RESERVOIR CHARACTERIZATION OF THE LOWER GREEN RIVER FORMATION, SOUTHWEST UINTA BASIN, UTAH

Biannual Technical Progress Report

10/1/99 - 3/31/00

C. D. Morgan, Program Manager, and K. P. McClure
Utah Geological Survey
S. Robert Bereskin, Tesseract Inc.
Milind D. Deo, University of Utah,
Kevin Weller, Inland Resources Inc.,

Date of Report: June 2000

Contract DE-AC26-98BC15103

Virginia Weyland, Contract Manager
U.S. Department of Energy
National Petroleum Technology Office
Tulsa, Oklahoma

Submitting Organization: Utah Geological Survey
1594 West North Temple, Suite 3110
P.O. Box 146100
Salt Lake City, Utah 84114-6100
(801) 537-3300

DISCLAIMER

ABSTRACT

Properties of cycles in the Middle and Lower Members of the Green River Formation, including boundaries, total sandstone, and total feet of porosity, were studied and correlated using geophysical well logs from more than 1000 wells. Stratigraphic sections from Willow Creek and Nine Mile Canyons are being correlated to the well logs. Well logs from the Peters Point field have been correlated to measured sections in Desolation Canyon.

A detailed study site was selected in Nine Mile Canyon near the Nutter's Ranch house. The photomosaics of the study site are being annotated to show bed relationships, major bed forms, and fracture patterns. The annotations will be field checked and additional detail will be added during the year-2000 field season.

Conventional core from 26 wells, along with rotary sidewall cores from six other wells in the project area, have been studied and described in detail. Thin sections and photographs using a scanning electronic microscope (SEM) were made from many of the samples and are currently being analyzed. Conventional core data (porosity, permeability, grain density, and fluid saturation) were gathered and analyzed at the log-cycle scale. Porosity and permeability relationships were similar for all the sandstone beds in the Middle and Lower Members of the Green River Formation. Permeability development in the Lower Member carbonate was significantly less than in the sandstone. Grain density of the sandstone was typically 2.66 grams/cubic centimeter (g/cc) or slightly less than 2.68 g/cc which is commonly used for density porosity logging in the area. Comparing core-derived porosity to porosity derived from density logging and density-neutron averaging shows the density porosity correlates best to the core porosity. But even the density porosity has a wide variance. As a result, permeability based on log-derived porosity/permeability relationships will be a source of error in the numerical simulation modeling.

Technology transfer activities included presentations to the Technical Advisory Board at a meeting hosted by Inland Resources Incorporated, in Denver, Colorado. A home page for the project was developed on the Utah Geological Survey's (UGS) web site.

TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

EXECUTIVE SUMMARY

The objectives of the study are to increase both primary and secondary hydrocarbon recovery through improved characterization (at the regional, unit, interwell, well, and microscopic scale) and numerical simulation modeling of fluvial-deltaic lacustrine reservoirs, thereby preventing premature abandonment of producing wells. The study will encourage exploration and establishment of additional water-flood units throughout the southwest region of the Uinta Basin, and other areas with production from fluvial-deltaic reservoirs.

We established a log-based correlation scheme and nomenclature that reflect, as near as possible, time-correlative depositional cycles of the Middle and Lower Members of the Green River Formation. The cycles are at a scale that is easily recognizable on geophysical well logs and can be correlated throughout most of the southwest Uinta Basin. More than 1000 wells have been correlated, and data on cycle boundaries, total sandstone, and total feet of porosity for each cycle have been entered into the well database.

Regional investigation of the surface exposures of the Green River Formation in Willow Creek and Nine Mile Canyons is continuing. Numerous stratigraphic sections in the Middle Member of the Green River were measured and described. Spectral gamma-ray (GR) data were collected over three regional stratigraphic sections totaling about 3700 ft (1130 m) in the Green River Formation: one in Willow Creek Canyon, and two in Nine Mile Canyon. Curves generated from the GR data have been correlated with GR curves from wells in the area.

A detailed study site was selected in Nine Mile Canyon, from Petes Canyon to Gate Canyon, both tributaries to Nine Mile Canyon. The exposure is about 2000 ft (600 m) in the east-to-west direction and about 500 ft (150 m) in the north-to-south direction. The stratigraphic interval being studied is slightly more than 100 ft (30 m) thick, bounded by carbonate beds. Six sections have been measured and described, and GR data gathered from five of the sections. To aid in the interpretation, the site was photographed from the canyon walls opposite the study site, and photomosaics were compiled. The photomosaics have been annotated showing bed relationships, major bed forms, and fractures. The annotations will be checked and more detailed information added during the year-2000 field season. Data from the study site will provide significant information about the reservoir heterogeneity in the interwell environment.

Core from 32 wells in the project area have been described. Thin sections and SEM photographs of reservoir beds and outcrop samples were prepared and analyzed. Maceral and vitrinite reflectance analyses were performed on two coal samples found in the core.

Presentations were made to the Technical Advisory Board and future activities were discussed. A home page was developed containing information about the project.

INTRODUCTION

Geologic Setting

The Uinta Basin is a topographic and structural trough encompassing an area of more than 9300 square mi (14,900 km^2) in northeast Utah (Fig. 1). The basin is sharply asymmetrical, with a steep north flank bounded by the east-west-trending Uinta Mountains, and a gently dipping south flank.

The Uinta Basin formed in Paleocene to Eocene time, creating a large area of internal drainage which was filled by ancestral Lake Uinta. Deposition in and around Lake Uinta consisted of open- to marginal-lacustrine sediments that make up the Green River Formation. Alluvial red-bed deposits that are laterally equivalent to and intertongue with the Green River make up the Colton Formation (Wasatch).

More than 450 million barrels of oil (63 MT) have been produced from the Green River and Colton Formations in the Uinta Basin. The Cedar Rim, Altamont, Bluebell, and Red Wash fields produce from the northern shoreline deposits of Lake Uinta, while the fields in the Monument Butte area produce from southern deltaic shoreline deposits as preserved in the Middle and Lower Members of the Green River. The southern shore of Lake Uinta was very broad and flat, which allowed large transgressive and regressive shifts in the shoreline in response to climatic and tectonic-induced rise and fall of the lake. The cyclic nature of Green River deposition in the Monument Butte area resulted in numerous stacked deltaic deposits. Distributary-mouth bars, distributary channels, and nearshore bars are the primary producing sandstone reservoirs in the area.

Project Status

We are studying the Green River Formation in outcrop and in the subsurface to increase our knowledge of its reservoir characteristics, and to improve our ability to identify new play areas. We established a log-based correlation scheme and nomenclature that reflect, as near as possible, time-correlative depositional cycles of the Middle and Lower Members of the Green River Formation. The regional correlation nomenclature will aid understanding of which intervals are productive in the southwest Uinta Basin. The cycles are at a scale that is easily recognizable on geophysical well logs and can be correlated throughout most of the southwest Uinta Basin. More than 1000 wells have been correlated and entered into the project database. The database is currently being checked for data entry errors. After editing is completed, the data will be used for regional mapping. Periods of stable deposition and periods of significant basin tectonism were identified based on the well-log and surface correlations.

Core from 32 wells in the project study area has been described and depositional environments interpreted. Thin sections and SEM photographs have been made from many of the reservoir rocks for further petrophysical analysis. Coal samples were analyzed petrographically to determine the type of macerals, and vitrinite reflectance was measured to assess thermal maturity. Bed forms, depositional

interpretations, and petrophysical analyses have been compared to interpretations and samples from the outcrop. The core descriptions are currently in final editing.

Several stratigraphic sections were measured and described, and spectral gamma-ray (GR) data were gathered in Willow Creek and Nine Mile Canyons. Curves were generated from the GR data and used to correlate the sections to the geophysical logs of nearby wells. Additional sections in Nine Mile and Desolation Canyons will be measured and described during the year-2000 field season.

A study site was selected to better understand the interwell-scale reservoir heterogeneity of one depositional cycle. The site, referred to as the Nutter's Ranch study site, lies along Nine Mile Canyon from Petes Canyon to Gate Canyon, both tributaries to Nine Mile Canyon. The exposure provides a three-dimensional perspective that, in the longest dimension, is a slightly greater distance than that which would exist between two wells if they were drilled on 40-acre (16.2-ha) spacing. Seven sections have been measured and described and gamma-ray data were gathered over six of the sections. Photomosaics were constructed and annotated. The annotations will be field checked, and paleoflow and fracture data will be gathered during the year-2000 field season.

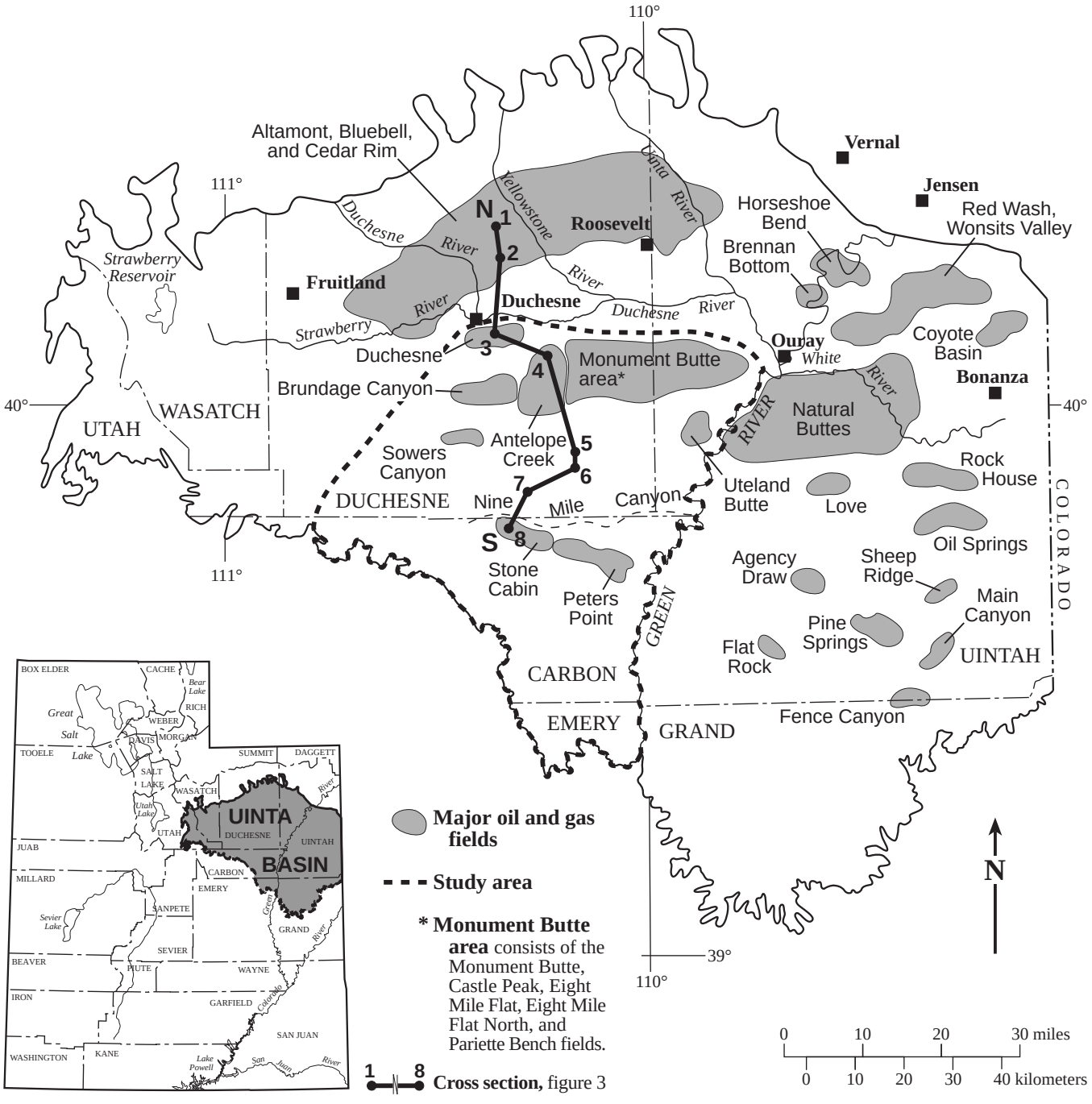


Fig. 1. Index map of the Uinta Basin, Utah, showing study area and major oil and gas fields.

GEOLOGIC INVESTIGATION OF THE GREEN RIVER FORMATION IN THE SUBSURFACE

Geophysical Well Logs

We defined twenty-two log cycles using geophysical well logs for the Middle and Lower Members of the Green River Formation (Morgan and others, 1999a). Two cycles at the base of the Lower Member have been added to the correlations (Fig. 2). The logs are being correlated using an alpha-numeric scheme described in the first biannual technical report (Morgan and others, 1999a). The drill-depth top of each log cycle, total feet of sandstone, and total feet of sandstone with 10% or more porosity, are entered into the Geographic Information System (GIS) database. The GIS database will be used to map and interpret regional trends and depositional environments of each of the log cycles after completion of the correlations. Logs from more than 1000 wells have been correlated and entered into the database.

A north-to-south cross section (Fig. 3) based on the log-cycle correlations (Table 1) shows minor thinning in the Lower Member of the Green River Formation and in cycles MGR1 through MGR12 of the Middle Member from the Duchesne field near the center of the basin to the area just north of Nine Mile Canyon (wells 3 through 6, Fig. 3). The lower third of the stratigraphic section to thicken southward in the Nine Mile Canyon area due to alluvial tongues of the Colton Formation (wells 5 through 8, Fig. 3). The upper part of the stratigraphic section thins considerably from north to south between the base of the Mahogany oil shale and MGR12. In Nine Mile Canyon this interval correlates to the transitional facies of Remy (1992) and consists of deeper lake deposits. These deposits are transitional from the underlying deltaic deposits to the overlying deep saline deposits of the Upper Member. The Lower Member and log-cycles MGR3 through MGR12 have only minor thickness variation over a large portion of the basin, indicating a gently dipping slope and a time of tectonic stability. The depositional axis of the basin appears to shift northward as indicated by the thickening at well 3 in the Lower Member, and at well 2 in the MGR3 through MGR12 interval.

The interval from the base of the Middle Member of the Green River Formation to the top of the MGR3 log cycle thickens in wells 4 and 3 (Fig. 3). This interval is informally called the lower Douglas Creek by many of the well operators. The lower Douglas Creek interval often consists of thick sandstone buildups in the Monument Butte area that were identified as turbidites by Lutz and others (1994). This interval may represent a time of active tectonism in the basin. The basinal thickening of the interval from MGR12 to the base of the Mahogany oil shale (Remy's [1992] transitional facies) indicates a time of active tectonism in the basin and expansion of the lake. Expansion of the lake during a period of basin deepening would have required a significant increase in the volume of water flowing into the basin and/or a reduction in the volume of water leaving the basin. Some possible mechanisms were:

(1) tectonic movement raised the spill point of the lake,
(2) regional tectonic activity resulted in capturing additional drainage area, and
(3) rainfall increased in the drainage area.

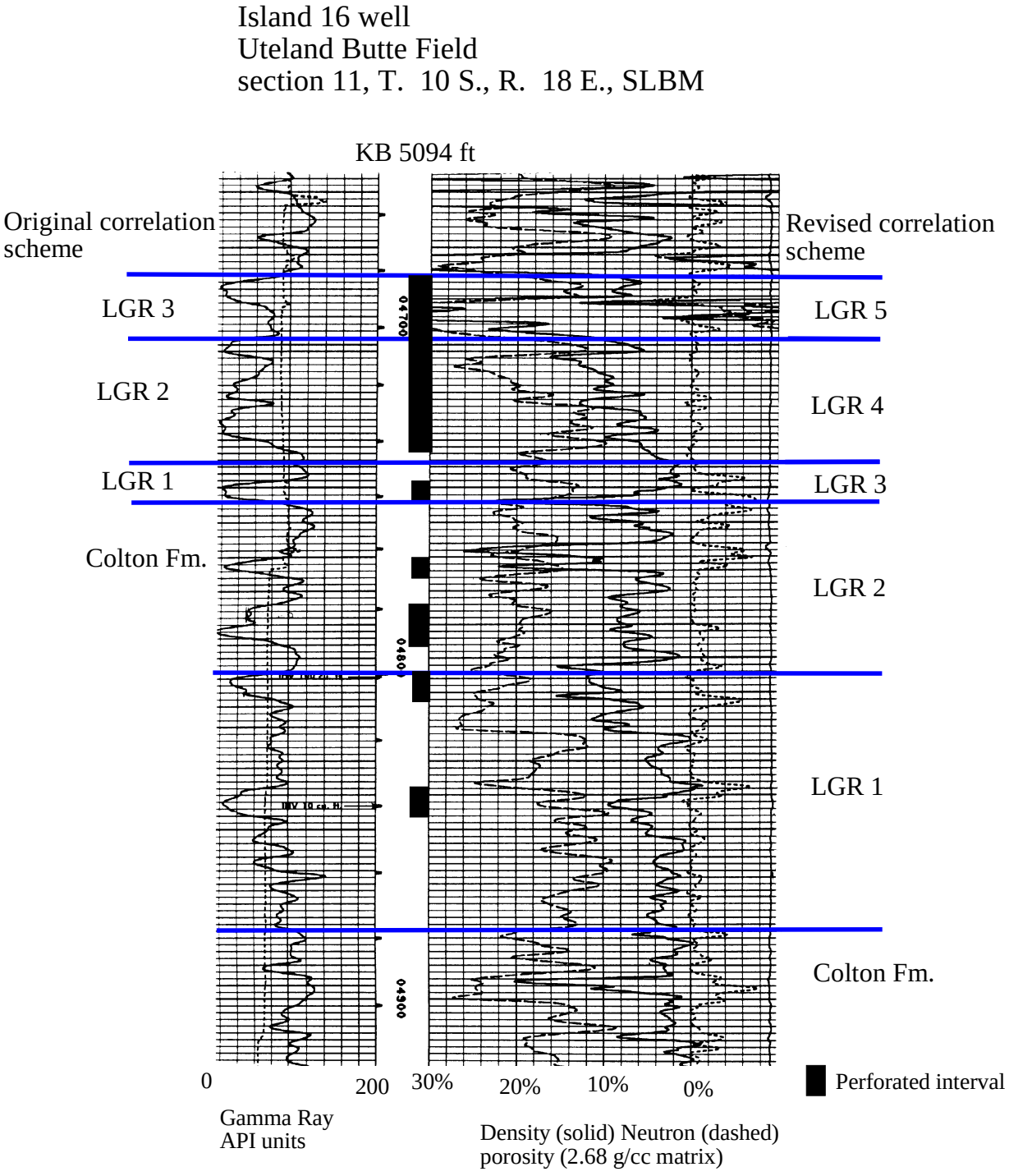


Fig. 2. Log of the lower portion of the Lower Member of the Green River Formation showing change in the correlation scheme.

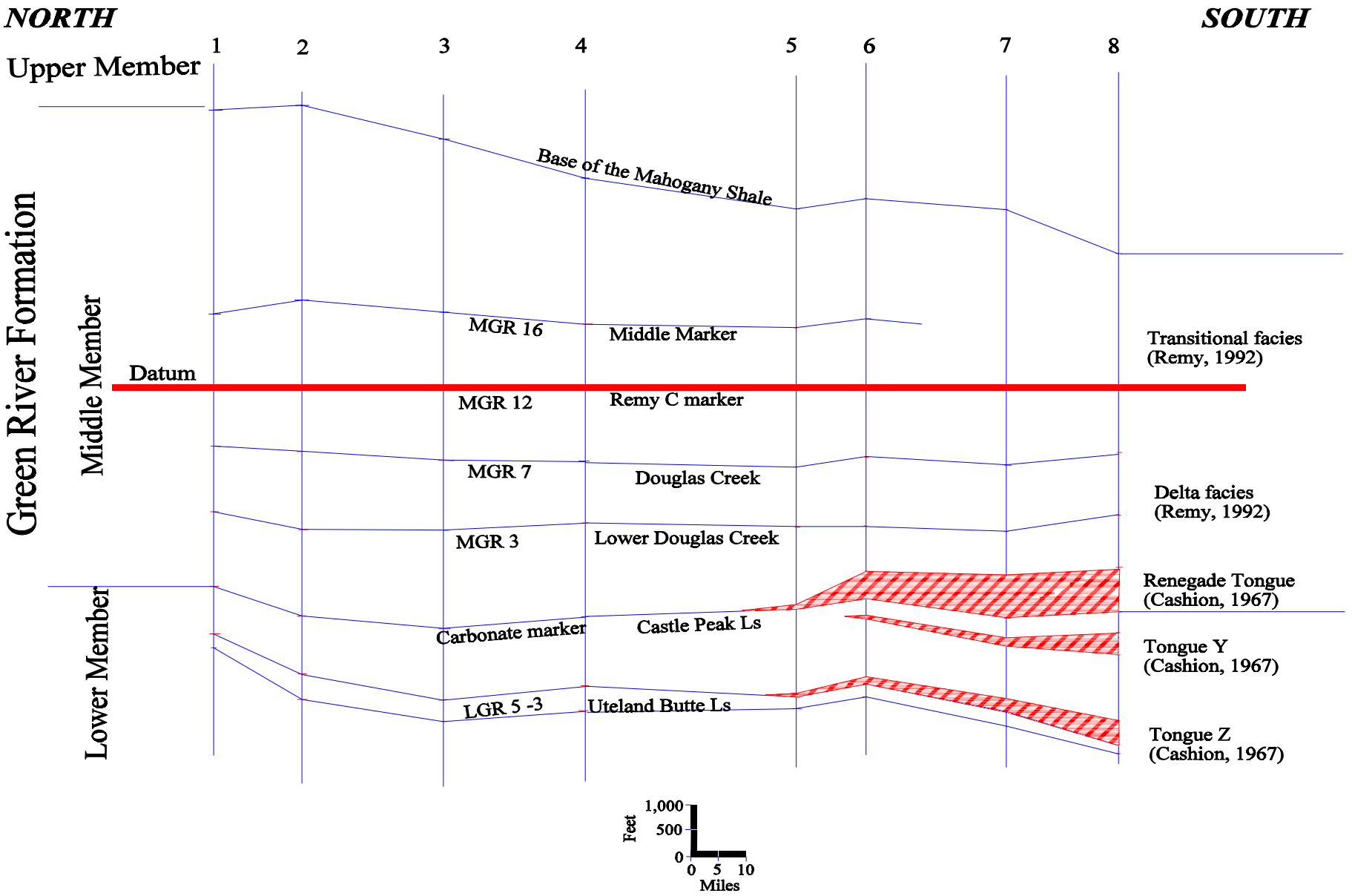


Fig. 3. North-to-south cross section from the base of the Mahogany oil shale to the base of the LGR 3 log cycle. The datum is the top of the MGR 12 log cycle which contains Remy's C marker. Note the basinal thickening of the transitional facies. Hatching pattern represents alluvial tongues of the Colton Fm. Both UGS (left) and operator (right) terminology shown for correlated intervals. See Fig. 1 for location of cross section and Table 1 for well data.

Table 1. Well information and correlation depths (in feet) used in the cross section, Fig. 3.

Well Name and Number	**Brotherson 1-14B4**	**Geritz-Murphy 1-6C4**	**Ute Tribal 6-16D**	**Ute Tribal 2-3**
Location	**sec 14 T2S R4W (UBL)**	**sec 6 T3S R4W (UBL)**	**sec 16 T4S R4W (UBL)**	**sec 3 T5S R3W (UBL)**
API Number	**4301330051**	**4301330573**	**4301331204**	**4301331097**
Kelly Bushing Elevation	**KB 6141**	**KB 6034**	**KB 5867**	**KB 5896**
Number on Cross Section	**1**	**2**	**3**	**4**
Base of Mahogany	7830	6630	3590	3140
MGR 16 (middle marker)	9000	7770	4600	4009
MGR 12 (Remy C marker)	9430	8275	5038	4400
MGR 7	9775	8640	5466	4800
MGR 3	10155	9100	5875	5192
Carbonate marker	10585	9615	6458	5741
LGR 5	10860	9940	6858	6155
BASE LGR 3	10935	10090	7002	6284
Well Name and Number	**Five Mile 12-22**	**Gate Canyon 41-10**	**Badlands Cliff 2**	**Argyle 33-15**
Location	**sec 22 T0S R15E (SLBL)**	**sec 10 T11S R15E (SLBL)**	**sec 22 T11S R14E (SLBL)**	**sec 15 T12S R14E (SLBL)**
API Number	**4301330799**	**4301331290**	**4301310483**	**4300730054**
Kelly Bushing Elevation	**KB 6766**	**KB 7256**	**KB 7243**	**KB 7651**
Number on Cross Section	**5**	**6**	**7**	**8**
Base of Mahogany	2010	1760	160	-160
MGR 16 (middle marker)	2692	2475		
MGR 12 (Remy C marker)	3048	2878	1200	616
MGR 7	3500	3284	1660	996
MGR 3	3860	3688	2052	1352
Carbonate marker	4332	4090	2555	1920
LGR 5	4852	4584	3080	2664
BASE LGR 3	4940	4658	3154	2752

Every productive bed has been correlated in the Monument Butte Northeast (part of Monument Butte), Uteland Butte, and a portion of Brundage Canyon fields. The beds will be mapped and numerical simulation models for each field will be developed. The Monument Butte Northeast is primarily productive from the MGR7, 6, and 5 (Douglas Creek). Uteland Butte field is primarily productive from the LGR5 through LGR1 (Uteland Butte Limestone) in the Lower Member. The Brundage Canyon field is primarily productive from sandstone beds (Castle Peak Sandstones) of the carbonate marker unit of the Lower Member. These three fields represent all the major reservoirs in the Green River Formation in the study area.

Well Core

Cores from 32 wells in the project area have been described, and depositional environments have been subsequently interpreted. Thin sections have been made from many of the reservoir and nonreservoir lithotypes for further petrophysical analysis. Available data (porosity, permeability, grain density, and fluid saturation) were gathered from the cores, as well as from the log-cycle correlation and well-log data (gamma-ray value, density and neutron porosity values) (Appendix A).

Porosity and permeability are typically cross plotted to identify the relationship between the two. In wells where core data are not available, the porosity will be assigned from the porosity/permeability relationship derived from core data in other wells. Porosity versus permeability curves were developed for the entire data set (Fig. 4) and for each log cycle or group of related log cycles (Fig. 5). The porosity/permeability slope for each of the log cycles is very similar except for the carbonate beds in the Lower Member of the Green River Formation (LGR5 through LGR1).

The porosities determined from the core samples were compared to porosities calculated by averaging the density log and neutron log porosity values (Fig. 6). Both the density and density-neutron porosities were calculated assuming a grain density of 2.68 g/cc. The density-neutron log nearly always overestimated the core-derived porosity. The density porosity more closely matches the core-derived porosities, but the range in values is large and can be a source of error in determining permeability values for numerical simulation modeling. For example, a density-log porosity of 10% may be equivalent to 10% core porosity, but could range between 6% and 14% core porosity (points A, B, C, Fig. 6a). Using the core-derived porosity versus permeability cross plot to determine permeability for rock having 10% porosity, a value of 0.6 milliDarcy (mD) would be assigned (point A, Fig. 4). However, because of the range in log-derived porosities compared to core-derived porosities, the permeability could range from 0.08 mD (point B, Fig. 4) to 6.0 mD (point C, Fig. 4).

Porosity determined from density well logs is a function of the grain density of the rock. Typically, porosities in the study area were calculated from the density log data assuming a grain density of 2.68 g/cc. Plotting the grain density values from all of the core data shows the majority of the samples have a grain density of 2.66 g/cc (Fig. 7a) except for the carbonate beds in LGR5 through LGR1, where most samples have a grain density of 2.75 to 2.76 g/cc (Fig. 7b). The higher grain density (2.68 versus 2.66 g/cc) results in an overestimate of the porosity by about 1%. This error can be easily corrected and is small compared to the potential error caused by the large range in values between core-derived porosity and log-derived porosity.

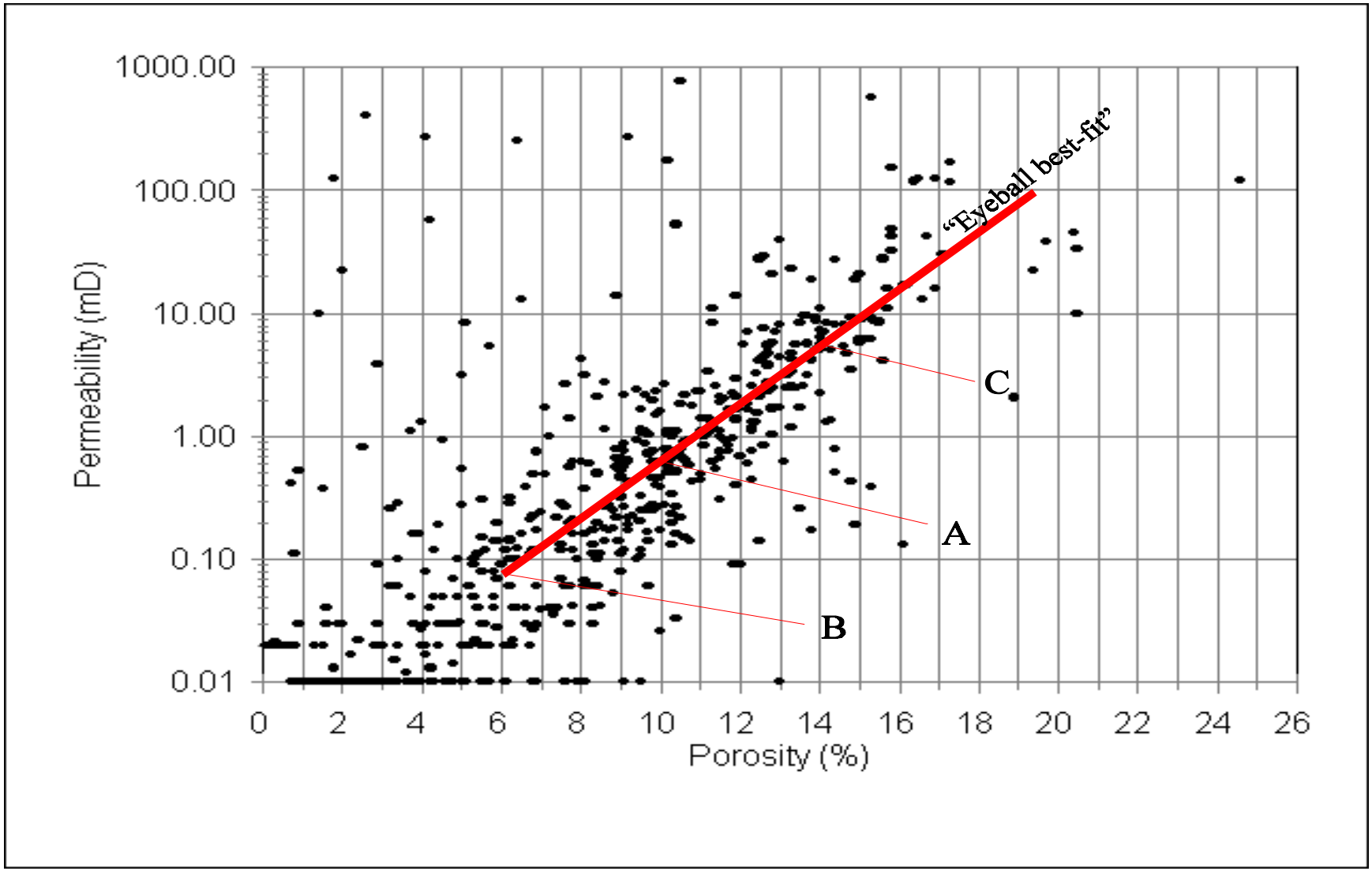


Fig. 4. Porosity versus permeability plot of all of the core data (Appendix A). The "eyeball best-fit" line represents the general trend of the data. Points on the line labeled A, B, and C show the range that can exist in comparing log-derived porosity to core-derived porosity. All three points represent 10% density log porosity (see Fig. 6) resulting in a range in permeability from 0.08 mD to 6.0 mD.

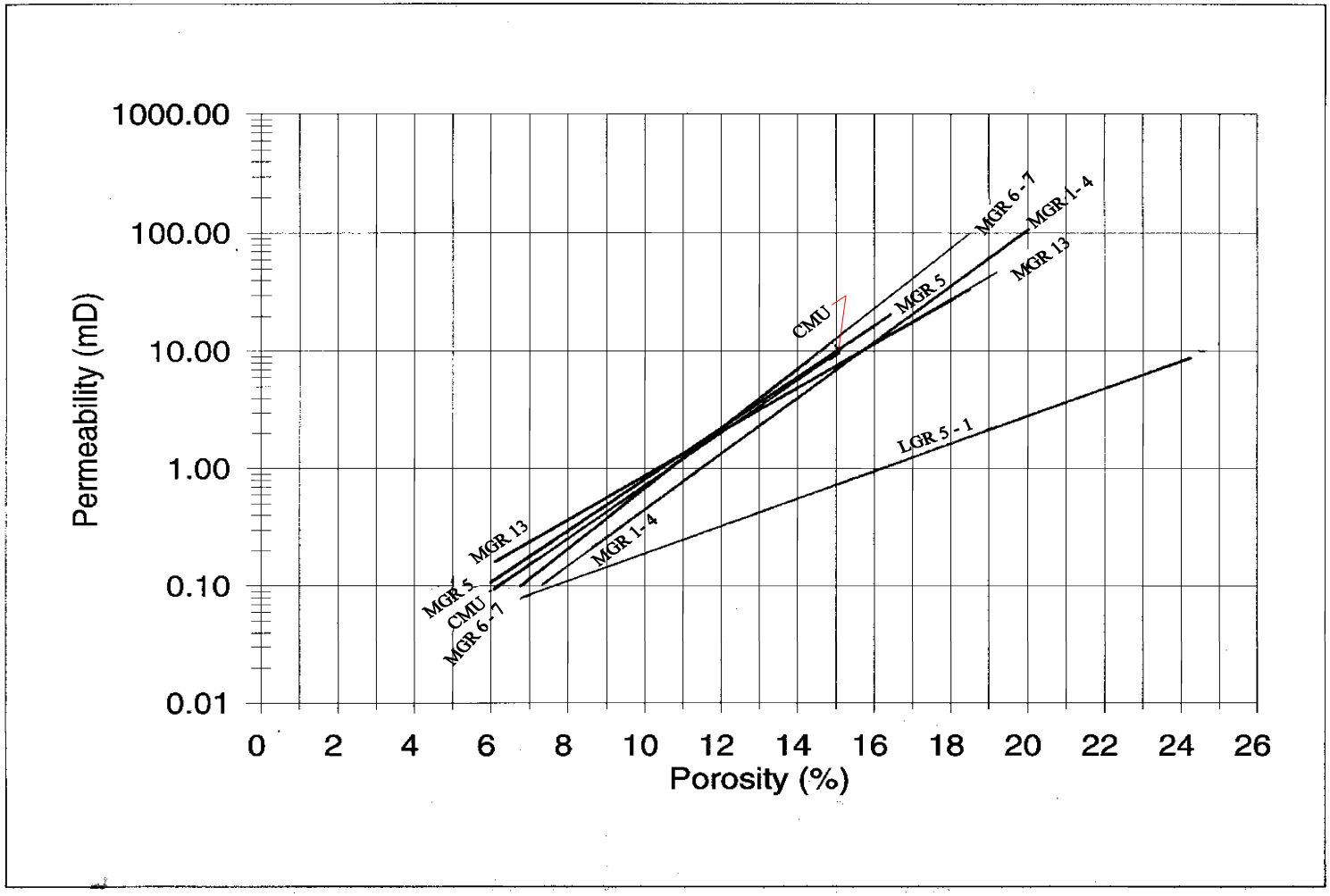
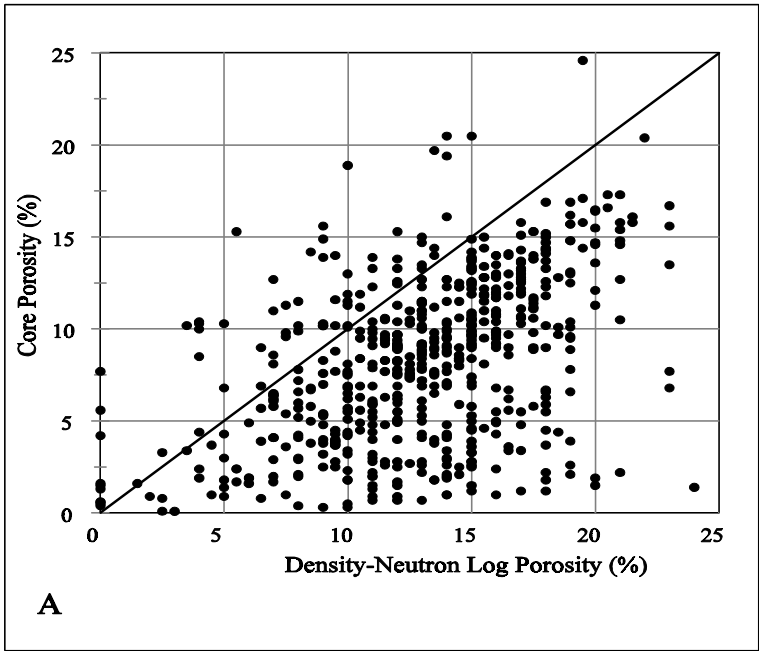


Fig. 5. "Eyeball best-fit" lines for porosity versus permeability core data (Appendix A) based on log cycle or groups of log cycles. The slopes of all the lines are similar except for the LGR 5 - 1 data which are from carbonate beds; all other data are from clastic beds.



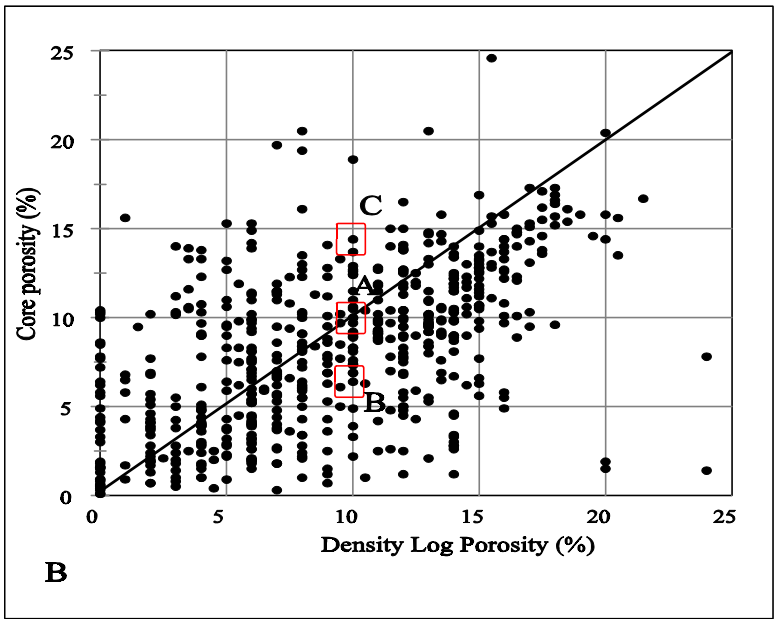


Fig. 6. Log-derived porosity versus core-derived porosity. (A) log porosity derived from averaging the density-log and neutron-log porosities using a matrix density of 2.68 g/cc. (B) density-log porosity only with a matrix density of 2.68 g/cc. Points labeled A, B, and C, (graph B) show the range that can exist in comparing 10% density-log porosity to core porosity; Fig. 4 shows the range in permeabilities this example represents.

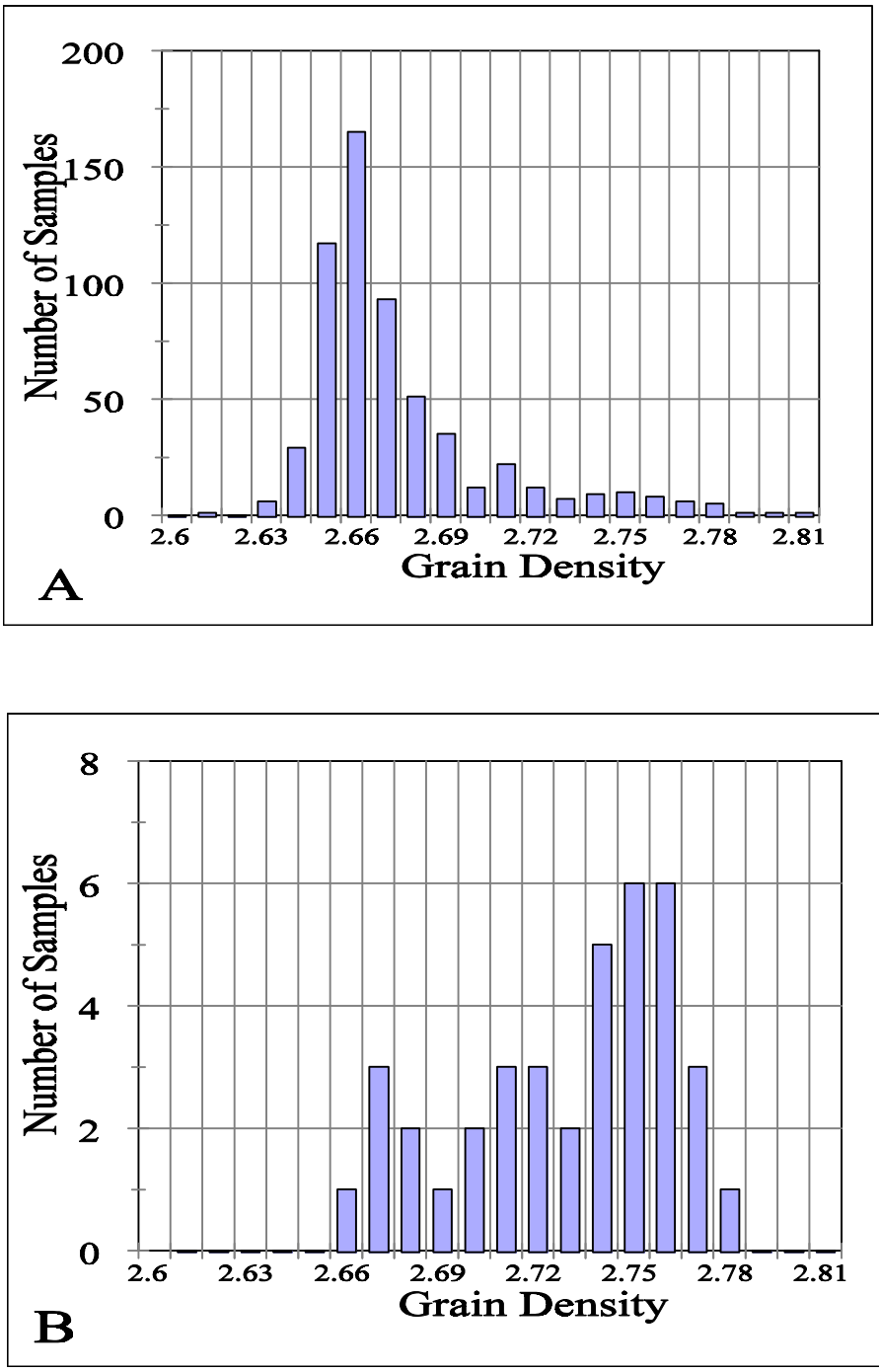


Fig. 7. Grain density measured from core samples, (A) from all of the samples (Appendix A) and (B) samples from LGR 5-1 (Uteland Butte Limestone) in the Lower Member of the Green River Formation.

GEOLOGIC INVESTIGATION OF THE OUTCROP OF THE GREEN RIVER FORMATION

Regional Outcrop Study

Published measured sections by Remy (1992) were reviewed in the field and additional sections were measured and described by the UGS in Willow Creek and Nine Mile Canyons. Gamma-ray data collected over three stratigraphic sections were used to generate curves correlated to geophysical well logs (Morgan and others, 1999b). One or two more sections will be measured and described in Nine Mile Canyon. Multiple sections will be measured and described in Desolation Canyon in May 2000. The measured sections from Desolation Canyon will help correlate the stratigraphy as described by Remy (1992) and the UGS (Morgan and others 1999a, 1999b) in the western portion of the Uinta Basin with the stratigraphy as described by Cashion (1967) in the eastern portion of the basin. Preliminary correlations with Cashion (1967) are shown in Fig. 3.

Detailed Study Site

A study site was selected to better understand the interwell-scale reservoir heterogeneity in one depositional cycle. The study site, referred to as the Nutter's Ranch study site, lies along Nine Mile Canyon from Petes Canyon to Gate Canyon, both tributaries to Nine Mile Canyon. The exposure is about 2000 ft (600 m) in length in the west-to-east direction, a slightly greater distance than the 1320 ft (402.3 m) between two wells if they are drilled on 40 acre (16.2 ha) spacing. The study site extends about 500 ft (150 m) in the south-to-north direction in the two tributary canyons thereby providing a three-dimensional perspective.

The Nutter's Ranch study site was photographed on all three sides from the opposite side of the canyons. The photographs were digitally joined into mosaics (Morgan and others, 1999b) that were used to correlate the beds along the entire length of the exposure. Seven stratigraphic sections were measured and described in the study site, and GR data were gathered over six of the sections (Morgan and others, 1999b). Bed relationships identified on the photomosaics will be confirmed in the field and paleoflow directions as well as fracture data will be gathered in the Nutter's Ranch study site during the year-2000 field season.

RESERVOIR SIMULATION ACTIVITY

There were two focus areas in the reservoir simulation activity during the period of this report. They were:

1. Developing more efficient parallel simulators.
2. Streamlining the HERSIM® (described in Morgan and others, 1999b) geological model procedures for data input.

Efficient Parallel Simulation

Current parallel computational models can be grouped into six categories: data parallelism, shared memory, message passing, remote memory operations, threads, and combined models (Gropp and others, 1994). The message-passing model fits well on distributed memory machines. Thus, it matches the hardware of most of today's parallel supercomputers, as well as the networked workstations and dedicated PC clusters. With properly implemented message-passing libraries, the message-passing model can also take advantage of shared memory machines.

Message-Passing Interface (MPI) has recently become a standard for the message-passage model in parallel computing. Although MPI is robust, efficient, and portable, application code and numerical libraries using MPI are still tedious to program and difficult to debug. Enabling the construction of robust libraries is one of the primary motives behind the MPI effort, and perhaps its single most distinguishing feature when compared with other parallel programming environments. In-house parallel libraries using MPI are expensive to build and difficult to maintain. Unless detailed documentations are available, it is difficult for other developers to adapt parallel libraries into their own application code. Therefore, a carefully designed and implemented parallel numerical library is necessary to fill the gap between MPI and general scientific programming. Based on this concept, the Portable, Extensible Toolkit for Scientific computation (PETSc) has been developed at Argonne National Laboratory.

PETSc is a set of object-oriented numerical libraries including parallel data structures, parallel linear and non-linear solvers for general scientific applications. The design principles of PETSc are based on the balance between performance and ease of use. The following are the major design principles of the PETSc:

- The use of optimized Basic Linear Algebra Subprograms (BLAS) and Linear Algebra Package (LAPACK) libraries for linear algebracalculation on each local node.
- Communication and computation are overlapped such that the waiting for message passing is minimized.
- Users work efficiently with parallel objects without specific regard for underlying parallel data structures.

- Users directly operate on parallel object or objects instead of working with lower-level message-passing routines.
- PETSc has Fortran, C and C++ programming interfaces so it can be accessed by most scientific applications.

The PETSc libraries are being implemented in the finite-difference and finite-element black-oil simulators at the University of Utah. This incorporation will enable study of a large-scale model (with approximately a million grid blocks) in a reasonable computational time.

Streamlining Data Input Methodology for HERSIM

Generation of a suitable reservoir model using HERSIM® is a five-step process:

- Field
- Study
- Lithounits
- Simulation
- Reservoir

Field

Define the name of the oil field.

Study

Well selection and data: Define the lithofacies as a function of depth (elevation) at given x and y locations (well deviations can be included). Porosity and permeability information can be included as available. Wells can be selected from the list or from the location map.

Edit well: HERSIM® 3D offers the users a chance to examine or modify their data interactively at this stage. Locations of wells can be examined and modified from map view and/or coordinates. The lithofacies of each well can be viewed individually or compared to a group of wells.

Geometry: A Reference Grid is set up interactively to include all of the wells or some of the wells.

Display: Calculated surfaces can be displayed and examined in map view and in cross section.

Lithounits

Statistical information for each lithofacies can be examined and petrophysical property histograms and cross plots can be studied. Lithofacies with similar petrophysical properties may be

combined into one lithotype. There can be as many lithotypes as the geologic description requires. Lithotypes in individual wells can be viewed and edited from the figure or spreadsheet. This is where the user decides if there is adequate vertical resolution. Distribution of lithotypes can be calculated, an example of which is shown in Fig. 8. Vertical proportions of lithotypes can be calculated for the whole domain (example shown in Fig. 9).

Simulations

After setting up horizontal and vertical proportion curves, horizontal and vertical variograms can be computed. HERSIM® 3D offers several ways to interpolate petrophysical properties. Petrophysical properties are determined by performing geostatistical simulations. A simulated slice with distributed porosities is shown in Fig. 10.

Reservoir

The last step in HERSIM® is to convert all the previously calculated statistical data to a format that can be read by an oil reservoir simulator. Upscaling can also be performed if necessary.

Assign Sw: Water saturation can be assigned; the gas-oil contact and water-oil contact can also be assigned at this step.

Horizontal zonation: The whole field or part of it can be selected by a polygon for later study.

Gridding and upscaling: The user can combine layers with similar petrophysical properties interactively and perform vertical upscaling while preserving geologic identity of the lithotypes. There are several methods available for upscaling petrophysical properties, for example, arithematic mean, harmonic mean, geometric mean, algebraic isotropic, algebraic anisotropic, and other numeric schemes. A reservoir simulation grid is then constructed and exported out in a suitable file format.

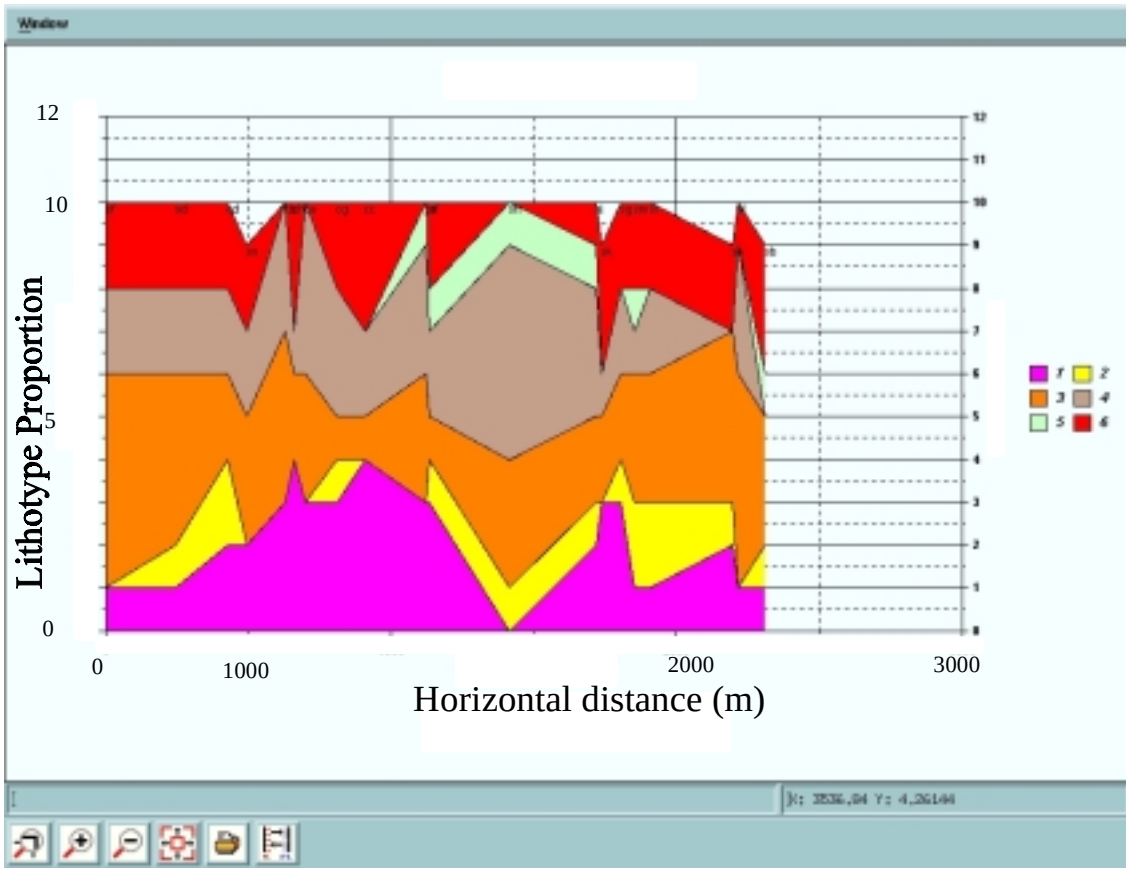


Fig. 8. Horizontal distribution of lithotypes for one particular cross section.

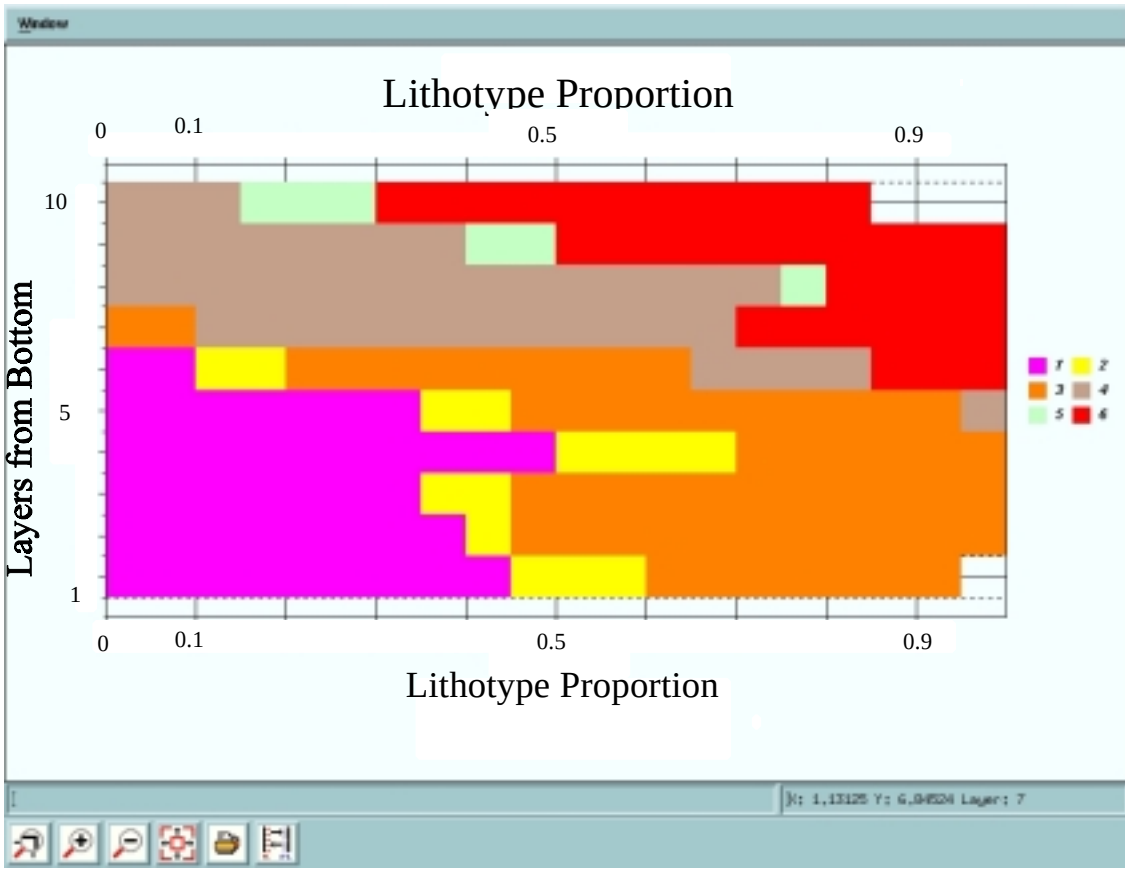


Fig. 9. Vertical proportion curve of lithotypes.

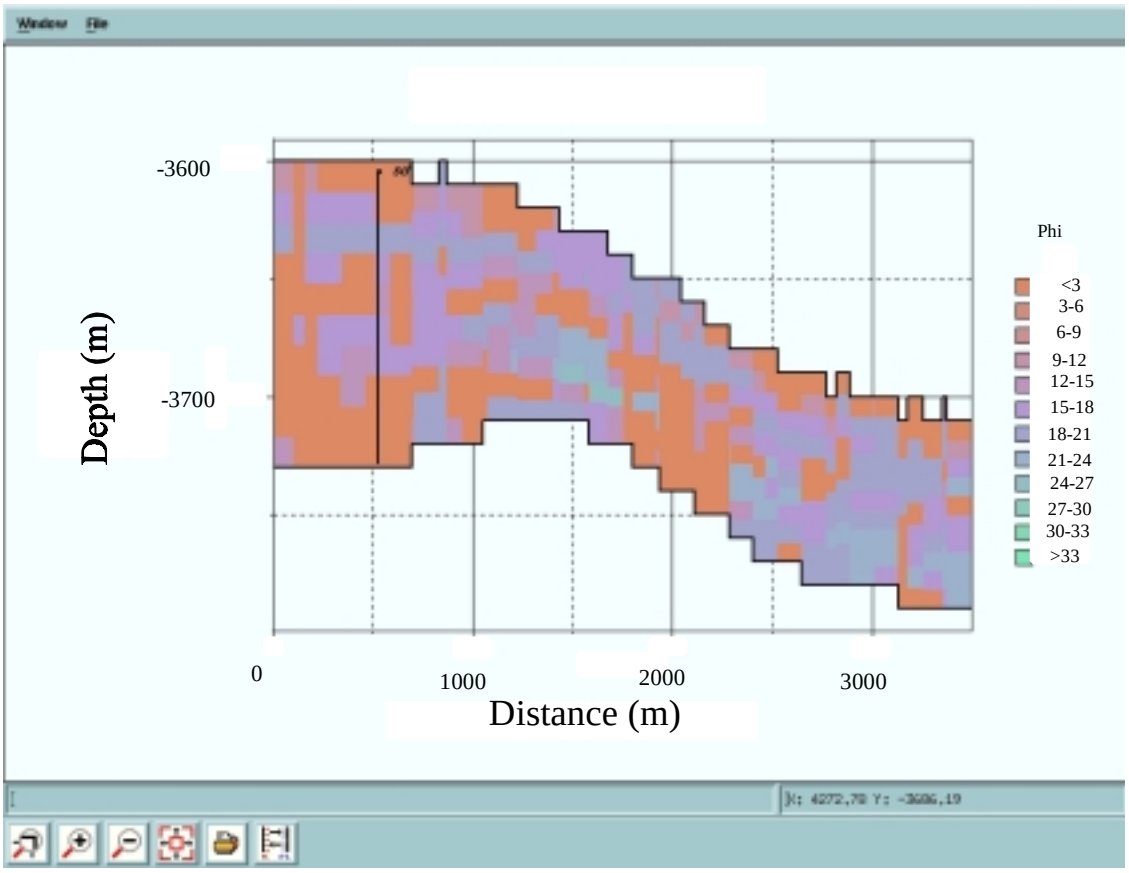


Fig. 10. Simulated cross-section distribution of porosity.

TECHNOLOGY TRANSFER

The second meeting of the Technical Advisory Board was hosted by Inland Resources Incorporated in Denver, Colorado. Current project materials were presented to the board and future direction of the project was discussed. The board consists of oil company representatives and geologic consultants from the Monument Butte area.

The UGS maintains a Green River Study home page on its web site containing the following information: (1) an index map of the study area, (2) a copy of the proposal and statement of work, (3) each of the Biannual Technical Progress Reports, and (4) an extensive selected reference list for the Uinta Basin and lacustrine deposits worldwide. The home page address is ***http://www.ugs.state.ut.us/greenriv.htm***

FUTURE ACTIVITIES

The following work is planned for the period of April 1, 2000 through September 30, 2000:

(1) Regional mapping of the structure, sandstone thickness, and feet-of-sandstone with 10% or more porosity, based on well-log data, will begin. The maps, core, and outcrop data will be used to help interpret the distribution of the regional depositional environments within the Middle and Lower Members of the Green River Formation, and ultimately identify areas with exploration potential.

(2) Final editing of the well-core descriptions will be completed. The reservoir rocks will be divided into subfacies and correlated to the well logs, and porosity and permeability values will be applied to each subfacies. Geophysical well logs will be used to correlate the subfacies with the other wells in the areas selected for numerical reservoir simulation modeling that do not have core. These data will be used to further refine the numerical reservoir simulation modeling.

(3) Paleoflow and fracture data will be gathered from the Nutter's Ranch study site. The new data along with the annotated photomosaics, GR curves, and measured sections of the Nutter's Ranch study site will be used to develop detailed three-dimensional images of the selected stratigraphic interval. These data will be used to develop variograms of the interwell environment.

(4) Additional sections may be measured and described in Nine Mile Canyon.

(5) Several sections will be measured and described in the Desolation Canyon area. These sections will be used to correlate the stratigraphic units we have identified in the western portion of the basin with stratigraphic units defined by Cashion (1967) in the eastern portion of the basin.

(6) The well log correlation data from the Monument Butte Northeast, Uteland Butte, and Brundage Canyon fields will be mapped, and the data will be incorporated into the numerical reservoir simulation models for each of the fields

(7) A paper will be presented at the AAPG Rocky Mountain Section meeting in Albuquerque, New Mexico entitled *Nine Mile Canyon - outcrop analogue for oil reservoirs in the Monument Butte area, Uinta Basin, Utah.*

(8) Project materials will be displayed at the UGS exhibitor's booth during the AAPG Annual Convention in New Orleans, Louisiana, and the AAPG Rocky Mountain Section meeting in Albuquerque, New Mexico.

(9) Results from the study will be presented at the DOE June 2000 contractors review meeting in Denver, Colorado.

(10) The biannual technical report will be sent to all interested parties and posted on the project web site.

(11) A field review will be scheduled in the fall 2000 to show the technical advisory board members the work completed in Willow Creek and Nine Mile Canyons. The board will be asked to advise the project team on what type of additional work is needed.

REFERENCES

Cashion, W.B., 1967, Geology and fuel resources of the Green River Formation, southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Professional Paper 548, 48 p.

Gropp, W.D., Lusj, E., and Skejellum, A., 1994, Using MPI portable parallel programing with message-passing interfaces: Cambridge, MIT Press, 317 p.

Lutz, S.J., Nielson, D.L., and Lomax, J.D., 1994, Lacustrine turbidite deposits in the lower portion of the Green River Formation, Monument Butte field, Uinta Basin, Utah: American Association of Petroleum Geologists Annual Meeting Program with Abstracts, v. 3, p. 203.

Morgan, C.D., Chidsey, T.C., Jr., Hanson, J.A., McClure, K.P., Weller, Kevin, Bereskin, S.R., Deo, M.D., and Yeager, Randy, 1999a, Reservoir characterization of the lower Green River Formation, southwest Uinta Basin, Utah, Biannual technical progress report for the period 4/1/9 to 9/30/99: U.S. Department of Energy unpublished report.

Morgan, C.D., Chidsey, T.C., Jr., Hanson, J.A., McClure, K.P., Weller, Kevin, Bereskin, S.R., Deo, M.D., and Yeager, Randy, 1999b, Reservoir characterization of the lower Green River Formation, southwest Uinta Basin, Utah, Biannual technical progress report for the period 10/1/98 to 3/31/99: U.S. Department of Energy unpublished report.

Remy, R.R., 1992, Stratigraphy of the Eocene part of the Green River Formation in the south-central part of the Uinta Basin, Utah: U.S. Geological Survey Bulletin 1787 - BB, 79 p.

APPENDIX
Core and Log Data

Porosity and Permeability data Green River study				Perm = permeability, horizontal (Horz) and vertical (Vert) So = saturation oil, Sw saturation water Den = density, D/N = density and neutron averaged								Depths are in feet Porosity and saturation values are in percent Permeability in milliDarcies		
Last edit 04/28/00				LDC = lower Douglas Creek, MGR1-4 CMU = carbonate marker unit (Castle Peak SS) LGRLS = lower Green River limestone LGR1-5 (Uteland Butte Ls)								Grain density in grams/ cubic centimeter Gamma ray in API units		
Well	***Depth***	***Core***	***Log***	***Core***	***Horz***	***Vert***	***Core***	***Core***	***Grain***	***Log***	***Log Den***	***Log D/N***	***Log***	***API***
number	***Interval***	***Depth***	***Depth***	***porosity***	***perm***	***perm***	***So***	***Sw***	***density***	***GR***	***Por***	***Por***	***cycle***	***Number***
6-35	5026-27	5026	5029	14.1	5.9		33.5	21.3	2.67	90	12	16.5	MGR7	43-013-30751
6-35	5028-29	5028	5031	14.1	7		40.7	17.8	2.66	105	9	18	MGR7	43-013-30751
6-35	5029-30	5029	5032	13.8	4.1		37.8	13.7	2.67	75	12	17.5	MGR7	43-013-30751
6-35	5030-31	5030	5033	14	6.5		40.4	15.5	2.66	65	15	17.5	MGR7	43-013-30751
6-35	5031-32	5031	5034	13.3	4.7		36	16.6	2.66	65	15	17	MGR7	43-013-30751
6-35	5032-32.5	5032	5035	8.6	0.27		34.9	15.5	2.67	75	13	16.5	MGR7	43-013-30751
6-35	5033-34	5033	5036	12.6	7.5		43.3	11.4	2.66	95	12	17	MGR7	43-013-30751
6-35	5034-35	5034	5037	13	4.4		38.4	13.5	2.65	85	15	19	MGR7	43-013-30751
6-35	5035-36	5035	5038	13.6	9.6		37.5	13.4	2.66	70	14	17	MGR7	43-013-30751
6-35	5036.37	5036	5039	16.9	124		36.5	15.4	2.67	70	15	19	MGR7	43-013-30751
6-35	5037-38	5037	5040	17.3	118		33.4	15.7	2.66	65	17	20.5	MGR7	43-013-30751
6-35	5038-39	5038	5041	17.3	170		33.5	17.9	2.66	60	18	21	MGR7	43-013-30751
6-35	5039-40	5039	5042	15.8	155		41.7	13.2	2.69	60	16	19.5	MGR7	43-013-30751
6-35	5040-41	5040	5043	11.9	14		37.4	14.2	2.72	75	14	17	MGR7	43-013-30751
6-35	5041-42	5041	5044	12.5	28		42.9	10.5	2.66	80	12	14.5	MGR7	43-013-30751
6-35	5047-48	5047	5050	4.2	0.01		49	18.4	2.66	75	6	10	MGR7	43-013-30751
14A-28	5595-96	5595	5592	14.8	3.5	0.07	67	20.4	2.65	65	16.5	19	LDC	43-013-30792
14A-28	5598-99	5598	5595	16.6	13	0.43	70.7	16.4	2.65	60	18	20.5	LDC	43-013-30792

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
14A-28	5615-16	5615	5612	12.5	0.14	0.07	29.1	44.2	2.66	80	12.5	17	LDC	43-013-30792
14A-28	5638-39	5638	5635	11.7	0.77	0.99	40.5	20.2	2.66	85	12	16	LDC	43-013-30792
14A-28	5639-40	5639	5336	9	0.46	0.5	49.6	34.2	2.66	85	12.5	16.5	LDC	43-013-30792
10-34		4488	4488	12.3	1.2		53.3	22.1	2.66	75	16.5	18	MGR13	43-013-31371
10-34		4989	4989	5.8	0.04		39.9	18.8	2.67	75	16	17.5	MGR7	43-013-31371
10-34		4998	4998	13.3	1.2		37.6	48.5	2.66	120	4	12	MGR7	43-013-31371
10-34		5006	5006	12.2	0.6		47.3	17.4	2.66	70	15	17	MGR7	43-013-31371
10-34		5007	5007	14	5.5		36	39.4	2.66	70	14	16	MGR7	43-013-31371
10-34		5510	5510	12	0.09		50.7	22.6	2.66	60	12.5	16	LDC	43-013-31371
10-34		5514	5514	11.8	0.09		49.2	25.6	2.66	60	12.5	16.5	LDC	43-013-31371
10-34		5800	5800	14.8	0.43		41.8	25.9	2.67	75	16.5	19	LDC	43-013-31371
10-34		5810	5810	10.6	0.15		48.2	16.4	2.69	75	15	17.5	LDC	43-013-31371
10-34		5880	5880	13.7	9.6		34.1	27.6	2.65	75	15.5	17	CMU	43-013-31371
10-34		5920	5920	7.9	0.1		41.4	32.8	2.69	75	9	11	CMU	43-013-31371
10-34		5924	5924	9.1	0.12		43.4	32.9	2.66	85	10	12	CMU	43-013-31371
10-34		5956	5956	9.2	0.22		19.9	46.3	2.66	65	11	11.5	CMU	43-013-31371
10-34		5961	5961	9.7	0.26		18	45.3	2.65	70	11.5	12	CMU	43-013-31371
2-25		5528.1	5532	9	0.315		13.5	44.3	2.66	90	14	16	CMU	43-013-31833
2-25		5529.1	5533	6.8	0.027		15.3	38.3	2.66	60	28	23	CMU	43-013-31833
2-25		5530.2	5534	7.8	0.042		11.2	51.4	2.66	50	24	19	CMU	43-013-31833
2-25		5531.5	5535	6	0.004		10.4	52.2	2.67	60	8	12	CMU	43-013-31833
2-25		5532.7	5537	10.3	0.335		8.9	28.8	2.66	80	8	12.5	CMU	43-013-31833
2-25		5533.9	5538	6.3	0.022		10.4	46.6	2.67	100	9	11.5	CMU	43-013-31833
2-25		5535.4	5540	7.7	0.061		9.2	41.6	2.67	80	9	11.5	CMU	43-013-31833

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
2-25		5536.7	5541	9.7	0.06		8.4	45.9	2.66	80	9.5	11.5	CMU	43-013-31833
2-25		5538.4	5542	7	0.039		11.6	36.4	2.64	100	11.5	14	CMU	43-013-31833
2-25		5539.8	5544	8.8	0.053		7.8	31	2.65	85	11.5	14	CMU	43-013-31833
2-25		5540.7	5545	4.8	0.014		12.5	40.6	2.66	80	11.5	14	CMU	43-013-31833
3A-35		4991.4	4986	11.3	0.615		17.5	18.1	2.64	90	12	20	MGR7	43-013-30608
3A-35		4992.9	4988	12.7	2.67		16.5	14.2	2.63	115	12	21	MGR7	43-013-30608
3A-35		4994.4	4989	13.2	3.21		12.2	11.3	2.64	90	5	17	MGR7	43-013-30608
3A-35		4997.5	4995	13.3	2.57		13.4	12.2	2.64	65	3.5	11	MGR7	43-013-30608
3A-35		5000.5	4996	13.9	9.4		12.3	9.5	2.67	75	3.5	11	MGR7	43-013-30608
3A-35		5002.2	4997	11.6	2.02		19.7	19	2.64	75	3.5	9.5	MGR7	43-013-30608
16	4694-95	4694.5	4694	1.5	0.38	0.11	72.3	20.6	2.67	25	20	20	LDC	43-047-31505
16	4695-96	4695.5	4695	1.4	9.9	0.43	74.8	14.7	2.67	30	24	24	LDC	43-047-31505
16	4706-7	4706.5	4706	5	3.2	9.32	62.2	19.2	2.64	60	12	16	LDC	43-047-31505
16	4707-8	4707.5	4707	14.9	0.19	0.17	54.1	30.3	2.73	30	6	9	LDC	43-047-31505
16	4723-24	4723.5	4723	11.9	0.4	0.28	57.7	8.4	2.75	40	12	16	LDC	43-047-31505
16	4726-27	4726.5	4726	3.2	0.26	0.07	65.8	19.7	2.69	35	6	9	LDC	43-047-31505
16	4729-30	4729.5	4729	6.5	1923	0.26	55.8	33.1	2.73	20	6	10	LDC	43-047-31505
16	4730-31	4730.5	4730	6.1	0.01	0.001	47.3	13.5	2.71	20	8	11	LDC	43-047-31505
16	4733-34	4733.5	4733	6.4	256	0.01	61	20.3	2.73	20	8	12	LDC	43-047-31505
16	4734-35	4734.5	4734	9.1	0.27	0.001	39.1	20.4	2.75	35	10	12	LDC	43-047-31505
16	4735-36	4735.5	4735	13	0.01	0.001	59.4	28.1	2.71	60	8	10	LDC	43-047-31505
16	4736-37	4736.5	4736	6	2396	1.1	30.2	60.4	2.67	80	6	8	LDC	43-047-31505
16	4747-48	4747.5	4747	5.1	8.3	0.56	59.1	22.8	2.75	60	2	10	LDC	43-047-31505
16	4748-49	4748.5	4748	6.5	13	2.3	80.7	8.7	2.68	40	1	7	LDC	43-047-31505

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
16	4749-50	4749.5	4749	4.1	270	52	70.5	18.3	2.71	20	2	8	LDC	43-047-31505
16	4750-51	4750.5	4750	7.5	0.07	0.08	73.8	13.6	2.76	25	6	10	LDC	43-047-31505
16	4751-52	4751.5	4751	7.7	0.06	0.04	74	12.1	2.72	25	6	10	LDC	43-047-31505
16	4769-70	4769.5	4769	8.3	0.11	0.001	67.9	15.9	2.71	100	10	12	LDC	43-047-31505
16	4770-71	4770.5	4770	4.2	57	15	81	12.2	2.69	60	11	14	LDC	43-047-31505
16	4771-72	4771.5	4771	10.3	0.2	0.17	82.1	12.1	2.78	60	17	17	LDC	43-047-31505
16	4776-77	4776.5	4776	2	0.03	0.03	7.4	59	2.69	115	6	14	LDC	43-047-31505
16	4787-88	4787.5	4787	13.5	0.26	0.09	27.6	55.3	2.77	50	8	13	LDC	43-047-31505
16	4788-89	4788.5	4788	9.1	0.01	0.001	49.6	37	2.69	60	8	14	LDC	43-047-31505
16	4789-90	4789.5	4789	16.1	0.13	0.001	23	33.5	2.81	60	8	14	LDC	43-047-31505
16	4802-3	4802.5	4802	2.9	3.9	1	79	12.3	2.69	105	6	14	LDC	43-047-31505
16	4804-5	4804.5	4804	9.5	0.01	0.001	69.8	23.3	2.69	60	12	16	LDC	43-047-31505
16	4805-6	4805.5	4805	13.8	0.17	0.001	82.3	10	2.73	35	12	15	LDC	43-047-31505
15-17	4260-61	4260.5	4269	13.3	23	18	24.4	35.6	2.66	95	9.5	15	MGR6	43-047-31002
15-17	4261-62	4261.5	4270	10.4	1.12	0.75	29.8	29.1	2.66	75	12	19	MGR6	43-047-31002
15-17	4262-63	4262.5	4271	12.1	5.56	1.42	27.4	31.4	2.66	70	16.5	20	MGR6	43-047-31002
15-17	4263-64	4263.5	4272	17.1	30	20	24.4	40.2	2.65	65	17.5	19.5	MGR6	43-047-31002
15-17	4264-65	4264.5	4273	15.7	16	9.25	23.4	41.4	2.65	60	18	19	MGR6	43-047-31002
15-17	4265-66	4265.5	4274	16.2	17	12	23.7	39.4	2.64	65	17.5	19	MGR6	43-047-31002
15-17	4266-67	4266.5	4275	14.7	4.8	1.49	22.4	45.6	2.65	65	16.5	20	MGR6	43-047-31002
15-17	4267-68	4267.5	4276	15.7	11	8.52	26.2	42.7	2.65	75	15.5	19	MGR6	43-047-31002
15-17	4268-69	4268.5	4277	14.3	4.98	1.58	26.2	39	2.66	80	13.5	18	MGR6	43-047-31002
15-17	4269-70	4269.5	4278	14.7	7.87	2.41	22.8	40.2	2.66	75	13.5	18	MGR6	43-047-31002
15-17	4270-71	4270.5	4279	13.6	2.57	0.84	23.6	40.4	2.67	65	17.5	20	MGR6	43-047-31002

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
15-17	4271-72	4271.5	4280	14.6	5.4	3.7	20.6	47.7	2.65	60	19.5	21	MGR6	43-047-31002
15-17	4272-73	4272.5	4281	14.6	8.21	4.78	26.6	38.1	2.66	65	17.5	20	MGR6	43-047-31002
15-17	4273-74	4273.5	4282	15.5	8.51	6.34	23.6	38.6	2.66	65	17.5	20	MGR6	43-047-31002
15-17	4274-75	4274.5	4283	15.4	8.7	9.02	19.5	46.7	2.66	65	18.5	21	MGR6	43-047-31002
15-17	4275-76	4275.5	4284	16.1	17	15	28.3	34.3	2.66	65	18.5	21.5	MGR6	43-047-31002
15-17	4276-77	4276.5	4285	13.5	8.4	1.42	28.4	45.2	2.65	70	20.5	23	MGR6	43-047-31002
15-17	4277-78	4277.5	4286	15.6	28	21	26.8	40.7	2.65	70	20.5	23	MGR6	43-047-31002
15-17	4278-79	4278.5	4287	16.7	42	49	28.8	36.3	2.65	65	21.5	23	MGR6	43-047-31002
15-17	4279-80	4279.5	4288	15.8	49	44	29	30.3	2.65	65	20	21.5	MGR6	43-047-31002
15-17	4280-81	4280.5	4289	15.8	42	28	29.5	29.5	2.65	65	19	21	MGR6	43-047-31002
15-17	4281-82	4281.5	4290	14.4	27	22	29.1	31.8	2.66	80	16	19.5	MGR6	43-047-31002
15-17	4282-83	4282.5	4291	5.5	0.03	0.04	12.7	77.1	2.71	95	13	17	MGR6	43-047-31002
15-17	4283-84	4283.5	4292	11.7	1.66	0.45	7.6	69.1	2.67	75	14	17.5	MGR6	43-047-31002
15-17	4284-85	4284.5	4293	12.5	4.11	1.65	29.4	35.3	2.68	65	15	19	MGR6	43-047-31002
15-17	4285-86	4285.5	4294	12.8	21	31	29.2	29.3	2.67	70	15	18.5	MGR6	43-047-31002
15-17	4286-87	4286.5	4295	12.6	29	11	23.2	42.7	2.68	75	16	18	MGR6	43-047-31002
15-17	4287-88	4287.5	4296	13	40	17	29.1	37.8	2.68	80	13	16.5	MGR6	43-047-31002
15-17	4300-1	4300.5	4309	3.6	0.01	3.6	0	61.1	2.67	75	4	7.5	MGR6	43-047-31002
15-17	4302-3	4302.5	4311	10.5	0.22	10.5	0	71.6	2.67	115	3.5	11.5	MGR6	43-047-31002
15-17	4304-5	4304.5	4313	5.1	0.01	5.1	0	85.6	2.69	90	4	12	MGR6	43-047-31002
11-16H	4347-48	4347.5	4347	1.9	0.01		0	52	2.68	110	20	20	MGR9	43-013-30616
11-16H	4348-49	4348.5	4348	1.4	0.01		0	73.9	2.67	110	30	30	MGR9	43-013-30616
11-16H	4349-50	4349.5	4349	1.9	0.01		0	91.1	2.77	135	30	30	MGR9	43-013-30616
11-16H	4354-55	4354.5	4354	3.6	0.01		0	86.6	2.69	120	7.5	15	MGR8	43-013-30616

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
11-16H	4355-56	4355.5	4355	3.4	0.01		0	95.3	2.68	75	6	17	MGR8	43-013-30616
11-16H	4585-86	4585.5	4585	5.4	0.04		62.4	13.4	2.67	105	2	9	MGR8	43-013-30616
11-16H	4586-87	4586.5	4586	1.5	0.01		0	51.4	2.72	120	4	11	MGR6	43-013-30616
11-16H	4587-88	4587.5	4587	0.9	0.01		0	64.4	2.7	120	5	12	MGR6	43-013-30616
11-16H	4608-09	4608.5	4608	1	0.01		0	50.8	2.68	115	3	7.5	MGR6	43-013-30616
11-16H	4609-10	4609.5	4609	0.9	0.01		22.6	52.8	2.66	135	1	11	MGR6	43-013-30616
11-16H	4610-11	4610.5	4610	2.8	0.01		0	80.8	2.67	135	4	13	MGR6	43-013-30616
11-16H	4611-12	4611.5	4611	1.9	0.01		0	60.4	2.68	135	6	14	MGR6	43-013-30616
11-16H	4630-31	4630.5	4630	0.7	0.01		0	61.1	2.69	120	2	13	MGR6	43-013-30616
11-16H	4631-32	4631.5	4631	0.7	0.01		0	57.7	2.68	115	2	11	MGR6	43-013-30616
11-16H	4633-34	4633.5	4633	1.2	0.01		0	26.1	2.69	120	12	18	MGR6	43-013-30616
11-16H	4634-36	4634.5	4634	1	0.01		0	52.4	2.68	125	8	16	MGR6	43-013-30616
11-16H	4636-37	4636.5	4636	1	0.01		0	28.7	2.67	120	4	14	MGR6	43-013-30616
11-16H	4641-42	4641.5	4641	1.5	0.02		0	29.2	2.68	130	6	15	MGR6	43-013-30616
23-25	5164-65	5164.5	5159	7.6	2.69	0.002	15	52.5	2.68	105	6	12.5	MGR5	43-047-32529
23-25	5165-66	5165.5	5160	12.7	4.82	0.805	16.6	37	2.67	75	10	13	MGR5	43-047-32529
23-25	5166-67	5166.5	5161	13.4	2.46	1.12	34.2	29.4	2.87	65	14	15	MGR5	43-047-32529
23-25	5167-68	5167.5	5162	12.8	1.71	0.141	26.5	34.1	2.66	70	15	15.5	MGR5	43-047-32529
23-25	5168-69	5168.5	5163	12.8	1.02	0.375	26.3	32.4	2.67	70	15	15.5	MGR5	43-047-32529
23-25	5169-70	5169.5	5164	12.6	0.847	0.001	24	34.1	2.66	75	15	15	MGR5	43-047-32529
23-25	5170-71	5170.5	5165	12.3	2.59	0.209	24	31.8	2.67	70	14.5	14.5	MGR5	43-047-32529
23-25	5171-72	5171.5	5166	12.5	2.12	1.97	26.3	32	2.67	70	14	15	MGR5	43-047-32529
23-25	5172-73	5172.5	5167	13.4	5.58	1.97	33.5	29.6	2.67	70	14	15.5	MGR5	43-047-32529
23-25	5173-74	5173.5	5168	15.3	6.28	0.833	36.3	25.9	2.67	60	17	17.5	MGR5	43-047-32529

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
23-25	5174-75	5174.5	5169	15.2	6.2	1.91	39.3	26.1	2.67	65	18	18	MGR5	43-047-32529
23-25	5175-76	5175.5	5170	13.8	4.29	0.638	34.2	28.7	2.66	65	17.5	17.5	MGR5	43-047-32529
23-25	5176-77	5176.5	5171	14.3	1.37	0.775	29.8	27.8	2.66	65	17	17	MGR5	43-047-32529
23-25	5177-78	5177.5	5172	14	7.41	0.349	29	31.1	2.66	65	16.5	16.5	MGR5	43-047-32529
23-25	5178-79	5178.5	5173	12.7	2.34	0.268	27.5	32.4	2.66	65	16	17	MGR5	43-047-32529
23-25	5179-80	5179.5	5174	13	8	0.345	30	30.8	2.67	65	15.5	16	MGR5	43-047-32529
23-25	5180-81	5180.5	5175	11.9	1.38	0.117	21.9	34.9	2.67	65	14	15	MGR5	43-047-32529
23-25	5181-82	5181.5	5176	10.5	1.85	1.85	20.4	36	2.66	75	14	15	MGR5	43-047-32529
23-25	5182-83	5182.5	5177	6.4	0.125	1e-04	1.5	63	2.66	85	10	12	MGR5	43-047-32529
23-25	5183-84	5183.5	5178	6.2	0.143	0.128	2.5	62.8	2.65	90	8	10	MGR5	43-047-32529
23-25	5184-85	5184.5	5179	4	0.027	0.002	0	90.5	2.71	100	7	9.5	MGR5	43-047-32529
34-8	4050-51	4050.5	4051	8.4	2.11		50.6	16.9	2.66	105	8	10.5	MGR13	43-013-30778
34-8	4051-52	4051.5	4052	6.9	0.12		50.2	13.2	2.65	120	7	11	MGR13	43-013-30778
34-8	4052-53	4052.5	4053	4.3	0.05		53.5	23.4	2.65	105	8	13	MGR13	43-013-30778
34-8	4053-54	4053.5	4054	5.5	0.02		38	13.1	2.66	75	12	16	MGR13	43-013-30778
34-8	4054-55	4054.5	4055	9.9	1.5		34.9	20.1	2.65	65	13.5	15	MGR13	43-013-30778
34-8	4055-56	4055.5	4056	10.5	0.78		31.7	26.5	2.65	65	13.5	15	MGR13	43-013-30778
34-8	4056-57	4056.5	4057	12.2	1.83		40.3	26.3	2.66	65	14	15	MGR13	43-013-30778
34-8	4057-58	4057.5	4058	10.7	0.93		40.7	15.4	2.65	75	15	16	MGR13	43-013-30778
34-8	4058-59	4058.5	4059	9.8	1.99		34.2	34.2	2.67	70	14	16	MGR13	43-013-30778
34-8	4059-60	4059.5	4060	13.9	5.12		43.1	13.9	2.67	75	12	15	MGR13	43-013-30778
34-8	4060-61	4060.5	4061	12.4	3.25		34.1	17.1	2.67	85	10	15	MGR13	43-013-30778
34-8	4061-62	4061.5	4062	12.8	2.52		32.7	16.1	2.66	75	11	15.5	MGR13	43-013-30778
34-8	4062-63	4062.5	4063	8	0.63		33.4	12.5	2.66	70	13	14.5	MGR13	43-013-30778

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
34-8	4063-64	4063.5	4064	11	1.04		26.7	20.1	2.66	90	10	13	MGR13	43-013-30778
34-8	4064-65	4064.5	4065	11.3	11		32.3	17.1	2.66	105	6	12	MGR13	43-013-30778
34-8	4065-66	4065.5	4066	9.9	2.35		40.7	28.5	2.66	115	6	10.5	MGR13	43-013-30778
34-8	4066-67	4066.5	4067	2.3	0.01		0	73.1	2.67	115	5	10	MGR13	43-013-30778
34-8	4071-72	4071.5	4072	1.2	0.01		0	46.1	2.69	105	9	17	MGR13	43-013-30778
34-8	4076-77	4076.5	4077	1.3	0.01		0	48.1	2.78	75	2	11	MGR13	43-013-30778
34-8	4077-78	4077.5	4078	1.8	0.01		0	55.6	2.8	75	0	10	MGR13	43-013-30778
34-8	4079-80	4079.5	4080	4.8	0.01		28.5	52.9	2.66	115	4	11	MGR13	43-013-30778
34-8	4080-81	4080.5	4081	7.1	0.49		23.3	54.3	2.66	105	6	15	MGR13	43-013-30778
34-8	4081-82	4081.5	4082	9.5	1.67		30.4	11.4	2.66	80	5	14	MGR13	43-013-30778
34-8	4082-83	4082.5	4083	10	1.58		29.3	11	2.65	65	8	13	MGR13	43-013-30778
34-8	4083-84	4083.5	4084	11.9	2.11		29.3	28.1	2.66	55	7	10.5	MGR13	43-013-30778
34-8	4084-85	4084.5	4085	11.9	2.93		30.1	9.5	2.66	60	5.5	10	MGR13	43-013-30778
34-8	4085-86	4085.5	4086	12.7	5.34		39.4	12.1	2.67	65	11	13	MGR13	43-013-30778
34-8	4086-87	4086.5	4101	9.1	2.15		48.5	24.2	2.66	110	4	11	MGR13	43-013-30778
34-8	4101-02	4101.5	4102	2.5	0.01		0	68.4	2.7	115	3.5	9.5	MGR13	43-013-30778
34-8	4102-03	4102.5	4103	3.9	0.01		0	75.7	2.69	105	4	9.5	MGR13	43-013-30778
34-5	5007-8	5007.5	5007	2.1	0.01		73.6	16.4	2.67	105	6	14	LDC	43-013-30721
34-5	5011-12	5011.5	5011	4	0.01		58.9	31.4	2.65	85	4	11	LDC	43-013-30721
34-5	5012-13	5012.5	5012	4.3	0.01		50.8	36.3	2.66	85	5	10	LDC	43-013-30721
34-5	5013-14	5013.5	5013	4.5	0.03		48.9	32.6	2.66	80	5.5	10.5	LDC	43-013-30721
34-5	5014-15	5014.5	5014	4.8	0.03		46.9	33.8	2.66	80	7	11.5	LDC	43-013-30721
34-5	5015-16	5015.5	5015	5.3	0.05		48	30.7	2.67	75	9	13	LDC	43-013-30721
34-5	5016-17	5016.5	5016	5	0.02		57.2	20.2	2.66	65	9.5	13	LDC	43-013-30721

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
34-5	5017-18	5017.5	5017	6.1	0.12		67.1	14.9	2.65	60	9.5	13	LDC	43-013-30721
34-5	5018-19	5018.5	5018	8.5	0.11		62.1	16.3	2.65	65	9.5	12.5	LDC	43-013-30721
34-5	5019-20	5019.5	5019	8.1	0.16		65.4	15.7	2.66	75	8	11	LDC	43-013-30721
34-5	5020-21	5020.5	5020	5.5	0.08		57.5	16.9	2.66	100	8	12	LDC	43-013-30721
34-5	5021-22	5021.5	5021	4.8	0.01		51.6	28.9	2.7	100	12	17	LDC	43-013-30721
34-5	5022-23	5022.5	5022	4.5	0.05		67.5	14.5	2.67	75	14	15	LDC	43-013-30721
34-5	5023-24	5023.5	5023	3	0.02		54.6	15.6	2.74	45	6	11	LDC	43-013-30721
34-5	5024-25	5024.5	5024	15	21		40.8	9.4	2.67	45	12	15.5	LDC	43-013-30721
34-5	5025-26	5025.5	5025	15.8	32		44.7	8.7	2.68	55	13.5	17	LDC	43-013-30721
34-5	5026-27	5026.5	5026	10.4	53		38.5	8.7	2.66	55	12	15.5	LDC	43-013-30721
34-5	5027-28	5027.5	5027	8.6	2.73		51	9.4	2.66	75	8	13	LDC	43-013-30721
34-5	5028-29	5028.5	5028	3.8	0.01		62.1	16.6	2.66	105	5	13.5	LDC	43-013-30721
12-4	4871-72	4871.5	4871	2	0.01		9.4	84.5	2.67	115	3	11	MGR7	43-013-30699
12-4	4872-73	4872.5	4872	2.8	0.01		31	55.1	2.67	100	3	9.5	MGR7	43-013-30699
12-4	4873-74	4873.5	4873	3	0.01		26.5	64.9	2.65	90	4	8	MGR7	43-013-30699
12-4	4874-75	4874.5	4874	3.2	0.01		27.2	66.4	2.66	115	6	11	MGR7	43-013-30699
12-4	4875-76	4875.5	4875	2.7	0.01		9.5	85.2	2.65	110	7	12.5	MGR7	43-013-30699
12-4	4876-77	4876.5	4876	2.6	0.01		4.5	90	2.64	115	6	13	MGR7	43-013-30699
12-4	4877-78	4877.5	4877	4	0.02		50.4	19.2	2.66	110	6	13.5	MGR7	43-013-30699
12-4	4878-79	4878.5	4878	5.9	0.07		50.5	33.7	2.65	100	6.5	11	MGR7	43-013-30699
12-4	4879-80	4879.5	4879	6	0.09		45.1	35.5	2.65	105	6.5	11	MGR7	43-013-30699
12-4	4880-81	4880.5	4880	6.9	0.06		32.5	23.8	2.65	110	6	13	MGR7	43-013-30699
12-4	4881-82	4881.5	4881	7.5	0.13		36.7	20.6	2.67	105	5.5	12.5	MGR7	43-013-30699
12-4	4882-83	4882.5	4882	6.2	0.29		59.7	18.6	2.67	100	5.5	12	MGR7	43-013-30699
12-4	4883-84	4883.5	4883	2.6	0.01		28.9	47	2.67	85	7	11.5	MGR7	43-013-30699

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
12-4	4884-85	4884.5	4884	7.5	0.29		38.3	29.8	2.68	85	8	12	MGR7	43-013-30699
12-4	4885-86	4885.5	4885	9.4	0.1		38.6	21.4	2.68	100	7.5	11.5	MGR7	43-013-30699
12-4	4886-87	4886.5	4886	11	0.49		37.1	16.9	2.65	105	7	12.5	MGR7	43-013-30699
12-4	4887-88	4887.5	4887	6.9	0.03		38.5	31.3	2.66	90	10	14	MGR7	43-013-30699
12-4	4888-89	4888.5	4888	7.6	0.06		40.8	29.9	2.66	75	13.5	13.5	MGR7	43-013-30699
12-4	4889-90	4889.5	4889	7.6	0.06		47.4	27.1	2.68	85	10	12	MGR7	43-013-30699
12-4	4890-91	4890.5	4890	8.2	0.6		53.8	28.3	2.68	120	8	12	MGR7	43-013-30699
12-4	4891-92	4891.5	4891	7.4	0.04		46.1	25.9	2.67	115	9	15	MGR7	43-013-30699
12-4	4892-93	4892.5	4892	6.8	0.49		30.3	15.2	2.66	90	12	16	MGR7	43-013-30699
12-4	4893-94	4893.5	4893	4.6	0.03		54.6	13.7	2.66	75	14	15.5	MGR7	43-013-30699
12-4	4894-95	4894.5	4894	1.2	0.01		70.2	20	2.68	80	14	15	MGR7	43-013-30699
12-4	4985-96	4895.5	4895	2.1	0.01		35.2	56.3	2.7	85	13	14.5	MGR7	43-013-30699
41-8	4111-12	4111.5	4111	6.9	0.01		51.1	32.7	2.66	75	12	15	MGR13	43-013-30741
41-8	4112-13	4112.5	4112	2.6	0.01		46.7	35	2.65	70	11.5	14	MGR13	43-013-30741
41-8	4113-14	4113.5	4113	5.9	0.2		41.4	35.9	2.66	75	12.5	14.5	MGR13	43-013-30741
41-8	4114-15	4114.5	4114	8.4	0.5		37.3	29.3	2.65	80	13	14.5	MGR13	43-013-30741
41-8	4115-16	4115.5	4115	9.9	0.26		37.3	23.3	2.66	85	13	15	MGR13	43-013-30741
41-8	4116-17	4116.5	4116	9.2	0.64		44.5	28.8	2.66	85	13	15	MGR13	43-013-30741
41-8	4117-18	4117.5	4117	10.9	2.36		35.7	21	2.67	80	13	15	MGR13	43-013-30741
41-8	4118-19	4118.5	4118	9.6	0.86		34.7	16.3	2.65	85	13	15	MGR13	43-013-30741
41-8	4119-20	4119.5	4119	10.2	1.12		31	19.4	2.66	85	13	15	MGR13	43-013-30741
41-8	4120-21	4120.5	4120	9	0.63		31.6	19.8	2.66	85	12	14.5	MGR13	43-013-30741
41-8	4121-22	4121.5	4121	10.2	0.8		35.6	25.4	2.66	80	13	15	MGR13	43-013-30741
41-8	4122-23	4122.5	4122	10.6	0.64		36.4	20.2	2.66	75	13.5	15	MGR13	43-013-30741

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
41-8	4123-24	4123.5	4123	9	0.67		45	25.7	2.65	80	13.5	15	MGR13	43-013-30741
41-8	4124-25	4124.5	4124	9.1	0.57		41.6	28.6	2.65	80	13.5	15	MGR13	43-013-30741
41-8	4125-26	4125.5	4125	9.6	1.1		37.8	26	2.65	85	13	14	MGR13	43-013-30741
41-8	4126-27	4126.5	4126	9.1	0.77		36.4	17.3	2.65	90	11	13	MGR13	43-013-30741
41-8	4127-28	4127.5	4127	10.5	0.69		25	14	2.65	100	10	12.5	MGR13	43-013-30741
41-8	4128-29	4128.5	4128	9.7	0.7		30.8	15.4	2.65	115	6	12	MGR13	43-013-30741
41-8	4129-30	4129.5	4129	10.2	1.02		48.5	15.5	2.65	100	2	9	MGR13	43-013-30741
41-8	4130-31	4130.5	4130	8.6	1.14		50.9	18.5	2.65	85	0	7	MGR13	43-013-30741
41-8	4131-32	4131.5	4131	7.8	0.62		49.3	24.7	2.65	120	4	8	MGR13	43-013-30741
41-8	4132-33	4132.5	4132	6.2	0.32		51.3	25.7	2.65	135	7	16.5	MGR13	43-013-30741
41-8	4133-34	4133.5	4133	2.5	0.82		25.6	61.4	2.66	105	9	14.5	MGR13	43-013-30741
41-8	4134-35	4134.5	4134	1	0.01		41.1	47	2.78	85	10.5	14	MGR13	43-013-30741
41-8	4135-36	4135.5	4135	0.7	0.42		0	86.5	2.68	85	9	12	MGR13	43-013-30741
41-8	4137-38	4137.5	4137	9.5	1.09		34.7	16.2	2.68	85	12	14	MGR13	43-013-30741
41-8	4138-39	4138.5	4138	11.5	1		35.9	12.6	2.67	90	14	15.5	MGR13	43-013-30741
41-8	4139-40	4139.5	4139	12.2	1.64		38.9	10.6	2.66	90	14	15.5	MGR13	43-013-30741
41-8	4140-41	4140.5	4140	2.8	0.01		39.6	28.3	2.66	90	14	15	MGR13	43-013-30741
41-8	4141-42	4141.5	4141	11.7	0.83		32.3	12.7	2.66	85	14.5	16	MGR13	43-013-30741
41-8	4142-43	4142.5	4142	10.7	0.58		29.1	13.7	2.65	75	15	17	MGR13	43-013-30741
41-8	4143-44	4143.5	4143	11.1	0.84		25.5	13.6	2.66	80	15.5	17	MGR13	43-013-30741
41-8	4144-45	4144.5	4144	10.4	0.27		46.9	9.4	2.66	105	14	16	MGR13	43-013-30741
41-8	4145-46	4145.5	4145	12.8	1.69		33.6	16	2.66	110	9	17	MGR13	43-013-30741
41-8	4146-47	4146.5	4146	13.7	3.21		49.6	9.4	2.66	105	10	15	MGR13	43-013-30741
41-8	4147-48	4147.5	4147	15	5.74		27.2	19.2	2.66	85	11.5	13	MGR13	43-013-30741

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
41-8	4148-49	4148.5	4148	20.5	10		35.8	11.9	2.66	85	13	14	MGR13	43-013-30741
41-8	4149-50	4149.5	4149	2.6	0.01		37.1	32.6	2.7	85	14	15	MGR13	43-013-30741
41-8	4150-51	4150.5	4150	8.1	0.38		39.5	31	2.66	85	14	15.5	MGR13	43-013-30741
41-8	4151-52	4151.5	4151	9.5	0.33		36.4	22.8	2.65	100	13	15.5	MGR13	43-013-30741
41-8	4152-53	4152.5	4152	9.7	0.73		31.8	14.4	2.66	90	13	16.5	MGR13	43-013-30741
41-8	4153-54	4153.5	4153	9.2	0.62		36.6	10	2.66	85	13.5	16	MGR13	43-013-30741
41-8	4154-55	4154.5	4154	9.9	0.46		30.4	15.2	2.66	75	14	16	MGR13	43-013-30741
41-8	4155-56	4155.5	4155	9.8	0.76		36.4	12.1	2.66	65	14	16	MGR13	43-013-30741
41-8	4156-57	4156.5	4156	12.7	3.78		47.2	9.7	2.68	70	12	14	MGR13	43-013-30741
41-8	4157-58	4157.5	4157	12.6	4.43		37.7	11.5	2.67	90	10	12	MGR13	43-013-30741
41-8	4158-59	4158.5	4158	12.7	5.54		43.7	10.9	2.67	150	8	14	MGR13	43-013-30741
41-8	4159-60	4159.5	4159	11	2.32		40.8	9.8	2.66	150	6	16	MGR13	43-013-30741
41-8	5001-2	5001.5	5001	14.8	9.2		34.3	9.1	2.67	125	13	21	LDC	43-013-30741
41-8	5002-3	5002.5	5002	7.7	1.39		45.1	12	2.66	125	15	23	LDC	43-013-30741
41-8	5021-22	5003.5	5003	2.2	0.01		19.8	62.2	2.68	120	8	18	LDC	43-013-30741
41-8	5022-23	5004.5	5004	4.1	0.03		31.2	40.1	2.66	105	4	14	LDC	43-013-30741
41-8	5023-24	5005.5	5005	5.5	0.01		46.2	22.7	2.66	105	8	12	LDC	43-013-30741
41-8	5024-25	5006.5	5006	3.4	0.02		0	76.3	2.68	105	8	14	LDC	43-013-30741
41-8	5025-26	5007.5	5007	7.1	1.7		39.8	22.8	2.65	105	6	14	LDC	43-013-30741
41-8	5026-27	5008.5	5008	6.6	0.39		43.8	21.9	2.66	120	7	19	LDC	43-013-30741
41-8	5027-28	5009.5	5009	6.7	0.11		43.4	25.2	2.66	120	6	18	LDC	43-013-30741
41-8	5028-29	5010.5	5010	5.9	0.14		37	24.6	2.66	120	5	18	LDC	43-013-30741
41-8	5029-30	5011.5	5011	3.7	0.01		36.6	31.4	2.66	125	5	18	LDC	43-013-30741
41-8	5224-25	5224.5	5224	20.4	45		41.5	5.9	2.65	105	20	22	LDC	43-013-30741

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
41-8	5225-26	5225.5	5225	19.4	22		76.7	6.1	2.65	115	8	14	LDC	43-013-30741
41-8	5226-27	5226.5	5226	19.7	39		81.5	9.1	2.65	115	7	13.5	LDC	43-013-30741
41-8	5227-28	5227.5	5227	20.5	34		71.5	17.3	2.65	120	8	15	LDC	43-013-30741
41-8	5228-29	5228.5	5228	2.4	0.01		5.3	30.5	2.67	120	8	16	LDC	43-013-30741
41-8	5229-30	5229.5	5229	5	0.55		38.8	7.1	2.65	120	8	15	LDC	43-013-30741
41-8	5230-31	5230.5	5230	8.6	0.18		44	7.3	2.65	115	9	14.5	LDC	43-013-30741
41-8	5231-32	5231.5	5231	8.3	0.03		36.6	16.3	2.66	105	10	14.5	LDC	43-013-30741
41-8	5232-33	5232.5	5232	2.5	0.01		48	16.9	2.67	105	11	15	LDC	43-013-30741
41-8	5233-34	5233.5	5233	3.4	0.29		64.6	6.2	2.64	100	14	16.5	LDC	43-013-30741
41-8	5234-35	5234.5	5234	6.3	0.02		75.2	9.4	2.67	95	15	18	LDC	43-013-30741
41-8	5235-36	5235.5	5235	6.6	0.04		57.2	14.3	2.65	90	15	18	LDC	43-013-30741
41-8	5236-37	5236.5	5236	9.8	0.62		58.6	20.7	2.66	95	15	17.5	LDC	43-013-30741
41-8	5237-38	5237.5	5237	11.2	1.09		61.8	21.8	2.67	95	15	17.5	LDC	43-013-30741
41-8	5238-39	5238.5	5238	11.6	0.93		53.2	24.8	2.67	90	15	17.5	LDC	43-013-30741
41-8	5239-40	5239.5	5239	11.4	1.14		66.4	36.4	2.65	100	15	17.5	LDC	43-013-30741
41-8	5240-41	5240.5	5240	12	0.68		66.8	12.1	2.67	105	14.5	17	LDC	43-013-30741
41-8	5241-42	5241.5	5241	10.6	0.91		63.6	13.6	2.65	105	14.5	17	LDC	43-013-30741
41-8	5242-43	5242.5	5242	11.1	1		62	12.4	2.65	100	14.5	17.5	LDC	43-013-30741
41-8	5243-44	5243.5	5243	10.2	0.64		61.1	13.3	2.65	100	14.5	18	LDC	43-013-30741
41-8	5244-45	5244.5	5244	9	0.55		54.7	5.2	2.66	100	14.5	18	LDC	43-013-30741
41-8	5245-46	5245.5	5245	10.1	0.63		60.5	6	2.65	90	16	18.5	LDC	43-013-30741
41-8	5246-47	5246.5	5246	9.5	1.13		58	5.8	2.65	90	17	19	LDC	43-013-30741
41-8	5247-48	5247.5	5247	8.9	0.67		56	5.9	2.66	90	16.5	19	LDC	43-013-30741
41-8	5248-49	5248.5	5248	9.7	0.06		71.6	9.5	2.64	90	16	18.5	LDC	43-013-30741

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
41-8	5249-50	5249.5	5249	10.1	0.79		52.1	11.8	2.65	100	16.5	19	LDC	43-013-30741
41-8	5250-51	5250.5	5250	11.8	0.96		56.9	10.9	2.65	105	15	18	LDC	43-013-30741
41-8	5251-52	5251.5	5251	9.9	0.61		56.6	9.8	2.66	115	12	16	LDC	43-013-30741
41-8	5252-53	5252.5	5252	11.8	2.22		60.4	5.5	2.65	105	11	15.5	LDC	43-013-30741
41-8	5253-54	5253.5	5253	11.9	1.68		55.1	6.4	2.66	100	11	15.5	LDC	43-013-30741
41-8	5254-55	5254.5	5254	9.7	1.03		58.1	5.5	2.65	105	10	15	LDC	43-013-30741
41-8	5255-56	5255.5	5255	3.3	0.01		58.8	7.4	2.66	115	10	15	LDC	43-013-30741
41-8	5256-57	5256.5	5256	8.9	0.79		45.5	5.4	2.65	105	14	17.5	LDC	43-013-30741
41-8	5473-74	5473.5	5473	2.9	0.09		21.3	34.1	2.67	105	5	7	CMU	43-013-30741
41-8	5474-75	5474.5	5474	2.4	0.01		37.7	41.9	2.66	105	2	5.5	CMU	43-013-30741
41-8	5475-76	5475.5	5475	1.7	0.01		19.7	52.5	2.71	110	1	5.5	CMU	43-013-30741
41-8	5476-77	5476.5	5476	1.9	0.01		42	33.6	2.72	120	2	6	CMU	43-013-30741
41-8	5477-78	5477.5	5477	2.1	0.01		22.6	60.3	2.71	140	2.5	8	CMU	43-013-30741
41-8	5478-79	5478.5	5478	2.8	0.01		4.9	87.9	2.69	155	2	11	CMU	43-013-30741
41-8	5479-80	5479.5	5479	1.7	0.01		3.6	72.5	2.73	165	2	12	CMU	43-013-30741
41-8	5480-81	5480.5	5480	4.6	0.01		3.8	91.5	2.72	180	2	15	CMU	43-013-30741
41-8	5484-85	5484.5	5484	3.4	0.06		45.2	18.1	2.66	95	8	10	CMU	43-013-30741
41-8	5485-86	5485.5	5485	7	0.24		40.2	23	2.65	100	7	9	CMU	43-013-30741
41-8	5486-87	5486.5	5486	5.4	0.11		46	23	2.65	100	6	7.5	CMU	43-013-30741
41-8	5487-88	5487.5	5487	2.9	0.03		29.2	38.9	2.66	135	4	8	CMU	43-013-30741
41-8	5488-89	5488.5	5488	2.2	0.01		0	87.7	2.68	155	2	11	CMU	43-013-30741
33-8	4642-43	4642.5	4642	5.2	0.02	0.01	37.8	42.5	2.65	50	6	8	MGR7	43-013-31427
33-8	4643-44	4643.5	4643	5.3	0.1	24	42.5	64.3	2.67	60	7	9	MGR7	43-013-31427
33-8	4644-45	4644.5	4644	6.7	0.02	79	28.1	56	2.67	60	7	8.5	MGR6	43-013-31427

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
33-8	4645-46	4645.5	4645	6.4	0.04	1186	43	38.2	2.65	60	5	7	MGR6	43-013-31427
33-8	4648-49	4648.5	4648	4.8	0.07	0.01	5.9	68.7	2.66	85	4	9	MGR6	43-013-31427
33-8	4650-51	4650.5	4650	3.7	1.1	0.1	39.6	31.9	2.66	80	7	9.5	MGR6	43-013-31427
33-8	4653-54	4653.5	4653	9.9	0.4	0.02	43.9	19	2.65	75	6	8	MGR6	43-013-31427
33-8	4654-55	4654.5	4654	12.7	2.8	0.72	48.8	9.7	2.64	75	5	7	MGR6	43-013-31427
33-8	4655-56	4655.5	4655	13.9	8.7	3.8	59.6	6.2	2.64	60	6	9	MGR6	43-013-31427
33-8	4656-57	4656.5	4656	14.7	7.8	3	49.3	13.4	2.65	55	13	13	MGR6	43-013-31427
33-8	4657-58	4657.5	4657	14.9	19	19	52.1	12.7	2.66	30	15	15	MGR6	43-013-31427
33-8	4658-59	4658.5	4658	14	11	7.4	59.6	6.9	2.66	30	16	16	MGR6	43-013-31427
33-8	4659-60	4659.5	4659	12.2	7	2.2	45.1	12.6	2.65	30	16	16	MGR6	43-013-31427
33-8	5440-41	5440.5	5438	9	0.52	0.96	45.8	22.4	2.65	85	4	6.5	CMU	43-013-31427
33-8	5441-42	5441.5	5439	11	1.4	2.4	49.4	14.9	2.63	75	5	7	CMU	43-013-31427
33-8	5442-43	5442.5	5440	11.3	1.3	1	50.5	10.6	2.64	65	7	7.5	CMU	43-013-31427
33-8	5443-44	5443.5	5441	11.5	2.1	1.6	51.9	10.1	2.63	75	7	8	CMU	43-013-31427
33-8	5444-45	5444.5	5442	10.2	0.59	0.49	49.1	15.5	2.64	90	6	8	CMU	43-013-31427
33-8	5445-46	5445.5	5443	7.6	0.27	0.08	55.5	16.8	2.65	85	7	9	CMU	43-013-31427
33-8	5446-47	5446.5	5444	8.9	0.56	0.08	49.8	21	2.64	60	12	12	CMU	43-013-31427
33-8	5447-48	5447.5	5445	9.8	0.46	0.29	52.2	15.3	2.64	50	13.5	13.5	CMU	43-013-31427
33-8	5448-49	5448.5	5446	6.5	0.16	0.01	45.6	33.5	2.66	50	13.5	13.5	CMU	43-013-31427
33-8	5451-52	5451.5	5449	10.4	0.53	0.46	50.6	13.3	2.65	55	10.5	11	CMU	43-013-31427
33-8	5452-53	5452.5	5450	9.8	0.28	0.17	51.2	14.5	2.68	55	11	11	CMU	43-013-31427
33-8	5453-54	5453.5	5451	6.9	0.17	0.01	45.7	27.2	2.71	55	10	10.5	CMU	43-013-31427
33-8	5454-55	5454.5	5452	10.2	0.51	0.19	49	16.5	2.67	60	9.5	10	CMU	43-013-31427
33-8	5455-56	5455.5	5453	8.8	0.25	0.17	47.8	18.3	2.68	65	9	9.5	CMU	43-013-31427

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
33-8	5456-57	5456.5	5454	7.8	0.12	0.01	47.8	19.8	2.69	55	12	12	CMU	43-013-31427
33-8	5457-58	5457.5	5455	8.4	0.2	0.11	46.8	20.1	2.66	55	13	13	CMU	43-013-31427
33-8	5458-59	5458.5	5456	10.4	0.51	0.38	53.6	12.8	2.65	75	12	12	CMU	43-013-31427
33-8	5459-60	5459.5	5457	10	0.39	0.33	52.1	14	2.67	80	10	11	CMU	43-013-31427
33-8	5461-62	5461.5	5459	4.9	0.1	0.01	44.1	30.6	2.67	60	10	10.5	CMU	43-013-31427
33-8		4109	4109	16.9	16		45	52.8	2.66	40	18	18	MGR13	43-013-31427
33-8		4114	4114	15.1	8.9		46.5	50.6	2.66	45	17	17	MGR13	43-013-31427
33-8		4141.5	4141	13.2	2.5		49.6	43.8	2.66	45	15	15	MGR13	43-013-31427
33-8		4142	4142	10.8	0.43		42.2	27.6	2.67	40	16	16	MGR13	43-013-31427
33-8		4315	4315	13.3	3.4		51.6	42.7	2.66	40	13	13	MGR10	43-013-31427
33-8		4350	4350	6.6	0.03		26.9	41.9	2.67	50	7.5	8	MGR10	43-013-31427
33-8		4401	4401	24.6	122		30	63.1	2.77	10	15.5	19.5	MGR9	43-013-31427
33-8		4536	4536	11.5	0.31		67.6	10.3	2.67	40	14	14	MGR8	43-013-31427
33-8		4546	4546	6.1	0.02		57.4	26.5	2.68	60	4	7	MGR8	43-013-31427
33-8		4655	4655	4.4	0.02		54.3	34.2	2.66	85	4	11	MGR6	43-013-31427
33-8		4659	4659	15.3	569		36	57.3	2.66	100	6	12	MGR6	43-013-31427
33-8		5013	5013	5.7	0.02		59.8	34.3	2.65	50	7	8	LDC	43-013-31427
33-8		5041	5041	6.9	0.03		61.4	26.4	2.67	50	9	10	LDC	43-013-31427
33-8		5077	5077	10.1	0.28		52.5	12.4	2.68	35	13	13	LDC	43-013-31427
33-8		5171	5171	9.5	0.25		56.1	15.7	2.67	40	13	13.5	LDC	43-013-31427
33-8		5275	5275	10.5	787		54.5	11.7	2.47	55	15	21	LDC	43-013-31427
33-8		5446	5446	6.9	0.77		46.1	31.1	2.64	50	13.5	13.5	CMU	43-013-31427
33-8		5455	5455	11.5	0.67		43.4	19.1	2.66	55	13	13	CMU	43-013-31427
33-8		5462	5462	8.3	0.17		54	19.6	2.68	65	12	12	CMU	43-013-31427

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
9-34		4994	4994	6.3	0.04		55	34.9	2.66	60	10.5	10.5	MGR7	43-013-31407
9-34		5004	5004	11	0.45		50.1	20.2	2.65	85	13	15.5	MGR7	43-013-31407
9-34		5006	5006	13.5	1.7		51.5	12.5	2.66	60	15	16	MGR7	43-013-31407
9-34		5338	5338	14.4	0.8		55.7	20.7	2.66	70	16	18	LDC	43-013-31407
9-34		5344	5344	3.8	0.03		75.1	18.7	2.67	65	7	9	LDC	43-013-31407
9-34		5356	5356	10.4	0.16		57.5	20.2	2.69	80	11.5	14	LDC	43-013-31407
9-34		5650	5650	9	0.11		64.8	37.4	2.67	75	14	17.5	LDC	43-013-31407
9-34		5651	5651	13.1	0.63		69.4	12.3	2.66	65	17	19	LDC	43-013-31407
9-34		5857	5857	10.6	0.15		33.7	37.5	2.67	75	10	13	CMU	43-013-31407
9-34		5858	5858	10	0.17		33.7	30.3	2.68	70	10	13	CMU	43-013-31407
9-34		5862	5862	14	5		34.3	36.4	2.65	85	11.5	13.5	CMU	43-013-31407
9-34		5903	5903	9.7	0.14		40.4	35.2	2.68	60	11	12	CMU	43-013-31407
9-34		6093	6093	7.7	0.2		38.3	55.1	2.68	55	12	14	CMU	43-013-31407
11-20	4971.2-71.	4971.5	4975	14.2	1.317		53.6	5.7	2.76	20	6	8.5	LGRLS	43-013-32088
11-20	4971.9-72.	4972	4976	2	22.6		33.5	51.8	2.54	20	4.5	8	LGRLS	43-013-32088
11-20	4972.2-72.	4972.5	4976	0.4	0.005		28.5	60.5	2.71	20	4.5	8	LGRLS	43-013-32088
11-20	4988.7-89.	4988.9	4993	2.2	0.017		41.4	12.8	2.75	25	5	13	LGRLS	43-013-32088
11-20	4989.2-89.	4989.5	4994	3.6	0.012		44.7	44.3	2.75	55	9	16.5	LGRLS	43-013-32088
11-20	4989.8-90.	4990	4994	4.3	0.004		77	9.3	2.75	45	9	16	LGRLS	43-013-32088
11-20	4990.3-90.	4990.5	4995	14.4	0.509		79.3	0.8	2.77	85	20	15.5	LGRLS	43-013-32088
11-20	4993.0-93.	4993.1	4997	8.3	0.133		50.7	7.2	2.75	30	5.5	9	LGRLS	43-013-32088
11-20	4993.2-93.	4993.5	4998	12.3	0.447		52	4.9	2.74	20	8	11	LGRLS	43-013-32088
11-20	4993.8-94.	4994	4998	5.9	0.028		73.8	6.8	2.75	20	8	11	LGRLS	43-013-32088
11-20	4994.2-95.	4995	4999	8.1	0.068		59.7	24.1	2.74	30	10	13	LGRLS	43-013-32088

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
11-20	4995.8-98.	4997	5001	10.1	2.7		62.2	4.6	2.74	25	9	10	LGRLS	43-013-32088
11-20	4998.2-98.	4998.5	5002	18.9	2.07		87	2.1	2.74	15	10	10	LGRLS	43-013-32088
11-20	4998.7-99.	4999	5003	10.3	0.233		69.5	9.9	2.7	15	4	5	LGRLS	43-013-32088
11-20	4999.2-99.	4999.5	5004	15.3	0.393		54.9	5.3	2.76	30	5	5.5	LGRLS	43-013-32088
11-20	5000.2-00.	5000.5	5005	2.4	0.022		79.8	16.7	2.74	35	4	5.5	LGRLS	43-013-32088
11-20	5001.2-1.8	5001.5	5006	4.1	0.017		85.2	14.6	2.67	60	2	7	LGRLS	43-013-32088
11-20	5001.8-2.2	5002	5006	2	0.005		44.9	21.9	2.68	60	2	7	LGRLS	43-013-32088
11-20	5002.2-2.6	5002.4	5006	1.8	0.005		88	11.5	2.68	60	3	10	LGRLS	43-013-32088
11-20	5002.6-3	5002.8	5007	0.5	0.005		26.7	16.2	2.67	70	3	10	LGRLS	43-013-32088
11-20	5017.6-18.	5017.9	5122	3.4	0.101		90.4	5.8	2.76	55	2	3.5	LGRLS	43-013-32088
11-20	5018.8-19.	5019	5023	6.8	0.01		81.9	11.6	2.77	10	2	5	LGRLS	43-013-32088
11-20	5019.2-19.	5019.5	5024	10	0.026		68.2	18	2.78	25	0	4	LGRLS	43-013-32088
11-20	5019.8-20.	5020	5024	10.4	0.033		48.8	34.6	2.77	25	0	4	LGRLS	43-013-32088
11-20	5020.2-20.	5020.5	5025	5.7	0.009		79.1	17.6	2.76	45	2	6.5	LGRLS	43-013-32088
11-20	5020.8-21.	5021	5025	6.9	0.029		64.6	17.3	2.76	45	2	6.5	LGRLS	43-013-32088
11-20	5021.2-21.	5021.5	5026	0.3	0.021		69.1	29.4	2.66	75	7	10	LGRLS	43-013-32088
11-20	5022.4-22.	5022.6	5027	1.5	0.003		57.6	39.9	2.72	85	9	12	LGRLS	43-013-32088
11-20	5120.7-21.	5121.3	5126	1.8	0.013		54	25	2.71	75	7	13.5	LGRLS	43-013-32088
11-20	5121.5-22.	5122	5126	1.8	0.003		65.3	24.9	2.73	75	7	13.5	LGRLS	43-013-32088
11-20	5130-31	5130.5	5134	3.3	0.015		89.3	6.8	2.76	25	0	2.5	LGRLS	43-013-32088
11-20	5131.7-32.	5132.3	5136	3.9	0.003		27.5	71.2	2.72	45	4	6.5	LGRLS	43-013-32088
11-20	5132.4-33.	5132.9	5137	1.7	3025		29	13.7	2.7	50	4	7	LGRLS	43-013-32088
11-20	5133.4-34.	5133.9	5138	8.5	0.042		79	10	2.75	45	0	4	LGRLS	43-013-32088
11-20	5143.7-44.	5144.2	5148	1.4	0.003		62.1	4.9	2.67	75	3	5	LGRLS	43-013-32088

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
11-20	5145.7-46.	5146.2	5150	2.4	0.003		59.6	9.2	2.71	55	3	4	LGRLS	43-013-32088
11-20	5146.7-47.	5147.2	5151	1.9	0.003		54.9	44.3	2.73	70	2	4	LGRLS	43-013-32088
11-20	5148.7-49.	5149.2	5153	1.8	0.003		60.5	36.2	2.72	75	4	5	LGRLS	43-013-32088
11-20	5149.7-50.	5150.2	5154	1	0.004		51.7	44.8	2.69	65	4	4.5	LGRLS	43-013-32088
5-33		4666	4666	12.81	5.775				2.65	40	15.5	16	MGR11	43-013-31435
5-33		5023	5023	5.35	0.022				2.66	90	6	9	MGR6	43-013-31435
5-33		5028	5028	12.28	0.755				2.65	135	7.5	14.5	MGR6	43-013-31435
5-33		5033	5033	9.48	0.203				2.65	115	1.5	11	MGR6	43-013-31435
5-33		5035	5035	10.62	0.912				2.65	115	5	14.5	MGR6	43-013-31435
5-33		5040	5040	4.93	0.031				2.66	105	4	12	MGR6	43-013-31435
5-33		5456	5456	12.37	1.315				2.66	60	14	16.5	LDC	43-013-31435
5-33		5458	5458	12.45	1.562				2.65	75	10	12	LDC	43-013-31435
5-33		5464	5464	10.75	0.14				2.65	130	4	15	LDC	43-013-31435
5-33		5918	5918	10.17	0.683				2.66	150	3	9	CMU	43-013-31435
5-33		5922	5922	8.96	0.141				2.65	65	10	12	CMU	43-013-31435
5-33		5931	5931	9.51	0.108				2.67	105	9	11.5	CMU	43-013-31435
5-33		5993	5993	9.68	0.168				2.66	145	4	16	CMU	43-013-31435
5-33		6028	6028	4.24	0.013				2.76	70	3	8	CMU	43-013-31435
5-33		6054	6054	7.33	0.036				2.66	45	10	12.5	CMU	43-013-31435
5-33		5304	5304	14	2.282				2.65	105	3	9.5	LDC	43-013-31435
6-32	5042-43	5042-43	5046	5.3	0.09		40.4	22.4	2.67	55	13	15	MGR5	43-013-30748
6-32	5043-44	5043-44	5047	4.3	0.01		0	83.5	2.65	55	12.5	14	MGR5	43-013-30748
6-32	5046-47	5046-47	5050	4.1	0.08		0	90.8	2.71	100	6	13	MGR5	43-013-30748
6-32	5047-48	5047-48	5051	5.5	0.15		49.7	9.1	2.65	75	8	11	MGR5	43-013-30748

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
6-32	5048-49	5048-49	5052	11.3	8.5		47.8	9.7	2.65	65	8.5	10	MGR5	43-013-30748
6-32	5049-50	5049-50	5053	10.2	0.64		41.4	8.9	2.64	65	8	9.5	MGR5	43-013-30748
6-32	5050-51	5050-51	5054	11.5	1.9		48	7.9	2.64	75	7	10	MGR5	43-013-30748
6-32	5051-52	5051-52	5055	9.6	0.25		42.6	9.8	2.64	70	5	7.5	MGR5	43-013-30748
6-32	5052-53	5052-53	5056	9.8	0.25		45.7	9.1	2.64	65	5.5	7.5	MGR5	43-013-30748
15-24B		4768.5	4766	4.9	0.05				2.3	75	16	16	CMU	43-047-32420
15-24B		4769.5	4767	8.1	3.2				2.71	35	-6	7	CMU	43-047-32420
15-24B		4770	4768	1.6	0.03				2.7	35	0	1.5	CMU	43-047-32420
15-24B		4771.5	4769	1.9	0.03				2.71	35	0	6	CMU	43-047-32420
15-24B		4772.5	4770	11.2	3.4				2.67	30	3	10.5	CMU	43-047-32420
15-24B		4773.5	4771	15.6	4.1				2.68	25	1	9	CMU	43-047-32420
15-24B		4774.5	4772	7.2	1				2.75	25	0	8	CMU	43-047-32420
15-24B		4775.5	4773	10.3	0.7				2.69	30	0	4	CMU	43-047-32420
15-24B		4776.5	4774	10.2	0.62				2.69	25	0	3.5	CMU	43-047-32420
15-24B		4777.5	4775	0.1	0.02				2.69	20	0	3	CMU	43-047-32420
15-24B		4778.5	4776	7.7	0.57				2.64	15	0	0	CMU	43-047-32420
15-24B		4779.5	4777	5.6	0.12				2.67	15	0	0	CMU	43-047-32420
15-24B		4780.5	4778	0.6	0.02				2.7	15	0	0	CMU	43-047-32420
15-24B		4781.5	4779	1.6	0.01				2.74	15	0	0	CMU	43-047-32420
15-24B		4782.5	4780	1.5	0.02				2.69	15	0	0	CMU	43-047-32420
15-24B		4783.5	4781	1.3	0.02				2.69	15	0	0	CMU	43-047-32420
15-24B		4784.5	4782	4.2	0.04				2.67	15	0	0	CMU	43-047-32420
15-24B		4785.5	4783	0.5	0.001				2.69	15	0	0	CMU	43-047-32420
15-24B		4786.5	4784	0.6	0.02				2.7	15	0	0	CMU	43-047-32420

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
15-24B		4787.5	4785	0.4	0.02				2.68	25	0	0	CMU	43-047-32420
15-24B		4788.5	4786	4.3	0.12				2.69	40	1	5	CMU	43-047-32420
15-24B		4789.5	4787	0.8	0.02				2.66	50	3	6.5	CMU	43-047-32420
15-24B		4790.5	4788	0.8	0.11				2.36	40	0	2.5	CMU	43-047-32420
15-24B		4791.5	4789	0.9	0.03				2.7	40	0	2	CMU	43-047-32420
15-24B		4792.5	4790	0.1	0.02				2.68	45	0	2.5	CMU	43-047-32420
15-24B		4793.5	4791	0.9	0.53				2.69	75	0	5	CMU	43-047-32420
15-24B		4794.5	4792	0.3	0.02				2.74	130	0	9	CMU	43-047-32420
15-24B		4795.5	4793	1.6	0.04				2.54	105	0	6	CMU	43-047-32420
15-24B		4796.5	4794	3.7	0.05				2.54	85	0	4.5	CMU	43-047-32420
15-24B		4797.5	4795	4.4	0.03				2.66	85	0	4	CMU	43-047-32420
15.24B		4798.5	4796	3	0.01				2.68	85	0	5	CMU	43-047-32420
15-24B		4798.5	4797	4.9	0.03				2.65	95	0	6	CMU	43-047-32420
15-24B		4799.5	4798	6.2	0.06				2.67	95	0	7	CMU	43-047-32420
15-24B		4800.5	4798	4.1	0.02				2.69	95	0	7	CMU	43-047-32420
15-24B		4801.5	4799	6.4	0.1				2.71	80	0	7	CMU	43-047-32420
15-24B		4802.5	4800	5.8	0.08				2.72	75	0	7	CMU	43-047-32420
15-24B		4803.5	4801	5.8	0.14				2.79	75	1	8.5	CMU	43-047-32420
15-24B		4804.5	4802	6.8	0.23				2.69	75	1	8.5	CMU	43-047-32420
15-24B		4805.5	4803	7.7	0.56				2.66	60	2	9.5	CMU	43-047-32420
15-24B		4806.5	4804	9.4	0.93				2.65	50	6	12	CMU	43-047-32420
15-24B		4807.5	4805	10.8	1.8				2.63	55	7.5	13	CMU	43-047-32420
15-24B		4808.5	4806	11.4	2.6				2.63	60	7	13	CMU	43-047-32420
15-24B		4809.5	4807	9	0.57				2.61	70	5	12	CMU	43-047-32420

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
15-24B		4810.5	4808	7.8	0.16				2.63	115	0	12.5	CMU	43-047-32420
1-26	5266-67	5266.5	5266	4	1.3	0.001	0	96.4	2.71	165	6	9	CMU	43-013-30609
1-26	5267-67.4	5267.2	5267	5.5	0.31	0.08	0	95.5	2.72	140	3	10	CMU	43-013-30609
1-26	5268.4-69	5268.7	5268	4.3	0.001	0.001	0	89.3	2.71	135	2	9.5	CMU	43-013-30609
1-26	5269-70	5269.5	5269	3.9	0.01	0.001	0	86.2	2.68	135	2	9.5	CMU	43-013-30609
1-26	5270-71	5270.5	5270	3.7	0.001	0.001	0	89.3	2.68	135	2	9.5	CMU	43-013-30609
1-26	5271-72	5271.5	5271	3.8	0.01	0.001	0	72.9	2.69	140	2	9.5	CMU	43-013-30609
1-26	5272-73	5272.5	5272	4	0.02	0.01	0	84.7	2.68	150	4	12	CMU	43-013-30609
1-26	5273-74	5273.5	5273	5.7	5.4	0.03	6.7	76.7	2.68	145	6	13	CMU	43-013-30609
1-26	5274-75	5274.5	5274	5.2	0.06	0.03	7.1	77.1	2.64	105	6	11	CMU	43-013-30609
1-26	5275-76	5275.5	5275	4.5	0.95	0.04	0	89.2	2.68	115	6	9.5	CMU	43-013-30609
1-26	5276-77	5276.5	5276	4.4	0.19	0.08	0	93.6	2.68	125	6	10	CMU	43-013-30609
1-26	5277-78	5277.5	5277	3.2	0.06	0.001	6.2	91.3	2.67	115	5	10	CMU	43-013-30609
1-26	5278-79	5278.5	5278	8.1	0.06	0.05	22.1	51	2.65	105	6	10	CMU	43-013-30609
1-26	5279-80	5279.5	5279	8.4	0.06	0.06	26.3	43.1	2.65	90	8	10.5	CMU	43-013-30609
1-26	5280-81	5280.5	5280	9.5	0.12	0.13	30.3	34	2.65	105	7	10.5	CMU	43-013-30609
1-26	5281-82	5281.5	5281	9.2	0.17	0.15	31.8	31.2	2.65	140	6	12	CMU	43-013-30609
1-26	5282-83	5282.5	5282	8.6	0.14	0.13	27.7	36.5	2.64	135	7	13.5	CMU	43-013-30609
1-26	5283-84	5283.5	5283	9.2	0.19	0.16	32.9	30.1	2.65	115	10	13	CMU	43-013-30609
1-26	5284-85	5284.5	5284	10.2	174	0.53	37.8	26	2.67	100	11	13	CMU	43-013-30609
1-26	5285-86	5285.5	5285	9.3	0.23	0.18	32.9	29.2	2.65	100	11	13.5	CMU	43-013-30609
1-26	5286-87	5286.5	5286	7.5	0.12	0.07	26.5	41.1	2.66	80	12	13.5	CMU	43-013-30609
1-26	5287-88	5287.5	5287	8.9	14	0.15	35.1	30.7	2.67	85	11	13.5	CMU	43-013-30609
1-26	5288-89	5288.5	5288	8.9	0.22	0.22	34.8	32	2.65	90	10	13	CMU	43-013-30609

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
1-26	5289-90	5289.5	5289	9.1	0.88	0.21	34.3	29.9	2.66	85	11	13	CMU	43-013-30609
1-26	5290-91	5290.5	5290	8	4.2	0.03	29.9	37.2	2.66	80	12	14	CMU	43-013-30609
1-26	5291-92	5291.5	5291	8.7	0.17	0.1	35.5	32.1	2.65	100	11	13	CMU	43-013-30609
1-26	5292-93	5292.5	5292	7.8	0.21	0.05	37.6	38	2.66	120	11.5	13	CMU	43-013-30609
1-26	5293-94	5293.5	5293	8.8	0.18	0.06	34.7	30.2	2.66	120	11	13	CMU	43-013-30609
1-26	5294-95	5294.5	5294	9.2	274	243	30.3	30.2	2.68	120	11	13	CMU	43-013-30609
1-26	5295-96	5295.5	5295	6.9	0.73	0.01	29.5	40.1	2.67	120	9	12	CMU	43-013-30609
1-26	5296-97	5296.5	5296	7.4	0.22	0.01	25.3	45.9	2.67	120	10	12.5	CMU	43-013-30609
1-26	5307-8	5307.5	5307	3.9	0.16	0.01	0	94.6	2.71	170	6	19	CMU	43-013-30609
1-26	5308-9	5308.5	5308	2.2	0.01	0.001	0	94.9	2.71	150	10	21	CMU	43-013-30609
1-26	5309-10	5309.5	5309	2.1	0.001	0.01	0	95.2	2.7	135	8	19	CMU	43-013-30609
1-26	5310-11	5310.5	5310	1.8	126	114	0	90.4	2.71	145	6	18	CMU	43-013-30609
1-26	5312-13	5312.5	5312	2.6	413	365	0	92.1	2.72	160	6	19	CMU	43-013-30609
13-32		5540	5540	9.9	0.63					85	11	14	LDC	43-013-31112
13-32		5584	5584	13	1.73					85	14.5	17	LDC	43-013-31112
13-32		5600	5600	15	6.27					75	16.5	18	LDC	43-013-31112
33-11J	4854-55	4854.5	4859	7.9	0.01	0.001	0	87	2.69	105	7	13	MGR5	43-013-31451
33-11J	4855-56	4855.5	4860	7.2	0.04	0.01	31.7	39.1	2.66	100	8	13	MGR5	43-013-31451
33-11J	4856-57	4856.5	4861	10	0.46	0.21	27.5	12.4	2.65	75	12	14	MGR5	43-013-31451
33-11J	4857-58	4857.5	4862	11	1.1	0.82	31.6	14.4	2.65	75	11	13	MGR5	43-013-31451
33-11J	4858-59	4858.5	4863	8.3	0.06	0.02	37.5	21.7	2.66	90	6	11.5	MGR5	43-013-31451
33-11J	4859-60	4859.5	4864	9	0.08	0.05	38	23.3	2.66	120	4	12	MGR5	43-013-31451
33-11J	4860-61	4860.5	4865	8.1	0.01	0.001	0	82.6	2.68	105	6	12.5	MGR5	43-013-31451
33-11J	4863-64	4863.5	4868	9.7	0.14	0.04	28.2	29	2.66	60	13	15	MGR5	43-013-31451

Well number	Depth Interval	Core Depth	Log Depth	Core porosity	Horz perm	Vert perm	Core So	Core Sw	Grain density	Log GR	Log Den Por	Log D/N Por	Log cycle	API Number
33-11J	4864-65	4864.5	4869	10.3	0.99	0.13	43.1	14.8	2.66	100	3	9	MGR5	43-013-31451
33-11J	4865-66	4865.5	4870	12.3	1.1	0.26	0.5	16.5	2.66	110	4	14	MGR5	43-013-31451
33-11J	4866-67	4866.5	4871	10.6	2.2	0.2	39.1	20.3	2.65	105	3.5	11.5	MGR5	43-013-31451
33-11J	4867-68	4867.5	4872	12.9	7.2	0.17	38.8	21.5	2.68	120	10	16	MGR5	43-013-31451
33-11J	4868-69	4868.5	4873	4.5	0.03	0.001	24.8	27.2	2.66	95	12	18	MGR5	43-013-31451
33-11J	4869-70	4869.5	4874	13.8	19	1.9	37.2	14.6	2.65	85	4	12	MGR5	43-013-31451
33-11J	5168-69	5168.5	5173	5	0.28	0.02	50.3	11.8	2.67	90	3	8.5	LDC	43-013-31451
33-11J	5170-71	5170.5	5175	3.8	0.16	0.001	28.3	55.3	2.69	95	3	8.5	LDC	43-013-31451
33-11J	5171-72	5171.5	5176	2.5	0.001	0.001	24.7	59.9	2.69	90	4.5	9	LDC	43-013-31451
33-11J	5181-82	5181.5	5177	5.7	0.01	0.001	10.9	62.7	2.69	90	6	10	LDC	43-013-31451
33-11J	5182-83	5182.5	5187	7.6	0.01	0.04	52.6	13.1	2.67	100	5	10	LDC	43-013-31451
33-11J	5183-84	5183.5	5188	8.3	0.04	0.02	54.8	10.2	2.67	120	5	11.5	LDC	43-013-31451
33-11J	5184-85	5184.5	5189	11.4	0.55	0.5	51.4	4.6	2.65	115	6	13	LDC	43-013-31451
33-11J	5185-86	5185.5	5190	11.5	0.75	0.2	54.3	7.4	2.65	75	10	13	LDC	43-013-31451
33-11J	5186-87	5186.5	5191	11.5	1.1	0.72	50	5.4	2.64	70	11	14.5	LDC	43-013-31451
33-11J	5187-88	5187.5	5192	9.2	0.43	0.22	49.6	4.8	2.65	60	13	16	LDC	43-013-31451
33-11J	5188-89	5188.5	5193	6.7	0.21	0.09	57.7	6.3	2.67	60	14	16.5	LDC	43-013-31451
33-11J	5189-90	5189.5	5194	5.8	0.05	0.03	47.7	11.7	2.65	60	12	15	LDC	43-013-31451
33-11J	5190-91	5190.5	5195	9.1	0.001	0.001	57.7	23.2	2.67	70	10	13	LDC	43-013-31451
33-11J	5191-92	5191.5	5196	7.7	0.03	0.001	67	19	2.67	75	9.5	13.5	LDC	43-013-31451
33-11J	5192-93	5192.5	5197	8.4	0.1	0.11	58.8	4.3	2.66	120	8.5	15	LDC	43-013-31451
33-11J	5193-94	5193.5	5198	11.2	1.4	0.59	50.9	2.8	2.66	130	9	13.5	LDC	43-013-31451
33-11J	5194-95	5194.5	5199	12.3	1.3	0.06	50.1	6.7	2.65	90	9	13	LDC	43-013-31451
33-11J	5195-96	5195.5	5200	14.4	8.2	4	48.7	12.1	2.65	75	10	13.5	LDC	43-013-31451

Well	Depth	Core	Log	Core	Horz	Vert	Core	Core	Grain	Log	Log Den	Log D/N	Log	API
number	Interval	Depth	Depth	porosity	perm	perm	So	Sw	density	GR	Por	Por	cycle	Number
33-11J	5196-97	5196.5	5201	14.2	8.3	5	66.7	12	2.65	60	13	15	LDC	43-013-31451
33-11J	5197-98	5197.5	5202	13.3	4.3	1.4	40.6	4	2.64	50	16	18	LDC	43-013-31451
33-11J	5198-99	5198.5	5203	13.7	5.7	2.1	42	8.6	2.64	50	16	18	LDC	43-013-31451
33-11J	5199-5200	5199.5	5204	15.3	9.4	5.6	45.1	12.8	2.66	55	15.5	17.5	LDC	43-013-31451
33-11J	5200-01	5200.5	5205	6.2	0.1	0.001	56.7	3	2.66	55	14.5	12	LDC	43-013-31451
33-11J	5201-02	5201.5	5206	5.5	0.01	0.02	63.5	9.4	2.66	50	16	18	LDC	43-013-31451
33-11J	5202-03	5202.5	5207	5.6	0.03	0.001	48.6	16.4	2.68	60	15	16.5	LDC	43-013-31451
33-11J	5203-04	5203.5	5208	2.8	0.02	0.02	27.2	57.9	2.67	75	14	15	LDC	43-013-31451
33-11J	5204-05	5204.5	5209	2	0.03	0.01	2	36.8	2.68	85	6	11	LDC	43-013-31451
12-35	5005-6	5005.5	5002	9	0.47		37.9	11.8	2.66	70	12	13.5	MGR7	43-13-30744
12-35	5006-7	5006.5	5004	3.9	0.001		48.1	26.2	2.68	90	10	15	MGR7	43-13-30744
12-35	5007-8	5007.5	5004	4.4	0.001		0	86	2.71	115	7	18.5	MGR7	43-13-30744
12-35	5008-9	5008.5	5005	16.5	127		31.6	12.1	2.64	75	12	20	MGR7	43-13-30744
12-35	5009-10	5009.5	5006	16.4	119		41.7	9.1	2.65	55	18	20	MGR7	43-13-30744
12-35	5010-11	5010.5	5007	9.6	2.2		44.8	8.5	2.66	50	18	19	MGR7	43-13-30744
12-35	5011-12	5011.5	5008	9.4	2.4		40.1	11.5	2.66	50	15	15	MGR7	43-13-30744
12-35	5012-13	5012.5	5009	9	0.33		45.9	11	2.66	60	14	14	MGR7	43-13-30744
12-35	5013-14	5013.5	5010	2.8	0.001		38.6	49.7	2.74	90	8	12	MGR7	43-13-30744
12-35	5014-15	5014.5	5011	2.8	0.001		58	21	2.66	105	5	11.5	MGR7	43-13-30744
12-35	5015-16	5015.5	5012	6.8	0.12		57.3	17.9	2.65	90	7	10	MGR7	43-13-30744
12-35	5016-17	5016.5	5013	5.6	0.01		26.7	57.9	2.72	85	7	10.5	MGR7	43-13-30744
12-35	5019-18	5019.5	5014	9.1	0.61		38.1	21.4	2.67	90	8	12	MGR7	43-13-30744
12-35	5018-19	5018.5	5015	10.3	0.66		44.5	16.2	2.65	50	14	15	MGR7	43-13-30744
12-35	5019-20	5019.5	5016	10.3	0.13		45.5	13.3	2.64	50	14	14	MGR7	43-13-30744

Well	*Depth*	*Core*	*Log*	*Core*	*Horz*	*Vert*	*Core*	*Core*	*Grain*	*Log*	*Log Den*	*Log D/N*	*Log*	*API*
number	*Interval*	*Depth*	*Depth*	*porosity*	*perm*	*perm*	*So*	*Sw*	*density*	*GR*	*Por*	*Por*	*cycle*	*Number*
12-35	5020-21	5020.5	5017	8.7	0.28		46.2	15	2.65	50	14	14	MGR7	43-13-30744
12-35	5021-22	5021.5	5018	5	0.01		48.8	19.6	2.65	55	12	12	MGR7	43-13-30744
12-35	5022-23	5022.5	5019	3.3	0.01		21.6	5.6	2.69	60	14	15	MGR7	43-13-30744
12-35	5023-24	5023.5	5020	3	0.001		31.1	51.9	2.66	60	14	14	MGR7	43-13-30744
12-35	5024-25	5024.5	5021	2.5	0.001		33.9	52.2	2.68	65	12	12	MGR7	43-13-30744