Quarterly Technical Progress Report, ORO-EY-76-S-05-5200 - No. 9

October 1, 1978 through December 31, 1978

Milestone Schedule

Resource Inventory Milestones

Complete stratigraphic cross sections per Tasks 3.2.1.1 (4), as revised.	6/30/78
Document and evaluate progress to date in inventorying unrecorded wells in Eastern Ohio.	12/31/77
Assemble and evaluate accumulated results of gas detection monitoring of wells drilled through shale.	3/31/78 & 9/30/78
Document and evaluate progress to date in analysis of lineaments using remote sensing imagery.	6/30/78
Complete isopach maps of Ohio Shale and lithologic subunits, per Task 3.2.2.1 (5), as revised.	6/30/79
Complete lithofacies maps, per Task 3.2.2.1 (6), as revised.	6/30/80

Shale Characterization Milestones

Assemble and document quarterly the accumulated results of mineralogic, petrographic, and geochemical analyses of shale cores.	12/31/77 3/31/78 6/30/78 9/30/78
Report status of technique for obtaining textural and elemental composition of shale using SEM with micro-analyzer, and submit plan and schedule for any remaining work to accomplish Task 3.2.2.1 (8).	
Assemble and report determinations of shale core density and grain size measurements, per Task 3.2.2.1 (5) and (6).	3/31/78

Ohio Dept. of Nat. Resources
Columbus, OH

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Report of Progress, October 1, 1978 - December 31, 1978

Except for minor slowdowns caused by a normal turnover in personnel in the technical support areas, the Division's program has run smoothly for the quarter and most phases of the project are proceeding according to the projected milestone schedules. The recruiting process of the Division is slow due to posting procedures and interviewing. From the time a resignation becomes effective to the time it takes to fill the position takes about two months. However, the slowdown and inconvenience caused by these resignations has not delayed the program to any great extent. This quarter we have had one (1) geology technician resign from the position of inventorying unrecorded wells and one (1) laboratory technician resign from the mineralogy-petrology laboratory. These positions have been posted and we will be interviewing candidates for these positions in the next quarter. To date we have had no turnover of personnel in the professional ranks.

This quarter the Division continued to sample, describe and analyze core and drill cuttings which are available at the Division's sample repository or were obtained from repositories elsewhere in the State. The Devonian sequence was sampled and described from a core made available by International Salt Company. Location of the core hole is on Wiskey Island, City of Cleveland, Cuyahoga County, Ohio. Samples from this core have been given laboratory designation OH09. A second core (unoriented), located on the property of the Erie Nuclear Power Plant, Berlin Township, Erie County has been described, sampled and samples prepared for analytical work. These samples have been given the laboratory designation OH06. A third set of samples from drill cutting of a mud-rotary well have been described and prepared for analytical tests. The well location was in Muskingum County, Ohio and the samples have been given laboratory designation of OH08.

The geological survey will continue to prepare samples from core in the Division's repository and from drill cuttings collected by technicians monitoring gas shows in drilling wells in order to have a good representative of the shale throughout the Ohio area. This phase of the project is on schedule and no problems are anticipated.

The stratigraphic and structural phase of the project is still running behind schedule due to the late start but work this quarter has proceeded at the projected work rate. Data are being generated and compiled for all Resource Inventory Tasks. Major emphasis this quarter has been in tying geophysical logs to the interlocking network of cross sections, making positive correlations, and compiling the data for subsequent preparation of unit isopach, lithofacies and structure maps. Along with the geophysical log interpretation and data compilation, detailed structure maps have been completed on county bases at a scale of 1:62,500 on the following datums for the indicated counties.

Datum: Onondaga

Counties: Trumbull, Huron, Portage, Lawrence

Datum: Packer Shell,

Counties: Ashtabula, Portage, Trumbull, Mahoning, Noble,
Geauga

Structure data for the Onondaga datum is being posted on 1:62,000 scale base maps for preparation of detailed structural interpretations for Guernsey and Noble Counties.

Work on the fracture analysis of eastern Ohio from interpretation of remote sensing imagery proceeded satisfactorily this quarter and a good deal of knowledge and information has been obtained. The two investigators working together selected Hocking County, Ohio as a pilot area for detailed study in order to see if it would be possible to determine which linear features being mapped were fracture controlled. After one week of intensive field study in the massive sandstone area of Hocking County, detailed mapping of linear features on 1:20,000 scale aerial photography and the plotting the data on frequency-rose diagrams, it became evident to both researchers that as many as 35 to 50 percent of the linear features being mapped were probably not fracture controlled and that the use of such data would result in spurious fracture density data. Another pass at linear mapping was completed for the area using an interpretive technique based upon field observation data. When frequency-rose diagrams were compared with diagrams prepared earlier it was obvious that the noise level had been eliminated or greatly reduced. Using this new interpretative technique we are more confident that linear features we are mapping are fracture controlled and when plotted on maps will be representative of the true fracture density and orientation. We propose to finish mapping eastern Ohio at the 1:80,000 scale using this new interpretive technique. This area of investigation is slightly behind schedule but no problems are anticipated.

The shale characterization phase of the project is running smoothly. This quarter microscopic examination and lithologic descriptions were completed on 126 samples from core designations OH06 (12), OH07 (2), OH08 (63), OH09 (34) and 15 miscellaneous outcrop samples. Whole rock x-ray analysis was completed on the same 126 samples and x-ray diffraction analysis of the less than 2 micron clay minerals was completed on 102 samples. Detailed petrographic analysis was completed on 102 samples this quarter. Core samples analyzed were OH01 (12), OH05 (62), and OH07 (28). Petrographic work will continue on remaining sample backlog. The mineralogy and petrology work is slightly behind schedule but work is now proceeding at an acceptable rate and according to projected work schedules. No problems anticipated.

Geochemical analysis continued through the quarter but the Division is experiencing some slowdown because of equipment problems. We are not having major problems with equipment but this quarter found it necessary to be shut down for irregular periods of time to perform routine maintenance and repairs. Some pieces of equipment being used on the project are old and require a greater degree of maintenance than new equipment. However, some analytical work is being done on equipment not requiring maintenance. Analytical work on major and minor elements has been run on 35 samples designated OH04, water and ash determinations on 20 samples of OH04 have also been run and trace elements of Mn, P, and Zn have been determined on 24 samples of OH04. Total sulfur determinations have been run on 88 samples from the following cores, OH05 (57), OH06 (12), OH07 (19). Ash determinations have been reported on the following cores, OH05 (57), and OH06 (12). Geochemical work is now running behind schedule, but no serious problems are anticipated.

The monitoring of gas shows program continued through the quarter but was slowed in December because of bad weather and the holiday season. Eight (8) additional wells have been monitored this quarter and the data from the gas show profiles have been plotted for correlation with available geophysical logs and sample logs prepared from sample examinations of drill cutting collected at well sites where units are operating. The program is behind schedule due to late start caused by difficulties in recruiting personnel but is moving along well at this time. No problems are anticipated.

The well inventorying phase of the project is continuing but has slowed down due to the resignation of the geology technician who was doing the work. This position has been posted and we will be interviewing candidates for the position in January 1970. Two (2) additional townships in Hocking County have been inventoried and maps corrected.

The Division continues to encode data on the P.I. prescribed data encoding forms in the areas of mineralogy, petrology, and geochemistry. This quarter the first well data was encoded and forwarded to P.I. to check if data were encoded properly for entry into the system. A few minor corrections needed to be made but data was considered to be in good order. We will continue to encode well data for inclusion into the Eastern Gas Shale data bank.

Meetings

Dr. Richard Carlton, Dr. Norman Knapp, Mr. Frank Majchszak and Mr. Edward Rothman attended the Second Annual Eastern Gas Shales Symposium in Morgantown, West Virginia on October 16, 1978 through October 18, 1978.

Mr. Frank Majchszak and Dr. Richard Carlton accompanied Dr. Paul Potter, University of Cincinnati and Mr. Roy Kepferle, U.S.G.S. on a field trip to northeastern Ohio to examine outcrop sections of the Cleveland, Huron and Chagrin members of the Ohio shale on October 30 and 31, 1978.

Dr. Richard A. Struble participated as a speaker at a petroleum and natural gas energy workshop sponsored by Kent State University at Kent, Ohio on December 12, 1978. Dr. Struble discussed the Division's research on Devonian-age black shales in eastern Ohio for the Eastern Gas Shales Project. The major emphasis of the talk centered on the fracture analysis phase of the Division's integrated investigation.

Milestone Progress

3.2.1 Resource Inventory Milestones

3.2.2.1 Stratigraphy and Structure

3.2.2.1 Task 1, No progress on this task this quarter.

Task 2, Continued to make progress on this task this quarter but some slowdown has occurred due to the resignation of the geology technician doing the work under this task. Additional wells were inventoried in Benton

and Washington Townships in Hocking County this quarter. This position has been posted and we will be interviewing candidates for the position in January 1979. Work slightly behind schedule. No problems anticipated.

Task 3, Continuing to encode mineralogic, petrologic and geochemical data this quarter. Encoded well information on three locations this quarter and forwarded to Petroleum Information to see if data met encoding standards and procedures. Few minor corrections necessary for data to be accepted into system. Will begin working on backlog of well data immediately. Work behind schedule. No problems anticipated.

Task 4, Completed

Tasks 5, 6, Work continuing under these tasks this quarter (see narrative). Work slightly behind schedule. No problems anticipated.

Tasks 7, 8, Completed

Task 9, Continued correlating geophysical logs, calculating elevation for tops and bases and compiling data for preparation of regional structure maps. Task behind schedule but no problems anticipated.

Task 10, Continuing to make progress under this task this quarter. Detailed structure maps on Onondaga datum complete for four (4) counties. Detailed structure maps on the Packer Shell datum completed for six (6) counties. Elevation posted for Onondaga datum for two additional counties. Work behind schedule due to late start. No problems anticipated.

Task 11, Work this quarter on linear feature mapping continuing at the projected work rate. Work behind schedule. No problems anticipated (see narrative).

3.2.2 Shale Characterization Tasks

3.2.2.1 Mineralogy and Petrology Characterization

3.2.2.1 Tasks 1, 2, 3, 4, 6, Work accomplished this quarter under these tasks is shown on the attached mineralogy and petrology data sheets and discussed in the narrative (see attachments).

Tasks 5, 7, 8, No progress on these tasks this quarter.

3.2.2.2 Geochemical Characterization

3.2.2.2 Tasks 1, 2, 3, Work accomplished under these tasks this quarter is shown on the attached geochemical data sheets and discussed in the narrative (see attachments).

Task 4, No work accomplished under this task this quarter.

3.2.2.1 Shale Characterization (Gas Detection)

3.2.2.3 Task 1, Work under this task this quarter consisted of monitoring of gas shows in eight (8) additional wells drilled through the Devonian shale sequence in eastern Ohio. Bringing the total number to twenty-four (24).

Task 2, Gas show profiles for the eight (8) wells this quarter were plotted for correlation with available geophysical logs and sample descriptions made from drill cuttings collected at the drilling sites where gas shows were being monitored.

3.2.2.4 Inventory and Plot Unrecorded Wells

3.2.2.4 Task 1, This quarter work has slowed under this task do to the resignation of the technician doing the work. Two (2) additional townships in Hocking County were inventoried and wells correctly spotted on Division's base maps. Work slightly behind schedule. No problems anticipated.

3.2.2.5 Data Collection and Storage

3.2.2.5 Task 1, Continuing to make progress under this task this quarter (see narrative).

Richard A. Struble
Principal Investigator and
Project Coordinator

Date completed: November
December

Laboratory										Sulfur				Water		H ₂		Carbon		Hydrogen		
Sample No.	Si	Al	Fe	Mg	Ca	Na	K	Ti	Sulfide	Sulfate	Organic	Total	-110°C	+110°C	Ash	LT Ash	Organic	Total	Organic	Total	N	
0430-430	✓	✓		✓	✓	✓	✓															
450	✓			✓	✓	✓	✓															
480	✓	✓		✓	✓	✓	✓															
490	✓	✓		✓	✓	✓	✓															
500	✓	✓		✓	✓	✓	✓															
510	✓	✓	✓	✓	✓	✓	✓															
520	✓	✓	✓	✓	✓	✓	✓															
530	✓	✓	✓	✓	✓	✓	✓															
540	✓	✓	✓	✓	✓	✓	✓															
550	✓	✓	✓	✓	✓	✓	✓															
560	✓	✓	✓	✓	✓	✓	✓															
570	✓	✓	✓	✓	✓	✓	✓															
580	✓	✓	✓	✓	✓	✓	✓															
590	✓	✓	✓	✓	✓	✓	✓															
600	✓	✓	✓	✓	✓	✓	✓															
610	✓	✓	✓	✓	✓	✓	✓						✓		✓							
620	✓	✓	✓	✓	✓	✓	✓						✓		✓							
630	✓	✓	✓	✓	✓	✓	✓						✓		✓							
640	✓	✓	✓	✓	✓	✓	✓						✓		✓							
661	✓	✓	✓	✓	✓	✓	✓						✓		✓							
670	✓	✓	✓	✓	✓	✓	✓						✓		✓							

[illegible]

TRACE ELEMENTS OH04 Barberton Core

THERMAL EVOLUTION ANALYSIS

November, 1978
October
December

Laboratory																	Hydrocarbon				Temperature			
Sample No.	As	Cd	Co	Cr	Cu	Pb	Li	Mn	Hg	Ni	P	Se	Ag	Sr	V	Zn	C1-C6	C7-C12	C13-C20	C21-C27	>C27	Total	Volatile	Peak 11 Max
570								✓			✓					✓								
580								✓			✓					✓								
590								✓			✓					✓								
600								✓			✓					✓								
610								✓			✓					✓								
620								✓			✓					✓								
630								✓			✓					✓								
640								✓			✓					✓								
660								✓			✓					✓								
670								✓			✓					✓								
680								✓			✓					✓								
690								✓			✓					✓								
691								✓			✓					✓								
700								✓			✓					✓								
710								✓			✓					✓								
720								✓			✓					✓								
730								✓			✓					✓								
740								✓			✓					✓								
741								✓			✓					✓								
761								✓			✓					✓								
770								✓			✓					✓								

TRACE ELEMENTS OH04 Barberton Core

THERMAL EVOLUTION ANALYSIS December

[illegible]

Laboratory Sample No.	Si	Al	Fe	Mg	Ca	Na	K	Ti	Sulfur				Water		Ash	LT Ash	Carbon		Hydrogen		N
									Sulfide	Sulfate	Organic	Total	-110°C	+110°C			Organic	Total	Organic	Total	
0405-000												✓	✓		✓						
011												✓	✓		✓						
020												✓	✓		✓						
030												✓	✓		✓						
031												✓	✓		✓						
040												✓	✓		✓						
050												✓	✓		✓						
051												✓	✓		✓						
060												✓	✓		✓						
070												✓	✓		✓						
080												✓	✓		✓						
091												✓	✓		✓						
100												✓	✓		✓						
110												✓	✓		✓						
120												✓	✓		✓						
130												✓	✓		✓						
140												✓	✓		✓						
150												✓	✓		✓						
160												✓	✓		✓						
170												✓	✓		✓						
180												✓	✓		✓						

Laboratory Sample No.	Si	Al	Fe	Mg	Ca	Na	K	Ti	Sulfur				Water		Ash	LT Ash	Carbon		Hydrogen		N
									Sulfide	Sulfate	Organic	Total	-110°C	+110°C			Organic	Total	Organic	Total	
0405-190												✓	✓		✓						
191												✓	✓		✓						
200												✓	✓		✓						
210												✓	✓		✓						
220												✓	✓		✓						
230												✓	✓		✓						
240												✓	✓		✓						
250												✓	✓		✓						
251												✓	✓		✓						
252												✓	✓		✓						
253												✓	✓		✓						
260												✓	✓		✓						
270												✓	✓		✓						
280												✓	✓		✓						
290												✓	✓		✓						
300												✓	✓		✓						
310												✓	✓		✓						
311												✓	✓		✓						
320												✓	✓		✓						
330												✓	✓		✓						

EGSP: MAJOR AND MINOR ELEMENTS

01/05 Grain C

Date completed: November

: November

[illegible]

EGSP: MAJOR AND MINOR ELEMENTS

OH06 Erie Co.

Date completed: November
December

[illegible]

EGSP: MAJOR AND MINOR ELEMENTS

Date completed: December
October
November

Laboratory									Sulfur				Water		Ash	LT Ash	Carbon		Hydrogen		N
Samnle No.	Si	Al	Fe	Mg	Ca	Na	K	Ti	Sulfide	Sulfate	Organic	Total	-110°C	+110°C			Organic	Total	Organic	Total	
007-107												✓									
010												✓									
011												✓									
020												✓									
030												✓									
040												✓									
077												✓									
080												✓									
086												✓									
090												✓									
082												✓									
094												✓									
110												✓									
110												✓									
150												✓									
130												✓									
140												✓									
150												✓									
160												✓									
170												✓									
180												✓									

EGSP: MAJOR AND MINOR ELEMENTS

Date completed: December
November
October

OH07 FRANKLIN CO.

[illegible]

1978

OHOM are miscellaneous outcrop samples.