. diameter tricone roller bit was used to drill the pilot hole down to and into bedrock. Competent bedrock was encountered at 40.5 ft BGS (no weathered bedrock was observed at this location). Above bedrock, the borehole penetrated predominantly dry, stiff clay with scattered lenses or beds of residual chert. Immediately overlying the bedrock surface was 5.5 ft of soft, wet clay or decomposed shale.

A 15-in. diameter hole opener was used to ream the pilot hole prior to the installation of surface casing. The pilot hole was reamed to a depth of 43.4 ft (2.9 ft into competent rock). A total of 43.7 ft of 10 3/4-in. OD, 10-in. ID steel casing was installed in the reamed hole to 43.4 ft BGS. The surface casing was grouted in place by pumping 21, 94-lb sacks of Type I cement into the annulus through 40 ft of 1.5-in. OD PVC tremie pipe installed to 39.0 ft BGS. The cement was allowed a 24-hr cure period.

A 9 7/8-in. diameter tricone roller bit was used to drill the completion zone to 135.0 ft BGS. A small, water-bearing fracture zone/void was encountered at 54.5 ft to 55.4 ft BGS; however, it was determined that groundwater recharge was inadequate for sampling purposes. A significant water-bearing fracture zone/void was encountered at 127.6 ft to 128.0 ft BGS. The bedrock lithology at this depth consisted of massive, very finely crystalline, stylolitic, occasionally pelletal

dolostone with minor chert. The two water-bearing voids also produced fragments of stained, finely laminated, lithified, shaley sediment.

One 10-ft section of 4 1/2-in. OD, 4 1/4-in. ID, single wire wound (0.01-in. openings), stainless steel screen with cap and 124.8 ft of 4 1/2-in. OD, 4 1/4-in ID, Schedule 5 stainless steel casing were installed in the borehole. The screened interval straddles the lowermost water zone and is between 124.1 ft and 134.2 ft BGS.

Eleven, 50-lb sacks of #2 filter sand were tremied into the annulus to 122.1 ft BGS. Two, 50-lb buckets of 3/8-in. diameter bentonite pellets, poured into the annulus, form a seal from 122.1 ft to 116.4 ft BGS. The remaining annulus was grouted to within 5.2 ft of the ground surface by pumping a total of 44, 94-lb sacks of Type I cement through 1.5-in. OD PVC tremie pipe in several lifts.

Well GW-827 was developed by the swab method. A total of 420 gallons of water (5.9 well volumes) were removed from the well (initial water level was measured at 37.9 ft BGS). Water quality indicators stabilized rapidly, however, the water remained slightly turbid due to the presence of very fine silt (common to Knox Group groundwater).

3.3.3 Boneyard/Burnyard

Two boreholes were drilled in the Boneyard/Burnyard Area, near the intersection of Bear Creek Road and Haul Road. Temporary wells were installed in the borings as they were advanced and sampled in an effort to intercept a potential nitrate plume that was thought to be migrating along the geologic strike within the Nolichucky Shale. Target zones for the temporary wells were the water table, at approximately 100 ft BGS.

GW-828

Exploratory boring GW-828 was initially drilled to a depth of 82.7 ft BGS using a 9 7/8-in. diameter tricone roller bit. Weathered rock (shale) was encountered at 7.5 ft BGS, and fresh rock (medium dark gray and very dusky red, thinly laminated shale with brownish-gray, massive, pelletal, and oolitic micrite) at 38.7 ft BGS. A section of 10 3/4-in. OD steel casing was pushed into the borehole (but not grouted) to maintain the integrity of the borehole collar while drilling to completion.

An apparent increase in water production between 77.7 and 82.7 ft BGS led to the installation of a temporary well in the first stage of the borehole. One 10-ft section of 4 1/2-in. OD, 4 1/4-in. ID, single wire wound (0.01-in. openings), stainless steel screen with cap and 79.7 ft of 4 1/2-in. OD, 4 1/4-in. ID, Schedule 5 stainless-steel casing were installed. The screened interval was located between 72.3 ft and 82.7 ft BGS. Sand was tremied into the annulus to form a filter pack around the screen from 82.7 ft to 69.7 ft BGS. After a bentonite pellet seal was installed on top of the filter pack and allowed to hydrate (final depths of seal: 69.7 ft to 63.0 ft BGS), the well was sampled. Annular water levels were checked during purging and sampling to ensure that the bentonite seal was competent and no drawdown was occurring.

After the analytical data were reviewed, the temporary well casing and screen were removed from the borehole and the borehole deepened. The same 9 7/8-in. diameter bit was used to extend the boring from 82.7 ft to 168.0 ft BGS through a lithology similar to that described above. A 10-ft section of stainless steel screen and 159.7 ft of casing (of previous description) were installed in the borehole to sample a potential groundwater occurrence between 153.5 ft and approximately 164 ft BGS. The screen was located between 155.5 and 165.9 ft BGS. A filter pack (11, 50 -lb sacks of #2 sand; interval: 167.8 ft to 153.0 ft BGS) and bentonite seal (4, 50-lb buckets of 3/8-in. bentonite aggregate; hydrated interval: 153.0 ft to 144.6 ft BGS) were installed as before, and the well sampled.

Health, Safety, Environment, and Accountability Organization (HSEA) personnel decided to complete a permanent monitoring well in this boring after review of sampling data from the

second interval. The well annulus was filled by pumping the equivalent of approximately 77, 94-lb sacks of Type I Portland cement into the borehole in several stages.

Well GW-828 was developed using the swab method. A total of 295 gallons of water (2.5 well volumes) were removed from the well (initial water level was measured at 7.1 ft BGS). The monitored interval turned out to have very slow recharge and, although water quality indicators had not quite stabilized, HSEA terminated further well development to prevent detrimental impact to the aquifer.

GW-829

Exploratory boring GW-829 was drilled (also with a 9 7/8-in. diameter tricone roller bit) initially to 30.0 ft BGS. Weathered rock (shale) was encountered at 1.3 ft BGS and fresh rock (medium dark gray shale and brownish-gray to dark gray, pelletal micrite) at 29.0 ft BGS. One 10-ft section of 4 1/2-in. OD, 4 1/4-in. ID, single wire wound (0.01-in. openings) stainless steel screen with cap; and 19.9 ft of 4 1/2-in. OD, 4 1/4-in. ID, Schedule 5 stainless steel casing were installed to monitor a minor groundwater occurrence from 24.0 ft to 27.0 ft BGS. The screened interval was between 29.5 ft and 19.6 ft BGS. A filter pack was installed in the annulus from 29.5 ft to 17.8 ft BGS, as was a bentonite seal (final hydrated depths: 17.8 ft to 12.7 ft BGS, after which the well was sampled.

Upon review of analytical data, the temporary well casing and screen were removed from the borehole, and the borehole deepened. The same 9 7/8-in. diameter bit was used to extend the boring from 30.0 ft to 115.0 ft BGS through a similar lithology as above. A 10-ft section of stainless steel screen and 110.3 ft of casing (of previous description) were installed to sample a diffuse water zone spanning the bottom 12 ft of the hole. The screen was located between 114.6 ft and 104.7 ft BGS. A filter pack (9, 50-lb sacks of #2 sand; interval: 114.6 ft to 102.9 ft BGS) and bentonite seal (2, 50-lb sacks of 3/8-in. bentonite aggregate; hydrated interval: 102.9 ft to 98.3 ft BGS) were installed as before and the well sampled.

HSEA personnel decided to complete a permanent monitoring well in this boring after review of sampling data from the second interval. The well annulus was filled by pumping the equivalent of approximately 27, 94-lb sacks of Type I Portland cement into the borehole in several stages.

Well GW-829 was developed using the swab method. A total of 148 gallons of water (2.1 well volumes) were removed from the well (initial water level was measured at 16.6 ft BGS). The monitored interval turned out to have a very slow recharge rate and, although water quality indicators had not quite stabilized, HSEA terminated further well development to prevent detrimental impact to the aquifer.

3.4 WELL REHABILITATION

Well rehabilitation is requested when the Energy Systems well maintenance and inspection program has identified wells with errors in their reported depths. Well rehabilitation is performed in an attempt to remove silt accumulations, which may be the source for the measurement discrepancies. Eleven monitoring wells at the Y-12 Plant underwent rehabilitation (redevelopment) during FY 1995 (Table 3.3). Development of these wells was by swabbing, hand bailing, and purging with a submersible pump. A minimum total of three well volumes was removed from each of the wells undergoing rehabilitation. Specific conductance, pH, temperature, and turbidity also were monitored daily for these wells. Appendix H contains well development data and rehabilitation Activity/Progress reports for wells that underwent redevelopment in FY 1995. Detailed construction information of the wells rehabilitated during FY 1995 can be found in Jones et al. (1994).

Table 3.3. FY 1995 rehabilitated wells and functional areas

Well	Functional area	Easting coordinate	Northing coordinate
GW-006	Oil Landfarm	47995	29810
GW-087	Oil Landfarm	48313	29534
GW-160	Landfill III	62165	27803
GW-171	USGS Site	69654	28403
GW-172	USGS Site	69579	28359
GW-181	Chestnut Ridge Security Pit	57736	28048
GW-230	USGS Site	69617	28389
GW-242	Y-12 Burial Grounds	43144	31004
GW-541	Landfill II expansion	51738	26654
GW-731	Sediment Disposal Basin	63863	27464
GW-732	Sediment Disposal Basin	64268	27717

3.5 WASTE MANAGEMENT PRACTICES

A waste management plan for the well installation program was supplied to Energy Systems (Appendix E). Drilling cuttings and water were discharged to the ground surface or to an excavated cuttings pit, provided that field screening criteria for radiation, volatile organics, and pH were not exceeded. In the event that drill cuttings exceeded acceptable disposal limits, HSEA personnel directed subcontractor personnel in the proper disposal techniques.

At no time during FY 1995 did drill cuttings or development water exceed acceptable disposal limits or require any unusual waste management techniques.

4. QUALITY ASSURANCE

All FY 1995 monitoring wells were installed and developed following procedures and technical guidelines in Environmental Surveillance Procedure (ESP)-600, *Well Installation, Development, and Abandonment* (Energy Systems 1988), the *Resource Conservation and Recovery Act (RCRA) Technical Enforcement Guidance Document* (EPA 1986), and *Guidelines for Installation of Monitor Wells at the Y-12 Plant* (Geraghty & Miller 1985). Details of well construction were recorded by SAIC oversight geologists in bound field books, and the information was compiled into a final well installation activity/progress report (Appendix A). Any deviations from standard well installation guidelines, such as the use of bentonite Hole Plug™ for the annular sealant, were pre-approved by the Energy Systems GWPP Manager or designee and were recorded in the activity report. Independent verification of well depths and wellhead completion was conducted by Energy Systems.

All well construction materials and drilling equipment were decontaminated or certified as precleaned before use at each well and as needed during well installation. Inspection of all materials and equipment before use at each well site was conducted by the oversight geologist. Equipment was periodically checked during drilling activities to ensure sound mechanical operation and to avoid detrimental impact to well quality from equipment failure. A nonpetroleum (beeswax)-based lubricant (Well-Guard™) was used for all drilling and steel casing installation activities.

Lithologic control during well installation was maintained by continuously collecting and logging drill cutting samples over 2- to 5-ft intervals. The presence of cavities, fractures, and soft drilling zones was denoted by continuous observation of drilling characteristics, such as penetration rate. This information was also recorded in bound field books and compiled into a final well log for each well (Appendix B). All carbonate lithologic descriptions were accomplished following the system of classification established by Folk (1980), where applicable, and color notations were standardized through use of the Geological Society of America Rock Color Chart (GSA 1980).

All well installation reports underwent internal technical and editorial reviews prior to being issued to Energy Systems.

5. HEALTH AND SAFETY

Health and safety monitoring during each well installation was conducted in accordance with the *Health and Safety Plan for Well Installation and Plugging and Abandonment Activities, Y-12 Plant, Oak Ridge, Tennessee* (SAIC 1992). All personnel working on site were required to have completed the 40-hr hazardous waste site operations training in accordance with 29 CFR 1910.120, and satisfied annual refresher requirements. Oversight personnel were required to have been Red Cross-certified in first aid and CPR techniques and to maintain that certification throughout the task. All personnel had undergone an occupational physical examination and respirator fit test within one year before drilling operations. On-site personnel attended a site-specific health and safety briefing before commencement of drilling activities to discuss potentially hazardous materials, potentially dangerous activities and situations, protective equipment, and decontamination procedures. Site-specific waste management plans and excavation/penetration permits were obtained prior to drilling at each well site.

Based on reviews of the hazard potential that were conducted at each specific site before drilling operations, Level D personnel protective equipment was selected for each site. At this level, individual protection consists of either Tyvek™ suits or individual work clothes, steel-toed safety boots, gloves, hard hats, ear plugs, and safety glasses.

Air quality in the breathing zone was monitored throughout the drilling program using an HNu™ photoionization detector, or a Century Foxboro OVA™ flame ionization detector. Radioactivity was measured using a Ludlum Model 3 survey meter and G-M pancake probe for beta and gamma activity, and a Ludlum Model 12 Count Ratemeter with a scintillation tube probe for alpha activity. Thermoluminescent detector badges for long-term radiological monitoring were worn by all personnel at all times.

In addition to the health and safety screening outlined above, composite samples of drilling cuttings and well development waters were screened on a daily basis for organic vapors in headspace samples, pH, and specific conductance (in development water only) according to a general waste management plan (Appendix E). Screening data for well cuttings and development water (Appendix F) provided further information on the presence or absence of hazardous compounds and characteristics of drilling cuttings or fluids to which site personnel might be exposed.

6. REFERENCES

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APPENDIX A

ACTIVITY/PROGRESS REPORTS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			Probe NO. <u>GW-825</u>
GAS MONITORING PROBE INSTALLATION ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>Centralized Sanitary Landfill II</u>		DATE: START: <u>12-7-94</u>	
DRILLERS: <u>R. Phillips/H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-7-94</u>	
HELPER: <u>G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>S.L. Abston - SAIC</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-7-94	0952	1035	Arrive at site. Susan L. Abston (SAIC) providing oversight. Move drill rig to position over staked probe location, position plastic under rig, and flag off work zone.
	1035	1047	Pre-entry Health and Safety and site briefing conducted by W. Thedford (HSEA).
	1047	1050	Mast up and rigging up with 6 1/4-in. diameter tricone bit with subadaptor = 2.5 ft in length, table height = 2.0 ft. Background radiation scan of location: alpha = 0 cpm, beta/gamma = 30 cpm.
	1050	1052	Clear grass from surface at drill location.
	1052	1121	Commence drilling borehole with compressed air only from 0.0 ft to 36.0 ft below ground surface (BGS.)
	1121	1130	At 36.0 ft BGS. Clean out borehole and trip out.
	1130	1136	Tag bottom of borehole at 30.6 ft BGS, 5.4 ft of fill.
	1136	1149	Commence cleaning borehole out to 36.0 ft BGS.
	1149	1156	At 36.0 ft clean out borehole. Trip out.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

PROBE NO. GW-825

**GAS MONITORING PROBE
INSTALLATION ACTIVITY/PROGRESS REPORT
continued**

PAGE 2 of 2

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			PROBE NO. <u>GW-826</u>
GAS MONITORING PROBE INSTALLATION ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>Sanitary Landfill II</u>		DATE: START: <u>12-8-94</u>	
DRILLERS: <u>R. Phillips/H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-8-94</u>	
HELPER: <u>G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>S.L. Abston - SAIC</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-8-94	0852	0918	Arrive at site. Susan L. Abston (SAIC) providing oversight. Move drill rig to position over staked probe location. Position plastic under rig and flag off work zone. Background radiation scan of location: alpha = 0 cpm, beta/gamma = 60 cpm.
	0918	0927	Mast up and rigging up with 6 1/4-in. diameter tricone bit with subadaptor = 2.5 ft in length, table height = 2.7 ft. Add 25 ft drilling rod to bit and clear gravel from surface at drilling location.
	0927	0955	Commence drilling borehole with compressed air only from 0.0 ft to 36.0 ft below ground surface (BGS).
	0955	1009	At 36.0 ft BGS. Clean out borehole and trip out.
	1009	1012	Tag bottom of borehole at 8.4 ft BGS. Sides of borehole bridged off.
	1012	1014	Commence clearing borehole out to 25.0 ft BGS and trip out.
	1014	1016	Tag bottom of borehole at 32.0 ft BGS, 4.0 ft of fill.
	1016	1020	Commence cleaning borehole out to 36.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT			PAGE 1 of 9
LOCATION: <u>Landfill VI</u>		DATE: START: <u>1-10-95</u>	
DRILLERS: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>1-24-95</u>	
HELPERS: <u>R. Phillips/G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-10-95	1215	1227	Arrive at GW-827 site. Drill rig is on site, positioned over proposed well location. W. Thedford (HSEA) conducts site-specific pre-work Health & Safety briefing. Bill approves steam cleaning of casings, tools, etc. on site.
	1227	1249	Continue setting up site/preparing to drill. Drill rig has already been rigged up with a 10 5/8-in. diameter tricone bit on a stabilizer; total length = 20.1 ft, table height = 2.1 ft. Background radiological scan of location: alpha = 0 cpm, beta/gamma = 40 cpm.
	1249	1309	Commence drilling with compressed air only. Drill from 0.0 ft to 10.5 ft below ground surface (BGS).
	1309	1317	At 10.5 ft BGS. Trip out bit/stabilizer. Push in a 4.3-ft section of 13 1/4-in. outside diameter (OD), 12 5/8 in. inside diameter (ID) steel conductor casing. Casing stick-up = 0.8 ft.
	1317	1333	Trip back into borehole and continue drilling with compressed air only. Drill from 10.5 ft to 18.0 ft BGS.
	1333	1346	At 18.0 ft BGS. Clean out borehole: having difficulty keeping borehole clean - sticky clay is clinging to borehole wall. Trip out stabilizer.
	1346	1400	Set up auxiliary air compressor to help raise the cuttings.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-10-95	1400	1426	Start rig, trip back into borehole. Discover hole in air hose from
(cont.)			auxiliary compressor. Swap connections for use on another air
			hose. Continue to clean out borehole.
	1426	1504	Continue drilling with compressed air only. Drill from 18.0 ft to 45.0
			ft BGS. Top of bedrock at 40.5 ft BGS, no weathered bedrock
			interval observed.
	1504	1552	At 45.0 ft BGS. Clean out borehole. Trip out.
	1552	1603	Complete trip out, do not rig down stabilizer: plan to remove bit.
			Clean up. Secure site and depart.
1-11-95	0816	0850	Arrive at GW-827 site. Crew arrives. Conduct pre-work equipment
			inspections. Break bit loose from stabilizer.
	0850	0938	Rig down stabilizer. Rig up with a 15-in. diameter hole opener;
			length to reaming cones = 18.6 ft, total length = 20.1 ft.
	0938	1007	Pull out the 12-in. conductor casing. Drill rig table height = 2.1 ft.
	1007	1011	Commence reaming borehole with compressed air only. Ream
			from 0.0 ft to approximately 4 ft BGS.
	1011	1023	Push in a 3.5-ft section of 16-in. OD, 15 1/2-in. ID conductor
			casing. Casing stick-up = 0.2 ft. New table height = 2.7 ft.
	1023	1107	Perform light maintenance on auxiliary compressor (need com-
			pressor to raise the cuttings).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			
			PAGE 3 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-11-95 (cont.)	1107	1133	Continue reaming borehole with compressed air only. Ream from about 4 ft to 15.9 ft BGS. Will need to use water to keep borehole clean.
	1133	1356	Break for lunch. Water truck arrives on site. Crew member having trouble with truck off site: work delayed further. Steam clean surface casing.
	1356	1450	Continue reaming borehole with water and compressed air. Ream from 15.9 ft to 43.4 ft BGS. Confirm bedrock surface at 40.5 ft BGS.
	1450	1533	At 43.4 ft BGS. Clean out borehole. Trip out, rig down hole opener. Try to tag reamed portion of borehole: unable to find reamed ledge, tag bottom of pilot hole at 45.4 ft BGS.
	1533	1550	Clean up. Winterize equipment. Secure site and depart.
1-12-95	0844	0900	Arrive at GW-827 site. Tag reamed portion of borehole (successful this time) at 43.4 ft BGS.
	0900	0921	Move hole opener out of the way. Tally casing: 2 sections of 10 3/4 in. OD, 10.0-in. ID steel casing totalling 43.7 ft in length.
	0921	1040	Discover that the clevis on site will not work with lifting bell. Member of crew goes to get a different clevis.
	1040	1111	Crew member returns. Run casing into the borehole. Casing stick-up = 0.3 ft. Bottom of the casing is at 43.4 ft BGS. Calculate an annular volume of 25.7 cubic ft, equivalent to 21.8 sacks of Type I cement. Shovel several cubic ft of cuttings into casing to prevent grout from rising inside casing.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 4 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-12-95	1111	1120	Run 1.5-in. OD PVC tremie pipe into annulus to approximately
(cont.)			39 ft BGS.
	1120	1212	Break for lunch.
	1212	1307	Mix and pump-tremie 17 sacks (20.1 cubic ft) of neat, Type I
			Portland cement (average grout weight of 12.8 lbs/gal.) into the
			annulus. Tag inside of casing: encounter mud at about 23 ft BGS.
			Cement is entering the casing and pushing the mud/cuttings up
			inside the casing.
	1307	1310	Pull out tremie pipe.
	1310	1335	Manufacture a "home-made" plug of cement sacks and cedar
			boughs. Push plug to approximately 31 ft BGS.
	1335	1343	Trip out. Tag cement in annulus at 16.0 ft BGS. Tag plug inside
			casing at 23.0 ft BGS.
	1343	1346	Re-insert PVC tremie pipe in annulus to 19.0 ft BGS.
	1346	1400	Mix and pump-tremie an additional 4 sacks (4.7 cubic ft) of neat,
			Type I Portland cement (grout weight of 13.2 lbs/gal.) into the
			annulus.
	1400	1408	Pull out tremie pipe. Cleanup. Tag water/mud inside casing at 16.0
			ft BGS, tag cement level in annulus at 11.0 ft BGS.
	1408	1419	Pull out conductor casing. Re-thread lifting bell onto casing and
			attach to clevis to remain centered in the borehole.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 5 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-12-95	1419	1446	Secure site and depart.
(cont.)			
1-13-95	0807	0817	Arrive at GW-827 site. Tag annular cement level at 15.8 ft BGS.
			Level is such that well construction may continue. Plan to re-convene around 1200 hrs. Depart site.
	1105	1126	Return to GW-827 site. Crew has just finished rigging up with a 9 7/8-in. diameter tricone bit on a stabilizer; total length = 20.3 ft, table height = 2.2 ft.
	1126	1227	Break for lunch.
	1227	1253	Start drill rig. Trip into casing. Begin returning water at approximately 16 ft BGS. Encounter resistance at 23.0 ft BGS (cement), drilling through cement.
	1253	1303	At bottom of pilot hole (45.5 ft BGS), add water to facilitate borehole cleaning. Dry up borehole.
	1303	1327	Commence drilling completion interval with compressed air only. Drill from 45.4 ft to 55.4 ft BGS. Small amount of moisture (just enough for dust abatement) at 49.6 ft BGS. Encounter a small void from 54.5 ft to 55.4 ft BGS, returning fairly significant amount of water. Clean out borehole to this point.
	1327	1359	Pull bit off bottom approximately 12 ft. Waiting to see how much water fills the borehole.
	1359	1403	Start drill rig, trip in. Water level (which is actually mostly mud) is only about 1 or 2 ft off bottom. Plan to continue drilling.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 6 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-13-95	1403	1514	Continue drilling with compressed air only. Drill from 55.4 ft to 93.1
(cont.)			ft BGS. Very small amounts of moisture (enough for dust abate-
			ment) at 68.1 ft and 78.8 ft BGS.
	1514	1538	At 93.1 ft BGS. The drill rig is nearly out of fuel, will have to stop
			here. Clean out borehole. Trip out. Leave stabilizer hanging from
			top of casing. Lower mast as a safety precaution.
	1538	1555	Clean up. Winterize equipment. Secure site and depart.
1-17-95	0834	0928	Oversight and crew at GW-827 site, waiting for fuel.
	0928	1002	D. Key (Highland) arrives and fuels the drill rig. Start drill rig and
			raise the mast.
	1002	1016	Pick up stabilizer, and trip into borehole (table height = 2.4 ft).
			Water level is at 41.8 ft BGS.
	1016	1023	At 92.8 ft BGS. Clean out borehole. Observe large, smooth rocks
			in returns: probably from small void (cave) at 54.5 ft - 55.4 ft BGS.
			Surge borehole with compressed air until dry.
	1023	1149	Commence drilling with compressed air only. Drill from 93.1 ft to
			135.0 ft BGS. Using auxiliary compressor to help raise cuttings.
			Ratty drilling 121.4 ft to 121.6 ft. Ratty drilling at 127.4 ft; bit stops
			rotating at 127.5. Cross a small void from 127.6 ft to 128.0 ft BGS.
			Begin to return significant water.
	1149	1206	At 135.0 ft BGS (7 ft deeper than water occurrence so that it will be
			centered approximately in the screened interval). Clean out bore-
			hole. Pull bit approximately 18 ft off bottom..

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			
PAGE 7 of 9			
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-17-95	1206	1303	Break for lunch.
(cont.)			
	1303	1308	Start drill rig. Check water level in borehole: water level is higher
			than the bit (more than 18 ft of water in borehole). Plan to set well
			at this depth. Run bit to bottom of borehole and clean out.
	1308	1337	Trip out, rig down stabilizer. Tag bottom of bore hole at 134.8 ft
			BGS (0.2 ft of fill). Tally stainless steel screen and riser:
			Screen: 1, 10-ft section of 4.5-in. OD, 4.25-in. ID continuous-
			wire wound (0.01-in. opening), #304 stainless steel screen
			(end cap consists of : 4.5-in. OD stainless steel, 0.1 ft-long,
			to be threaded to bottom of screen).
			Riser: total of 124.7 ft of 4.5-in. OD, 4.25-in. ID, schedule 5,
			#304 stainless steel casing. Total of cap, screen, and riser =
			134.8 ft.
	1337	1424	Commence running screen and riser into borehole. Use centraliz-
			ers at 40 ft above top of screen and 80 ft above top of screen. Set
			screen and riser on bottom, top of casing even with ground surface.
			Pull up screen and casing 0.6 ft: bottom of cap is at 134.2 ft BGS,
			top of screen is at 124.1 ft. BGS.
	1424	1438	Run 1.5-in. OD PVC tremie pipe into annulus to approximately
			117 ft BGS.
	1438	1502	Tremie 11, 50-lb sacks of #2 filter sand into the annulus while
			continuously tamping with a weighted tape to prevent bridging.
			Filter pack from 134.8 ft to 122.1 ft BGS (2.0 ft above top of screen).
	1502	1506	Pull out 2 sections of tremie pipe (20 ft).

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 8 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
1-17-95	1506	1511	Slowly pour 2, 50-lb buckets of 3/8-in. diameter bentonite pellets
(cont.)			into the annulus. Tag unhydrated bentonite level at 118.0 ft BGS.
			Let hydrate overnight.
	1511	1536	Clean up. Secure site and depart.
1-18-95	0812	0853	Arrive at GW-827 site. Tag hydrated bentonite level at 116.4 ft
			(bentonite swelled 1.6 ft). Total thickness of bentonite seal is 5.7 ft.
	0853	0929	Add another section of tremie to that already in borehole (tremie
			pipe to 107.0 ft BGS). Mix and pump-tremie 3 sacks (3.5 cubic ft)
			of neat, Type I Portland cement (grout weight of 14.2 lbs/gallon)
			into annulus.
	0929	0945	Pull out tremie pipe. Clean up. Secure carousel and lower mast.
			Secure site and depart.
1-19-95	1250	1328	At GW-827 site. Tag cement level at 103.4 ft BGS. Calculate an
			annular volume to the ground surface of 45.0 cubic ft, equivalent
			to 38.1 sacks of Type I cement.
	1328	1350	Run 1.5-in OD PVC tremie pipe into annulus to 99.0 ft BGS.
	1350	1535	Mix and pump-tremie 25 sacks (29.5 cubic ft) of neat, Type I
			Portland cement (average grout weight of 13.2 lbs/gallon).
	1535	1547	Pull out tremie pipe. Clean up. Secure site and depart.
1-20-95	0828	0835	At GW-827 site. Tag cement level at 50.7 ft BGS. Calculate an
			annular volume of 22.1 cubic ft, equivalent to 18.7 sacks of Type
			I cement. Depart.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT			PAGE 1 of 10
LOCATION: <u>Boneyard/Burnyard</u>		DATE: START: <u>2-9-95</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>3-6-95</u>	
HELPERS: <u>R. Phillips/G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-9-95	1400	1416	Arrive at GW-828 site. Drill rig is on site, positioned over well location. Crew is on site, finishing setting up drill rig. W. Thedford (HSEA) conducts detailed inspection of the drill rig. The oversight geologist observes and documents the activity in the field book.
	1416	1432	Raise the mast. Rig up with a 9 7/8-in. diameter tricone bit on a stabilizer; total length = 20.2 ft, table height = 2.1 ft. Background radiological scan of location: alpha = 0 cpm, beta/gamma = 40 cpm.
	1432	1455	Commence drilling using compressed air only. Drill from 0.0 ft to 18.1 ft below ground surface (BGS). Pass through gravel pad at 0.8 ft BGS. Begin to observe shale fragments in the returns at 3.8 ft BGS. Encounter top of weathered rock at 7.5 ft BGS. Encounter moisture at 10.5 ft BGS (water table), and again at 15.5 ft BGS.
	1455	1500	At 18.1 ft. BGS. Clean out borehole. Trip out bit/stabilizer assembly.
	1500	1505	Push in a 3.7-ft long section of 10 3/4-in. outside diameter (OD), 10-in. inside diameter (ID), steel conductor casing. Casing stick-up = 0.4 ft.
	1505	1520	Trip back into borehole to clean out debris from casing installation, hit water at 11.5 ft BGS. Secure site and depart.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAMWELL NO. GW-828**WELL INSTALLATION ACTIVITY/PROGRESS REPORT
continued**

PAGE 2 of 10

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-13-95	0804	0849	Arrive at GW-828 site. Water level in the borehole is at 9.3 ft BGS.
			Crew arrives and conducts pre-work equipment inspections.
			Having difficulty starting drill rig and backhoe.
	0849	0929	Excavate a shallow trench from borehole to the pit to divert water
			that will be produced from this boring. Controls on drill rig are
			sluggish, allowing hydraulic fluid to warm up.
	0929	0946	Trip into borehole to bottom, and clean out.
	0946	1003	Commence drilling using compressed air only. Drill from 18.1 ft
			to 30.7 ft BGS. Elevated breathing zone analysis (BZA) reading
			at 23.1 ft BGS (3.1 ppm) may be from residual alcohol antifreeze
			in drill rig system. Occasional ratty drilling from 26.3 ft to 28.1 ft
			BGS. Observe very large rock fragments in returns (washing out
			of borehole wall); will have to run a section of casing.
	1003	1013	Have drilled to 30.7 ft BGS. Trip out of hole, rig down bit/stabilizer
			assembly. Pull out conductor casing.
	1013	1130	Prepare to run casing into borehole. Part of crew goes to get a
			lifting bell. Steam clean 1, 22.1-ft long (length includes threads)
			section of 10 3/4-in. OD, 10-in. ID, steel casing.
	1130	1211	Crew returns. Thread lifting bell onto the casing and push into the
			borehole (casing will be temporary and will not be grouted in
			place). Casing stops and becomes stuck. Casing stick-up = 2.9 ft,
			bottom of the casing is at 19.2 ft BGS.
	1211	1300	Break for lunch.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			
			PAGE 3 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-13-95	1300	1332	Return to work. Remove lifting bell from casing. Cut off top of casing with a torch. New casing stick-up = 1.2 ft.
(cont.)			
	1332	1350	Rig back up with the bit/stabilizer assembly, and trip into borehole.
			New table height = 2.5 ft. Level of debris fill is at 26.7 ft BGS.
			Cleaning borehole.
	1350	1458	At 30.7 ft BGS. Continue drilling using compressed air only. Drill from 30.7 ft to 82.7 ft BGS. Apparent water zone: 35.3 ft to 35.6 ft.
			Ratty drilling from 35.7 ft to 42.7 ft BGS. Top of fresh bedrock at 38.7 ft BGS. Ratty drilling from 49.7 ft to 52.7 ft, with an apparent increase in water production at 51.5 ft BGS. Significant water production increase at approximately 77 ft BGS.
	1458	1506	At 82.7 ft BGS. Clean out borehole. Report status to K. Jago (HSEA). Kevin approves the installation of a temporary well at this depth.
	1506	1526	Trip out, rig down bit/stabilizer assembly. Tag bottom of borehole at 82.7 ft BGS (no fill). Tally well construction materials:
			Screen: 1, 10-ft section of 4.5-in. OD, 4.25-in. ID, continuous wire-wound (0.01-in. openings), #304 stainless steel screen.
			The cap is 0.4 ft long and is threaded onto the bottom of the screen.
			Riser: 8 sections of 4.5-in. OD, 4.25-in. ID, schedule 5, #304 stainless steel casing totalling 79.7 ft. Total length of screen, cap, and riser = 90.1 ft.
	1526	1555	Run screen, cap, and riser casing into the borehole. No centralizers used.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 4 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-13-95	1555	1603	Screen to the bottom of the borehole. Casing stick-up = 7.4 ft.
(cont.)			Bottom of the screen (cap) is at 82.7 ft BGS, top of the screen
			is at 72.3 ft BGS. Run 1.5-in. OD PVC tremie pipe into borehole
			to 67.0 ft BGS.
	1603	1618	Tremie 10, 50-lb sacks of #2 filter sand into the annulus. Used
			approximately 50 gallons of water. Sand pack from 82.7 ft to
			69.7 ft BGS (2.6 ft above top of the screen).
	1618	1622	Pull out the tremie pipe.
	1622	1645	Pour 3, 50-lb buckets of 3/8-in. diameter bentonite pellets into
			the annulus. Tag unhydrated bentonite level at 64.1 ft BGS.
			Clean up. Secure site and depart.
2-14-95	0806	0824	Arrive at GW-828 site. Measure water level in well at 8.7 ft BGS.
			Measure water level in annulus at 8.9 ft BGS. Tag hydrated
			bentonite level at 63.0 ft BGS (bentonite swelled 1.1 ft). Total
			thickness of seal is 6.7 ft.
	0824	0917	Crew arrives. Remove the top-most 10-ft section of well casing
			and replace it with one 5.3 ft in length. New casing stick-up =
			2.8 ft. Sampling crew arrives: W. Sanders (#24059) and B. Gross
			(#9680), both of MMES/K-25. B. Rundle (HSEA) arrives.
	0917	0955	Insert pump into well and begin purging water from well. Pump
			is not working properly. Extract pump from well to make repairs.
	0955	1135	Repairs complete. Insert pump into well and begin purging
			water. Pump rate is 0.25 gal/min. Trying to have another pump
			brought to site.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u> PAGE 5 of 10
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-14-95	1135	1142	New pump on site; extract pump from well.
(cont.)			
	1142	1306	Insert new pump into well and begin purging water. Measure water level in annulus at 9.0 ft BGS (dropped 0.1 ft): bentonite seal appears to be fairly tight. Begin measuring water quality parameters after having removed about 50 gallons of water from well.
	1306	1313	Parameters are stabilized. Extract pump. Purged a total of 115 gallons of water (approximately 2.5 well volumes).
	1313	1327	Sample the well for volatile organic compounds (VOCs) and nitrates using a teflon bailer. Measure water level in well at 41.5 ft BGS. Secure site and depart. Oversight and crew to "stand-by" until sample analyses have been made.
2-16-95	0850	0926	Sample results in: VOCs-less than detectable, Nitrate-43 ppm. Plan to deepen borehole and set another temporary well on a water occurrence between 150 and 200 ft BGS. Arrive at GW-828 site. Crew is on site performing pre-work equipment inspections. Water level in the pit is less than 2.5 ft from the edge. Prepare to extract the temporary well.
	0926	1011	Pull out the stainless steel casing and screen.
	1011	1030	Rig up with the 9 7/8-in. diameter bit/stabilizer assembly, table height = 2.2 ft. Begin tripping into borehole.
	1030	1127	Bit is at 43.0 ft BGS. Shut off rig. Crew wants to pump out the pit before putting any more water into it.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 6 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-16-95	1127	1145	J. Young (Highland) brings pump to site. Pump will not start. Take
(cont.)			back to shop.
	1145	1233	R. Phillips (Highland) goes to rent a pump.
	1233	1320	Randy returns with rented pump. Pump water from pit out onto
			nearby ground surface with HSEA approval.
	1320	1338	Start drill rig, begin flushing the borehole. Continue tripping into
			the hole; cleaning out the sand pack and bentonite seal.
	1338	1446	At 82.7 ft BGS, borehole is fairly clean. Commence drilling using
			compressed air only. Drill from 82.7 ft to 123.0 ft BGS. Possible
			increase in water production at 85.3 ft BGS (associated with ratty
			drilling zone). Apparent increase in water production at 108 ft
			BGS (again, associated with ratty drilling).
	1446	1452	Lightning flashes force shut down of operations. Depth of bit is
			123.0 ft BGS. Pull out 2 rods, and shut down drill rig.
	1452	1508	In trucks, waiting out the storm.
	1508	1528	Continue tripping out of the borehole. Will continue drilling
			tomorrow. Clean up. Winterize equipment. Secure site and
			depart.
2-17-95	0815	0844	Arrive at GW-828 site with crew. Crew pumps water in pit out onto
			nearby ground surface with HSEA approval.
	0844	0901	Start drilling rig and begin tripping into borehole. Blow water out
			of the hole. Continue tripping in to bottom, cleaning.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 7 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-17-95	0901	1010	At 123.0 ft BGS. Commence drilling using compressed air only.
(cont.)			Drill from 123.0 ft to 168.0 ft BGS. Ratty drilling from 153.5 ft to 155.5 ft BGS along with an apparent increase in water production.
			Obvious water production increase at approximately 164 ft BGS.
	1010	1042	At 168.0 ft BGS. Report status to K. Jago. Kevin approves setting a temporary well at this depth. Clean out borehole thoroughly.
	1042	1100	Trip out, rig down bit/stabilizer assembly. Tag bottom of borehole at 167.8 ft BGS (0.2 ft of fill).
	1100	1122	Steam clean well screen and casing extracted from shallow temporary well for re-use.
	1122	1200	Break for lunch.
	1200	1214	Prepare to run screen and casing. Tally well construction materials:
			Screen: 1, 10-ft section of 4.5-in. OD, 4.25-in. ID, continuous wire-wound (0.01-in. openings), #304 stainless steel screen.
			The cap is 0.4 ft long and is threaded onto the bottom of the screen. Riser: 16 sections of 4.5-in. OD, 4.25-in. ID, schedule 5, #304 stainless steel casing totalling 159.7 ft.
			Total length of screen, cap, and riser = 170.1 ft.
	1214	1329	Run the well screen and casing into the borehole. Hang the well so that the bottom of the screen is at 165.9 ft BGS, and the top of the screen is at 155.5 ft BGS. No centralizers used.
	1329	1342	Run 1.5-in. OD PVC tremie pipe into the annulus to 156.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 8 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-17-95	1342	1405	Tremie 11. 50-lb sacks of #2 filter sand into the annulus. Sand
(cont.)			pack from 167.8 ft to 153.0 ft BGS (2.5 ft above the top of the
			screen). Used approximately 40 gallons of water to tremie the
			sand.
	1405	1411	Pull out the tremie pipe.
	1411	1420	Pour 4, 50-lb sacks of 3/8-in. diameter Shur-Plug™ bentonite
			aggregate into the annulus. Tag top of unhydrated bentonite at
			147.7 ft BGS.
	1420	1454	Clean up, secure site, and depart.
2-18-95	0754	0911	Arrive at GW-828 site. Measure water level in well at 7.4 ft BGS.
			Measure water level in annulus at 8.2 ft BGS. Tag hydrated
			bentonite level at 144.6 ft BGS (bentonite swelled 3.1 ft). Total
			thickness of bentonite seal is 8.4 ft. Sampling crew arrives:
			W. Sanders (#24059) and M. Cleveland (#33409).
	0911	0956	Insert pump into well and begin purging water. Purge rate is
			1.7 gal/min. Lowering the pump as the water level is drawn down.
			Begin measuring water quality parameters after having removed
			about 40 gallons of water from the well.
	0956	1001	Parameters have stabilized. Extract pump. Purged a total of
			77 gallons of water (approximately 0.7 well volumes). Measure
			water level in well at 67.4 ft BGS. Water level in annulus does not
			appear to have dropped at all.
	1001	1014	Sample the well for VOC's and nitrates using a teflon bailer.
			Secure site and depart. Oversight and crew to "stand-by" until
			sample analyses have been made.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 9 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-21-95	0835	0855	Sample results in: VOCs are Methylchloride = 4 ppb, chloroform = 2 ppb (all others <detectable); Nitrates = 623 ppm. K. Jago directs to leave the well in place and grout the annulus. Arrive at GW-828 site. Crew is on site, preparing to grout annulus.
	0855	0906	Run 1.5-in. OD PVC tremie pipe into annulus to 136.0 ft BGS.
	0906	0934	Mix and pump-tremie 4 sacks (4.7 cubic ft) of neat, Type I Portland cement (grout weight = 14.1 lbs/gal) into the annulus.
	0934	0957	Pull out tremie pipe. Clean up.
	0957	1013	Cut off protective casing with torch, new casing stick-up = 0.2 ft. Cut off well casing, new casing stick-up = 0.4 ft. Crew to demobilize the drill rig. Oversight departs.
2-22-95	0800	0808	At GW-828 site. Tag cement level at 130.0 ft BGS. Calculate an annular volume to the ground surface of 54.8 cubic ft = 2.0 cubic yds. Notify Highland Drilling Co. supervisor. Cement (2 1/2 yds) delivery scheduled for 1400 hrs. Depart site.
	1432	1546	Return to GW-828 site. Crew has already run 1.5-in. OD PVC tremie pipe into annulus to 119.0 ft BGS. Call to cement plant: they are running late. Delivery is eventually cancelled, scheduled for tomorrow at 0730 hrs. Secure site and depart.
2-23-95	0711	0733	Oversight and crew at GW-828 site. Cement truck arrives.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 10 of 10
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-23-95	0733	0838	Pump-tremie cement into annulus by pouring cement from truck
(cont.)			into 55-gal drum; then pumping through the tremie pipe. Circulate
			water. Lose circulation about half-way through activity; restore
			circulation near the end of the load.
	0838	0849	Pull out tremie pipe. Clean up. Secure site and depart.
2-24-95	0800	0831	Arrive at GW-828 site. Tag cement level in annulus at 29.6 ft
			BGS. Calculate an annular volume to ground surface of
			12.5 cubic ft, equivalent to 10.6 sacks of Type I cement. Crew
			arrives.
	0831	0835	Run 1.5-in. OD PVC tremie pipe into the annulus to 29.0 ft BGS.
	0835	0917	Mix and pump-tremie 11 sacks (13.0 cubic ft) of neat, Type I
			Portland cement (grout weight = 13.4 lbs/gal) into the annulus.
			Circulate water.
	0917	0930	Pull out tremie pipe. Crew goes to get more water to continue
			grouting the annulus.
	0930	0952	Mix and pump-tremie (using pump discharge hose as tremie
			pipe) 5 additional sacks (5.9 cubic ft) of neat, Type I Portland
			cement (grout weight = 13.2 lbs/gal) into the annulus. Circulate
			water, then 100% cement.
	0952	1013	Cleanup. Liquid grout level appears to be holding at approximately
			1 ft BGS. Depart site.
			Well construction is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT			PAGE 1 of 9
LOCATION: <u>Boneyard/Burnyard</u>		DATE: START: <u>2-28-95</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>3-17-95</u>	
HELPERS: <u>R. Phillips/G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-28-95	0915	0947	Arrive at GW-829 site. The drill rig is onsite, positioned over the borehole location. Crew conducts pre-work equipment inspections. Begin excavating a cuttings pit. Background radiological scan of location: alpha = 0 cpm, beta/gamma = 50 cpm.
	0947	1030	K. Jago and B. McMaster (both of HSEA) on site to conduct a detailed health and safety inspection of drill rig. The oversight geologist observes and documents the activity in the field notebook.
	1030	1046	Begin raising mast. Driller notices one of the rods had slipped out of its cup (probably in transit to the location). Lay mast back down. Driller on rig to slide rod into cup before raising mast.
	1046	1119	Rod back in cup. Raise mast. Finish setting up the site. Prepare to drill.
	1119	1127	Rig up with a 9 7/8-in. diameter tricone bit on a stabilizer; total length = 20.2 ft, table height = 2.2 ft.
	1127	1203	Break for lunch.
	1203	1242	Commence drilling using compressed air only. Drill from 0.0 ft to 30.0 ft below ground surface (BGS). Through gravel drill pad at 0.8 ft BGS. Top of weathered bedrock encountered at 1.3 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAMWELL NO. GW-829**WELL INSTALLATION ACTIVITY/PROGRESS REPORT
continued**

PAGE 2 of 9

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-28-95			Encounter a small amount of moisture at 10.5 ft BGS (returns are
(cont.)			dusty by 12.0 ft BGS). More moisture at 14.5 ft BGS, then dusty
			again almost immediately. Encounter yet more moisture from
			24.0 ft to 27.0 ft BGS. Top of fresh bedrock at 29.0 ft BGS.
	1242	1246	At 30.0 ft BGS, no obvious big water occurrences yet. Pull tools
			up to first connection. Shut off drill rig.
	1246	1318	Waiting for water to accumulate in borehole.
	1318	1322	Drill rig back on, check water level in borehole: 2.5 ft of water in
			the hole. Pull tools back out to first connection.
	1322	1330	Report status to K. Jago who directs to set well to monitor water
			occurrence from 24.0 ft to 27.0 ft BGS.
	1330	1345	Clean out borehole. Begin tripping out. While tripping out, a
			hydraulic line snags on the drill head and gets mangled. Metal
			piping attached to hose is bent, has a broken connection, but is not
			leaking any fluid.
	1345	1436	Making repairs to hydraulic pipe.
	1436	1445	Repairs complete. Finish tripping out of the borehole. Tag bottom
			at 29.5 ft BGS (0.5 ft of fill). Rig down bit/stabilizer assembly. Tally
			well construction materials:
			Screen: 2 sections of 4.5-in. outside diameter (OD), 4.25-in.
			inside diameter (ID), continuous wire-wound (0.01-in.
			openings) stainless steel screen totaling 9.9 ft in length. A
			0.1-ft cap is welded to one of the sections (included in the
			length). Riser: 2 sections of 4.5-in. OD, 4.25-in. ID, schedule 5,

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-28-95			#304 stainless steel casing totaling 19.9 ft in length. Total
(cont.)			screen, cap, and riser = 29.8 ft.
	1445	1501	Steam clean the screen sections which were not sealed in plastic
			and assemble all of the screen and riser pieces on the ground.
	1501	1505	Run the screen and riser string into the borehole. Casing stick-up
			= 0.3 ft. Bottom of the screen/cap is at 29.5 ft BGS, top of the
			screen is at 19.6 ft BGS.
	1505	1510	Run 1.5-in. OD PVC tremie pipe into the annulus to 17.0 ft BGS.
	1510	1523	Tremie 8 1/2, 50-lb sacks of #2 filter sand into the annulus. Sand
			pack from 29.5 ft to 17.8 ft BGS (1.8 ft above top of screen). Pull
			out tremie.
	1523	1527	Slowly pour 2, 50-lb sacks of 3/8-in. diameter Shur-Plug™ bentonite
			aggregate into the annulus. Tag level of unhydrated bentonite at
			14.5 ft BGS.
	1527	1538	Clean up. Crew departs for a bailer.
	1538	1554	Measure water level in well at 7.6 ft below top of casing (BTOC).
	1554	1558	G. Shillings (Highland) returns. Steam clean bailer. Begin bailing
			water out of the well. Bailer bottom comes apart, drops to bottom
			of well.
	1558	1606	G. Shillings off getting another bailer.
	1606	1632	G. Shillings returns with bailer already decontaminated. Continue
			bailing. Bail a total of 15 gallons of water out of the well.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 4 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
2-28-95	1632	1639	Measure water level in well at 16.1 ft BTOC (drop of 8.5 ft).
(cont.)			Measure water level in annulus at 5.3 ft BGS. Depart site.
3-1-95	0800	0818	Arrive at GW-829 site. Measure water level in well at 9.9 ft BTOC
			(rose 6.2 ft since bailing on 2-28-95). Measure water level in
			annulus at 5.0 ft BGS (rose 0.3 ft). Tag hydrated bentonite level at
			12.7 ft BGS (swelled 1.8 ft). Total thickness of bentonite seal is
			5.1 ft.
	0818	1021	Wait on samplers.
	1021	1030	B. Rundle (HSEA) and sampling crew arrive. Samplers: W. Sanders
			(#24059), L. Johnson (#12344), and A. Hild (#28484).
	1030	1038	Insert pump into well and begin purging water. Purge approximately
			13 gallons of water (1 well volume).
	1037	1042	Obtain nitrate and gross alpha/beta samples using the pump.
	1042	1055	Extract the pump. Obtain volatile organic compounds (VOC)
			sample with a teflon bailer. Clean up. Depart site. Oversight and
			crew to "stand-by" until sample analyses have been made.
3-3-95			Results of water sample analyses:
			Volatile organics (Acetone) = 49 ppb
			Gross Alpha = Background
			Gross Beta = 65.7± 30 pc/liter
			Nitrate = 259 ppm
			Plan to extract well screen and casing, deepen the borehole
			approximately 100 ft, and install another well.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 5 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
3-3-95	0820	0845	Arrive at GW-829 site. Crew performs pre-work equipment
(cont.)			inspections.
	0845	0918	Start drill rig and let warm up.
	0918	0930	Pull out temporary well screen and riser casing. Driller decides to
			use a piece of conductor casing to keep the collar of the borehole
			intact, and wants to use a piece longer than what is onsite.
	0930	1000	Crew off-site getting casing.
	1000	1012	Crew returns and steam-cleans the casing.
	1012	1024	Begin pushing the casing into the borehole. Rig up with the bit/
			stabilizer assembly and finish pushing casing to desired depth.
			Casing stick-up = 1.1 ft.
	1024	1042	Trip tools into borehole and begin cleaning out borehole (bentonite
			seal and filter pack).
	1042	1138	At 30.0 ft BGS. Commence drilling using compressed air only. Drill
			from 30.0 ft to 68.0 ft BGS. Encounter small amounts of moisture
			at 34.0 ft and 39.5 ft BGS (cuttings from the interval between these
			groundwater occurrences are weathered—see Well Log).
			Encounter more moisture at 48.0 ft and 52.0 ft BGS. The rods drop
			rapidly through a small void from 54.0 ft to 55.5 ft BGS. Encounter
			a small amount of water at 62.0 ft BGS.
	1138	1239	At 68.0 ft BGS. Throughout this interval, drilling was mostly dry and
			dusty. After hitting water at 62.0 ft BGS, the cuttings became sticky
			and difficult to clear from the borehole. Plan to add water to clean
			borehole. Pull bit 25 ft off bottom. Break for lunch.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 6 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
3-3-95	1239	1251	Turn rig on, turn air on: have more than 25 ft of water in borehole.
(cont.)			Trip into borehole, clean out thoroughly. Report status to K. Jago
			(HSEA). Still planning to install well to monitor a groundwater
			occurrence approximately 100 to 120 ft deep.
	1251	1347	Continue drilling using compressed air and water. Drill from
			68.0 ft to 115.0 ft BGS. Appear to encounter water at 103.0 ft BGS,
			water production appears to increase to 115.0 BGS.
	1347	1430	At 115.0 ft BGS. Clean out borehole. Shut off water: borehole
			appears to be making water. Trip out tools. Rig down bit/stabilizer
			assembly. Tag bottom of borehole at 114.6 ft BGS (0.4 ft of fill).
	1430	1448	Crew off-site filling water supply.
	1448	1515	Crew returns and steam-cleans screen and casing extracted from
			temporary well in this borehole. Decide to run screen and casing
			on 3-6-95. Winterize equipment. Secure site and depart.
3-6-95	0755	0816	Arrive at GW-829 site. Measure water level in borehole at 9.5 ft
			BGS. Tag bottom of borehole at 114.6 ft BGS (no change/no
			additional fill in borehole). Crew arrives, performs pre-work
			equipment inspections. Tally well construction materials:
			Screen: 2 sections of 4.5-in. OD, 4.25-in. ID, continuous wire-
			wound (0.01-in. openings), stainless steel screen totaling
			9.9 ft in length. A 0.1 ft cap is welded to the bottom of one of
			the sections (included in the length).
			Riser: 11 sections of 4.5-in. OD, 4.25-in. ID, schedule 5, #304
			stainless steel casing totaling 110.3 ft. Total of screen, cap,
			and riser = 120.2 ft.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			PAGE 7 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
3-6-95	0816	0840	Run screen and casing into borehole, to the bottom (centralizers not used). Casing stick up = 5.6 ft. Bottom of the screen/cap = 114.6 ft BGS. Top of the screen = 104.7 ft BGS.
(cont.)			
	0840	0851	Run 1.5-in. OD PVC Tremie pipe into the annulus to 97.0 ft BGS.
	0851	0904	Tremie 9, 50-lb sacks of #2 filter pack sand into the borehole. Sand pack from 114.6 ft to 102.9 ft BGS. Used approximately 40 gallons of water to tremie the sand.
	0904	0907	Pull out tremie pipe.
	0907	0918	Slowly pour 2, 50-lb sacks of Shur-Plug™ 3/8-in. diameter bentonite aggregate into the annulus. Top of unhydrated bentonite is at 99.0 ft BGS. Bentonite to hydrate a minimum of 4 hours prior to sampling. Clean up, secure site, and depart.
3-7-95	0803	0852	Arrive at GW-829 site. Measure water level inside well at 8.9 ft BGS. Measure water level in annulus also at 8.9 ft BGS. Tag hydrated bentonite at 98.3 ft BGS (bentonite swelled 0.7 ft). Total thickness of bentonite seal is 4.6 ft.
	0852	0908	Samplers arrive on site: L. Johnson (#12344) and A. Hild (#28484). B. Rundle (HSEA) also onsite.
	0908	0950	Insert pump into well. Begin purging the well (purge rate = 1.7 gal/minute). Lower pump as water level drops.
	0950	1016	Begin measuring water quality parameters on 5-min. intervals.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL INSTALLATION ACTIVITY/PROGRESS REPORT continued			
			PAGE 8 of 9
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
3-7-95	1016	1025	Parameters have stabilized, obtain Anion sample and gross alpha/beta sample with pump. Remove pump from well. Purged a total of 124 gallons of water from the well. Obtain VOC sample using a teflon bailer. Measure water level in annulus at 9.8 ft BGS (lowered 0.9 ft). Unable to measure water level inside well because probe and cable cling to the wall of the casing.
(cont.)			
	1025	1038	Clean up sampling equipment. Secure site and depart. Oversight and drill crew to "stand-by" until sample analyses have been made.
3-9-95			Results of water sample analyses:
			Volatile organics (Acetone) = 174 ppb
			Gross Alpha = 70.4 ± 35 pc/liter
			Gross Beta = 535 ± 49 pc/liter
			Nitrate = 2210 ppm
	0801	0846	HSEA plans to keep the well at this location at this depth for monitoring purposes, directs to complete the well installation. Arrive at GW-829 site. The drill rig has been demobilized. New well casing stick-up = 2.9 ft. Calculate an annular volume to the ground surface of 41.4 cubic ft = 1.5 cubic yds, equivalent to 35.1 sacks of Type I cement. Run 1.5-in OD PVC tremie pipe into the annulus to 8.0 ft BGS.
	0846	0902	Mix and pump-tremie 4 sacks (4.7 cubic ft) of neat, Type I Portland cement (grout weight = 12.2 lbs/gal) into the annulus. Circulate water.
	0902	0913	Pull out tremie pipe. Clean up. Secure site and depart. Grout delivery for the remaining annulus scheduled for 1000 hrs on 3-10-95.

APPENDIX B
LITHOLOGIC LOGS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			PROBE NO. <u>GW-825</u>
BORING LOG			PAGE 1 of 2
LOCATION: <u>Centralized Sanitary Landfill II</u>		DATE: START: <u>12-7-94</u>	
DRILLERS: <u>R. Phillips/H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-7-94</u>	
HELPER: <u>G. Shillings - Highland Drilling Co.</u>		DRILLING METHOD: <u>Air Rotary</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>		LOGGED BY: <u>S.L. Abston - SAIC</u>	
NOTES: <u>Installation of a shallow methane gas monitoring probe.</u>			

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.5		Moderate brown (5 YR 3/4) moist, clayey surface soils with many rootlets.
0.5	3.0	Breathing zone	Moderate reddish-brown (10 YR 4/6), slightly moist clay with
		analysis (BZA) at 2 ft	approximately 20% weathered chert fragments.
		BGS = 0.1 ppm	
		(background). Lower	
		explosive limit at 2.4 ft	
		BGS. LEL <1%	
		(6 ppm) [back-ground	
		= <1% (6.4 ppm)].	
3.0	7.0		Moderate yellowish-brown (10 YR 5/4) moist clay with smaller
			weathered chert fragments.
7.0	18.5	BZA at 8.0 ft BGS =	Light brown (5 YR 5/6) (almost yellow) dry clay with approximately
		0.1 ppm. LEL at 2.5 ft	10% small yellow, weathered, and stained chert fragments.
		BGS <1% (6.0 ppm).	
		Beta/gamma = 30	
		cpm. BZA at 11 ft	
		BGS = 0.1 ppm. LEL	
		at 11.3 ft BGS <1%	
		(7.5 ppm). BZA at	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			PROBE NO. <u>GW-826</u> PAGE 1 of 2
BORING LOG			
LOCATION: <u>Sanitary Landfill II</u>		DATE: START: <u>12-8-94</u>	
DRILLERS: <u>R. Phillips/H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-8-94</u>	
HELPER: <u>G. Shillings - Highland Drilling Co.</u>		DRILLING METHOD: <u>Air Rotary</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>		LOGGED BY: <u>S.L. Abston - SAIC</u>	
NOTES: <u>Installation of a shallow methane gas monitoring probe.</u>			
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	2.5	Breathing zone	Dark yellowish-brown (10YR 4/6) moist clay with 20% weathered
		analysis (BZA) at	chert fragments.
		1.5 ft below ground	
		surface (BGS) = 0.0	
		ppm (background).	
		Lower explosive limit	
		(LEL) at 2.5 ft BGS	
		<1% (9.5 ppm)	
		(background).	
2.5	10.0	Beta/gamma = 40	Light brown (5YR 5/6) dry clay with 20% weathered chert frag-
		cpm (60 cpm back-	ments. Large chert fragment from 9 ft to 9.2 ft BGS.
		ground) BZA at 7 ft	
		BGS = 0.0 ppm; LEL	
		at 7.6 ft BGS <1%	
		(4.5 ppm)	
10.0	36.0	BZA at 21.2 ft BGS =	Alternating moderate reddish-brown (10YR 4/6) moist clay and a
		0.0 ppm LEL at 21.5 ft	light brown (5YR 5/6) slightly moist clay with both containing
		BGS <1% (12 ppm).	approximately 10% weathered chert fragments.
		BZA at 29 ft BGS =	
		0.0 ppm. LEL <1%	
		(>100 ppm)	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

 WELL NO. GW-827
WELL LOG

PAGE 1 of 4

 LOCATION: Sanitary Landfill VI

 DATE: START: 1-10-95

 DRILLERS: H. Hall - Highland Drilling Co.

 FINISH: 1-24-95

 HELPERS: R. Phillips/G Shillings - Highland Drilling Co.

 DRILLING METHOD: Air Rotary

 DRILL: Ingersoll-Rand XL-750

 LOGGED BY: Timothy Coffey - SAIC

 NOTES: Stainless-steel screened well monitoring bedrock groundwater occurrence in Knox Group. Well is a replacement for GW-545. All rock colors described while wet.

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.5		Grayish-brown (5YR 3/2) to dusky brown (5YR 2/2), loamy topsoil.
0.5	1.0		Pale yellowish - orange (10YR 8/6) to dark yellowish-orange (10YR 6/6), dry, clayey subsoil.
1.0	14.5	Breathing zone	Light brown (5YR 5/6), massive, dry stiff clay with light gray (N7)
		analysis (BZA) at 2.0 ft	to very pale orange (10YR 8/2), angular chert fragments.
		= 0.0 ppm. BZA at 4.5	Thin chert bed or lens at 3.0 ft below ground surface (BGS).
		ft = 0.0 ppm. Lower	Chert bed or lens: 4.5 ft to 5.0 ft BGS.
		explosive limit (LEL) at	Chert bed or lens: 13.5 ft to 14.5 ft BGS.
		6.5 ft <1% (6.4 ppm).	
		BZA at 10.0 ft = 1.4	
		ppm. Alpha = 0 cpm,	
		beta/gamma = 60	
		cpm. LEL at 12.5 ft	
		<1% (5.8 ppm).	
14.5	21.0	BZA at 16.0 ft = 0.0	Light brown (5YR 5/6), massive, moist "sticky" clay with chert
		ppm. Alpha = 0 cpm,	fragments as above.
		beta/gamma = 50	
		cpm. Screening of	
		cuttings from 0.0 to	
		18.0 ft: alpha = 0 cpm,	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-827</u>
WELL LOG - continued			PAGE 2 of 4
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
14.5	21.0	beta/gamma = 60	
(cont.)		cpm, pH = 7.7,	
		headspace = 0.5 ppm.	
21.0	35.0	BZA at 24.0 ft = 0.0	Predominantly moderate yellowish-brown (10YR 5/4), massive,
		ppm. BZA at 29.0 ft =	moist clay with pale yellowish-orange (10YR 8/6), stained residual
		0.0 ppm.	chert fragments (approximately 10% by volume).
35.0	40.5	BZA at 39.0 ft = 0.0	Pale yellowish-brown (10YR 6/2) to yellowish-gray (5YR 7/2),
		ppm. BZA at 40.0 ft =	massive, wet clay with weathered/residual chert fragments of the
		0.0 ppm.	same color.
			Top of bedrock at 40.5 ft BGS (no weathered bedrock observed at
			this location).
40.5	117.8	Screening of cuttings	Predominantly pale yellowish-brown (10YR 6/2) to light brownish-
		from 18.0 ft to 45.0 ft:	gray (5YR 6/1), massive, stylolitic, very finely-crystalline dolostone
		alpha = 0 cpm, beta/	with minor (approximately 15% each of) olive black (5YR 2/1),
		gamma = 70 cpm, pH	massive dolostone and light bluish-gray (5B 7/1), massive
		= 7.8, headspace =	dolostone. Interval also contains rare chert, and rare zones of
		0.0 ppm. BZA at 48.1	accumulations of pellets. Small amount of moisture at 49.6 ft BGS.
		ft = 0.3 ppm. LEL at	Cavity/void: 54.5 ft to 55.4 ft BGS with minor water. Small amount
		49.1 ft <1% (6.3 ppm).	of moisture associated with a fracture at 68.1 ft BGS.
		BZA at 54.5 ft = 0.0	
		ppm. BZA at 57.0 ft =	
		0.0 ppm. LEL at 61.0 ft	
		<1% (5.2 ppm). BZA	
		at 64.0 ft = 0.2 ppm.	
		Alpha = 0 cpm, beta/	
		gamma = 60 cpm.	
		BZA at 69.3 ft = 0.0	
		ppm, BZA at 76.5 ft =	
		0 ppm. BZA at 85.5 ft	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-827

WELL LOG - continued

PAGE 3 of 4

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
40.5	117.8	= 0 ppm. BZA at 90.5	
(cont.)		ft = 0 ppm. Screening	
		of cuttings from 45.0	
		to 93.1 ft: alpha = 0	
		cpm, beta/gamma =	
		50 cpm, pH = 9.8,	
		headspace = 1.4	
		ppm. BZA at 100.2 ft	
		= 0.3 ppm. BZA at	
		106.0 ft = 1.4 ppm.	
		LEL at 110.8 ft <1%	
		(5.2 ppm). BZA at	
		116.0 ft = 0.1 ppm.	
		Alpha = 0 cpm, beta/	
		gamma = 40 cpm.	
117.8	135.0	BZA at 122.6 ft = 0	Predominantly olive black (5Y 2/1), massive, very finely crystal-
		ppm. LEL at 131.5 ft	line dolostone with minor light bluish-gray (5B 7/1) dolostone and
		<1% (3.5 ppm). BZA	grayish-orange pink (10R 8/2) dolostone and very pale orange
		at 132.6 ft = 0 ppm.	(10YR 8/2), weathered (bleached) and pitted dolostone. Also
		Screening of cuttings	observed a small amount of dark yellowish-orange (10YR 6/6),
		from 117.8 to 135.0	thinly laminated, shaley cavity sediment from this interval. Cavity/
		ft: alpha = 0 cpm,	void: 127.6 ft to 128.0 ft BGS - significant water occurrence.
		beta/gamma = 70	
		cpm, pH = 9.7,	Total Depth = 135.0 ft BGS.
		headspace = 2.1	
		ppm.	SUBSURFACE DATABASE SUMMARY*
			Rock Formation(s): KNOX
			Aquifer: B

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL LOG			PAGE 1 of 4
LOCATION: <u>Boneyard/Burnyard</u>		DATE: START: <u>2-9-95</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>3-6-95</u>	
HELPERS: <u>R. Phillips/G. Shillings - Highland Drilling Co.</u>		DRILLING METHOD: <u>Air Rotary</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
NOTES: <u>Stainless-steel screened well monitoring a bedrock groundwater occurrence in the Nolichucky Shale. Temporary well installed at same location from 82.7 ft to 72.3 ft BGS. Rock colors described while wet.</u>			
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.8		Medium light gray (N6) gravel. Top course is ≤1-in. diameter, base is 2- to 3-in. diameter.
0.8	7.5	Breathing zone analysis (BZA) at 2.0 ft and 6.0 ft = 0.0 ppm.	Dark yellowish-brown (10YR 4/2) topsoil grading to dark yellowish-orange (10YR 6/6), dry, clayey subsoil. Minor weathered and stained shale fragments. Top of weathered bedrock at 7.5 ft below ground surface (BGS).
7.5	10.5	Lower explosive limit (LEL) reading at 9.5 ft <1% (4.0 ppm).	Predominantly pale yellowish-brown (10YR 6/2) to light olive gray (5Y 5/2), weathered and stained, thinly laminated shale; minor moderate yellowish-brown (10YR 5/4), massive, weathered and stained micrite. Moisture (water table) at 10.5 ft BGS.
10.5	18.1	BZA at 13.5 ft and 17.5 ft = 0.0 ppm. Composite from 0.0 ft to 18.1 ft: alpha = 0 cpm, beta/gamma = 80 cpm, pH = 7.4, headspace = 0.4 ppm.	Pale brown (5YR 5/2) to grayish-red (10R 4/2), weathered, thinly laminated shale (color change the result of groundwater staining). More moisture at 15.5 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-828</u>
WELL LOG - continued			PAGE 2 of 4
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
18.1	38.7	BZA at 23.1 ft =	Generally: grayish-red (R 4/2), light olive gray (5Y 5/2) and
		3.1 ppm. LEL at	greenish-gray (5G 6/1), weathered and stained, thinly laminated
		30.6 ft <1% (9.0 ppm).	shale; with minor moderate olive brown (5Y 4/4), weathered,
		Composite from	massive micrite. The shale is occasionally blocky with beds up to
		18.1 ft to 30.7 ft: alpha	0.5-in. thick. The shale is also occasionally micaceous. Water
		= 0 cpm, beta/gamma	zone from 35.3 ft to 35.6 ft, and associated ratty drilling from 35.7 ft
		= 80 cpm, pH = 8.8,	to 38.7 ft BGS.
		headspace = 0.0 ppm.	
		BZA at 31.0 ft =	
		0.3 ppm. LEL at	
		35.0 ft <1% (3.9 ppm).	
		BZA at 38.7 ft =	
		0.2 ppm.	
38.7	47.7	Alpha = 0 cpm, beta/	Medium dark gray (N4), thinly laminated shale; brownish-gray
		gamma = 60 cpm.	(5YR 4/1) to light brownish-gray (5YR 6/1), massive micrite. Ratty
			zone above continues to 42.7 ft BGS. White (N9) and moderate
			pink (5R 7/4) calcite vein material (probably from ratty/fracture
			zone) also observed in this interval, but mainly from upper part of
			interval.
47.7	82.7	BZA at 55.0 ft =	The medium dark gray (N4) shale and brownish-gray (5YR 4/1)
		0.0 ppm. BZA at	micrite of above continue throughout this interval. Also observe
		62.7 ft = 0.1 ppm.	very dusky red (10R 2/2), thinly laminated shale in this interval as
		Beta/gamma =	well as pelletal micrite, oolitic micrite, and oomicrite. Calcite vein
		60 cpm (67.7 ft). BZA	material is again present in this interval, apparently more abun-
		at 75.5 ft = 0.0 ppm.	dant in the ratty/fracture zones. Observe an increase in water
		Composite from	production at 51.5 ft and at approximately 77 ft BGS.
		30.7 ft to 82.7 ft: alpha	
		= 0 cpm, beta/gamma	
		= 60 cpm, pH = 9.3,	
		headspace = 0.2 ppm.	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-828

WELL LOG - continued

PAGE 3 of 4

DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
			Temporary well installation: screened interval from 82.7 ft to 72.3 ft BGS.
82.7	123.0	BZA at 86.0 ft = 0.0 ppm. BZA at 90.5 ft = 0.1 ppm. Beta/gamma = 50 cpm (93.0 ft). BZA at 97.7 ft = 0.1 ppm. BZA at 106.0 ft = 0.0 ppm. BZA at 114.5 ft = 0.0 ppm. Beta/gamma = 80 cpm (118.0 ft). Composite from 82.7 ft to 123.0 ft: alpha = 0 cpm, beta/gamma = 50 cpm, pH = 9.5, headspace = 0.2 ppm.	Very dusky red (10R 2/2), thinly laminated shale; medium dark gray (N4) to dark greenish-gray (5G 4/1), thinly laminated shale; and brownish-gray (5YR 4/1) to brownish-black (5YR 2/1), oomicrite and oolitic intramicrite. At the beginning of the interval, the 3 primary lithologies are in approximate equal amounts. Toward the end of the interval, the shales predominate. Calcite again occurs, scattered throughout the interval (between 102.0 ft and 118.0 ft, some fragments as large as 4 mm). Zones of increased water production as follows: – 85.3 ft (assoc. with ratty drilling: 82.7 ft to 85.3 ft). – 108.0 ft (assoc. with ratty drilling: 107.5 ft to 108.3 ft).
123.0	168.0	BZA at 126.0 ft = 0.0 ppm. LEL at 132.0 ft <1% (2.9 ppm). BZA at 138.0 ft = 0.0 ppm. Beta/gamma = 50-60 cpm (143.0 ft). BZA at 146.0 ft = 0.0 ppm. LEL at 152.0 ft <1% (2.5 ppm). BZA at 155.0 ft = 0.1 ppm. BZA at 163.5 ft = 0.0 ppm. Composite from 123.0 ft to 168.0 ft: alpha =	Predominately very dusky red (10R 2/2) and medium dark gray (N4), thinly laminated shale; with continued minor brownish-gray (5YR 4/1) to brownish-black (5YR 2/1), massive micrite and oomicrite. Observe an increase in oololiths toward the bottom of the interval. Also have rare light olive gray (5Y 5/2) massive, very finely crystalline micrite near the bottom of the interval. Calcite vein material is still present in the interval, scattered throughout. Water zones in the following intervals: – 153.5 ft to 155.5 ft (assoc. with ratty drilling of the same interval). – 164.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-829</u>	
WELL LOG		PAGE 1 of 3	
LOCATION: <u>Boneyard/Burnyard</u>		DATE: START: <u>2-28-95</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>3-17-95</u>	
HELPERS: <u>R. Phillips/G. Shillings - Highland Drilling Co.</u>		DRILLING METHOD: <u>Air Rotary</u>	
DRILL: <u>Ingersoll-Rand XL-750</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
NOTES: <u>Stainless-steel screened well monitoring a bedrock groundwater occurrence in the Nolichucky Shale from 104.7 ft to 114.6 ft BGS. Temporary well installed in same borehole from 19.6 ft to 29.5 ft BGS was sampled and removed. All rock colors described while wet.</u>			
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
0.0	0.8		Medium light gray (N6) undifferentiated limestone gravel. Top course is ≤1-in. diameter, base is 2- to 3-in. diameter.
0.8	1.3		Pale reddish-brown (10R 5/4) to moderate reddish-brown (10R 4/6), dry, clayey soil with weathered shale fragments. Top of weathered bedrock at 1.3 ft BGS.
1.3	16.5	Breathing zone analysis (BZA) at 2.0 ft = 0.0 ppm.	Generally pale brown (5YR 5/2) to pale red (10R 6/2), and pale olive (10Y 6/2), weathered, thinly laminated shale stained dark yellowish-orange (10YR 6/6) to light brown (5YR 5/6). Slight moisture (enough for dust abatement) at 10.5 ft and 14.5 ft BGS.
		BZA at 10.0 ft and 16.0 ft, both = 0.0 ppm.	
16.5	18.0	Beta/gamma = 70-80 cpm.	Dark yellowish-brown (10YR 4/2), massive, weathered and stained micrite; with rare shale.
18.0	29.0	BZA at 21.2 ft = 0.0 ppm. Composite from 0.0 ft to 30.0 ft: BGS: alpha = 0 cpm, beta/gamma = 70 cpm, pH = 8.2, headspace = 0.0 ppm.	Predominantly grayish-red (5R 4/2), pale brown (5YR 5/2), and light olive gray (5Y 5/2), weathered, thinly laminated shale, stained dark yellowish-brown (10YR 4/2). Lithology nearly identical to the 1.3 ft to 16.5 ft BGS interval above, but darker in color. Small amount of moisture from 24.0 ft to 27.0 ft BGS. Top of fresh bedrock at 29.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-829</u>
WELL LOG - continued			PAGE 2 of 3
DEPTH (ft)		SAMPLE (NO. & INTERVAL)	SOIL/BEDROCK DESCRIPTION
FROM	TO		
29.0	34.0		Predominantly medium dark gray (N4), thinly laminated shale with minor brownish-gray (5YR 4/1) to dark gray (N3), massive micrite and pelletal micrite. Small amount of moisture at 34.0 ft BGS.
34.0	39.5	BZA at 34.5ft = 0.0 ppm	Light olive gray (5Y 5/2), weathered, thinly laminated shale; and moderate brown (5YR 4/4), weathered, massive micrite. Moisture at 39.5 ft BGS. Interval consists of weathered and stained rock.
39.5	54.0	BZA at 41.0 ft and 50.8 ft, both = 0.0 ppm Beta/gamma = 60 cpm (43.0 ft BGS).	Predominately blackish-red (5R 2/2), thinly laminated shale (in excess of 50% for the interval); with medium dark gray (N4) to medium bluish-gray (5B 5/1), thinly laminated shale; and brownish-gray (5YR 4/1) micrite. Begin to see fragments of dark greenish-gray (5GY 4/1), massive to bedded micrite near the end of the interval. Calcite vein material common to entire interval. Moisture at 48.0 ft and 52.0 ft BGS.
54.0	55.5		Void/cavity, and associated moisture.
55.5	93.0	BZA at 59.5 ft = 0.0 ppm. Composite from 30.0 ft to 68.0 ft: alpha = 0 cpm, beta/gamma = 80 cpm, pH = 9.3, headspace = 0.0 ppm. BZA at 70.0 ft, 80.0 ft, and 90.0 ft, all = 0.0 ppm. Beta/gamma = 60 cpm (93.0 ft).	Medium dark gray (N4) to dark greenish-gray (5GY 4/1), thinly laminated shale (~60%); blackish-red (5R 2/2), shale (~20%); and brownish-gray (5YR 4/1) micrite (~20%). Continue to see calcite fragments and veinlets in the returns. Small water occurrence at 62.0 ft BGS.

[illegible]

APPENDIX C
WELL CONSTRUCTION DIAGRAMS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

PROBE NO. GW-825GAS MONITORING PROBE
INSTALLATION DIAGRAMLOGGED BY: S.L. Abston - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling Co.STARTED: 12-7-94DRILLERS: R. Phillips/H. Hall HELPER: G. ShillingsFINISHED: 12-7-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

PROBE NO. GW-826GAS MONITORING PROBE
INSTALLATION DIAGRAMLOGGED BY: S.L. Abston

DRILLING DATES

DRILLING COMPANY: Highland Drilling Co.STARTED: 12-8-94DRILLERS: R. Phillips/H. HallHELPER: G. ShillingsFINISHED: 12-8-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-827

WELL INSTALLATION DIAGRAM

LOGGED BY: Timothy Coffey - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling CompanySTARTED: 1-10-95FINISHED: 1-24-95DRILLER: H. Hall HELPERS: R. Phillips/G. Shillings

NOT TO SCALE

95-001MS(G)/022795

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-828

WELL INSTALLATION DIAGRAM

Page 1 of 2

LOGGED BY: Timothy Coffey - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling CompanySTARTED: 2/9/95DRILLER: H. HallHELPERS: R. Phillips/G. ShillingsFINISHED: 3/6/95

NOT TO SCALE

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-828

TEMPORARY WELL INSTALLATION DIAGRAM

Page 2 of 2

LOGGED BY: Timothy Coffey - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling CompanySTARTED: 2/9/95DRILLER: H. Hall HELPERS: R. Phillips/G. ShillingsFINISHED: 3/6/95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-829

WELL INSTALLATION DIAGRAM

Page 1 of 2

LOGGED BY: Timothy Coffey - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling CompanySTARTED: 2-28-95DRILLERS: H. Hall/R. PhillipsHELPERS: R. Phillips/G. ShillingsFINISHED: 3-17-95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-829

TEMPORARY WELL INSTALLATION DIAGRAM

Page 2 of 2

LOGGED BY: Timothy Coffey - SAIC

DRILLING DATES

DRILLING COMPANY: Highland Drilling CompanySTARTED: 2-28-95DRILLER: H. HallHELPERS: R. Phillips/G. ShillingsFINISHED: 3-17-95

APPENDIX D

WELL DEVELOPMENT DATA

MONITORING WELL DEVELOPMENT PROGRESS

WELL INSTALLATION COMPLETION DATE: 1-23-95

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. <u>GW-827</u>
MONITORING WELL DEVELOPMENT SUMMARY	
METHOD OF DEVELOPMENT: <u>Swab</u>	
DEVELOPMENT OBSERVED BY: <u>Timothy Coffey - SAIC</u>	
DEVELOPMENT DATE: <u>1-23-95</u> FINISH: <u>1-24-95</u>	
ONE WELL VOLUME: <u>71.1</u> GALLONS	
TOTAL GALLONS PUMPED: <u>420</u> TOTAL WELL VOLUMES PUMPED: <u>5.9</u>	
INITIAL pH: <u>8.3</u> FINAL pH: <u>7.6</u>	
INITIAL SPECIFIC CONDUCTANCE: <u>231 µmhos/cm</u> FINAL: <u>209 µmhos/cm</u>	
DESCRIPTION OF INITIAL TURBIDITY: <u>Clear (see Well Development Progress Sheet)</u>	
DESCRIPTION OF FINAL TURBIDITY: <u>Slightly Turbid</u>	
FINAL MEASURED TURBIDITY: <u>Not Analyzed</u>	
WELL APPROVED BY: <u>W. K. Jago - HSEA</u>	
ODOR OF WATER: <u>None Discernable</u>	
WATER DISCHARGED TO: ☐ GROUND SURFACE ☐ TANK TRUCK ☐ STORM SEWERS ☐ STORAGE TANKS ☐ DRUMS ☒ OTHER <u>Unlined pit on site</u>	
INITIAL PRE-DEVELOPMENT WATER DEPTH: <u>37.9 ft BGS on 1-23-95</u>	
DEVELOPMENT OBSERVATIONS: <u>Well exhibits good recharge as evidenced by inability to draw water level down significantly during development sessions. Unable to completely clear the well water - typical for wells installed in Knox Group formations.</u>	
OBSERVER SIGNATURE: <u> </u>	
DATE: <u>1-24-95</u>	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-828

MONITORING WELL DEVELOPMENT PROGRESS

LOCATION: Boneyard/Burnyard ONE WELL VOLUME: 117.0 GALLONSCOMPLETION DATE: 2-24-95

DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μ mhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
2-27-95	55	Turbid	7.6	2700	55	0.5	
2-27-95	32	Turbid	7.1	3020	87	0.7	1, 2
2-28-95	28	Turbid	7.9	1310	115	1.0	1
3-1-95	35	Moderately Turbid	8.2	830	150	1.3	1
3-2-95	50	Turbid	8.4	720	200	1.7	1, 3
3-3-95	40	Turbid	8.5	680	240	2.1	1, 3
3-6-95	55	Slightly Turbid	8.9	550	295	2.5	1, 4
RESULTS AT END OF DEVELOPMENT		Slightly Turbid	8.9	550	295	2.5	

COMMENTS

Swab tubing at 165.4 ft BGS.

1. Swabbed to dryness

2. Water sample has musty/fishy odor

3. Water sample has petroliferous odor

4. Water sample has unknown chemical odor

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-828

MONITORING WELL DEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 2-27-95FINISH: 3-6-95ONE WELL VOLUME: 117.0 GALLONSTOTAL GALLONS PUMPED: 295 TOTAL WELL VOLUMES PUMPED: 2.5INITIAL pH: 7.6 FINAL pH: 8.9INITIAL SPECIFIC CONDUCTANCE: 2700 μ mhos/cm FINAL: 550 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: TurbidDESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: Fishy odor: 2-27-95, petroliferous odor: 3-2-95 and 3-3-95, and unknown chemical odor: 3-6-95.WATER DISCHARGED TO: ☒ GROUND SURFACE☐ TANK TRUCK☐ STORM SEWERS☐ STORAGE TANKS☐ DRUMS☒ OTHER Cuttings Pit

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 7.1 ft BGS on 2-24-95DEVELOPMENT OBSERVATIONS: Well exhibits very slow recharge. Well was purged to dryness during each session. Rising pH levels probably due to grout influence. Well development terminated by K. Jago (HSEA).OBSERVER SIGNATURE: DATE: 3-6-95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-829

MONITORING WELL DEVELOPMENT PROGRESS

LOCATION: Boneyard/Burnyard ONE WELL VOLUME: 72.2 GALLONSCOMPLETION DATE: 3-13-95

DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μ mhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
3-13-95	55	Slightly Turbid	7.2	5600	55	0.8	
3-13-95	18	Slightly Turbid	6.9	5800	73	1.0	1.
3-13-95	10	Moderately Turbid	7.4	7000	83	1.2	1.
3-14-95	18	Moderately Turbid	8.1	1600	101	1.4	1.
3-15-95	22	Slightly Turbid	7.9	950	123	1.7	1.
3-17-95	25	Slightly Turbid	8.2	790	148	2.1	1.
RESULTS AT END OF DEVELOPMENT		Slightly Turbid	8.2	790	148	2.1	

COMMENTS

Swab tubing at 112.5 ft BGS.

1. Swabbed to dryness

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-829

MONITORING WELL DEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab DEVELOPMENT DATE:
 DEVELOPMENT OBSERVED BY: Timothy Coffey - SAIC START: 3-13-95
 FINISH: 3-17-95
 ONE WELL VOLUME: 72.2 GALLONS
 TOTAL GALLONS PUMPED: 148 TOTAL WELL VOLUMES PUMPED: 2.1
 INITIAL pH: 7.2 FINAL pH: 8.2
 INITIAL SPECIFIC CONDUCTANCE: 5600 μ mhos/cm FINAL: 790 μ mhos/cm
 DESCRIPTION OF INITIAL TURBIDITY: Slightly turbid
 DESCRIPTION OF FINAL TURBIDITY: Slightly Turbid
 FINAL MEASURED TURBIDITY: Not Analyzed
 WELL APPROVED BY: W.K. Jago - HSEA

ODOR OF WATER: A "fishy" odor on the first day of development, unknown chemical odor.

WATER DISCHARGED TO: ☐ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☒ OTHER Unlined cuttings pit

INITIAL PRE-DEVELOPMENT
 WATER DEPTH: 16.6 ft BGS on 3-13-95

DEVELOPMENT OBSERVATIONS: Well exhibits very slow recharge. Well purged to dryness during each development session. Well development terminated by K. Jago (HSEA) after purging 2.1 well volumes.

OBSERVER SIGNATURE: DATE: 3-17-95

APPENDIX E

WASTE MANAGEMENT PLAN FOR DRILLING ACTIVITIES

1. INTRODUCTION

The ultimate objective of monitoring groundwater is gathering data to assess potential impacts to human health and the environment. It is also the objective of the Y-12 Groundwater Protection Program (GWPP) to handle drill cuttings from the installation of groundwater monitoring wells or borings in a manner that protects the environment. The Y-12 philosophy has been and continues to be consistent with the U.S. Environmental Protection Agency (EPA) and Martin Marietta Energy Systems, Inc., (Energy Systems) E&SA guidance for managing well cuttings. Site-specific professional judgment is used to determine the potential for contamination prior to installation of each well. Factors considered in evaluating potential for site contamination include:

- previously collected sampling and analysis data,
- groundwater flow patterns,
- geologic and hydrogeologic setting, and
- purpose of well (containment plume assessment, background monitoring defining lines of compliance, etc.).

Based on the evaluation, one of two options is selected:

- stabilize material on site or
- collect for treatment or storage.

2. DRILL CUTTINGS DISPOSAL

There are two levels of drill cuttings management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste disposal. Disposal of drill cuttings at the drill site following best management practices (BMP) is permitted if the cuttings do not exceed the field-screening criteria discussed below. If the field-screening criteria are exceeded, the cuttings must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of the drill cuttings will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (ESH/Sub/87/21706/1).

E.2.1 FIELD SCREENING

Field screening of drill cuttings will consist of measuring three parameters: radioactivity, volatile organics, and pH. The Energy Systems procedures specified in Table E.1 will be followed with some modification as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the cuttings and the highest readings will be recorded.

Screening for organic vapors will be conducted on a composite sample from the cuttings generated at a single well. The sample will be collected with a hand trowel or similar tool to select cuttings from several depths. Enough cuttings will be placed in a clean 1-gt glass or metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 1 h at 70°F or the ambient temperature, whichever is higher. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a

photoionization detector with a 10.2 eV lamp and will be calibrated to isobutylene. The highest reading of the headspace vapors will be recorded.

Table E.1. Y-12 Plant field-screening criteria for drill cuttings and development water

Field analysis	Energy Systems Procedure No.	Limit
pH	ESP-307-2	4.0–10.5
Specific conductivity ^a	ESP-307-8	< 1000 μ mhos/cm
Organic	ESP-307-6	< 5 ppm
Radioactivity	ESP-307-7	
beta/gamma		< 600 dpm/100 cm ² (< 100 cpm)
alpha		< 1000 dpm/100 cm ² (< 500 cpm)

^a Not applicable to drill cuttings.

The pH of the cuttings will be estimated by adding one quart of deionized water to the composite sample used to determine the presence of organic vapors. The sample will be agitated until well mixed. The pH of the mixture will be determined by using an approved pH measuring instrument. This pH will be recorded.

E.2.2 CONTAINERIZATION FOR WASTE DISPOSAL

If the cuttings from a borehole exceed any one of the field screening limits, they will be containerized at the drill site and labeled with the contents (drill cuttings), borehole number, and date. The cuttings will then be handled according to Y-12 Plant waste management procedures.

An exception to the above may be made if the cuttings only exceed the organic vapor limits. Weather permitting, those cuttings may be passively treated by aeration at the drill site to reduce the organic vapor content. Such treatment shall not exceed 5 working days. If reanalysis following aeration indicates the cuttings continue to exceed the organic vapor limits, they must be containerized and handled as above.

E.2.3 BEST MANAGEMENT PRACTICES FOR DRILL SITE DISPOSAL

Drill cuttings that do not exceed the field-screening criteria will be disposed of at the drill site, if practicable. BMP dictate that the cuttings be disposed in such a way as to not be unsightly or cause erosion/sedimentation impacts on nearby surface water. The cuttings shall therefore be used as part of the restoration of the drill site, to fill in low areas and tire tracks, or spread to conform to the natural topography. They will subsequently be seeded and mulched. If bedrock cuttings contain a

liquid fraction, care shall be taken to ensure this liquid infiltrates or evaporates at the drill site and in no case runs off into surface waters, ephemeral drainages, or storm sewers. Drill cuttings that do not exceed the field-screening criteria but cannot be disposed of at the drill site due to its location (parking lot, yard, etc.) will be transported to a designated location and disposed of as clean fill, following BMP.

E.2.4 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the drill cuttings from each borehole will be documented on a Drill Cuttings Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each borehole by the on-site geologist who conducts the screening. A copy of each form will be provided to the Project Manager of the GWPP within 2 days of its completion.

E.3. DEVELOPMENT WATER DISPOSAL

There are two levels of development water management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste disposal. Disposal of development water at the drill site following BMP is permitted if the water does not exceed the field-screening criteria discussed below. If the field-screening criteria are exceeded, the water must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of development water will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (ESH/Sub/87/21706/1).

E.3.1 FIELD SCREENING

Initial development water will be containerized until it has been screened. This is accomplished by pumping the water into drums or other suitable container(s). Screening will be conducted on grab samples taken approximately every hour after the first one-half hour of development. (An alternative to the hourly grab samples is to totally contain all the development water produced at a well, then analyze a composite sample.) If initial grab samples do not exceed the limits specified in Table E.1, development water may be pumped directly on the ground (following BMP) unless or until a subsequent grab sample exceeds the limits.

Field screening of development water will consist of measuring four parameters: radioactivity, volatile organics, specific conductivity, and pH. The Energy Systems procedures specified in Table E.1 will be followed with some modification, as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the sample and the highest readings will be recorded.

Screening for organic vapors will be conducted by placing enough development water in a clean 1-gt glass or metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 1 h at 70°F or the ambient temperature, whichever is higher. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a photoionization detector with a 10.2 eV lamp and will be calibrated to isobutylene. The highest reading of the headspace vapors will be recorded.

E.3.2 CONTAINERIZATION FOR WASTE DISPOSAL

If the development water from a well exceeds any one of the field screening limits, it will be containerized at the drill site and labeled with the contents (development water), well number, and date. The water will then be handled according to Y-12 Plant waste management procedures.

An exception to this may be made if the development water only exceeds the organic vapor limits. Weather permitting, the water may be passively treated at the drill site by leaving the containers open for aeration to reduce the organic vapor content. Such treatment shall not exceed 5 working days and shall not be conducted over weekends without supervision. If reanalysis following aeration indicates the development water continues to exceed the organic vapor limits, it must be containerized and handled as above.

E.3.3 BMP FOR DRILL-SITE DISPOSAL

Development water that does not exceed the field-screening criteria will be disposed of at the drill site if practicable. BMP dictates that the water be disposed in such a way as to not cause erosion or enter nearby surface water or storm sewers. Precautions shall therefore be taken to ensure that development water pumped onto the ground or released from containers at the drill site either infiltrates or evaporates at the site and in no case runs off into surface waters, ephemeral drainages, or storm sewers. Development water that does not exceed the field screening (i.e., within a drainage, near a storm sewer, etc.) will be transported to a designated location and disposed as clean water following BMP.

E.3.4 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the development water from each well will be documented on a Development Water Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each well by the on-site geologist who conducts the screening. A copy of each form will be provided to the Project Manager of the GWPP within 2 days of its completion.

APPENDIX F

WASTE MANAGEMENT SCREENING DATA

Y-12 PLANT GWPP DRILL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

PROBE NO. GW-825 SITE: Centralized Sanitary Landfill II

APPROX. VOLUME OF CUTTINGS: 7 cubic feet

CALIBRATION OF INSTRUMENTS (Check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>HNu Model HW-101</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS (Background/Maximum Observed Values):

pH	<u>7.9</u>	Date/Time	<u>12-7-94/1502</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/2.0 ppm</u>	Date/Time	<u>12-7-94/1500</u>	(<5.0 ppm above background)
Beta/Gamma	<u>30 cpm/60 cpm</u>	Date/Time	<u>12-7-94/1141</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-7-94/1142</u>	(<500 cpm above background)

Weather: Misty and overcast to mostly cloudy Temp.: 50-55°F

DISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Cuttings discharged to ground surface.

Onsite Geologist (print): Susan L. Abston - SAIC

Signature: Susan L Abston Date: 12-7-94

Y-12 PLANT GWPP DRILL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

PROBE NO. GW-826 SITE: Sanitary Landfill II

APPROX. VOLUME OF CUTTINGS: 7 cubic feet

CALIBRATION OF INSTRUMENTS (Check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>HNu Model HW-101</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS (Background/Maximum Observed Values):

pH	<u>8.4</u>	Date/Time	<u>12-8-94/1108</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.0 ppm</u>	Date/Time	<u>12-8-94/1106</u>	(<5.0 ppm above background)
Beta/Gamma	<u>60 cpm/60 cpm</u>	Date/Time	<u>12-8-94/1010</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>12-8-94/1011</u>	(<500 cpm above background)

Weather: Partly cloudy to mostly sunny.

Temp.: 50-60°F

DISPOSITION: Drill-site Disposal X

Containerization
(Labeled?) y/n

Describe: Cuttings discharged to ground surface.

Onsite Geologist (print): Susan L. Abston - SAIC

Signature: *Susan L Abston*

Date: 12-8-94

Y-12 PLANT GWPP DRILL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-827 SITE: Landfill VI

APPROX. VOLUME OF CUTTINGS: 102.0 cubic feet

CALIBRATION OF INSTRUMENTS (Check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS (Background/Maximum Values):

pH	<u>9.8</u>	Date/Time	<u>1-13-95/1625</u> (4.0 - 10.5)
Organic vapors	<u>0.0 ppm/2.1 ppm</u>	Date/Time	<u>1-17-95/1354</u> (<5.0 ppm above background)
Beta/Gamma	<u>40 cpm/70 cpm</u>	Date/Time	<u>1-10-95/1524</u> <u>1-17-95/1242</u> (<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>All Readings</u> (<500 cpm above background)

Weather: See field logbook Temp.: See field logbook

DISPOSITION: Drill-site Disposal X Containerization (Labeled?) y/n

Describe: Cuttings diverted into unlined pit on site.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 1-17-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-827 SITE: Centralized Sanitary Landfill IIAPPROX. VOLUME OF DEVELOPMENT WATER: 420 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>1-23-95</u>	<u>1420</u>	<u>8.3</u>	<u>231 μhos/cm</u>	<u>0.7 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>1-23-95</u>	<u>1435</u>	<u>7.8</u>	<u>227 μhos/cm</u>	<u>0.6 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>1-23-95</u>	<u>1506</u>	<u>7.6</u>	<u>216 μhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>1-24-95</u>	<u>1249</u>	<u>7.9</u>	<u>210 μhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>1-24-95</u>	<u>1319</u>	<u>7.7</u>	<u>208 μhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>1-24-95</u>	<u>1400</u>	<u>7.6</u>	<u>209 μhos/cm</u>	<u>0.0 ppm</u>	<u>60 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: 1-23-95: Partly cloudy and cold.
1-24-95: Mostly clear, cold.

Temp.: 1-23-95: upper 20s to low 30s °F
1-24-95: low - to upper 20s °F.

DISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water diverted into on site cuttings pit.

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 1-24-95

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-828 SITE: Boneyard/Burnyard

APPROX. VOLUME OF CUTTINGS: 89.3 cubic ft

CALIBRATION OF INSTRUMENTS (Check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS (background/maximum value):

pH	<u>9.8</u>	Date/Time	<u>2-17-95/1203</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.4 ppm</u>	Date/Time	<u>2-9-95/1559</u>	(<5.0 ppm above background)
Beta/Gamma	<u>40 cpm/80 cpm</u>	Date/Time	<u>2-9-95/1502</u> <u>2-13-95/1110</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>All Readings</u>	(<500 cpm above background)

Weather: Refer to field logbook Temp.: Refer to field logbook

DISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Cuttings discharged to unlined cuttings pit at location.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 2-17-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-828 SITE: Boneyard/Burnyard

APPROX. VOLUME OF DEVELOPMENT WATER: 295 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>2-27-95</u>	<u>0931</u>	<u>7.6</u>	<u>2700 µmhos/cm</u>	<u>2.6 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>2-27-95</u>	<u>0955</u>	<u>7.1</u>	<u>3020 µmhos/cm</u>	<u>1.3 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>2-28-95</u>	<u>0905</u>	<u>7.9</u>	<u>1310 µmhos/cm</u>	<u>0.2 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>3-1-95</u>	<u>0844</u>	<u>8.2</u>	<u>830 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>3-2-95</u>	<u>0855</u>	<u>8.4</u>	<u>720 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>3-3-95</u>	<u>0911</u>	<u>8.5</u>	<u>680 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>3-6-95</u>	<u>0934</u>	<u>8.9</u>	<u>550 µmhos/cm</u>	<u>0.1 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Refer to field notebook

Temp.: Refer to field notebook

DISPOSITION: Drill-site Disposal X

Containerization (Labeled?) y/n

Describe: Development water discharged to unlined cutting pit on 2-27-95, then to ground surface thereafter.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 3/6/95

Y-12 PLANT GWPP WELL CUTTINGS FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-829 SITE: Boneyard/Burnyard

APPROX. VOLUME OF CUTTINGS: 61.2 cubic ft

CALIBRATION OF INSTRUMENTS (Check those instruments calibrated to manufacturer's specifications):

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS (background/maximum value):

pH	<u>9.3</u>	Date/Time	<u>3-3-95/1410</u>	(4.0 - 10.5)
Organic vapors	<u>0.0 ppm/0.2 ppm</u>	Date/Time	<u>3-3-95/1535</u>	(<5.0 ppm above background)
Beta/Gamma	<u>50 cpm/80 cpm</u>	Date/Time	<u>3-3-95/1218</u>	(<100 cpm above background)
Alpha	<u>0 cpm/0 cpm</u>	Date/Time	<u>All Readings</u>	(<500 cpm above background)

Weather: 2-28-95: Cloudy with scattered rain.
3-3-95: Snow changing to rain.

Temp.: 2-28-95: Low-to mid-50s °F
3-3-95: Low 30s to low 40s °F

DISPOSITION: Drill-site Disposal X Containerization _____
(Labeled?) y/n

Describe: Cuttings diverted into unlined pit onsite.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 3-3-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-829 SITE: Boneyard/Burnyard

APPROX. VOLUME OF DEVELOPMENT WATER: 148 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>3-13-95</u>	<u>1035</u>	<u>7.2</u>	<u>5600 μmhos/cm</u>	<u>2.1 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>3-13-95</u>	<u>1058</u>	<u>6.9</u>	<u>5800 μmhos/cm</u>	<u>2.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>3-13-95</u>	<u>1229</u>	<u>7.4</u>	<u>7000 μmhos/cm</u>	<u>4.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>3-14-95</u>	<u>0847</u>	<u>8.1</u>	<u>1600 μmhos/cm</u>	<u>0.3 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>3-15-95</u>	<u>1426</u>	<u>7.9</u>	<u>950 μmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>3-17-95</u>	<u>0839</u>	<u>8.2</u>	<u>790 μmhos/cm</u>	<u>0.4 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: Refer to field notebook

Temp.: Refer to field notebook

DISPOSITION: Drill-site Disposal X

Containerization
(Labeled?) y/n

Describe: Development water discharged to unlined cuttings pit onsite

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 3-17-95

APPENDIX G

EQUIPMENT DECONTAMINATION SUMMARIES

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	PROBE NO. <u>GW-825</u> INSTALLATION ☒ P&A ☐ REDEVELOPMENT ☐
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY	

LOCATION: Centralized Sanitary Landfill IIDATE: START: 12-7-94DECONTAMINATION CREW H. Hall/G. ShillingsFINISH: 12-7-94Highland Drilling Co.

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ingersoll-Rand XL-750</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-5-94	12-7-94	Pass	SLA
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-5-94	12-7-94	Pass	SLA
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-5-94	12-7-94	Pass	SLA
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	12-7-94	Pass	SLA
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	-NA-	—	—	—
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS: *Probe construction materials cleaned and packaged at factory. Inspected packaging to ensure integrity.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		PROBE NO <u>GW-826</u>		
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☒ P&A ☐ REDEVELOPMENT ☐		
LOCATION: <u>Sanitary Landfill II</u>		DATE: START: <u>12-8-94</u>		
DECONTAMINATION CREW <u>H. Hall/G. Shillings</u>		FINISH: <u>12-8-94</u>		
<u>Highland Drilling Co.</u>				

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ingersoll-Rand XL-750</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	12-7-94	12-8-94	Pass	SLA
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	12-7-94	12-8-94	Pass	SLA
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	12-7-94	12-8-94	Pass	SLA
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-*	12-8-94	Pass	SLA
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Ballers, Pumps, Etc.)	-NA-	—	—	—
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS: *Probe construction materials cleaned and packaged at factory. Inspected packaging to ensure integrity.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-827</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☒ P&A ☐ REDEVELOPMENT ☐	
LOCATION: <u>Landfill VI</u>		DATE: START: <u>1-10-95</u>	
DECONTAMINATION CREW <u>H. Hall/G. Shillings</u>		FINISH: <u>1-24-95</u>	
<u>J. Gallaher/R. Phillips</u>			

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG: <u>Ingersoll-Rand XL-750</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	1-9-95	1-10-95	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	1-9-95	1-10-95	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	1-9-95/ 1-11-95*	1-10-95/ 1-11-95	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	1-17-95**	1-17-95	Pass	TJC
WORKOVER RIG: <u>Smeal Swab rig</u> (Mast, Chassis, Cables, Hoses, Etc.)	1-23-95	1-23-95	Pass	TJC
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	1-23-95	1-23-95	Pass	TJC
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS: *Hole opener/stabilizer steam cleaned on 1-11-95.
 **Well construction materials brought to the site sealed in manufacturer's packaging, will not require further decontamination (as per W. E. Thedford - HSEA). Unpackaged well construction materials were steam cleaned as reported.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-828</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☒ P&A ☐	
LOCATION: <u>Boneyard/Burnyard</u>		DATE: START: <u>2-9-95</u>	
DECONTAMINATION CREW <u>H. Hall/G. Shillings</u>		FINISH: <u>3-6-95</u>	

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Ingersoll-Rand XL-750</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	2-3-95	2-9-95	Pass	TJC
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	2-3-95	2-9-95	Pass	TJC
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	2-3-95/ 2-16-95*	2-9-95/ 2-16-95	Pass	TJC
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	..	2-13-95/ 2-17-95	Pass	TJC
WORKOVER RIG <u>Smeal Swab Rig</u> (Mast, Chassis, Cables, Hoses, Etc.)	2-23-95	2-27-95	Pass	TJC
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	2-23-95	2-27-95	Pass	TJC
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				
Stainless-steel well screen and riser casing extracted from temporary well set at 82.7 ft BGS.	2-17-95	2-17-95	Pass	TJC
Well construction materials: 10-in. steel protective casing.	2-13-95	2-13-95	Pass	TJC

COMMENTS: *Steam clean two more drill rods brought to site to extend borehole from 143.0 ft to 168.0 ft BGS.
**No further decon. to well screen and riser casing brought to site sealed in plastic from manufacturer (as per HSEA). Screen and casing extracted from temporary well steam-cleaned prior to re-use. Date unwrapped and installed is reported.

APPENDIX H

WELL REHABILITATION/RE-DEVELOPMENT REPORTS

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-006</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>Oil Landfarm</u>		DATE: START: <u>12-2-94</u>	
DRILLER: <u>R. Phillips - Highland Drilling Co.</u>		FINISH: <u>12-5-94</u>	
HELPER: <u>G. Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>T.J. Coffey/S.L. Abston-SAIC</u>	
DRILL: <u>-NA- (Bail)</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-2-94	0950	1016	Arrive at GW-006 site. Technical oversight by T. J. Coffey (SAIC). The well, buried under a thin layer of topsoil for years, has been recently exposed. Rehabilitation for this well will consist of extending the casing stick-up and redeveloping the well. Examine the wellhead: well is constructed of 2.37-in. outside diameter (OD) stainless steel casing. The casing collar is not threaded, so the extension will need to be welded on.
	1016	1115	Crew departs for more casing and welding equipment. Oversight departs for monitoring instruments.
	1115	1135	Oversight returns to GW-006 site. Remove well wizard cap from well, well headspace: organic vapors = 0.8 ppm, background = 0.8 ppm; lower explosive limit (LEL) reading <1% (5.9 ppm). The top of the casing is presently 1.0 ft below the ground surface (BGS). Measure the water level at 5.2 ft below the top of casing (BTOC) = 6.2 ft BGS. Calculate a well volume (assuming a reported total depth of 46.8 ft) of 6.7 gallons of water (a water column of 40.8 ft). Background radiological scan of location (especially the excavated soil): alpha = 0 cpm, beta/gamma = 40-50 cpm.
	1135	1320	Break for lunch/waiting for crew.
	1320	1330	Return to GW-006 site with crew. Enlarge excavation around wellhead to facilitate welding.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-006</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-2-94	1330	1336	Pull out well wizard pump and tubing: everything appears to be
(cont.)			in very good condition. Tag bottom of well at 46.1 ft BTOC = 47.1
			ft BGS.
	1336	1400	Weld on a 4.0-ft casing extension using a coupler. Monitor
			breathing zone: LEL reading <1% (18 ppm, max.), organic vapors
			= 18 ppm, max. (welding emissions). Casing stick-up = 3.1 ft.
	1400	1412	Bag up well wizard for testing. Clean up site. Depart. Will begin
			redevelopment on 12-5-94.
12-5-94	0916	0956	Arrive at GW-006 site. Technical oversight assumed by S.L. Abston
			(SAIC). Bail 6.7 gallons of water (1 well volume) out of the well.
			Water sample is moderately turbid, has no discernable odor.
	0956	1002	Screen water sample. Readings: pH = 7.9, conductance =
			300 μ mhos/cm, temperature = 17°C.
	1002	1016	Bail another 6.7 gallons of water out of the well. Water sample is
			moderately turbid, has no discernable odor.
	1016	1020	Screen water sample. Readings: pH = 7.8, conductance =
			355 μ mhos/cm, temperature = 17°C.
	1020	1050	Bail another 6.7 gallons of water out of the well. Water sample is
			moderately turbid, has no discernable odor.
	1050	1055	Screen water sample. Readings: pH = 7.6, conductance =
			365 μ mhos/cm, temperature = 16°C.
	1055	1115	Bail another 6.7 gallons of water out of the well. Water sample is
			moderately to slightly turbid, has no discernable odor.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-006

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Bailing

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 12-2-94FINISH: 12-5-94ONE WELL VOLUME: 6.7 GALLONSTOTAL GALLONS PUMPED: 40.2 TOTAL WELL VOLUMES PUMPED: 6.0INITIAL pH: 7.9 FINAL pH: 7.2INITIAL SPECIFIC CONDUCTANCE: 300 μ mhos/cm FINAL: 375 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Moderately TurbidDESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☐ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☒ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 6.2 ft BGS on 12-2-94

DEVELOPMENT OBSERVATIONS: Well exhibits excellent recharge due to inability to draw water level down significantly during development sessions. Development water cleared only slightly, unable to completely clear up development water.

OBSERVER SIGNATURE: *Susan L. Abston*DATE: 12-5-94

WELL NO. GW-006 SITE: Oil Landfarm

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	X	(model)	Horiba Model U-7
Sp. Cond. meter	X	(model)	YSI S-C-T Meter Model 33
Organic vapor meter	X	(model)	Century-Foxboro OVA Model 128
Beta/gamma meter	X	(model)	Ludlum Model 3 Survey Meter; with G-M Pancake Probe
Alpha meter	X	(model)	Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
12-5-94	0956	7.9	300 µmhos/cm	2.4 ppm	50 cpm	0 cpm
12-5-94	1016	7.8	355 µmhos/cm	1.2 ppm	40 cpm	0 cpm
12-5-94	1050	7.6	365 µmhos/cm	0.0 ppm	50 cpm	0 cpm
12-5-94	1115	7.3	370 µmhos/cm	0.2 ppm	30 cpm	0 cpm
12-5-94	1223	7.2	370 µmhos/cm	0.6 ppm	40 cpm	0 cpm
12-5-94	1241	7.2	375 µmhos/cm	0.8 ppm	40 cpm	0 cpm
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Not recorded

Temp.: Not recorded

DISPOSITION: Drill-site Disposal X

Containerization y
(Labeled?) y/n

Describe: Development water contained in USDOT-approved, 55-gal, bung-top drums pending disposal.

Onsite Geologist (print): Susan L. Abston - SAIC

Signature: Susan L. Nelson

Date: 12-5-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-006</u>	
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☐ P&A ☐ REDEVELOPMENT ☒	
LOCATION: <u>Oil Landfarm</u>		DATE: START: <u>12-2-94</u>	
DECONTAMINATION CREW <u>R. Phillips/G. Shillings</u>		FINISH: <u>12-5-94</u>	

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG _____ (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	-NA-	—	—	—
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	-NA-	—	—	—
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	-NA-	—	—	—
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	12-2-94*	12-2-94	Pass	TJC
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)	-NA-	—	—	—
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	12-2-94	12-2-94	Pass	TJC
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS: *Decontamination of: one, 4.0-ft long section of 2.37-in. OD stainless steel casing, and one, stainless steel coupler to extend wellhead above ground surface.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-087</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>Y-12 Oil Landfarm</u>		DATE: START: <u>7-11-95</u>	
DRILLERS: <u>G. Shillings - Highland Drilling Co.</u>		FINISH: <u>7-14-95</u>	
HELPERS: <u>J. Gallaher - Highland Drilling Co.</u>		LOGGED BY: <u>Susan L. Abston - SAIC</u>	
DRILL: <u>-NA- (see text)</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-11-95	0715	0738	Arrive at GW-087. Crew on site. Greg Early (Y-12 HP) on site.
			Don anti-contamination clothing.
	0738	0803	Trim path through weeds to well.
	0803	0811	Uncap well. Remove Well Wizard well sampling apparatus.
			Water at 12.40 ft below top of casing (BTOC). Tag bottom of well
			at 21.85 ft BTOC. Calculate well volume of 1.5 gallons of water.
	0811	0817	Begin bailing with stainless steel bailer. Water sample of initial
			water is turbid. Readings: pH=6.3, conductance=250 µmhos/cm.
			Continue to bail. Bail 1.5 gallons (1 well volume) of water out of
			well. Water sample is turbid. Readings: pH = 6.4, conductance =
			310 µmhos/cm.
	0817	0830	Bail 1.5 gallons (total of 2 well volumes) of water out of well. Water
			sample is turbid. Readings: pH = 6.3, conductance = 300
			µmhos/cm.
	0830	0839	Bail 1.5 gallons (total of 3 well volumes) of water out of well. Water
			sample is still turbid. Readings: pH = 6.5, conductance =
			355 µmhos/cm. Remove small black rocks (up to 3 mm in size)
			and heavy duty fishing line with bailer from well.
	0839	0859	Well dry after bailing another gallon. Will let well recharge until
			tomorrow.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-087</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-11-95	0839	0935	Doff anti-contamination clothing. Scan out personnel and equipment, secure well site, and depart.
(cont.)			
7-12-95	0711	0721	Crew at GW-087 site. Don anti-contamination clothing.
	0721	0736	Uncap well. Tag bottom of well at 21.9 ft BTOC (.05 ft change from yesterday). Continue bailing well.
	0736	0756	Bail 4.5 gallons (total of 6 well volumes) of water out of well. Water sample still turbid. Readings: pH = 7.0, conductance = 370 μ mhos/cm. Well dry. Fewer rock fragments caught in bailer this time.
	0756	0834	Doff anti-contamination clothing. Scan out personnel and equipment, secure well site, and depart.
7-13-95	0705	0730	Crew at GW-087 site. Don anti-contamination clothing.
	0730	0749	Uncap well and continue bailing well.
	0749	0752	Bail 4 gallons (total of 8.7 well volumes) of water out of well. Water still turbid (milky brown). Reading: pH = 7.4, conductance = 370 μ mhos/cm. Well dry. Tag bottom of well at 21.9 ft BTOC. No change from 7-12-95.
	0752	0844	Doff anti-contamination clothing. Scan out personnel and equipment, secure well site, and depart.
7-14-95	0718	0749	Crew at GW-087 site. Don anti-contamination clothing.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-087

MONITORING WELL REDEVELOPMENT PROGRESS

LOCATION: Y-12 Oil Landfarm ONE WELL VOLUME: 1.5 GALLONSCOMPLETION DATE: 3-23-84

DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μ mhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
7-11-95	0	Turbid	6.3	250	0	0	
7-11-95	1.5	Turbid	6.4	310	1.5	1	
7-11-95	1.5	Turbid	6.3	300	3.0	2	
7-11-95	1.5	Turbid	6.5	355	4.5	3	1
7-12-95	4.5	Turbid	7.0	370	9.0	6	2
7-13-95	4.0	Turbid	7.4	370	13.0	8.7	2
7-14-95	4.0	Turbid	7.0	350	17.0	11.3	2
RESULTS AT END OF DEVELOPMENT		Turbid	7.0	350	17.0	11.3	

COMMENTS

1. Well dry after 5.5 gal.

2. Well dry.

After removing 11.3 well volumes water is still turbid. Well initially was 21.85 ft BTOC and after completion was 21.9 ft BTOC. Remove small black rocks from bottom of well.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-087

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Bailer

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 7-11-95FINISH: 7-14-95ONE WELL VOLUME: 1.5 GALLONSTOTAL GALLONS PUMPED: 17.0 TOTAL WELL VOLUMES PUMPED: 11.3INITIAL pH: 6.3 FINAL pH: 7.0INITIAL SPECIFIC CONDUCTANCE: 250 μ mhos/cm FINAL: 350 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: TurbidDESCRIPTION OF FINAL TURBIDITY: TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W. K. Jago - HSEAODOR OF WATER: No odor noted

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 12.40 ft BGS on 7-11-95

DEVELOPMENT OBSERVATIONS: Well has very slow recharge rate. Unable to clear water. Less turbid than at beginning, however, still turbid. Able to remove several small black rocks from bottom of well.

OBSERVER SIGNATURE: *Susan L. Abston*DATE: 7-14-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-087 SITE: Y-12 Oil LandfarmAPPROX. VOLUME OF DEVELOPMENT WATER: 17 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>7-11-95</u>	<u>0811</u>	<u>6.3</u>	<u>250 μmhos/cm</u>	<u>0.8 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-11-95</u>	<u>0817</u>	<u>6.4</u>	<u>310 μmhos/cm</u>	<u>1.8 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-11-95</u>	<u>0830</u>	<u>6.3</u>	<u>300 μmhos/cm</u>	<u>2.2 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-11-95</u>	<u>0839</u>	<u>6.5</u>	<u>355 μmhos/cm</u>	<u>1.2 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>0736</u>	<u>7.0</u>	<u>370 μmhos/cm</u>	<u>0.2 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-13-95</u>	<u>0749</u>	<u>7.4</u>	<u>370 μmhos/cm</u>	<u>4.5 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-14-95</u>	<u>0758</u>	<u>7.0</u>	<u>350 μmhos/cm</u>	<u>3.5 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: Foggy to partly cloudy.Temp.: 75°F - 85°FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: Susan L AbstonDate: 7-14-95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-160</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 5
LOCATION: <u>Landfill III</u>		DATE: START: <u>12-14-94</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-20-94</u>	
HELPERS: <u>G.Shillings/D. Williford - Highland Drilling Co.</u>		LOGGED BY: <u>Susan L. Abston-SAIC</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-14-94	1359	1510	Arrive at GW-160 site. Measure water level at 145.8 ft below top of casing (BTOC) = 143.4 ft below ground surface (BGS). Tag bottom of well (soft) at 225.1 ft BTOC = 222.7 ft BGS. Note: The Subsurface Data Base (Y/TS-881/R2) reports the total depth of well GW-160 to be 235.0 ft. Calculate a well volume of 132.0 gallons of water (includes mud in bottom of well). Move Smeal rig onto site and set up over well. Secure site and depart.
12-15-94	0853	0932	Arrive at GW-160 site. Run 2-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve into the well to 220.0 ft BGS.
	0932	0937	Commence swabbing well GW-160. Take sample of first water produced. Water sample is slightly turbid, has no discernable odor.
	0937	0942	Screen initial water sample. Readings: pH = 8.4, conductance = 290 μ mhos/cm, temperature = 5°C.
	0942	1010	Continue swabbing well GW-160. Swab 132 gallons of water out of the well.
	1010	1013	Screen water sample. Readings: pH = Not Recorded (pH meter temporarily in operable), conductance = 345 μ mhos/cm, temperature = 10°C.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-160</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-15-94	1013	1048	Wait for well to recharge.
(cont.)			
	1048	1115	Continue swabbing well GW-160. Swab 132 gallons of water out of the well. Water sample is very turbid-muddy, has no discernable odor.
	1115	1125	Screen water sample. Readings: pH = 7.5, conductance = 355 μ mhos/cm, temperature = 10.5°C.
	1125	1225	Break for lunch.
	1225	1251	Add a 16.4-ft section of swab tubing to the string, and lower into the well to an unrecorded depth.
	1251	1307	Smeal Rig out of fuel, crew departs.
	1307	1313	Crew returns and fuels swab rig.
	1313	1325	Continue swabbing well GW-160. Unable to get swabber to pass through tubing.
	1325	1421	Remove the last section of tubing and go get a replacement.
	1421	1432	Return with tubing, add to string, and lower to 234.2 ft BGS.
	1432	1445	Continue swabbing well GW-160. Only producing mud now.
	1445	1449	Pull up swab tubing to 227.0 ft BGS.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-160</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-15-94 (cont.)	1449	1507	Continue swabbing the well. Still producing mud, but not as thick as previously. Stop development for the day after producing 40 gallons of mud. Lower mast on swab rig. Secure site and depart.
12-16-94	0848	0858	Arrive at GW-160 site. Raise mast.
	0858	0912	Commence swabbing well GW-160. Still producing very muddy water. Swab 55 gallons of mud.
	0912	0919	Lower swab tubing to 233.0 ft BGS.
	0919	0931	Continue swabbing well GW-160. Swab gets hung inside the tubing; suspect that it is stuck on sediment that got sucked inside swab tubing. Plan to flush swab tubing with potable water to clear sediment from around swab.
	0931	1017	Drillers go get potable water supply. Report status to K. Jago (HSEA) who grants approval and directs to keep track of water volume introduced into well.
	1017	1047	Crew returns. Pour 8 gallons of potable water into swab tubing and try to free swab: still stuck.
	1047	1058	Try unwinding all of the cable and pull out the swab tubing. Cable will not feed through tubing.
	1058	1210	Pour an additional 18 gallons of potable water (total = 26 gallons) into the swab tubing. Break for lunch.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-160</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 4 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-16-94	1210	1337	Swab still stuck in tubing. Unwind wire-line cable and pull out
(cont.)			tubing. Swab appears to be stuck at connection between the
			bottom 2 sections of tubing. Discover that swab is stuck because
			the finger of a rubber glove got caught between the tubing wall and
			the swab cups. Free the swab using the steam cleaner.
	1337	1351	Steam clean the swab tubing a second time.
12-16-94	1351	1433	Report status to K. Jago. Plan to use a sand pump (bailer) to clean
			out the remaining sediment. Secure site and depart.
12-19-94	1015	1112	Arrive at GW-160 site. Ready bailer for use. Subadapter is
			bent and will not fit in the well. Unable to obtain a different
			subadapter, will try to heat this one and bend it back into position.
	1112	1132	Obtain burn permit from B. McMaster (UT/HSEA). Make neces-
			sary adjustments to subadapter.
	1132	1141	Commence bailing well GW-160. Bail 37 gallons of water out of
			the well. Water sample is very turbid-muddy, has no discernable
			odor.
	1141	1202	Screen water sample. Readings: pH = 7.9, conductance =
			310 μ mhos/cm, temperature = 12°C.
	1202	1247	Break for lunch.
	1247	1303	Resume development. Tag bottom of well (with difficulty) at
			233.4 ft BGS.
	1303	1350	Bail another 132 gallons of water out of the well. Water sample is
			turbid, has no discernable odor.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-160</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 5 of 5
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-19-94	1350	1358	Screen water sample. Readings: pH = 7.7, conductance =
(cont.)			355 μ mhos/cm, temperature = 13°C.
	1358	1439	Wait for well to recharge. Report status to K. Jago. Kevin directs
			to continue development by the swab method.
	1439	1504	Run swab tubing back into well to 231.1 ft BGS.
	1504	1511	Secure site and depart.
12-20-94	0853	0942	Arrive at GW-160 site. Commence swabbing well. Swab 132
			gallons of water out of the well. Water sample is turbid, has no
			discernable odor.
	0942	0947	Screen water sample. Readings: pH = 7.8, conductance =
			315 μ mhos/cm, temperature = 11°C.
	0947	1039	Swab another 132 gallons of water out of the well. Water sample
			is turbid (no longer have mud in the water), has no discernible
			odor.
	1039	1044	Screen water sample. Readings: pH = 7.8, conductance =
			325 μ mhos/cm, temperature = 12°C.
	1044	1120	Water clarity/turbidity is not improving, and parameters have been
			fairly stable: redevelopment/rehabilitation of GW-160 is com-
			plete. Pull out swab tubing. Tag bottom of well at 234.2 ft
			(removed 11.5 ft of sediment). Demobilize swab rig. Secure well.
			Depart site.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM						WELL NO. <u>GW-160</u>	
MONITORING WELL REDEVELOPMENT PROGRESS							
LOCATION: <u>Landfill III</u>							
COMPLETION DATE: <u>7-18-87</u>							
ONE WELL VOLUME: <u>132.0</u> GALLONS							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (µmhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
12-15-94	-NA-	Slightly turbid	8.4	290	-NA-	-NA-	1, Initial
12-15-94	132	Very turbid-muddy	-NA-*	345	132	1.0	1
12-15-94	132	Very turbid-muddy	7.5	355	264	2.0	1
12-15-94	40	Muddy	-NA-	-NA-	304	2.3	2,3
12-16-94	55	Muddy	-NA-	-NA-	359	2.7	2,3
12-19-94	37	Very turbid-muddy	7.9	310	396	3.0	4
12-19-94	132	Turbid	7.7	355	528	4.0	4
12-20-94	132	Turbid	7.8	315	660	5.0	5
12-20-94	132	Turbid	7.8	325	792	6.0	5
RESULTS AT END OF DEVELOPMENT		Turbid	7.8	325	792	6.0	
COMMENTS							
1: Swab tubing at 220.0 ft BGS.							
2: Produced mud only.							
3: Swab tubing at 227.0 ft BGS.							
4: Development accomplished with a bailer.							
5: Swab tubing at 231.1 ft BGS.							
*pH meter temporarily inoperable.							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-160

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab & Bailer

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 12-14-94FINISH: 12-20-94ONE WELL VOLUME: 132.0 GALLONSTOTAL GALLONS PUMPED: 792 TOTAL WELL VOLUMES PUMPED: 6.0INITIAL pH: 8.4 FINAL pH: 7.8INITIAL SPECIFIC CONDUCTANCE: 290 μ mhos/cm FINAL: 325 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Slightly turbid (initial water sample)DESCRIPTION OF FINAL TURBIDITY: TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 143.4 ft BGS on 12-14-94

DEVELOPMENT OBSERVATIONS: Well exhibits excellent recharge as indicated by inability to draw water level down significantly during development sessions. Removed 11.5 ft of accumulated sediment from the well.

OBSERVER SIGNATURE: *Susan L. Abston*DATE: 12-20-94

Y-12 PLANT GWPP REDEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-160 SITE: Landfill III

APPROX. VOLUME OF DEVELOPMENT WATER: 792 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter;</u> <u>with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter;</u> <u>with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>12-15-94</u>	<u>0937</u>	<u>8.4</u>	<u>290 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-15-94</u>	<u>1010</u>	<u>-NA-</u>	<u>345 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-15-94</u>	<u>1115</u>	<u>7.5</u>	<u>355 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-19-94</u>	<u>1141</u>	<u>7.9</u>	<u>310 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>12-19-94</u>	<u>1350</u>	<u>7.7</u>	<u>355 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>12-20-94</u>	<u>0942</u>	<u>7.8</u>	<u>315 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Refer to field logbook

Temp.: Refer to field logbook

DISPOSITION: Drill-site Disposal X

Containerization
(Labeled?) y/n

Describe: Development water discharged to ground surface.

Onsite Geologist (print): Susan L. Abston - SAIC

Signature: *Susan L. Abston*

Date: 12-20-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-160</u>		
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☐ P&A ☐ REDEVELOPMENT ☒		
LOCATION: <u>Landfill III</u>		DATE: START: <u>12-14-94</u>		
DECONTAMINATION CREW <u>H. Hall/G. Shillings</u>		FINISH: <u>12-20-94</u>		

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>Smeal Swab Rig</u> (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	-NA-	—	—	—
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	-NA-	—	—	—
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	-NA-	—	—	—
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG <u>Smeal Swab Rig</u> (Mast, Chassis, Cables, Hoses, Etc.)	2-14-94	2-14-94	Pass	SLA
DEVELOPMENT TOOLS (Tubing, Ballers, Pumps, Etc.)	2-14-94/ 2-15-94*/ 2-19-94**	2-14-94/ 2-15-94/ 2-19-94	Pass	SLA
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				
Steam clean swab tubing a second time after pulling out of well to free stuck swab.	2-16-94	2-16-94	Pass	SLA

COMMENTS: *One section of 2-in. ID, 2 3/8-in. OD replacement swab tubing, steam-cleaned, and used in well
GW-160 on 2-15-94.
**Large metal bailer used to remove heavy sediment accumulation in well GW-160.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-171</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>University of Tennessee Arboretum</u>		DATE: START: <u>9-6-94</u>	
DRILLER: <u>Hubert Hall - Highland Drilling Co.</u>		FINISH: <u>9-9-94</u>	
HELPERS: <u>Jeff Monger - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey (SAIC)</u>	
DRILL: <u>-NA- (see text)</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-6-94	1400	1413	At GW-171 site. B. Rundle (HSEA) obtains a VOA sample of water from well GW-171. Note: due to several headspace analysis (HSA) "hits" on other wells in cluster with well GW-171, a water sample is being sent to the lab to determine the possible presence of organic contaminants. The analysis will determine the disposition of development water before redevelopment begins.
9-7-94	-NA-	-NA-	Lab analysis of water sample indicates that contaminants of concern are below detection levels. HSEA approves discharging the development water directly to the ground surface.
9-9-94	0847	0908	Arrive at GW-171 site. Uncap well: organic vapors at well collar - 1.0 ppm (background = 0.2 ppm). Water level (measured 9-2-94) = 9.9 ft below ground surface (BGS). Tag bottom of well at 28.8 ft BGS (soft). The Subsurface Data Base (Y/TS-881/R1) reports the total depth of well GW-171 to be 31.2 ft BGS (2.4 ft of sediment in well). Calculate a well volume (to top of sediment accumulation) of 3.1 gallons of water. Crew arrives.
	0908	0938	Begin bailing well with a 2-liter, teflon bailer. Bail 5 gallons of water out of the well. Water sample is very turbid (silty). Water sample has a sewage-like odor.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-171</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-9-94	0938	0948	Screen water sample. Readings: pH = 7.4, conductance = 395
(cont.)			µmhos/cm. Tag bottom of well at 30.6 ft BGS. Have already
			apparently removed 1.8 ft of sediment from well.
	0948	1008	Bail an additional 5 gallons of water out of the well. Water sample
			is turbid (silty). Water sample still has a sewage-like odor. The
			water level does not appear to be dropping while bailing.
	1008	1017	Screen water sample. Readings: pH = 7.0, conductance =
			381 µmhos/cm.
	1017	1046	Bail another 10 gallons of water out of the well. Water sample is
			turbid (water contains less sediment than earlier). Water sample
			still has a sewage-like odor.
	1046	1106	Screen water sample. Readings: pH = 6.8, conductance =
			398 µmhos/cm. Tag bottom of well (firm) at 31.0 ft BGS (0.2 ft
			shallower than depth reported in Data Base). Even though a large
			amount of sediment has been removed from the well, the water is
			still laden with very fine silt that will take a long time to remove. The
			crew departs for pipeyard for a pump to speed up development.
	1106	1127	Bail 7 gallons of water out of the well. No parameters measured.
	1127	1138	Crew returns with pump. Assemble hoses and run into well to
			bottom.
	1138	1155	Pump 15 gallons of water out of the well. Water sample is turbid.
			Water sample has a faint sewage-like odor.
	1155	1200	Screen water sample. Readings: pH = 7.4, conductance =
			451 µmhos/cm.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. <u>GW-171</u>
MONITORING WELL REDEVELOPMENT SUMMARY	

METHOD OF DEVELOPMENT: Bailer/centrifugal pump
DEVELOPMENT DATE:
 DEVELOPMENT OBSERVED BY: Timothy Coffey - SAIC
START: 9-9-94
FINISH: 9-9-94

ONE WELL VOLUME: 3.1 GALLONS
 TOTAL GALLONS PUMPED: 56 TOTAL WELL VOLUMES PUMPED: 18.1
 INITIAL pH: 7.4 FINAL pH: 7.5
 INITIAL SPECIFIC CONDUCTANCE: 395 μ mhos/cm FINAL: 463 μ mhos/cm
 DESCRIPTION OF INITIAL TURBIDITY: Very Turbid (silty)
 DESCRIPTION OF FINAL TURBIDITY: Slightly Turbid
 FINAL MEASURED TURBIDITY: Not Analyzed
 WELL APPROVED BY: W.K. Jago - HSEA

ODOR OF WATER: Water had a sewage-like odor, also a faint varnish-like odor that dissipated rapidly.

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT
 WATER DEPTH: 9.9 ft BGS on 9-2-94

DEVELOPMENT OBSERVATIONS: Well is a good producing well (unable to draw water level down while bailing, and well recharges quickly while pumping). Removed an apparent sediment accumulation of 2.2 ft. Unable to clear the water entirely.

OBSERVER SIGNATURE:
 DATE: 9-9-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-172</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 4
LOCATION: <u>University of Tennessee Arboretum</u>		DATE: START: <u>9-1-94</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>9-2-94</u>	
HELPERS: <u>R. Phillips/J. Monger - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey (SAIC)</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-1-94	0842	1004	Arrive at GW-172 site. The Smeal swab rig is onsite. Crew begins arriving. Begin setting up location.
	1004	1021	Uncap well: organic vapors at well collar = 1.4 ppm (background = 0.2 ppm). Measure water level at 17.2 ft below ground surface (BGS). Tag bottom of well (firm) at 134.5 ft BGS. Note: The Subsurface Data Base (Y/TS-881/R1) reports the total depth of well GW-172 to be 133.8 ft BGS. Calculate a well volume of 73.5 gallons of water.
	1021	1045	Run 6 sections of 2.0-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing (with check valve) totalling 135 ft into the well to approximately 131.5 ft BGS.
	1045	1048	Begin swabbing the well. Collect a sample of the first water brought out of the well. Water is fairly clear with a rusty-brown tint, and contains rust fragments.
	1048	1053	Screen water sample. Initial readings: pH = 9.2, conductance = 240 µmhos/cm.
	1053	1058	Immediately swab 55 gallons of water out of the well. Water sample is still fairly clear, but beginning to see extremely fine-grained suspended sediment. Water has a faint, indescribable odor that dissipates rapidly.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-172</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-1-94	1058	1104	Screen water sample. Readings: pH = 7.7, conductance 430
(cont.)			µmhos/cm.
	1104	1123	Immediately swab an additional 110 gallons of water out of the
			well (noticeably less and less water with each pull). Water sample
			is moderately turbid (increasing suspended sediment). Water
			sample has an indescribable odor, but it dissipates rapidly.
	1123	1127	Screen water sample. Readings: pH = 7.5, conductance = 550
			µmhos/cm.
	1127	1210	Break for lunch. Conduct headspace analysis (HSA) on first two
			water samples with the following results:
			First Sample = 34.0 ppm
			Second Sample = 605.0 ppm
			Both water samples re-sealed with foil at 1204 hrs. Report high
			HSA measurement to W. Thedford (HSEA) who directs oversight
			and crew to hold off on development until he gets back to us.
	1210	1230	Waiting. Conduct HSA on third water sample: 26.0 ppm. Re-seal
			third sample at 1230 hrs.
	1230	1240	W. Thedford calls; directs oversight to recheck HSA of water
			samples with another instrument, directs crew to gather several
			bung-top drums for temporary storage of development water—
			may need to have a sample of the water analyzed. Lower mast
			on Smeal rig as safety precaution. Depart site.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-172</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-1-94	1250	1329	Arrive at Geology Lab, Bldg. 9207. Check calibration of OVA
(cont.)			#A41546 (meter used in field today), calibrate another OVA
			(#A41545) to double-check readings made by #A41546. Conduct
			second HSA on all three water samples with the following results:
			<u>Sample</u> <u>Reading</u> <u>Meter</u>
			1 9.4 ppm #A41545
			(1310 hrs) 8.9 ppm #A41546
			2 >1000 ppm #A41545
			(1311 hrs) >1000 ppm #A41546
			3 47 ppm #A41545
			(1312 hrs) 49 ppm #A41546
			Report readings to W. Thedford. HSEA will sample the development
			water for lab analysis. Depart Biology Building.
	1338	1400	Return to GW-172 site. Don Rosowitz (MMES, Y-12 ER) is onsite;
			he departs after W. Thedford briefs him on the current situation. B.
			Rundle (HSEA) arrives and collects a VOA sample of the
			development water that yielded the highest HSA readings. B.
			Rundle departs.
	1400	1427	Waiting for pump to be brought to site.
	1427	1500	J. Monger (Highland) arrives onsite with pump and U.S. DOT-
			approved, bung-top drums. Discover that pump motor is "frozen";
			repairing.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-172</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 4 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-1-94	1500	1521	Transfer development water into bung-top drum pending analysis
(cont.)			of water sample. Secure site and depart.
9-2-94	0925	0950	Arrive at GW-172 site. Crew is onsite, mast is up on workover rig.
			Swab 80 gallons of water out of the well. Water sample is slightly
			turbid. Water has a faint, indescribable odor.
	0950	0956	Screen water sample. Readings: pH = 7.3, conductance = 510
			umhos/cm. Development water transferred to bung-top drums.
	0956	1011	Immediately swab an additional 70 gallons of water out of the well.
			Water sample is moderately turbid (increasing suspended sediment,
			as before). No odor discernible in this sample.
	1011	1020	Screen water sample. Readings: pH = 7.3, conductance = 510
			umhos/cm. Development parameters have stabilized.
			Development water transferred to bung-top drums.
	1020	1118	Pull swab tubing out of the well. Radiological scan of tubing: beta/
			gamma = 30-50 cpm (background = 30 cpm). Tag bottom of well
			at 134.5 ft BGS (no change). Rig down workover rig and load
			tubing. Break down site and depart.
			Redevelopment/rehabilitation of well GW-172 is complete.
			Note: Lab analysis of water sample indicated that any organic
			contaminants in the development water were below detectable
			limits - development water is "clean" (HSEA personnel suspect the
			presence of methane in the development water): development
			water in bung-top drums discharged to ground surface on 9-6-94
			as per HSEA.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. <u>GW-172</u>
MONITORING WELL REDEVELOPMENT SUMMARY	
<p>METHOD OF DEVELOPMENT: <u>Swab</u></p> <p>DEVELOPMENT OBSERVED BY: <u>Timothy Coffey - SAIC</u></p> <p>ONE WELL VOLUME: <u>73.5</u> GALLONS</p> <p>TOTAL GALLONS PUMPED: <u>315</u> TOTAL WELL VOLUMES PUMPED: <u>4.3</u></p> <p>INITIAL pH: <u>9.2</u> FINAL pH: <u>7.3</u></p> <p>INITIAL SPECIFIC CONDUCTANCE: <u>240 μmhos/cm</u> FINAL: <u>510 μmhos/cm</u></p> <p>DESCRIPTION OF INITIAL TURBIDITY: <u>Fairly Clear</u></p> <p>DESCRIPTION OF FINAL TURBIDITY: <u>Moderately Turbid</u></p> <p>FINAL MEASURED TURBIDITY: <u>Not Analyzed</u></p> <p>WELL APPROVED BY: <u>W.K. Jago - HSEA</u></p> <p>ODOR OF WATER: <u>Water frequently had a faint, indescribable odor that appeared to dissipate rapidly.</u></p> <p>WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK ☐ STORM SEWERS ☐ STORAGE TANKS ☒ DRUMS ☐ OTHER _____</p> <p>INITIAL PRE-DEVELOPMENT WATER DEPTH: <u>17.2 ft BGS on 9-1-94</u></p> <p>DEVELOPMENT OBSERVATIONS: <u>Well exhibits fairly good recharge due to inability to completely dry up the well. Did not observe much sediment in development water, however, the water appeared to become more turbid as development progressed. Turbidity appears to be from extremely fine silt that does not settle out rapidly.</u></p>	
<p style="text-align: right;">OBSERVER SIGNATURE: <u> </u></p> <p style="text-align: right;">DATE: <u>9-2-94</u></p>	

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-172 SITE: University of Tennessee Arboretum

APPROX. VOLUME OF DEVELOPMENT WATER: 315 Gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-1-94</u>	<u>1048</u>	<u>9.2</u>	<u>240 µmhos/cm</u>	<u>34 ppm</u>	<u>55 cpm</u>	<u>0 cpm</u>
<u>9-1-94</u>	<u>1058</u>	<u>7.7</u>	<u>430 µmhos/cm</u>	<u>605 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>9-1-94</u>	<u>1123</u>	<u>7.5</u>	<u>550 µmhos/cm</u>	<u>26 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-2-94</u>	<u>0950</u>	<u>7.3</u>	<u>510 µmhos/cm</u>	<u>52 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-2-94</u>	<u>1011</u>	<u>7.3</u>	<u>510 µmhos/cm</u>	<u>33 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

*NR: Not Recorded (4.0-10.5) (<1000 µmhos/cm) (<5 ppm) (<100 cpm) (<500 cpm)

Weather: 9-1-94: Partly cloudy to cloudy, light rain. Temp.: 9-1-94: Low-70s to low-80s° F
9-2-94: Overcast, scattered light rain. 9-2-94: Low-60s to low-70s° F

DISPOSITION: Drill-site Disposal X Containerization X
(Labeled?) y/n

Describe: First 110 gallons of development water discharged to ground surface remaining 205 gallons placed in U.S. DOT-approved, bung-top drum pending analysis of water sample (see activity/progress log). Lab analysis indicated contaminants below detection levels, remaining water discharged to ground surface as per HSEA.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature: Date: 9/2/94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-181</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>Chestnut Ridge Security Pit</u>		DATE: START: <u>12-20-94</u>	
DRILLER: <u>H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-22-94</u>	
HELPER: <u>G.Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>Susan L. Abston-SAIC</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-20-94	1308	1328	Arrive at GW-181 site. Measure water level at 112.3 ft below top of casing (BTOC) = 109.9 ft below ground surface (BGS). Tag bottom of well at 168.8 ft BTOC = 166.4 ft BGS. Note: The Subsurface Data Base (Y/TS-881/R2) reports the total depth (of the open interval) of well GW-181 is 168.0 ft BGS. Calculate a well volume of 99.5 gallons of water. Depart site.
12-21-94	0932	1014	Arrive at GW-181 site. Will begin development using a bailer to remove heavy sediment accumulation. Begin bailing well GW-181. Take water sample from first bailer of water. Water sample is very turbid-muddy, has no discernable odor.
	1014	1018	Screen initial water sample. Readings: pH = 8.5, conductance = 210 μ mhos/cm, temperature = 13°C.
	1018	1042	Bail a total of 100 gallons of water out of the well. Water sample is very turbid, has no discernable odor.
	1042	1049	Screen water sample. Readings: pH = 7.9, conductance = 255 μ mhos/cm, temperature = 11°C.
	1049	1053	Tag bottom of well at 166.8 ft BGS, however, tape was clinging to side of well, and this may not be an accurate measurement.
	1053	1105	Bail another 100 gallons of water out of the well. Water sample is turbid, has no discernable odor.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-181</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-21-94	1105	1119	Screen water sample. Readings: pH = 7.7, conductance = 260
(cont.)			µmhos/cm, temperature = 11°C.
	1119	1245	Break for lunch.
	1245	1337	Continue bailing well GW-181. Bail another 100 gallons of water
			out of the well. Water sample is turbid, has no discernable odor.
	1337	1341	Screen water sample. Readings: pH = 7.9, conductance = 255
			µmhos/cm, temperature = 12.5°C.
	1341	1415	Bail another 100 gallons of water out of the well. Water sample
			is turbid, has no discernable odor.
	1415	1420	Screen water sample. Readings: pH = 7.9, conductance = 245
			µmhos/cm, temperature = 15°C.
	1420	1449	Run 2-in. inside diameter (ID), 2 3/8-in. outside diameter (OD)
			steel swab tubing with check valve into well to 165.1 ft BGS.
	1449	1507	Continue development using the swab method. Wire-line spool
			shaft on swab rig breaks after producing approximately 80 more
			gallons of water (parameters not measured).
	1507	1537	Remove broken parts to obtain replacements. Repairs to be
			made tomorrow morning. Secure site and depart.
12-22-94	1348	1353	Arrive at GW-181 site. Repairs to swab rig complete. Resume
			development on well GW-181. Swab 20 gallons of water out of the
			well. Water sample is very turbid-muddy, has no discernable
			odor.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-181</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 3 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-22-94	1353	1358	Screen water sample. Readings: pH = 8.5, conductance = 255
(cont.)			µmhos/cm, temperature = 12°C.
	1358	1420	Lower swab tubing to 166.1 ft BGS, and continue swabbing well
			GW-181. Swab another 100 gallons of water out of the well. Water
			sample is moderately turbid, has no discernable odor.
	1420	1424	Screen water sample. Readings: pH = 7.9, conductance = 255
			µmhos/cm, temperature = 12°C.
	1424	1439	Swab another 100 gallons of water out of the well. Water sample
			is moderately turbid.
	1439	1443	Screen water sample. Readings: pH = 7.9, conductance = 260
			µmhos/cm, temperature = 13°C.
	1443	1446	Swab another 100 gallons of water out of the well. No change in
			turbidity since the previous water sample, no discernable odor.
	1446	1503	Screen water sample. Readings: pH = 7.9, conductance = 260
			µmhos/cm, temperature = 12°C. Parameters have stabilized.
			Redevelopment/rehabilitation of well GW-181 is complete.
	1503	1533	Pull out swab tubing. Secure well, and depart.
12-27-94	0957	1002	At GW-181 site. Tag bottom of well at 167.2 ft BGS (removed 0.8
			ft of sediment). Depart.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM						WELL NO. <u>GW-181</u>	
MONITORING WELL REDEVELOPMENT PROGRESS							
LOCATION: <u>Chestnut Ridge Security Pit</u>							
COMPLETION DATE: <u>4-13-88</u>							
ONE WELL VOLUME: <u>99.5</u> GALLONS							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (μ mhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
12-21-94	-NA-	Very turbid-muddy	8.5	210	-NA-	-NA-	Initial, 1
12-21-94	100	Very turbid	7.9	255	100	1.0	1
12-21-94	100	Turbid	7.7	260	200	2.0	1
12-21-94	100	Turbid	7.9	255	300	3.0	1
12-21-94	100	Turbid	7.9	245	400	4.0	1
12-21-94	80	Not described	-NA-	-NA-	480	4.8	2
12-22-94	20	Very turbid-muddy	8.5	255	500	5.0	2
12-22-94	100	Moderately turbid	7.9	225	600	6.0	3
12-22-94	100	Moderately turbid	7.9	260	700	7.0	3
12-22-94	100	Moderately turbid	7.9	260	800	8.0	3
RESULTS AT END OF DEVELOPMENT		Moderately turbid	7.9	260	800	8.0	
COMMENTS							
1: Development accomplished using a bailer.							
2: Swab tubing at 165.1 ft BGS.							
3: Swab tubing at 166.1 ft BGS.							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-181

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Bailer/swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 12-20-94FINISH: 12-22-94ONE WELL VOLUME: 99.5 GALLONSTOTAL GALLONS PUMPED: 800 TOTAL WELL VOLUMES PUMPED: 8.0INITIAL pH: 8.5 FINAL pH: 7.9INITIAL SPECIFIC CONDUCTANCE: 210 μ mhos/cm FINAL: 260 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Very Turbid-muddyDESCRIPTION OF FINAL TURBIDITY: Moderately turbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 109.9 ft BGS on 12-20-94

DEVELOPMENT OBSERVATIONS: Well exhibits excellent recharge as indicated by inability to draw water levels down significantly during development sessions. Development water cleared significantly during redevelopment. Removed 0.8 ft of sediment from well.

OBSERVER SIGNATURE: Susan L. AbstonDATE: 12-22-94

Y-12 PLANT GWPP REDEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-181 SITE: Chestnut Ridge Security PitAPPROX. VOLUME OF DEVELOPMENT WATER: 800 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>12-21-94</u>	<u>1014</u>	<u>8.5</u>	<u>210 μmhos/cm</u>	<u>0.0 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>12-21-94</u>	<u>1042</u>	<u>7.9</u>	<u>255 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-21-94</u>	<u>1105</u>	<u>7.7</u>	<u>260 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-21-94</u>	<u>1337</u>	<u>7.9</u>	<u>255 μmhos/cm</u>	<u>0.0 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>12-21-94</u>	<u>1415</u>	<u>7.9</u>	<u>245 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-22-94</u>	<u>1353</u>	<u>8.5</u>	<u>255 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-22-94</u>	<u>1420</u>	<u>7.9</u>	<u>225 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: 12-21-94: Mostly sunny.
12-22-94: Cloudy, occasional rain.Temp.: 12-21-94: Mid-50s °F
12-22-94: Low-50s °FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: Susan L AbstonDate: 12-22-94

Y-12 PLANT GWPP REDEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-181 SITE: Chestnut Ridge Security PitAPPROX. VOLUME OF DEVELOPMENT WATER: 800 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
<u>12-22-94</u>	<u>1439</u>	<u>7.9</u>	<u>260 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-22-94</u>	<u>1446</u>	<u>7.9</u>	<u>260 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 μ mhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Cloudy, occasional rain.Temp.: Low-50s °FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: *Susan L. Abston*Date: 12-22-94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-230</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 3
LOCATION: <u>University of Tennessee Arboretum</u>		DATE: START: <u>9-6-94</u>	
DRILLER: <u>Hubert Hall - Highland Drilling Co.</u>		FINISH: <u>9-9-94</u>	
HELPERS: <u>Jeff Monger - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey (SAIC)</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-6-94	0930	0948	Arrive at GW-230 site. W. Thedford (HSEA) arrives on site.
	0948	0956	Crew arrives, move workover rig onto location and position over well. Begin setting up site.
	0956	1039	Uncap well: organic vapors at well collar = 16.0 ppm (steady), fluctuates between approximately 12 and 24 ppm (background = 1.0 ppm). Organic vapors in the breathing zone = 1.0 ppm (background = 1.0 ppm). Water level (measured 9-2-94) = 14.1 ft below ground surface (BGS). Bottom of well (tagged 9-2-94) = 406.9 ft BGS (soft). The Subsurface Data Base (Y/TS-881/R1) reports the total depth well GW-230 to be 406.4 ft BGS. Calculate a well volume of 249.0 gallons of water. Perform pre-work equipment inspections.
	1039	1124	Run 17 sections of 2.0-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve totaling 405.6 ft into the well to 401.6 ft BGS.
	1124	1130	Swab 55 gallons of water out of the well. Water is clear with a brown tint and generates foam in the collection barrel. Water has a strong fetid odor.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-230</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-6-94	1130	1137	Screen water sample. Readings: pH = 9.1, conductance =
(cont.)			278 μ mhos/cm.
	1137	1235	Break for lunch. W. Thedford departs.
	1235	1327	Perform headspace analysis (HSA) on water sample: 600 ppm.
			Call to W. Thedford, report results. HSEA plans to sample the
			well before continuing development.
	1327	1343	W. Thedford and B. Rundle (both of HSEA) arrive at site. Obtain
			VOA sample of development water from headspace jar.
			W. Thedford and B. Rundle depart.
	1343	1418	Crew seals development water in collection barrel pending lab
			analysis of water sample. Secure site and depart.
9-7-94	-NA-	-NA-	Lab analysis of water sample (obtained 9-6-94) indicates that
			contaminants of concern are either below detection levels, or
			below acceptable discharge levels (HSEA personnel suspect the
			presence of methane in the development water). HSEA ap-
			proves discharging the development water to the ground surface.
9-8-94	0816	0848	Arrive at GW-230 site. Crew arrives. Start Smeal rig and raise
			mast.
	0848	0916	Swab 270 gallons of water out of the well. Water sample is fairly
			clear, generates foam in the collection barrel, and has a faint fetid
			odor.
	0916	0921	Screen water sample. Readings: pH = 7.3, conductance =
			730 μ mhos/cm.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-230</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 3
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
9-8-94	0921	1002	Waiting for well to recharge.
(cont.)			
	1002	1029	Swab an additional 270 gallons of water out of the well. Water sample is fairly clear. Water sample has no discernible odor.
	1029	1038	Screen water sample. Readings: pH = 7.1, conductance = 800 μ mhos/cm.
	1038	1105	Waiting for well to recharge.
	1105	1131	Swab an additional 285 gallons of water out of the well. Water sample is fairly clear. Water has a strong fetid odor.
	1131	1137	Screen water sample. Readings: pH = 7.3, conductance = 810 μ mhos/cm. Parameters have stabilized.
	1137	1315	Break for lunch. Crew departs to pipeyard for supplies and returns. K. Jago (HSEA) onsite to check redevelopment progress.
	1315	1454	Pull the swab tubing out of the well. Radiological scan of tubing: beta/gamma = 30-50 cpm (background = 30 cpm).
	1454	1500	Rig down Smeal rig. Secure site and depart.
	0833	0847	At GW-230 site. Tag bottom of well at 406.9 ft BGS (no change). Depart.
			Redevelopment/rehabilitation of well GW-230 is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM						WELL NO. <u>GW-230</u>	
MONITORING WELL REDEVELOPMENT PROGRESS							
LOCATION: <u>University of Tennessee Arboretum</u> COMPLETION DATE: <u>5-12-86</u> ONE WELL VOLUME: <u>249.0</u> GALLONS							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (µS)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
9-6-94	55	Clear	9.1	278	55	0.2	1, 2
9-8-94	270	Fairly Clear	7.3	730	325	1.3	2, 3, 4
9-8-94	270	Fairly Clear	7.1	800	595	2.4	
9-8-94	285	Fairly Clear	7.3	810	880	3.5	3
RESULTS AT END OF DEVELOPMENT		Fairly Clear	7.3	810	880	3.5	
COMMENTS: Swab tubing to 401.6 ft BGS.							
1. Water has strong fetid odor.							
2. Water foams up in collection barrel.							
3. Water has faint fetid odor.							
4. Swabbed nearly to dryness.							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. <u>GW-230</u>
MONITORING WELL REDEVELOPMENT SUMMARY	
METHOD OF DEVELOPMENT: <u>Swab</u>	
DEVELOPMENT OBSERVED BY: <u>Timothy Coffey - SAIC</u>	
DEVELOPMENT DATE: START: <u>9-6-94</u> FINISH: <u>9-9-94</u>	
ONE WELL VOLUME: <u>249.0</u> GALLONS	
TOTAL GALLONS PUMPED: <u>880</u> TOTAL WELL VOLUMES PUMPED: <u>3.5</u>	
INITIAL pH: <u>9.1</u> FINAL pH: <u>7.3</u>	
INITIAL SPECIFIC CONDUCTANCE: <u>278 μmhos/cm</u> FINAL: <u>810 μmhos/cm</u>	
DESCRIPTION OF INITIAL TURBIDITY: <u>Clear (brown tint)</u>	
DESCRIPTION OF FINAL TURBIDITY: <u>Fairly clear</u>	
FINAL MEASURED TURBIDITY: <u>Not Analyzed</u>	
WELL APPROVED BY: <u>W.K. Jago - HSEA</u>	
ODOR OF WATER: <u>Water generally had a strong to faint fetid odor.</u>	
WATER DISCHARGED TO: <div style="display: flex; justify-content: space-between;"> <div> ☒ GROUND SURFACE ☐ STORM SEWERS ☐ DRUMS </div> <div> ☐ TANK TRUCK ☐ STORAGE TANKS ☐ OTHER _____ </div> </div>	
INITIAL PRE-DEVELOPMENT WATER DEPTH: <u>14.1 ft BGS on 9-2-94</u>	
DEVELOPMENT OBSERVATIONS: <u>Well is a good producing well (exhibits excellent recharge). Very little sediment observed in development water.</u>	
OBSERVER SIGNATURE:
DATE: <u>9-9-94</u>	

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-230 SITE: University of Tennessee ArboretumAPPROX. VOLUME OF DEVELOPMENT WATER: 880 Gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>9-6-94</u>	<u>1130</u>	<u>9.1</u>	<u>278 µmhos/cm</u>	<u>600 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-8-94</u>	<u>0848</u>	<u>7.3</u>	<u>730 µmhos/cm</u>	<u>49.5 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>9-8-94</u>	<u>1029</u>	<u>7.1</u>	<u>800 µmhos/cm</u>	<u>25 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>9-8-94</u>	<u>1131</u>	<u>7.3</u>	<u>810 µmhos/cm</u>	<u>29 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: 9-6-94: Cloudy with light showers to partly cloudy.
9-8-94: Clear and pleasant.Temp.: 9-6-94: Upper-60s to low-80s° F
9-8-94: Low-50s to low-80s° FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Initial development water temporarily stored in capped, 55-gal. barrel, pending lab analysis of water sample. Lab analysis indicated contaminants of concern either below detection level or below acceptable disposal standards: development water discharged to ground surface

Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 9/9/94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-242</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 4
LOCATION: <u>Y-12 Burial Ground</u>		DATE: START: <u>7-10-95</u>	
DRILLER: <u>G. Shillings - Highland Drilling Co.</u>		FINISH: <u>7-12-95</u>	
HELPER: <u>J. Gallaher - Highland Drilling Co.</u>		LOGGED BY: <u>Susan L. Abston - SAIC</u>	
DRILL: <u>-NA- (see text)</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-10-95	1041	1120	At GW-242 site. Uncap well. Water at 6.4 ft below top of casing (BTOC). Secured well. Off site to pipeyard to pick up supplies.
	1313	1328	At GW-242 site. Uncap well. Remove dedicated bailer. Tag bottom of well at 19.76 ft BTOC. Calculate well volume (to top of sediment accumulation) of 2.2 gallons of water.
	1328	1344	Begin bailing with dedicated stainless steel bailer. Water sample of initial water. Readings: pH = 6.9, conductance = 285 μ mhos/cm. Water is very turbid. Continue to bail. Bail 2.2 gallons of water out of well. Water sample is turbid. Readings: pH = 6.7, conductance = 280 μ mhos/cm.
	1344	1359	Bail another 2.2 gallons of water out of well. Water sample becomes moderately turbid. Readings: pH = 6.5, conductance = 280 μ mhos/cm.
	1359	1422	Bail another 2.2 gallons of water out of well. Water sample is turbid again (grayish brown in color). Readings: pH = 6.5, conductance = 280 μ mhos/cm.
	1422	1428	Bail another 2.2 gallons of water out of well (6 well volumes total). Water sample remains turbid. Readings: pH = 6.5, conductance = 280 μ mhos/cm.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-242</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-10-95	1428	1455	Lost bailer down well. Crew departs site for fishing equipment.
(cont.)			
	1455	1505	Crew back at site and begin fishing for lost bailer.
	1505	1527	Bailer retrieved from well. Crew departs site for more bailing rope.
			Secure site and well, depart site.
7-11-95	1013	1035	Arrive at GW-242 site. Waiting on crew. Uncap well. Organic vapors at well collar = 0.0 ppm.
	1035	1100	Crew on site. Attach new rope to bailer and set up to continue development.
	1100	1152	Break for lunch.
	1152	1218	Begin bailing. Bail 6.6 gallons of water out of well (total of 9 well volumes). Water sample still turbid. Readings: pH = 6.7, conductance = 285 μ mhos/cm.
	1218	1223	Continue bailing until well dries up (after 4.2 gallons).
	1223	1309	Allowing time for well to recharge.
	1309	1314	Bail 2.4 gallons of water out of well (total of 12 well volumes). Water sample is turbid. Readings: pH = 6.6, conductance = 290 μ mhos/cm.
	1314	1333	Bail another 6.6 gallons of water out of well (total of 15 well volumes). Water sample is turbid. Readings: pH = 6.7, conductance = 295 μ mhos/cm. Bailed well to dryness. Letting it recharge overnight.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-242</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 3 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-11-95	1333	1417	Tag bottom of well at 20.11 ft (solid) BTOC (removed .35 ft of sediment). Secure equipment and site. Depart site.
(cont.)			
7-12-95	0911	0930	At GW-242 site. Crew on site. Uncap well and continue bailing.
	0930	0933	Bail 6.6 gallons of water out of well (total of 18 well volumes). Water sample still turbid but becoming more moderate brown in color and less gray. Readings: pH = 6.7, conductance = 275 μ mhos/cm.
			Well dry.
	0933	1006	Allowing well to recharge.
	1006	1019	Continue to bail well.
	1019	1021	Bail 6.6 gallons of water out of well (total of 21 well volumes). Water sample is turbid (moderate brown in color). Readings: pH = 6.6, conductance = 260 μ mhos/cm. Well dry.
	1021	1106	Allowing well to recharge.
	1106	1120	Continue bailing.
	1120	1130	Bail 6.6 gallons of water out of well (total of 24 well volumes). Water sample is still turbid. Readings: pH = 6.6, conductance = 270 μ mhos/cm. Well dry.
	1130	1228	Break for lunch.
	1228	1251	Continue bailing.

[illegible]

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM						WELL NO. <u>GW-242</u>	
MONITORING WELL REDEVELOPMENT PROGRESS							
LOCATION: <u>Y-12 Burial Ground</u> ONE WELL VOLUME: <u>2.2</u> GALLONS COMPLETION DATE: <u>11-20-85</u>							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (µmhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
7-10-95	0	Very turbid	6.9	285	0	0	
7-10-95	2.2	Turbid	6.7	280	2.2	1	
7-10-95	2.2	Moderately turbid	6.5	280	4.4	2	
7-10-95	2.2	Turbid	6.5	280	6.6	3	
7-10-95	6.6	Turbid	6.5	280	13.2	6	
7-11-95	6.6	Turbid	6.7	285	19.8	9	
7-11-95	6.6	Turbid	6.6	290	26.4	12	Well dry after 24 gallons
7-11-95	6.6	Turbid	6.7	295	33.0	15	Well dry
7-12-95	6.6	Turbid	6.7	275	39.6	18	Well dry
7-12-95	6.6	Turbid	6.6	260	46.2	21	
7-12-95	6.6	Turbid	6.6	270	52.8	24	Well dry
7-12-95	6.6	Turbid	7.0	275	59.4	27	Well dry
7-12-95	6.6	Turbid	6.9	255	66.0	30	
RESULTS AT END OF DEVELOPMENT		Turbid	6.9	255	66.0	30	
COMMENTS							
After removing 30 well volumes ~1/4-in. of sediment would still settle out in sample jar. Well initially was 19.76 ft BTOC and after completion was 20.11 ft BTOC.							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-242

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Bailer

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 7-10-95FINISH: 7-12-95ONE WELL VOLUME: 2.2 GALLONSTOTAL GALLONS PUMPED: 66.0 TOTAL WELL VOLUMES PUMPED: 30INITIAL pH: 6.9 FINAL pH: 6.9INITIAL SPECIFIC CONDUCTANCE: 285 μ mhos/cm FINAL: 255 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Very turbid (silty)DESCRIPTION OF FINAL TURBIDITY: TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W. K. Jago - HSEAODOR OF WATER: No odor noted

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 6.40 ft BTOC on 7-10-95

DEVELOPMENT OBSERVATIONS: Well easily drawn down but able to recharge in ~30 min. Unable to clear water entirely. Less turbid than at beginning, however, still turbid.

OBSERVER SIGNATURE: Susan L. AbstonDATE: 7-12-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-242 SITE: Y-12 Burial GroundAPPROX. VOLUME OF DEVELOPMENT WATER: 66 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS: (continued on next page)

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>7-10-95</u>	<u>1328</u>	<u>6.9</u>	<u>285 μmhos/cm</u>	<u>0.2 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-10-95</u>	<u>1338</u>	<u>6.7</u>	<u>280 μmhos/cm</u>	<u>0.4 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>7-10-95</u>	<u>1344</u>	<u>6.5</u>	<u>280 μmhos/cm</u>	<u>0.1 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-10-95</u>	<u>1359</u>	<u>6.5</u>	<u>280 μmhos/cm</u>	<u>1.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-10-95</u>	<u>1422</u>	<u>6.5</u>	<u>280 μmhos/cm</u>	<u>0.4 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-11-95</u>	<u>1218</u>	<u>6.7</u>	<u>285 μmhos/cm</u>	<u>0.2 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-11-95</u>	<u>1314</u>	<u>6.6</u>	<u>290 μmhos/cm</u>	<u>0.2 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 μmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cpm)</u>

Weather: Foggy to sunny.Temp.: 75°F - 92°FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: Date: 7-12-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-242 SITE: Y-12 Burial GroundAPPROX. VOLUME OF DEVELOPMENT WATER: 66 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS: (continued from previous page)

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
<u>7-11-95</u>	<u>1333</u>	<u>6.7</u>	<u>295 µmhos/cm</u>	<u>0.3 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>0930</u>	<u>6.7</u>	<u>275 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>1019</u>	<u>6.6</u>	<u>260 µmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>1120</u>	<u>6.6</u>	<u>270 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>1251</u>	<u>7.0</u>	<u>275 µmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>7-12-95</u>	<u>1354</u>	<u>6.9</u>	<u>255 µmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Foggy to sunny.Temp.: 75°F - 92°FDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: Date: 7-12-95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-541</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 2
LOCATION: <u>Landfill II Expansion</u>		DATE: START: <u>8-23-94</u>	
DRILLER: <u>Hubert Hall - Highland Drilling Co.</u>		FINISH: <u>8-24-94</u>	
HELPERS: <u>Randy Phillips - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey (SAIC)</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
8-23-94	1350	1403	Arrive at GW-541 site. Crew is on site, Smeal swab rig is positioned over the well. W. Thedford (HSEA) is on site. Uncap well; measure organic vapors at collar: 0.0 ppm (background). Measure water level at 62.2 ft below ground surface (BGS). Tag bottom of well at 104.1 ft BGS. The Subsurface Data Base (Y/TS-881/R1) reports the total depth of well GW-541 to be 104.5 ft BGS. Calculate a well volume of 31.3 gallons.
	1403	1421	Run six sections of 2.0-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) swab tubing with check valve into well to approximately 102 ft BGS.
	1421	1430	Commence swabbing well. Water sample collected immediately: water is fairly clear of sediment with a rusty-brown tint. Screen water sample. Initial readings: pH = 8.2, conductance = 360 µmhos/cm.
	1430	1436	Immediately swab 36 gallons of water out of the well. Observed a small amount of cloudy, turbid water this development session; otherwise the development water was relatively clear. Well swabbed nearly to dryness. Water sample is clear.
	1436	1442	Screen water sample. Readings: pH = 9.2, conductance = 218 µmhos/cm.
	1442	1520	Waiting for well to recharge. W. Thedford departs.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-541</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 2
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
8-23-94 (cont)	1520	1530	Swab an additional 18 gallons of water out of the well. Well swabbed to dryness. Water sample is fairly clear of sediment and rusty-brown.
	1530	1540	Screen water sample. Readings: pH = 8.6, conductance = 300 µmhos/cm. Secure site and depart.
8-24-94	0818	0838	Arrive at GW-541 site. Crew arrives and conducts pre-work equipment inspections.
	0838	0846	Swab 22 gallons of water out of the well. Well swabbed nearly to dryness. Water sample is clear.
	0846	0900	Screen water sample. Readings: pH = 8.6, conductance = 272 µmhos/cm. Development water has been relatively clear since swabbing small amount of muddy water early in development. Have swabbed nearly three well volumes to this point. Call to W. Thedford (HSEA) for direction. W. Thedford declares that redevelopment/rehabilitation effort is adequate.
	0900	0943	Pull swab tubing out of the well. Tag bottom of well (soft) at 104.1 ft BGS (no change). Radiological scan of swab tubing: beta/gamma = 30-40 cpm (background = 30 cpm). Rig down Smeal Rig. Depart site.
			Rehabilitation/redevelopment for well GW-541 is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-541

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 8-23-94FINISH: 8-24-94ONE WELL VOLUME: 31.3 GALLONSTOTAL GALLONS PUMPED: 87 TOTAL WELL VOLUMES PUMPED: 2.8INITIAL pH: 8.2 FINAL pH: 8.6INITIAL SPECIFIC CONDUCTANCE: 360 μ mhos/cm FINAL: 272 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Fairly ClearDESCRIPTION OF FINAL TURBIDITY: ClearFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernible

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 62.2 ft BGS on 8-23-94

DEVELOPMENT OBSERVATIONS: Well is a moderately good producing well. Observed only a small amount of muddy/turbid water near beginning of development.

OBSERVER SIGNATURE: DATE: 8-24-94

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-541 SITE: Landfill II Expansion

APPROX. VOLUME OF DEVELOPMENT WATER: 87 Gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>HNu Model HW-101/Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>8-23-94</u>	<u>1422</u>	<u>8.2</u>	<u>360 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>8-23-94</u>	<u>1436</u>	<u>9.2</u>	<u>218 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>8-23-94</u>	<u>1530</u>	<u>8.6</u>	<u>300 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>8-24-94</u>	<u>0846</u>	<u>8.6</u>	<u>272 µmhos/cm</u>	<u>0.3 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: 8-23-94: Partly cloudy, warm
8-24-94: Partly cloudy, mild

Temp.: 8-23-94: Low to mid 80s° F
8-24-94: Low to mid 70s° F

DISPOSITION: Drill-site Disposal X

Containerization
(Labeled?) y/n

Describe: Development water discharged to ground surface.

Onsite Geologist (print): Timothy Coffey - SAIC

Signature:

Date: 8/24/94

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-541</u>		
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☐ P&A ☐ REDEVELOPMENT ☒		
LOCATION: <u>Landfill II Expansion</u>		DATE: START: <u>8-23-94</u>		
DECONTAMINATION CREW <u>Hubert Hall</u>		FINISH: <u>8-24-94</u>		

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG <u>(Mast, Chassis, Cables, Carousel, Hoses, Etc.)</u>	-NA-	—	—	—
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	-NA-	—	—	—
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	-NA-	—	—	—
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG <u>Smeal Swab Rig</u> (Mast, Chassis, Cables, Hoses, Etc.)	8-23-94	8-23-94	Pass	TJC
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	8-23-94	8-23-94	Pass	TJC
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS:

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-731</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 4
LOCATION: <u>Sediment Disposal Basin</u>		DATE: START: <u>12-5-94</u>	
DRILLERS: <u>R.M. Collins/H. Hall - Highland Drilling Co.</u>		FINISH: <u>12-12-94</u>	
HELPERS: <u>R.Phillips/R.Collins/G.Shillings - Highland Drilling Co.</u>		LOGGED BY: <u>Susan L. Abston-SAIC</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-5-94	1443	1523	Arrive at GW-731 site. Uncap well. Measure water level at 125.1 ft below top of casing (BTOC) = 121.7 ft below ground surface (BGS). Tag bottom of well (soft) at 174.4 ft BTOC = 171.0 ft BGS. Calculate a well volume of 32 gallons of water. Note: The Subsurface Data Base (Y/TS-881/R2) reports the total depth of the screen in well GW-731 is 175.2 ft BGS. Crew positions Smeal Swab rig over well location.
	1523	1546	Discover that there is not enough cable on wire-line spool to swab this well to the bottom. Will either have to use another swab rig or get more cable. Secure site and depart.
12-6-94	1113	1134	Arrive at GW-731 site. Crew (R.M. Collins/R. Collins) puts new cable on wire-line spool.
	1134	1226	Run 2-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve into the well to 171.1 ft BGS.
	1226	1230	Commence swabbing well GW-731, sample the first water out of the swab tubing. Water sample starts out moderately turbid, then becomes very turbid-muddy. The water sample has no discernable odor.
	1230	1245	Screen initial water sample. Readings: pH = 9.6, conductance = 300 µmhos/cm, temperature = 18.5°C.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-731</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 2 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-6-94	1245	1308	Break for lunch.
(cont.)			
	1308	1319	Swab 32 gallons of water (1 well volume) out of the well. Water sample is very turbid-muddy, has no discernable odor.
	1319	1323	Screen water sample. Readings: pH = 8.9, conductance = 220 μ mhos/cm, temperature = 17°C.
	1323	1332	Swab another 32 gallons of water out of the well. Water sample is very turbid-muddy, has no discernable odor.
	1332	1335	Screen water sample. Readings: pH = 8.3, conductance = 210 μ mhos/cm, temperature = 15°C.
	1335	1430	Continue swabbing well GW-731, but produce only about 1 gallon of water: well swabbed to dryness. Lower swab tubing 1 ft to 172.1 ft BGS. Wait for well to recharge.
	1430	1442	Continue swabbing well GW-731. Swab another 32 gallons of water out of the well. Water sample is very turbid-muddy (even muddier than previously), has no discernable odor.
	1442	1452	Screen water sample. Readings: pH = 8.4, conductance = 180 μ mhos/cm, temperature = 14.5°C.
	1452	1521	Continue swabbing well GW-731. Interrupt development to lower swab tubing to 174.2 ft BGS. Swab another 32 gallons of water out of the well. Water sample is very turbid-muddy, has no discernable odor.
	1521	1524	Screen water sample. Readings: pH = 8.2, conductance = 180 μ mhos/cm, temperature = 14°C.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-731</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
12-6-94 (cont.)	1524	1557	Continue swabbing well GW-731. Well swabbed to dryness after an additional 18 gallons (parameters not measured). Finish screening water samples (headspace analyses). Secure site and depart.
12-12-94	1003	1026	Arrive at GW-731 site. Crew (H. Hall/G. Shillings) rigs up Smeal rig. Continues swabbing well GW-731. Sample taken after 14 gallons of water. Water is very turbid, has no discernable odor.
	1026	1030	Screen water sample. Readings: pH = 9.1, conductance = 180 μ mhos/cm, temperature = 13°C.
	1030	1040	Swab another 32 gallons of water out of the well. Water sample is very turbid, has no discernable odor.
	1040	1049	Lower swab tubing 0.2 ft to 174.4 ft BGS (hard bottom). Continue swabbing GW-731. Swabbed well to dryness after only 5 gallons.
	1049	1212	Wait for well to recharge.
	1212	1224	Swab 27 gallons of water out of the well. Water sample is very turbid-muddy, has no discernable odor.
	1224	1228	Screen water sample. Readings: pH = 8.6, conductance = 160 μ mhos/cm, temperature = 13°C.
	1228	1300	Wait for well to recharge.
	1300	1312	Swab another 3 gallons of water out of the well. Water sample is turbid to moderately turbid.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-731

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Susan L. Abston - SAICSTART: 12-5-94FINISH: 12-12-94ONE WELL VOLUME: 32.0 GALLONSTOTAL GALLONS PUMPED: 260 TOTAL WELL VOLUMES PUMPED: 8.1INITIAL pH: 9.6 FINAL pH: 8.4INITIAL SPECIFIC CONDUCTANCE: 300 μ mhos/cm FINAL: 150 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: Very Turbid-muddyDESCRIPTION OF FINAL TURBIDITY: Turbid to moderately turbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W.K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 121.7 ft BGS on 12-5-94DEVELOPMENT OBSERVATIONS: Well is completed in moderately good producing water zone:

well swabbed to dryness after approximately 2 well volumes removed. Development removed 3.4 ft of
accumulated sediment, however, the water did not clear up significantly.

OBSERVER SIGNATURE: *Susan L. Abston*DATE: 12-12-94

Y-12 PLANT GWPP REDEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-731 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 260 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
<u>12-6-94</u>	<u>1230</u>	<u>9.6</u>	<u>300 µmhos/cm</u>	<u>0.0 ppm</u>	<u>20 cpm</u>	<u>0 cpm</u>
<u>12-6-94</u>	<u>1319</u>	<u>8.9</u>	<u>220 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-6-94</u>	<u>1332</u>	<u>8.3</u>	<u>210 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>12-6-94</u>	<u>1442</u>	<u>8.4</u>	<u>180 µmhos/cm</u>	<u>0.0 ppm</u>	<u>60 cpm</u>	<u>0 cpm</u>
<u>12-6-94</u>	<u>1521</u>	<u>8.2</u>	<u>180 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>12-12-94</u>	<u>1026</u>	<u>9.1</u>	<u>180 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-12-94</u>	<u>1040</u>	<u>8.8</u>	<u>175 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Not recordedTemp.: Not recordedDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n

Describe: Development water discharged to ground surface.

Onsite Geologist (print): Susan L. Abston - SAICSignature: *Susan L. Abston*Date: 12-12-94

Y-12 PLANT GWPP REDEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-731 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 260 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
<u>12-12-94</u>	<u>1224</u>	<u>8.6</u>	<u>160 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>12-12-94</u>	<u>1312</u>	<u>8.4</u>	<u>150 μmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 μ mhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: Not recordedTemp.: Not recordedDISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/n Describe: Development water discharged to ground surface.Onsite Geologist (print): Susan L. Abston - SAICSignature: *Susan L. Abston*Date: 12-12-94

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

LOCATION: Sediment Disposal Basin

DECONTAMINATION CREW L. Jones

FINISH: 12-12-94

COMMENTS:

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-732</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT			PAGE 1 of 4
LOCATION: <u>Sediment Disposal Basin</u>		DATE: START: <u>7-20-95</u>	
DRILLERS: <u>G. Shillings - Highland Drilling Co.</u>		FINISH: <u>7-26-95</u>	
HELPERS: <u>J. Monger/J. Gallaher - Highland Drilling Co.</u>		LOGGED BY: <u>Timothy Coffey - SAIC</u>	
DRILL: <u>Smeal Swab Rig</u>			

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-20-95	0846	0900	At GW-732 site. Measure water level at 157.8 ft below top of casing (BTOC) = 154.4 ft below ground surface (BGS). Tag bottom of well at 192.8 ft BTOC = 189.4 ft BGS. The Subsurface Data Base (Y/TS-881/R1) reports the total depth of well GW-732 to be 189.3 ft deep. Calculate a well volume of 25.9 gallons. Secure wellhead and depart.
	1220	1334	Return to GW-732 site. Smeal Swab Rig is positioned over the well. The crew has inserted 2.0-in. inside diameter (ID), 2 3/8-in. outside diameter (OD) steel swab tubing with check valve into the well to approximately 188 ft BGS.
	1334	1351	Crew arrives. Commence swabbing the well. Swab 30 gallons of water out of the well: water sample is turbid, and contains a small amount of very fine-grained sand.
	1351	1359	Screen water sample. Readings: pH = 8.7, conductance = 245 μ mhos/cm, temperature = 17.5°C.
	1359	1412	Swab an additional 50 gallons of water out of the well: water sample is turbid, and still contains a small amount of very fine-grained sand.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-732</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 2 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-20-95	1412	1420	Screen water sample. Readings: pH = 9.2, conductance = 220
(cont.)			µmhos/cm, temperature = 16.5°C. Crew adds a 2-ft section of
			tubing to string, and lowers tubing to solid bottom (189.4 ft BGS).
	1420	1438	Swab an additional 55 gallons of water out of the well: water
			sample is turbid, and still contains a small amount of very fine-
			grained sand.
	1438	1447	Screen water sample. Readings: pH = 8.2, conductance = 230
			µmhos/cm, temperature = 16.2°C. Secure site, and depart. Re-
			port status to K. Jago (HSEA) who directs to continue for a couple
			of days.
7-21-95	0744	0808	Arrive at GW-732 site. Swab 110 gallons of water out of the well:
			water sample is turbid (but appears to be slightly clearer than
			yesterday), and contains only a rare amount of very fine-grained
			sand.
	0808	0814	Screen water sample. Readings: pH = 8.1, conductance = 232
			µmhos/cm, temperature = 14.8°C.
	0814	0834	Swab an additional 80 gallons of water out of the well (swabbed
			well nearly to dryness): water sample is turbid to moderately
			turbid.
	0834	0839	Screen water sample. Readings: pH = 7.8, conductance = 239
			µmhos/cm, temperature = 15.9°C.
	0839	0940	Waiting on well to recharge.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-732</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			PAGE 3 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-21-95	0940	1003	Swab 110 gallons of water out of the well (swabbed well nearly to dryness): water sample is moderately turbid, sand is absent from the sample.
(cont.)			
	1003	1007	Screen water sample. Readings: pH = 7.7, conductance = 262 μ mhos/cm, temperature = 15.4°C.
	1007	1107	Waiting on well to recharge.
	1107	1125	Swab 55 gallons of water out of the well: water sample is moderately turbid.
	1125	1135	Screen water sample. Readings: pH = 7.6, conductance = 260 μ mhos/cm, temperature = 16.5°C.
	1135	1255	Break for lunch.
	1255	1315	Swab 110 gallons of water out of the well: water sample is slightly turbid (obvious clearing of development water over last few sessions).
	1315	1325	Screen water sample. Readings: pH = 7.7, conductance = 268 μ mhos/cm, temperature = 16.2°C. Secure site and depart.
7-24-95	0751	0820	Arrive at GW-732 site. Swab 110 gallons of water out of the well: water sample is slightly turbid.
	0820	0833	Screen water sample. Readings: pH = 7.8, conductance = 232 μ mhos/cm, temperature = 15.8°C. Depart site.
	0833	1258	Allowing the well to recharge.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM			WELL NO. <u>GW-732</u>
WELL REDEVELOPMENT ACTIVITY/PROGRESS REPORT continued			
			PAGE 4 of 4
DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	
7-24-95	1258	1332	Return to GW-732 site. Swab 110 gallons of water out of the well:
(cont.)			water sample is slightly turbid.
	1332	1413	Screen water sample. Readings: pH = 8.1, conductance = 239
			µmhos/cm, temperature = 17.0°C. B. McMaster (HSEA/UT) onsite,
			suggests continuing development for 1 more day. Secure site and
			depart.
7-25-95	0730	0754	Arrive at GW-732 site. Swab 110 gallons of water out of the well:
			water sample is slightly turbid.
	0754	0835	Screen water sample. Readings: pH = 7.9, conductance = 232
			µmhos/cm, temperature = 15.0°C. Depart site.
	0835	1236	Allowing the well to recharge.
	1236	1303	Return to GW-732 site. Swab 110 gallons of water out of the well:
			Water sample is slightly turbid.
	1303	1312	Screen water sample. Readings: pH = 8.0, conductance = 237
			µmhos/cm, temperature = 16.8°C. Crew will pull tubing out of the
			well tomorrow. Depart site.
7-26-95	0922	0947	Arrive at GW-732 site. Pull swab tubing out of the well. Tag bottom
			of well (solid) at 192.8 ft BTOC = 189.4 ft BGS (no change from pre-
			development depth). Rig down Smeal rig. Depart site.
			Rehabilitation/redevelopment of GW-732 is complete.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM						WELL NO. <u>GW-732</u>	
MONITORING WELL REDEVELOPMENT PROGRESS							
LOCATION: <u>Sediment Disposal Basin</u> ONE WELL VOLUME: <u>25.9</u> GALLONS COMPLETION DATE: <u>9-11-91</u>							
DATE	GALLONS PUMPED	DESCRIPTION OF TURBIDITY	pH	DISSOLVED SOLIDS (µmhos)	TOTAL GALLONS PUMPED	WELL VOLUMES PUMPED	COMMENTS
7-20-95	30	Turbid	8.7	245	30	1.2	1,2
7-20-95	50	Turbid	9.2	220	80	3.1	1,2
7-20-95	55	Turbid	8.2	230	135	5.2	2,3
7-21-95	110	Turbid	8.1	232	245	9.5	2,3
7-21-95	80	Turbid to Mod. Turbid	7.8	239	325	12.6	3,4
7-21-95	110	Moderately Turbid	7.7	262	435	16.8	3,4
7-21-95	55	Moderately Turbid	7.6	260	490	18.9	3
7-21-95	110	Slightly Turbid	7.7	268	600	23.2	3
7-24-95	110	Slightly Turbid	7.8	232	710	27.4	3
7-24-95	110	Slightly Turbid	8.1	239	820	31.7	3
7-25-95	110	Slightly Turbid	7.9	232	930	35.9	3
7-25-95	110	Slightly Turbid	8.0	237	1040	40.2	3
RESULTS AT END OF DEVELOPMENT		Slightly turbid	8.0	237	1040	40.2	
COMMENTS 1. Swab tubing to approximately 188 ft BGS. 2. Sample contains small amount of very fine-grained sand. 3. Swab tubing at 189.4 ft BGS. 4. Well swabbed nearly to dryness. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> After removing 2 or 3 well volumes at each session, water production from the well is reduced but recharges quickly enough so as to not completely dry up. </div>							

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. GW-732

MONITORING WELL REDEVELOPMENT SUMMARY

METHOD OF DEVELOPMENT: Swab

DEVELOPMENT DATE:

DEVELOPMENT OBSERVED BY: Timothy Coffey - SAICSTART: 7-20-95FINISH: 7-26-95ONE WELL VOLUME: 25.9 GALLONSTOTAL GALLONS PUMPED: 1040 TOTAL WELL VOLUMES PUMPED: 40.2INITIAL pH: 8.7 FINAL pH: 8.0INITIAL SPECIFIC CONDUCTANCE: 245 μ mhos/cm FINAL: 237 μ mhos/cmDESCRIPTION OF INITIAL TURBIDITY: TurbidDESCRIPTION OF FINAL TURBIDITY: Slightly TurbidFINAL MEASURED TURBIDITY: Not AnalyzedWELL APPROVED BY: W. K. Jago - HSEAODOR OF WATER: None Discernable

WATER DISCHARGED TO: ☒ GROUND SURFACE ☐ TANK TRUCK
☐ STORM SEWERS ☐ STORAGE TANKS
☐ DRUMS ☐ OTHER _____

INITIAL PRE-DEVELOPMENT

WATER DEPTH: 154.4 ft BGS on 7-20-95

DEVELOPMENT OBSERVATIONS: Well exhibits good recharge as evidenced by inability to completely draw water level down during development sessions. The concentrated development failed to clear the water completely, and heavy silt production continued from the first swab of each development session right up to the conclusion of development.

OBSERVER SIGNATURE: DATE: 7-25-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-732 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 1040 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter; with G-M Pancake Probe</u>
Alpha meter	<u>X</u>	(model)	<u>Ludlum Model 12 Count Ratemeter; with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>7-20-95</u>	<u>1351</u>	<u>8.7</u>	<u>245 µmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>7-20-95</u>	<u>1412</u>	<u>9.2</u>	<u>220 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-20-95</u>	<u>1438</u>	<u>8.2</u>	<u>230 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-21-95</u>	<u>0808</u>	<u>8.1</u>	<u>232 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-21-95</u>	<u>0834</u>	<u>7.8</u>	<u>239 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-21-95</u>	<u>1003</u>	<u>7.7</u>	<u>262 µmhos/cm</u>	<u>0.0 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
<u>7-21-95</u>	<u>1125</u>	<u>7.6</u>	<u>260 µmhos/cm</u>	<u>0.1 ppm</u>	<u>30 cpm</u>	<u>0 cpm</u>
		<u>(4.0-10.5)</u>	<u>(<1000 µmhos/cm)</u>	<u>(<5 ppm)</u>	<u>(<100 cpm)</u>	<u>(<500 cp</u>

Weather: 7-20-95: clear to partly cloudy. Temp.: 7-20-95: low-60s to low-90s°F
7-21-95: cloudy/drizzly, becoming clear. 7-21-95: mid-60s to mid-80s°F

DISPOSITION: Drill-site Disposal X Containerization
(Labeled?) y/n

Describe: Development water discharged to ground surface.Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 7-25-95

Y-12 PLANT GWPP DEVELOPMENT WATER FIELD SCREENING/DISPOSAL SHEET

WELL NO. GW-732 SITE: Sediment Disposal BasinAPPROX. VOLUME OF DEVELOPMENT WATER: 1040 gallons

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter	<u>X</u>	(model)	<u>Horiba Model U-7</u>
Sp. Cond. meter	<u>X</u>	(model)	<u>YSI S-C-T Meter Model 33</u>
Organic vapor meter	<u>X</u>	(model)	<u>Century-Foxboro OVA Model 128</u>
Beta/gamma meter	<u>X</u>	(model)	<u>Ludlum Model 3 Survey Meter;</u>
Alpha meter	<u>X</u>	(model)	<u>with G-M Pancake Probe</u>
			<u>Ludlum Model 12 Count Ratemeter;</u>
			<u>with Scintillation Tube Probe</u>

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/Gamma	Alpha
<u>7-21-95</u>	<u>1315</u>	<u>7.7</u>	<u>268 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-24-95</u>	<u>0820</u>	<u>7.8</u>	<u>232 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-24-95</u>	<u>1332</u>	<u>8.1</u>	<u>239 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u>7-25-95</u>	<u>0754</u>	<u>7.9</u>	<u>232 µmhos/cm</u>	<u>0.0 ppm</u>	<u>50 cpm</u>	<u>0 cpm</u>
<u>7-25-95</u>	<u>1303</u>	<u>8.0</u>	<u>237 µmhos/cm</u>	<u>0.0 ppm</u>	<u>40 cpm</u>	<u>0 cpm</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		(4.0-10.5)	(<1000 µmhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: 7-24-95: partly to mostly cloudy.
7-25-95: clear to partly cloudy.Temp.: 7-24-95: low-70s to low-90s°F.
7-25-95: low-60s to mid-90s°F.DISPOSITION: Drill-site Disposal XContainerization
(Labeled?) y/nDescribe: Development water discharged to ground surface.Onsite Geologist (print): Timothy Coffey - SAICSignature: Date: 7-25-95

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM		WELL NO. <u>GW-732</u>		
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY		INSTALLATION ☐ P&A ☐ REDEVELOPMENT ☒		
LOCATION: <u>Sediment Disposal Basin</u>		DATE: START: <u>7-20-95</u>		
DECONTAMINATION CREW <u>G. Shillings/J. Monger</u>		FINISH: <u>7-26-95</u>		

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG: _____ (Mast, Chassis, Cables, Carousel, Hoses, Etc.)	-NA-	—	—	—
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)	-NA-	—	—	—
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)	-NA-	—	—	—
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)	-NA-	—	—	—
WORKOVER RIG: <u>Smeal Swab Rig</u> (Mast, Chassis, Cables, Hoses, Etc.)	7-10-95	7-20-95	Pass	TJC
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)	7-20-95	7-20-95	Pass	TJC
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS:

APPENDIX I
WELL LOCATION MAP

DISTRIBUTION

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L. M. Sparks

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Y-12 Central Files