STUDY DONE FOR

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

New Cut Dune/Marsh Restoration Project
Coastal Terrebonne Parish, Louisiana

High Resolution Geophysical and Archaeological Survey of the South Pelto Area Block 13 Vicinity of Ship Shoal

PRELIMINARY DRAFT 0.0

By

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SEPTEMBER 2003

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EPA 68-W-02-009
Work Assignment 1-02
CEI Job # 23028
C&C Project # 4037-4040 (South Pelto 13)
C&C Project # 4036-4030 (Ship Shoal 88)

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EXECUTIVE SUMMARY

- C & C Technologies, Inc. performed a geophysical subbottom profiling and mapping survey offshore of coastal Terrebonne Parish, Louisiana on a portion of the Ship Shoal sand body in South Pelto Area Blocks 12, 13, 14, 18 and 19.

- This work was performed under EPA Contract No. 68-W-02-009 for the New Cut Dune/Marsh Restoration Project, a portion of Work Assignment No. 1-02.

- The purpose was to complete a Minerals Management Service (MMS) archaeological and hazard evaluation and to identify the thickness of the Ship Shoal sand body within the study area.

- Seafloor depths range from -26 to -48 feet MLLW across the survey area.

- The seaward side of Ship Shoal dips to the south-southeast at a max gradient of about 0.3°, and the landward side dips to the north-northwest at a max gradient of about 0.7°

- Isopach values of sand comprising the linear Ship Shoal sand feature indicate thickness varies from 0 feet in the northern and southern extremes, to 18 feet in the central region.

- Twelve sonar targets were detected by the side scan sonar system. One of the targets is a debris zone with multiple small targets.

- Eight existing pipelines traverse across the survey area, and seven more exist on the outskirts.

- Six production platforms and two wells also exist just outside the bounds of the survey area.

- Eleven identified magnetic clusters and three associated sonar contacts are recommended for avoidance based upon archaeological potential.

- Dredging, anchoring, and coring activities should take note of and avoid the locations of all sonar targets, pipelines, and other man-made infrastructure.

GEOPHYSICAL ASSESSMENT

1.0 INTRODUCTION

The US Environmental Protection Agency (EPA), Region 6 serves as a member of the Federal Task force created by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), P.L. 101-646, to carry out wetlands restoration projects in coastal Louisiana. The EPA is designated to implement several of these restoration projects in Louisiana, including the New Cut Dune/Marsh Restoration project located in coastal Terrebonne Parish. The New Cut project site is located between East Island and Trinity Island of the Isles Dernieres barrier island chain in southern Terrebonne Parish. The EPA proposes to excavate sand from the eastern portion of the offshore sand body known as Ship Shoal and transport the dredged material to New Cut to restore dunes and marsh. The area from which sand is to be dredged for this project lies in Federal waters of the Gulf of Mexico approximately 9.5 miles south of Isle Dernieres. The proposed borrow locale represents the present project area and contains 10.37 square miles of area encompassing portions of five lease blocks in the South Pelto area; blocks 12, 13, 14, 18 and 19.

Coastal Environments, Inc. of Baton Rouge, Louisiana contracted C&C Technologies, Inc. to perform an Archaeological and Hazard Study under the EPA Contract No. 68-W-02-009 for the New Cut Dune/Marsh Restoration Project (a portion of Work Assignment No. 1-02). The purpose of the high-resolution geophysical survey was to determine the thickness of the Ship Shoal sand body, identify any potential hazards or engineering constraints to dredging and mooring activities, determine the water depths and seafloor and subbottom conditions, and assess cultural resource potential. The survey was conducted in compliance with the latest Minerals Management Service guidelines.

Field operations were conducted aboard the R/V *Ocean Surveyor* between July 31 and August 7, 2003. Sea state ranged from 1 to 5 feet and the data quality was adequate for the geophysical interpretation. Geophysical instruments utilized for the survey included an Edgetech 500 kHz Side Scan Sonar, Odom Echotrac DF 3200 Bathymetric System, GeoMetrics 880 Cesium Magnetometer and SB-0512 Subbottom Towfish. Horizontal positioning of the survey vessel was accomplished using the C-Nav globally corrected GPS system. A Coast Guard beacon was monitored as a secondary source of differential corrections.

The survey grid consists of a total of eighty-eight (88) east-west primary tracklines (Line Nos. 1 to 88) spaced 50 meters apart and eleven (11) north-south tie lines (Line Nos. 89 to 99) spaced 900 meters apart. Line Nos. 100 to 102 were acquired for the correlation subbottom data to borings done in previous studies.

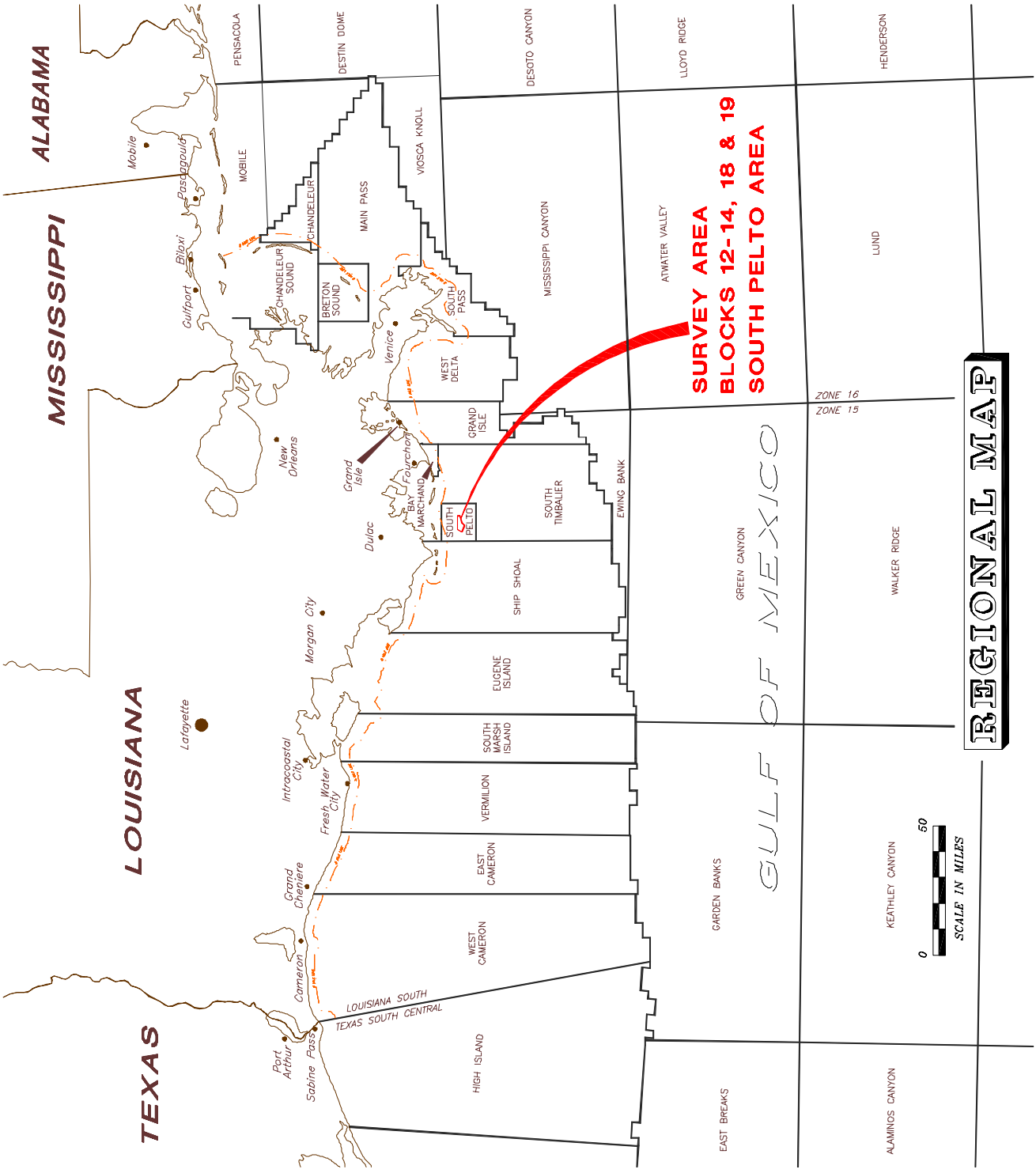
Geophysical data reproductions of pertinent features in the area may be observed in Appendix A. Magnetic Anomaly Tables and a nomogram for estimating the size of ferrous sources are included in Appendix B. A personnel list, boat setback diagram, a copy of the daily survey logs, instrument settings, and equipment descriptions are provided in Appendix C. Appendix D contains the tide curves and sound velocity data used to correct the bathymetric data.

Geophysical data collected from the remote sensing systems were reviewed for geologic interpretation and evidence of potential hazards to dredging and mooring activities. The survey results are projected on the Archaeological and Hazard Map. Isopach thicknesses are presented

GEOPHYSICAL ASSESSMENT

as contours on the Sand Isopach Map. The following written text is intended to be viewed in conjunction with the study maps to provide a comprehensive explanation of the seafloor and subsurface features within the study area. Regional and Vicinity Maps are included on the following two pages (Pages 4 and 5).

GEOPHYSICAL ASSESSMENT



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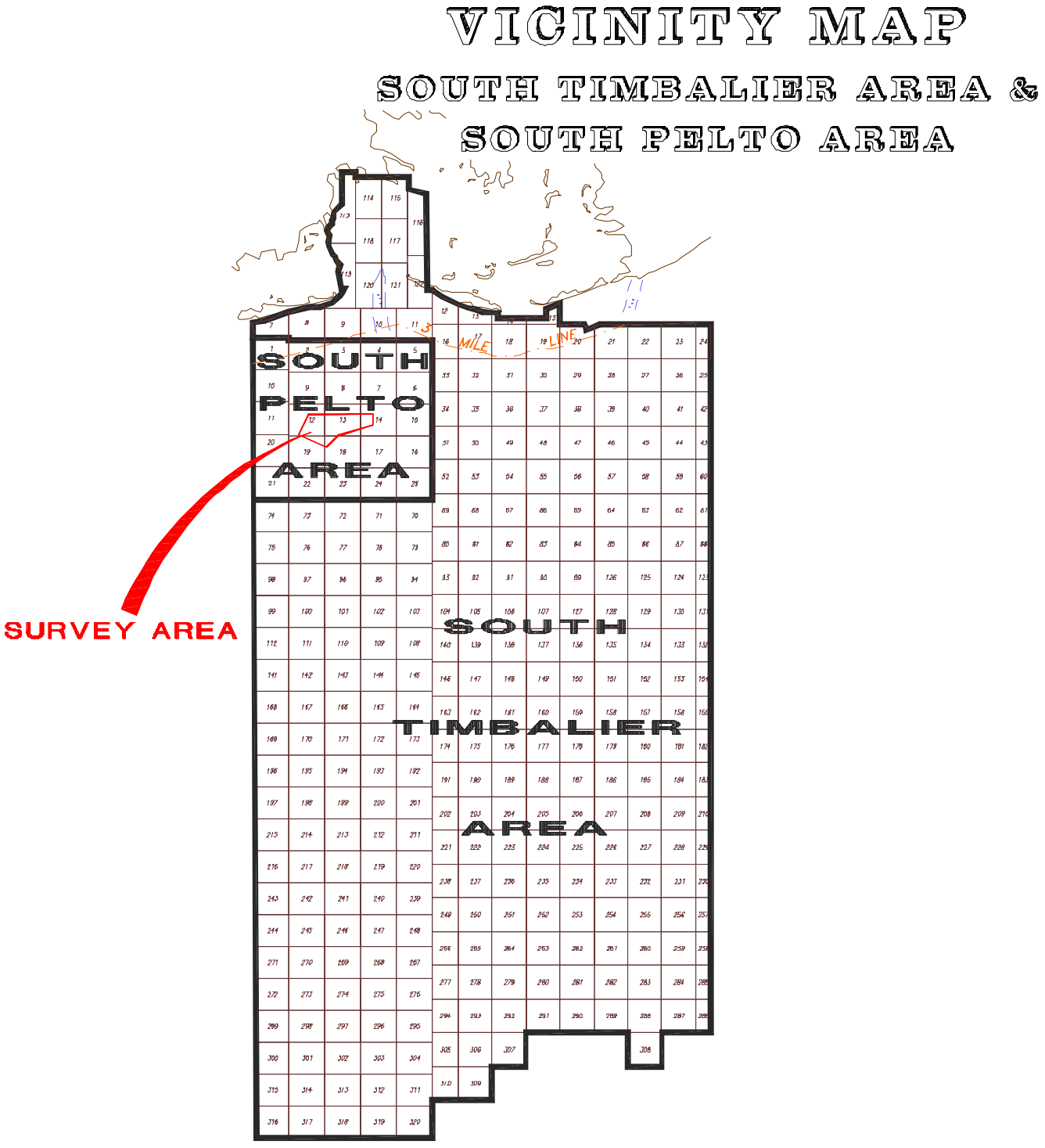

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2.0 REGIONAL GEOLOGIC SETTING

The New Cut Dune/Marsh Restoration project offshore borrow area is located on the inner continental shelf in the Gulf of Mexico in a region that has been influenced by two principal geological processes throughout the late Pleistocene and the Holocene (10,000 yrs ago to present). First is the cyclical marine regression-transgression sequences that have resulted from fluctuating sea levels operating in response to episodes of Pleistocene glaciation and deglaciation. And second is the deltaic processes of the sediment-dominated Mississippi River.

Most of the seafloor beneath the New Cut borrow area consists of a large, submarine sand body known as Ship Shoal. A considerable amount of research has been conducted on the geology, geomorphology and sediment character of Ship Shoal, particularly in relationship to its potential as a source of sand for restoring portions of Louisiana's rapidly eroding coastline (see particularly Kulp et al. 2001; Penland et al. 1985, 1986; Stone 2001; Suter et al. 1985; Williams et al. 1989). Underlying and adjacent to the Ship Shoal region lies a 125 to 150-foot-thick wedge of deltaic sediments deposited by the Mississippi River over the past 10,000 years or so. As with Ship Shoal, the processes of the Mississippi River delta formation and their sequences have been intensively studied and are reasonably well known (Coleman and Gagliano 1996; Frazier 1967; Saucier 1994). This literature on Ship Shoal and Mississippi River deltaic geology has been extensively relied upon in the following geologic synthesis. In addition, information has been drawn from reports of several geophysical studies that have been conducted in the vicinity of the project area. These studies were conducted relative to oil and gas production activities in the region and they provide information on the shallow subsurface geology derived from seismic instrument surveys.

The sand-rich feature known as Ship Shoal comprises most of the seafloor in the project area. Ship Shoal is the largest and easternmost of a series of sand shoals that have developed on the inner continental shelf of Louisiana as a result of deltaic abandonment and marine transgression (Kulp et al. 2001:7). The elongated shoal lies parallel to the coast approximately 8 to 12 miles off of coastal Terrebonne Parish, and measures approximately 30 miles long in an east-west direction. The central portion of the shoal ranges between 2.5 and 5 miles wide, while at its eastern and western ends, width ranges between 3 and 6.2 miles.

Ship Shoal is a transgressive sedimentary feature formed in the past 7,000 years or so from sediments eroded from the distal ends of deltaic features associated with an early Mississippi River delta system known as the Maringouin Delta Complex. The Maringouin Complex was formed when the Mississippi River occupied the western portion of its valley in lower Louisiana from about 6,000 to 7,500 years B.P. (before present) (Frazier 1967; Saucier 1994:Fig. 50). Saucier (1994:278) suggests that Maringouin Delta Complex development began when sea level was perhaps 25 feet lower than at present. At its maximum extent, the Maringouin Delta Complex projected onto the inner shelf off Louisiana to a point seaward of the present position of Ship Shoal; although exactly how far is unknown. As it prograded into this area, the Maringouin Complex deposited the typical stratigraphic sequence associated with deltaic systems which includes sediments associated with prodelta, channel, natural levee, backswamp, lake and marsh environments. The position of the main distributary of the Maringouin Complex is not known, but relict subjugate distributary channels associated with Maringouin Delta surfaces have been identified in subbottom profiler records collected in the central and western

areas of Ship Shoal (Gulf Ocean Services 2001:12; Intersea Research, Inc. 1985:11; Penland et al. 1985:7-43; Thales GeoSolutions 2002).

Frazier (1967) argued that the Maringouin Delta Complex was the earliest Holocene Mississippi River deltaic feature extending into the offshore waters of central Louisiana. However, Penland et al. (1988), relying on seismic and vibracore data, maintain that an earlier Holocene deltaic feature underlies the Maringouin Complex in offshore central Louisiana. They designate this earlier delta the Outer Shoal Delta Complex and others have suggested that it dates between 9,200 and 8,200 years B.P. (Saucier 1994:277). The top of the Outer Shoal Delta Complex is a ravinement surface that occurs at a depth of 45 to 75 feet along the central Louisiana coastline. No definitive information on the aerial extent of this postulated early delta complex is available and it is unknown if it extended into the South Pelto lease area or the vicinity of the present study area.

Frazier (1967) and others have argued that about 6,000 years B.P. the main course of the Mississippi River shifted to the east, abandoning the distributaries of the Maringouin Delta Complex and starting new deltaic deposition in southeastern Louisiana. This view holds that the Mississippi did not shift back to the west and begin another cycle of delta building off the central Louisiana coast until about 3,800 years B.P. with the establishment of what is termed the Teche Delta Complex. However, recently Saucier (1994:278-279) has proposed that the abandonment of the Maringouin Delta Complex was because of sea level rise, not because the Mississippi River shifted to the east. Saucier (1994:278) argues that continued sea level rise after about 6,000 years B.P. submerged large portions of the Maringouin Delta Complex, causing erosion, abandonment of distributaries and subsidence, all of which resulted in a shift of the loci of deltaic sedimentation farther inland. Subsequently, beginning about 4,500 years B.P. new distributary courses formed in the same area as the earlier Maringouin main channel and new deltaic sedimentation began to extend onto the older, now eroded and subsided Maringouin surface. This new delta feature is known as the Teche Delta Complex.

Regardless of the mechanism, once the fluvial sediment supply into the Maringouin Delta Complex distributaries began to be eliminated about 6,000 years ago, deltaic expansion ended and a period of deterioration began. The loosely consolidated sediments and organic deposits within the Maringouin Delta compacted, leading to subsidence. Subsidence, coupled with actual sea level rise, resulted in a rapid relative sea level rise. Some have estimated relative sea level rise in central coastal Louisiana to have been on the order of 0.40 to 0.54 inches per year (Penland et al. 1985:7-13); although others suggest a much lesser rate (Saucier 1994). Rising sea level, together with cessation of delta growth, led to erosion of deltaic headlands, landward migration of the shoreline and, ultimately, to transgression of the Maringouin Delta sediments by marine waters.

During transgression, marine processes reworked marginal deltaic landforms, removing fine-grained material and leaving behind heavier, sandy sediments such as those found in channels and distributary mouth bars. These sands initially formed into an erosional headland with flanking headland barriers and recurved spits that were transformed over time into a barrier island arc separated from the continually eroding mainland as relative sea level rise continued. These barrier island features represent the progenitors of what was to become Ship Shoal as well

as two other coastal Louisiana submerged features, Trinity and Tiger shoals.

During this period, estuarine and marine lagoon environments, similar to those seen in modern-day Terrebonne Bay, developed between the barrier islands and the retreating mainland shoreline. Fine-grained sediments associated with these lagoonal environments form a thin veneer over portions of the deltaic sediments beneath Ship Shoals. The extent and configuration of this lagoonal stratum have not been fully defined, but Penland et al. (1985:7-43) note these lagoonal deposits are "only found under the western end of Ship Shoal." These lagoonal sediments represent the earliest of the transgressive depositional facies in the project area (Penland et al. 1985:7-33). Vibracore data indicate that these deposits range from 1.6 to 5 feet thick and consist of a “uniform sequence of silty clay containing parallel laminations, starved ripples, asymmetrical ripple laminations, and shell” (Penland et al. 1985:7-33).

Ultimately, continued sea level rise and reworking of the barrier island features by marine processes produced a completely submerged, sand-rich marine shoal; today known as Ship Shoal (Kulp et al. 2001:3-5). The sandy spits and barrier islands that formed at the distal end of the Maringouin Delta Complex were located somewhat seaward of the present position of Ship Shoal. Over time, these sand deposits slowly migrate landward, burying the underlying, transgressive lagoonal sediments and the earlier, regressive deltaic deposits (Kulp et al. 2001:12). Available evidence indicates that Ship Shoal continues to slowly migrate landward to the northwest.

3.0 BATHYMETRY, MORPHOLOGY AND SEAFLOOR FEATURES

3.1 Bathymetry

The EchoTrac data were utilized to determine water depths across the survey area (Appendix A, Figure No. 1). The recorded two-way travel times were converted to depths in feet by applying the harmonic mean sound velocity. A constant offset was automatically added in the field to compensate for transducer depth. Predicted tides from the Wine Island tide station were applied to reference the depth values to Mean Lower Low Water (MLLW). The resulting depths are shown as smoothed contours at a two-foot contour interval on the Bathymetry Map.

The New Cut Project borrow area is located near the eastern end of Ship Shoal where the relief of the sand body is relatively low. Relief of Ship Shoal above the surrounding shelf is about 10 feet in the South Pelto Area. Water depths over the shoal within this area range from as little as 26 feet in the northwestern corner of the survey area to over 48 feet at the southern most point in the survey area. However, the main body of Ship Shoal does not extend into the southern portion of the project area.

No scarps, banks, outcrops or other bathymetric features were identified on the high-resolution geophysical data.

3.2 Morphology

The morphology and stratigraphy of Ship Shoal have been extensively studied and are well described. The "crest" of the shoal is on its landward, or northern side, where the slope down to the surrounding seafloor is relatively steep in comparison to the surrounding seafloor. The

northern edge of the shoal with its steep grade was obvious along the northwestern edge of the of the New Cut project area where the top of the shoal sloped from a water depth of 24 feet to a depth of 34 feet over a distance of just 1300 feet (0.7°). On its seaward, or southern side, the shoal slopes gradually from the crest down to the seafloor, at a gradient of approximately 0.3°. Seaward of the shoal is a broad, level platform 9 to 12 miles wide that slopes very gradually toward the south, south of the study area.

3.3 Seafloor Features

Kulp (2001) cites previous studies that indicate Ship Shoal surficial sediments are composed of 75 – 100% sand. As concluded by Krawiec (Kulp, 2001), through compositional and grain size analysis of grab samples taken on Ship Shoal and the vicinity, the surficial sediments are composed of fine-grained quartz sand. Combining previous datasets, Williams found that Ship Shoal contained 90 to 99% quartz sand (Kulp, 2001). Sonar imagery revealed a mottled seafloor of moderate reflectivity (Sonar Mosaic Map; Appendix A, Figure Nos. 5 to 16), which is consistent of fine-grained sandy sediments. Available data on previous core samples taken within the area are located in Appendix F and the locations of these are annotated on the Archaeological, Engineering and Hazard Map.

Several zones of increased seafloor reflectivity were noted within the survey area. One of these, in the northwestern corner, has sonar characteristic resembling sediment of increased grain size and/or a change in composition, as in carbonate sediments. Based on its location and orientation in relation to isopach and bathymetry values, it is possible that this feature represents the active shoal crest accumulation surface. Kulp (2001) describes the "shoal crest environment as a shore-parallel accumulation of sand and shell that has been deposited in response to reworking by wave and tidal currents". No known core samples were taken within this zone, therefore it is uncertain as to the precise reason for this signature.

Two small zones of increased seafloor reflectivity were noted in the western and southeastern regions of the study area. Sonar characteristics of these two zones resemble only small variations of surficial sediments, such as a slightly localized increase in sand percentage.

Where the shoal sediments disappear in the southern survey area, a subtle distinction can be seen in the sonar signature of the surface sediments. This signature marks the change in surficial sediment character from the shoal sands in the north, to the exposure of the underlying Maringouin delta sediments in the south, although a thin veneer of shoal sands is likely to cover this area.

No other significant naturally occurring seafloor features were found within the study area.

4.0 STRATIGRAPHY AND ISOPACH INTERPRETATION

4.1 Stratigraphy of Ship Shoal

Ship Shoal consists of an upper section, defined as the "shoal crest," a central section comprising most of the body of the shoal called the "lower shoal," and a thinner basal section called the "back shoal" (Penland et al. 1985:Figure 7.1.14). The shoal crest facies occupies the uppermost portion of Ship Shoal and ranges from 2 to 5 feet thick. This stratum represents high-energy

deposition on the shoal and is composed of "clean, well-sorted, fine-to-medium sand" (Penland et al. 1985:7-28). The shoal crest contains whole and reworked modern shell, as well as relict *Rangia* and *Crassostrea* shells. The latter are presumably mainly derived from estuarine and marine lagoonal environments that once existed shoreward of the original barrier spits and islands that formed at the distal margin of the Maringouin Delta Complex. However, it is conceivable that some of these shells are derived from greater than 6000-year-old aboriginal shell middens that may have once existed on Maringouin Delta Complex landforms.

The lower shoal ranges from 5 to 10 feet thick and consists of "moderately sorted fine- to very fine-grained sand (Penland et al. 1985:7-31). The lower shoal reflects a lower-energy environment of deposition than the shoal crest and is extensively burrowed, contains occasional horizontal and sub-horizontal laminations and whole and reworked modern shell similar to that in the shoal crest. The back shoal facies is a relatively thin stratum that represents "the advancing edge of the landward depositional surface of Ship Shoal" (Penland et al. 1985:7-33). It is "characterized by interbedded layers of silty clay and lenticular to wavy bedded, poorly sorted, very fine sand (Penland et al. 1985:7-33).

Underlying these sandy strata beneath portions of Ship Shoal is a 1.6-to-5-foot-thick stratum of silty clay, lagoonal sediments. These lagoonal sediments constitute the deepest transgressive facies at Ship Shoal and represent sedimentation that occurred in the relict back barrier environment shoreward of the barrier arc shoreline.

All of these transgressive features of Ship Shoal have been deposited within the past 7,000 years or so. The sand-rich facies (shoal crest, lower shoal and back shoal) represent sandy sediments derived from the erosion of deltaic shorelines associated with the Maringouin Delta Complex. Some of the finer-grained lagoonal sediments at the base of the transgressive section are likely to have been derived from the erosion of Maringouin Delta sediments. However, some of these sediments may have originated with other early Mississippi River deltas that prograded into the region long after the Maringouin Delta had entered its cycle of deterioration.

The available evidence indicates that the majority of the 150-or-so feet of Holocene sediments underlying the project area is associated with the Maringouin Delta Complex and has been deposited in the past 7,500 years or so. These thick Holocene deposits rest on weathered, Pleistocene-age, Prairie terrace deposits that represent floodplain, deltaic and open shelf sediments deposited between about 120,000 and 20,000 years B.P. (Frazier 1974; Saucier 1994:225; Fig. 4). During periods of lower sea level, large expanses of these Pleistocene surfaces were subaerially exposed (e.g., the present outer continental shelf) and streams extended an extensive network of channels across them. Several relict channels trending northwest to southeast have been identified incised into this deeply buried Pleistocene surface in the vicinity of the project area. These relict channels terminate at the head of Mississippi Canyon and they are believed to represent channels of an ancestral Mississippi River course (Moore et al. 1978). Approximately 18,000 to 20,000 years B.P., sea level was near the present edge of the outer continental shelf, approximately 300 feet lower than at present. Since that time, sea level has gradually risen and Pleistocene surfaces have been drowned and/or buried by marine or Holocene-age deltaic sediments.

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4.2 Subbottom Data and Isopach Interpretation

An Edgetech Geostar SB-0512 Subbottom Profiler was utilized in assessing subsurface conditions beneath the New Cut borrow area. The subbottom profiles resolved approximately 35 to 50 feet of shallow deposits across the study area; and data examples provided in Appendix A, illustrate the seismic character of these sediments. Although several surface multiples exist within the seismic data, adequate penetration allowed for the contouring of isopach values of Ship Shoal sediments within the area. A constant velocity of 5,000 feet per second was used to convert time values to depth/thickness values.

The New Cut borrow survey area is oriented on the eastern most portion of the transgressive Ship Shoal sand body. The orientation provides survey coverage of the subsurface within the shoal crest, beneath the shoreward and seaward faces, and within the eastern flank of the shoal. Extensive work has previously been done on the sedimentary facies of Ship Shoal and underlying sediments. Results from three University of New Orleans/United States Geological Society (USGS) cores examined in 2000 and one Louisiana Geological Society/USGS core examined in 1986, were made available for this report. These cores are listed in the following table, and their complete description logs are located within Appendix F. The representative stratigraphic log below was derived from these and other previous works done on Ship Shoal (Kulp, 2001).

Ship Shoal Cores Within Borrow Area					
Core ID	**Lat. (dec.deg.)**	**Long. (dec.deg.)**	**Water Depth (ft)**	**Core Length (ft)**	**Short ID**
BSS00 SS-02	**28.915933**	**-90.615950**	**27.59**	**6.79**	**00-2**
BSS00 SS-03	**28.912150**	**-90.654083**	**26.90**	**6.27**	**00-3**
BSS00 SS-05	**28.909117**	**-90.614033**	**30.81**	**3.67**	**00-5**
SS-86-25	**28.925022**	**-90.629975**	**25.00**	**43.54**	**86-25**

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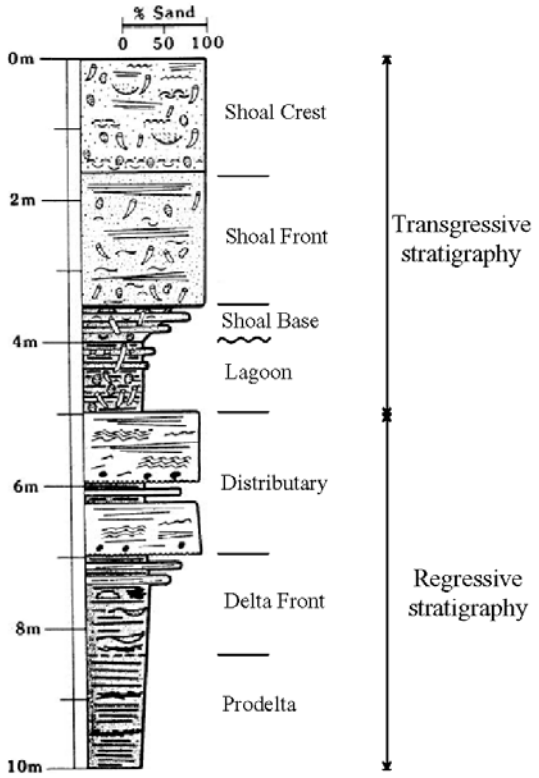

Although as mentioned above, several seafloor multiples existed and obscured some of the seismic response, the shoal base, lagoon, and delta sediments were distinguishable within the seismic records (Appendix A, Figure Nos. 2 to 4).

In the central and western survey area, the nature of the contact between the fine grained lagoonal muds and the sandy back shoal sediments supplied a distinctive well defined reflector that was used for isopach generation throughout most of the area. This area, which includes the shoal crest, shoal front and back shoal facies, exhibited the greatest isopach values throughout the borrow area, ranging from 14 to 18 feet, thickening from the center of the area to the west.

In the eastern region of the survey area, where lagoonal deposits were minimal, a moderately well stratified sequence of parallel medium to high amplitude reflectors existed. These reflectors eventually pinch out toward the center of the survey area beneath Ship Shoal. This seismic stratigraphy resembles the typical rapidly accumulated cycles of Mississippi River sedimentation on the continental shelf. This configuration is probably associated with the lack of lagoonal deposits on the eastern flank of the shoal. Isopach values were derived from the base of the highly reflective, massive sand unit above these alternating reflectors. Unlike thickness values in the western area, isopach values range from 10 to 14 feet, thinning to the east.

In the north, the survey area did not provide coverage over the present-day back shoal environment. Isopach values go from 14 feet down to 6 feet in this area and thin to the north. However in the south the survey area did provide coverage of the seaward extent of the main shoal sediments. Lagoonal and back shoal sediments appear to pinch out southward beneath the shoal front deposits and Ship Shoal sand is sitting directly upon the Maringouin delta sediments in the southern most

survey area (Appendix A, Figure Nos. 2 to 4). Sand thickness values thin from 14 feet to zero in this area.

Overall, isopach values ranged from zero to 18 feet in the New Cut borrow area. These contours are presented on the Ship Shoal Isopach Map.

One small relict channel was noted in the center of the survey area. This feature is a remnant piece of eroded channel exposed at the seafloor within the Ship Shoal sand body and lacks significant lateral extent. This channel extends into the subsurface approximately 5 feet.

Upper Maringouin Delta deposits below the Ship Shoal body were seismically imaged across the survey area. Although obscured by seismic multiples, no channels appeared to exist incising these deposits. Several areas of gas saturation were seen within the Maringouin delta deposits but do not appear to inundate the shoal deposits above and no gas saturation was noted within the Ship Shoal sand body itself.

5.0 EXISTING INFRASTRUCTURE

Public and company file information were reviewed in conjunction with the acquired geophysical data to confirm the presence of existing pipelines, platforms and wells within the New Cut borrow area. Eight existing pipelines traverse the borrow area, and seven more exist on the outskirts. Six production platforms and two wells also exist just outside the bounds of the area. These are outlined in the following tables. It is recommended that these pipelines and structures be avoided 500 feet on all sides.

Existing Pipelines Within Borrow Area				
Pipeline	**Segment**	**Blocks Crossed within Borrow Area**	**Overall Bearing**	**Approx. Length within Borrow Area**
Chevron 10"	S-5013	South Pelto 13 & 14	S63°00'45"E	11,127.20'
Equilon 20"	S-4006	South Pelto 13 & 18	S32°16'09"W	16,859.80'
Texaco 4"	S-6173	South Pelto 13	S31°40'17"E	10,489.57'
ANR 8"	S-6286	South Pelto 13	S31°31'01"E	10,587.03'
Energy 6"	S-12030	South Pelto 12 &13	S34°48'34"E	11,299.54'
Vastar 8"	S-5408	South Pelto 12 &13	S67°00'04"E	14,068.95'
Comstock 8"	S-8017	South Pelto 12	S26°00'E	7,856.11'

Existing Pipelines Outside of Borrow Area, Within Survey grid			
Pipeline	**Segment**	**Block**	**Distance from Borrow Area**
El Paso 4" & 2"	S-10156 & S-10154	South Pelto 13	216' North
El Paso 2", 4" & 4"	S-10792, S-10791 & S-10790	South Pelto 13	476' North
Murphy 4"	S-5955	South Pelto 12	183' Southwest
Murphy 4"	S-6237	South Pelto 19	464' Southwest

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Other Existing Infrastructure				
Structure	**Block**	**X-Coordinate (LA So. 1702)**	**Y-Coordinate (LA So. 1702)**	**Water Depth**
PL13 "7" Platform	South Pelto 13	2,218,242.89'	95,515.97'	31.0'
PL13 "9" Platform	South Pelto 13	2,219,948.16'	95,577.07'	31.0'
Well #G-1 (OCS-00072)	South Pelto 12	2,206,045.92'	87,707.46'	27.9'
PL12 "29" Platform	South Pelto 12	2,205,544.91'	85,742.34'	30.0'
PL12 "34" Platform	South Pelto 12	2,206,438.09'	85,747.36'	30.0'
PL19 "35" Platform	South Pelto 19	2,206,460.08'	84,741.23'	31.5'
PL19 "37" Platform	South Pelto 19	2,207,359.92'	85,043.42'	31.5'
Well #36 (OCS-00073)	South Pelto 19	2,208,345.05'	84,415.51'	33.0'

6.0 UNIDENTIFIED MAGNETIC ANOMALIES AND SONAR CONTACTS

The magnetometer recorded seven hundred seventy three (773) of magnetic deflections in the New Cut borrow area (e.g. Appendix A, Figure No. 17). The majority of these can be associated directly with the eight pipelines crossing the area and the several well sites and platforms located in the southwestern corner of the project area, or with objects immediately adjacent to these oilfield structures that represent debris associated with their construction, use or maintenance. Three hundred fifty six (356) magnetic anomalies were recorded that could not be reliably associated with identified oilfield structures and remain unidentified. These unidentified anomalies are widely scattered across the study area, are shown with reference numbers on the Archaeological and Hazard Map and are included in a table on the map and in Appendix B.

Most of these unidentified magnetic targets produce low amplitude deflections of less than 25 gammas or so, were recorded on only a single survey line, and the deflections covered an area ("duration") of less than 150 feet along that line. These types of magnetic signatures are typically related to single, individual ("point source") ferrous objects of varying sizes. It is impossible to identify the sources of these anomalies with certainty, but in most cases, these objects can be classified as modern objects or debris. Numerous studies have shown that quantities of modern debris can be expected in settings where commercial boat traffic or oil extraction activities have been intensive or long term and that this debris typically appears as scattered, single point source magnetic anomalies, just as is observed in the New Cut borrow area. This phenomenon is particularly characteristic of older offshore lease blocks where well or pipeline construction occurred prior to the mid 1970s when more stringent regulations concerning the disposal and dumping of materials in marine waters were enacted. Development began in all of the lease blocks in the New Cut borrow area prior to the 1970s and there is no doubt that a variety of large objects, such as pieces of pipe, rig and platform elements, and steel cable, as well as small items ranging from nuts and bolts to worn out tools, have been purposefully thrown or accidentally lost in the project area. These items are believed to represent the sources for most of the unidentified magnetic anomalies recorded.

Eleven clusters of magnetic anomalies were identified within the New Cut Dune/Marsh project area have characteristics similar to those associated with shipwreck sites. It is recommended that

all eleven clusters be avoided due to archaeological potential. For a list of these avoidance areas and an analysis of the anomalies, see the Archaeological Assessment portion of this report.

Twelve sonar targets were also detected within the New Cut borrow area by the side scan sonar system. One of these targets, Sonar Contact No. 9 is a debris zone with multiple small targets on the surface. The subbottom profiler recorded this target as well and there appears to be a significant amount of very dense material at this location (Appendix A, Figure Nos. 5 to 16). Sonar Contact Nos. 2 and 6 occur in association with clusters of magnetic anomalies. These three sonar contacts were recommended for avoidance based on archaeological potential. All sonar contacts are shown with index number on the Archaeological and Hazard and Sonar Mosaic Maps and listed with their location and dimensions on a table on the map and in section 5.3 of the Archaeological Assessment portion of this report.

The locations of all unidentified magnetic anomalies and sonar contacts should be avoided during dredging and mooring activities.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The high-resolution geophysical data collected by C & C Technologies, Inc. during the August, 2003 survey under EPA Contract No. 68-W-02-009 were suitable for the delineation of man-made and shallow geologic hazards and for mapping the thickness of a portion of the Ship Shoal sand body. The data were also suitable for performing an archaeological assessment of cultural resource potential in the study area, which encompasses portions of Blocks 12, 13, 14, 18 and 19.

Water depths in the survey area, determined using an Echotrac DF3200 fathometer and referenced to Mean Lower Low Water (MLLW) using predicted tides from the Wine Island tide station, ranged from slightly less than 26 feet to just over 48 feet. The maximum seafloor gradient is approximately 0.7° where the landward side of Ship Shoal dips to the north-northwest through the borrow area.

The subbottom profiler data, in conjunction with coring data, were used to map the sand rich facies that varies in thickness from zero to 18 feet as depicted by isopach contours on the enclosed Isopach Map. This sand rich facies is the body of the transgressive feature known as Ship Shoal, which is composed of sediments eroded from the distal ends of the Maringouin Delta Complex of the ancestral Mississippi River.

Eight existing pipelines traverse the borrow area, and seven more exist on the outskirts. Six production platforms and two wells also exist just outside the bounds of the area. It is recommended that these pipelines and structures be avoided by 500 feet.

Eleven identified magnetic clusters and three associated sonar contacts are recommended for avoidance based upon archaeological potential.

ARCHAEOLOGICAL ASSESSMENT

1.0 INTRODUCTION

The New Cut Dune/Marsh Restoration Project offshore borrow area is located in Federal waters of the Gulf of Mexico approximately 9.5 miles south of Isle Dernieres, Louisiana. The proposed borrow locale contains 10.37 square miles of area encompassing portions of Blocks 12, 13, 14, 18, and 19, South Pelto Area (See Regional and Vicinity Maps, pages 4 & 5). The field geophysical survey of the New Cut borrow area was conducted aboard the R/V *Ocean Surveyor* between August 1 and August 7, 2003. The geophysical instruments used for the survey included a GeoMetrics 880 Cesium Magnetometer, Edgetech GeoStar SB-512 Subbottom Profiler, Odom Echotrac Bathymetric System, Seacat 19 CTD Profiler, and an EG&G 260 500 kHz Side Scan Sonar. Horizontal positioning of the survey vessel was accomplished with the C-Nav globally corrected differential GPS system. Geophysical data reproductions of pertinent features in the area may be observed in Appendix A. The unidentified and identified magnetic anomaly tables and a nomogram for assessing ferrous mass are included in Appendix B. Boat setback diagram, instrument settings, personnel, equipment descriptions and a copy of the daily survey and geophysical logs are provided in Appendix C. Appendix D contains the tide curves and velocity curves used to correct the bathymetric contours. The instrumentation and the conduct of the survey followed the specifications and requirements of Notice to Lessee (NTL) No. 2002-G01, dated March 15, 2002 and entitled *Notice to Lessees and Operators of Federal Oil, Gas, Sulphur, and Salt Leases and Pipeline Right-of-Way Holders in the Outer Continental Shelf, Gulf of Mexico OCS Region* (Minerals Management Service, Gulf of Mexico OCS Region, 2002).

All of the lease blocks in the New Cut project area are identified by the Minerals Management Service (MMS) as high probability areas relative to prehistoric archaeological site potential and one (South Pelto 14) is identified as a high probability block relative to historic shipwreck potential. The archaeological requirements of NTL No. 2002-G01 mandate that survey coverage of the project area be conducted along lines spaced at 50-meter intervals. Coverage of the project area was achieved with eighty-eight (88) survey tracklines spaced 50 meters apart and oriented in an east-west direction. Additional survey coverage was obtained along eleven (11) north-south "tielines" spaced at 900-meter intervals across the project area and three (3) survey tracklines connecting previously collected vibracore locations. These last three lines were run to specifically collect subbottom geological data for correlation with the vibracore interpretations. Navigation fixes for the vessel are annotated on the recorded geophysical data at 150-meter intervals.

Geophysical data collected from the remote sensing systems were reviewed for evidence of submerged cultural resources. The survey results pertinent to pipeline construction are projected on the Archaeological and Hazard Maps (Sheet 1). A Sonar Mosaic Map was constructed as part of the archaeological requirements. The following written text provides a framework for understanding the cultural resources potential of the project area and is to be viewed in conjunction with the study maps to provide a comprehensive explanation of the seafloor and subsurface features identified within the New Cut borrow area.

ARCHAEOLOGICAL ASSESSMENT

2.0 PREHISTORIC BACKGROUND AND SITE POTENTIAL

Underlying the project area are approximately 125 to 150 feet of Holocene sediments that have been laid down in the past 10,000 years or so. These Holocene deposits rest on weathered, Pleistocene-age, Prairie terrace deposits that represent floodplain and deltaic sediments laid down between about 120,000 and 20,000 years B.P. (Saucier 1994:225). Between about 60,000 and 50,000 years ago and again between 24,000 and 20,000 years ago Wisconsin period glacial advances trapped large amounts of the Earth's water as polar ice (Coleman et al, 1991). As the glaciers advanced, ocean levels around the world were lowered by as much as 400 feet (Fisk and McFarlan, 1955). As sea level fell, large expanses of Prairie terrace deposits, now forming the Continental Shelf, were exposed. Approximately 18,000 to 20,000 years B.P., sea level was approximately 300 feet lower than at present, near the present edge of the Outer Continental Shelf. Streams extended an extensive network of channels across the Pleistocene surface; some of them deeply entrenched. Several relict channels trending northwest to southeast have been identified incised into this deeply buried Pleistocene surface in the vicinity of the project area. These relict channels terminate at the head of Mississippi Canyon and they are believed to represent channels of an ancestral Mississippi River course (Moore et al. 1978). Beginning about 18,000 years B.P., sea level has gradually risen and Pleistocene surfaces have been drowned and/or buried by marine or Holocene-age deltaic sediments.

Before its inundation by rising sea level, much of the Continental Shelf, including those portions under the project area, would have supported environments suitable for human habitation, such as where streams run into river valleys, near natural levees and point bars, and along river and coastal terraces (Pearson et al., 1986). Sea level curve data presented by Saucier (1994) suggests that the Prairie terrace surface beneath the project area was subaerially exposed from about 27,000 years B.P. to about 11,000 years B.P. when it was inundated by rising seas. Under the generally accepted assumption that human populations arrived in the region by or shortly before approximately 12,000 years B.P., it is possible that human use or settlement of this Prairie surface occurred during the very earliest phase of human occupation of the New World. The potentials for preservation of archaeological materials on this surface in the face of the impacts of transgressive seas are not well known, but it is believed that most cultural remains that might have existed on the Prairie terrace were destroyed or seriously disturbed during the early stages of inundation. Studies have shown, however, that cultural remains can survive the impacts of transgression if they occur in specific settings, such as in the topographic lows of incised river channels that have been filled by estuarine and riverine sediments prior to transgression (Belknap and Kraft, 1981, 1985; Pearson et al., 1986). Archaeological remains in these settings can become buried through subsidence and sedimentation and, if they remain below the erosive affects of marine transgression, can be preserved. Thus, early prehistoric sites or materials might be preserved within incised channels, or similar settings, on the Prairie terrace below the study area. However, any such materials are now covered by 150 feet or so of Holocene sediment and are so deeply buried that they will not be impacted by the proposed sand removal.

The Holocene sediments resting above the Pleistocene-age, Prairie terrace consist of two geologic units. The lower unit is a thick sequence of deltaic sediments representing drowned portions of ancestral deltas of the Mississippi River that prograded onto the inner shelf in this area after about 10,000 years B.P. In the project area, these regressive deltaic deposits extend from about 34 feet below sea level to the top of the Pleistocene surface, at about 155 to 180 feet

below sea level. Resting on top of these deltaic deposits throughout most of the project area is the other Holocene-age geologic unit, the sand body known as Ship Shoal. Ship Shoal is a sand-rich, submerged, transgressive feature formed from sediments derived from the erosion of the distal ends of those deltaic features that formerly extended onto this portion of the shelf. Each of these major geologic units has a distinctive geomorphic history and each provides differing potentials for prehistoric site preservation, as is discussed below.

The majority, and possibly all, of the remaining regressive Holocene deltaic sediments underlying the project area are associated with the Maringouin Delta Complex, which was active from about 6,000 to 7,500 years B.P. It is possible that the basal portions of these over 100-foot-thick deltaic deposits are associated with the Outer Shoal Delta Complex, a deltaic system identified by some researchers that is believed to date between approximately 9,200 and 8,200 years B.P. (Penland et al., 1989; Saucier, 1994:277). Presently, there is no definitive information on the aerial extent of this postulated early delta complex and it is unknown if it extended into the vicinity of the present project area.

At its maximum extent, the Maringouin Delta projected onto the inner shelf off Louisiana to a point south of the present position of Ship Shoal; although exactly how far to the south is unknown. As it prograded into this area, the Maringouin Delta deposited the typical stacked sequences of sediment suites associated with deltaic systems, including sediments associated with prodelta, channel, natural levee, backswamp, lake and marsh environments. Beginning about 6,000 years B.P. water flow through the distributaries of the Maringouin Delta system began to decline, possibly because of sea level rise and a shifting of the loci of sedimentation farther inland (Saucier, 1994). When the fluvial sediment supply was eliminated, deltaic expansion ended and a cycle of deterioration began. The loosely consolidated sediments and organic deposits within the Maringouin delta compacted, leading to subsidence. This, coupled with rising sea level, lead to erosion of deltaic headlands, landward migration of the shoreline and, ultimately, to inundation and transgression of the Maringouin Delta by marine waters.

Subbottom records collected during this and previous studies, plus a variety of core data, indicate that the top of intact Maringouin deltaic deposits lies between about 34 and 40 feet below sea level in the study area. Relying on a best-fit relative sea level curve for the Holocene Mississippi River delta plain published in Penland et al. (1985:Figure 7.1.6), it appears that inundation of the Maringouin delta by marine waters began approximately 6,700 years B.P. and by about 6,200 years B.P. the deltaic surface in the project area was entirely submerged. Prior to deterioration and submergence, the Maringouin Delta Complex would have existed as a typical delta plain, containing characteristic deltaic landforms, such as distributary systems with associated elevated natural levees and back swamps, as well as fresh and brackish ponds and lakes, brackish to saline bays, and beach ridges along the deltaic margins at the Gulf of Mexico. All of these various landforms presumably existed at the surface of the Maringouin Delta Complex plain immediately prior to inundation. Additionally, many of these landform features developed and became buried through subsidence and sedimentation as the delta advanced and now exist as stacked sequences within, at least, the upper portions of Maringouin Delta sediments beneath the project area.

An abundance of archaeological research in deltaic settings in Louisiana and elsewhere has

demonstrated that delta habitats presented prehistoric (and historic) populations with a rich and diverse environment, containing an abundance of easily exploited food resources. Particularly important were shellfish and fish species found throughout the year in the various water habitats, but elevated landforms, particularly natural levees, also supported an abundance of animal and plant food species. This archaeological research in deltaic Louisiana has also indicated a high correlation between prehistoric site locations and particularly landforms. Specifically, prehistoric sites are found on elevated landforms that provided suitable habitation locales in an otherwise low and wet environment. Most commonly, prehistoric settlement occurred along the elevated natural levees of distributaries, although sites are also known from other elevated features, such as beach ridges. Today, thousands of archaeological sites are known from natural levee settings in south Louisiana and there is every reason to believe that similar utilization of earlier deltaic systems, like the Maringouin Delta Complex, occurred.

Based on available sea level data, it is believed that occupation of Maringouin Delta Complex landforms beneath the project area would have ended about 6,200 B.P. when inundation occurred. This means that occupation of the Maringouin Delta in the project area would have taken place between 6,200 years B.P. and, possibly as early as about 7,000 B.P. when deltaic landforms suitable for human habitation may have first prograded into this area. Presumably, landforms associated with the earlier period will be buried beneath the present surface of the Maringouin Delta, while the later, circa 6,200-year-old landforms will be located at or near the present surface of the delta. This means that these landforms were available for occupation and use during the archaeological period known as the Middle Archaic (circa 7,000 to 5,000 years B.P.). In coastal Louisiana, little evidence of the Middle Archaic period has been found, principally because the deltaic features that cover much of the region are too young and any sites associated with Middle Archaic occupation are now deeply buried. Middle Archaic sites, however, are well known from elevated Pleistocene uplands bordering these deltaic features to the north, and from Avery Island, an elevated salt dome feature in the deltaic plain in Vermilion Parish (Gagliano, 1967; Brown and Lambert-Brown, 1978; Weinstein and Kelley, 1992). One characteristic of the Middle Archaic in the interior is the extensive exploitation of shellfish found on riverine sites. There is every reason to believe that Middle Archaic populations in deltaic and coastal settings placed similar reliance on the vast shellfish (particularly *Rangia* and oyster) resources found in these environments. Thus, it is presumed that Middle Archaic populations used and settled Maringouin Delta Complex landforms and that evidence of this exists in the form of shell middens, as well as other types of cultural materials.

As noted, archaeological research has demonstrated that certain deltaic landforms, particularly the elevated natural levees of distributary systems as well as elevated beach ridges and barrier islands, provided optimum locales for settlement and today natural levees contain the vast majority of known archaeological sites in delta settings. Subbottom profiler and core data have recorded the presence of several filled, fluvial channels incised into the surface of the Maringouin Delta Complex deposits in the vicinity of the project area. These features represent distributary pathways associated with the later stages of the Maringouin Delta. One large paleochannel, oriented roughly north-northwest by south-southeast and extending through lease blocks Ship Shoal 89 and 94, just a few miles west of the project area, has been identified (Intersea Research, Inc., 1985:11; Thales GeoSolutions, 2002). The top of this large channel is at or within a foot or so of the surface of the old Maringouin Delta and extends beneath the sands

of Ship Shoal. Relying on subbottom seismic data and vibracores, Penland et al. (1985) identified large distributary features incised into delta deposits beneath transgressive sands in the western portion of Ship Shoal, several miles west of the Ship Shoal Project Area. Additionally, Penland et al. (1989:78) identified a "distributary zone" extending north from Blocks 88 and 89, Ship Shoal Area as part of a delineation of sand resources along the central Louisiana coast. This identification, apparently, relied on collected seismic and core data. Similar, but smaller channels incised into the upper surface of the Maringouin Delta have been recorded during other geophysical surveys in the vicinity of Ship Shoal (Gulf Ocean Services, 2001:12).

The available evidence indicates that Holocene paleochannel features dating to between about 6,200 years B.P. and 7,000 years B.P. are preserved in the vicinity of the project area. The natural levees associated with these relict Maringouin Delta distributaries represent high probability locales relative to Middle Archaic period site occurrence. However, no paleochannel features associated with Maringouin Delta deposits that might be interpreted as high probability locales were observed in the project area.

The sandy deposits that form Ship Shoal represent transgressive sediments deposited in the past 7,000 years or so from sediments eroded from the distal ends of Maringouin Delta Complex features. These deposits have been churned, reworked and redeposited by wave and current action over the past several thousand years, and continue to be so. As discussed, it is believed that archaeological sites associated with the Middle Archaic period were established on the Maringouin Delta Complex. During the course of deltaic deterioration and marine transgression, some of these sites are certain to have been eroded and incorporated into the material forming Ship Shoal. The reworking of site materials by wave erosion probably removed and winnowed out or destroyed small, light and fragile items, but heavy and durable cultural objects could have become incorporated into the sandy sediments now forming Ship Shoal. In particular, it is anticipated that stone artifacts, such as projectile points, grinding stones, etc., which are very characteristic of Middle Archaic artifact assemblages, could have become incorporated into Ship Shoal sediments and remain there. Additionally, shellfish remains from Middle Archaic shell middens, assuming they existed, could, also, now exist within Ship Shoal sands. The presence of numerous reworked brackish water Rangia and Crassostrea shells within the body of Ship Shoal indicate some support for this contention. Penland et al. (1985:7-31) suggest that these shells are mainly derived from estuarine and marine lagoonal environments that once existed shoreward of the original barrier spits and islands that formed at the margins of the Maringouin Delta Complex. However, it is conceivable that some of these shells are derived from greater than 6,000-year-old aboriginal shell middens that once existed on Maringouin Delta Complex landforms. Even if these shells are from natural beds, their presence shows that large items can survive several thousand years of reworking within the body of Ship Shoal. Presumably, other durable items, such as stone tools and, possibly, bone, will, also, survive. In fact, the survival of bone items within Ship Shoal sediments is evidenced by the discovery of a deer tooth in a shallow core taken on Ship Shoal (Sherwood Gagliano, personal communication 2003).

Most of the seafloor beneath the New Cut project area consists of Ship Shoal sands, deposits that have a probability for containing archaeological materials dating from the Late Archaic period. Any archaeological materials now existing within these Ship Shoal sands will have been removed from their original depositional context by many years of wave and current erosion and

reworking; no in situ site material will exist. However, the occurrence of even isolated, out-of-context artifacts within Ship Shoal sands is extremely important because they will provide unique evidence of early occupation on now submerged deltaic features.

3.0 HISTORIC BACKGROUND

The New Cut project area is in a high probability zone for the occurrence of historic shipwrecks, principally because the shallow waters of Ship Shoal have constituted a hazard to coastal shipping. In fact, the name of the shoal itself is apparently derived from the dangers it presented to vessels. Waterborne transportation and commerce have been of great importance to this area of coastal Louisiana since the early historic period, beginning in the sixteenth century when Spanish vessels first traveled along the northern coast of the Gulf of Mexico. Early sailing routes typically hugged the coast, meaning that vessels sailing in the Gulf of Mexico during the early historic period often traversed the area of Ship Shoal. Specific information on vessel losses in the region prior to the nineteenth century is uncommon, but one vessel lost off Cameron Parish west of the Ship Shoal area was the Spanish merchantman *El Nuevo Constante*, sunk in 1766. Archaeological research on *El Nuevo Constante* revealed the presence of well-preserved vessel components and cargo items (Pearson and Hoffman, 1995).

Although vessels were sailing along the coast in the vicinity of Ship Shoal from an early period, settlement of coastal Louisiana west of the Mississippi River remained relatively sparse until the later part of the eighteenth century. Overland travel in this region of vast swamps and marshes was difficult and the movement of goods and peoples was principally by water. Much of the early vessel traffic in the region passed along inland waterways, but some coastal traffic occurred. By the second decade of the nineteenth century, small trading vessels, principally sloops and schooners, were regularly sailing along the central Louisiana coast in the vicinity of Ship Shoal. Most of this trade centered on New Orleans and these vessels typically carried merchandise, foodstuffs and manufactured goods out from New Orleans to smaller ports and communities in coastal Louisiana and Texas, such as Brashear City (now Morgan City) and Galveston, and returned to New Orleans with agricultural products, such as sugar and cotton. Passengers were also carried by these small coasting vessels, particularly after the mid 1820s when Americans began to travel from New Orleans to Texas in increasing numbers to take up settlement.

Vessel traffic through Atchafalaya Bay and along the coast near the Ship Shoal area increased as settlement and agricultural production expanded along Bayou Teche and into the interior. By 1840, the town of Franklin on lower Bayou Teche had developed into a locally important port for coastal as well as ocean-going vessels. By this time a large number of steamboats were traveling the interior waters of south Louisiana and some were steaming along the coast, following the same routes as the small sailing vessels. The growth in maritime activity led to a proportionate increase in ship losses.

In 1857 The New Orleans, Opelousas, and Great Western Railroad was completed from Algiers on the Mississippi River opposite New Orleans to the east bank of the Atchafalaya River on Berwick Bay. At the termination of the railroad was the small town of Brashear City, which soon developed into a thriving port for river vessels as well as ocean-going craft sailing through Atchafalaya Bay. Brashear City became the principal port for the steamers operated by Charles

Morgan between Louisiana and Texas. The importance of the Morgan Line to the economy of the region lead the Louisiana legislature to change the name of Brashear City to Morgan City in 1873. By this time, 17 Morgan Line steamers were calling at the port (Pearson and Simmons, 1995:61). These, and other steam vessels, were traveling into and out of Atchafalaya Bay and in the vicinity of Ship Shoals.

Increasing vessel traffic and recognition of the dangers posed by Ship Shoals led to the stationing of a lightship at Ship Shoal in the late 1840s. This vessel was the former Revenue Cutter *McLane*, re-christened *Pleasonton* after conversion to a lightship. In 1859, the *Pleasonton* was replaced by the Ship Shoal Lighthouse, a 125-foot tall, iron, screw pile structure erected near the western end of the shoals (Cipra, 1997). This lighthouse was discontinued in the 1970s, but is still standing.

In the late nineteenth century, fishing and oystering began to develop into important commercial activities along central coastal Louisiana. A variety of small vessels were used in these endeavors, many of which were locally constructed. The vast majority of the small vessels involved in these industries worked in coastal bays and rivers or along inshore Gulf waters; only occasionally did they venture as far offshore as the project area. However, beginning in the 1920s, after the development of the otter trawl, shrimping became an important aspect of the regional fishing economy. Soon, gasoline and, later, diesel-powered shrimp trawlers were venturing farther offshore in the Gulf of Mexico, including into the area of Ship Shoal. By the middle of the twentieth century, shrimp trawlers had become the most common type of vessel sailing in the waters around Ship Shoal.

In the 1940s, the Louisiana oil industry expanded offshore, and by the 1950s production had begun in the vicinity of Ship Shoal. The development of the offshore oil industry brought with it a variety of new types of vessels ranging from crew and supply boats, to drilling rigs and jack-up barges. In addition, the infrastructure of oil and gas production became a permanent presence in the offshore waters and today numerous wells, platforms, and pipelines are located in the Ship Shoal Area and several pipelines cross the New Cut project area. Oil and gas production and fishing, particularly shrimping, remain the principal economic activities of the region.

4.0 HISTORIC POTENTIAL

The long period of relatively intense vessel traffic along coastal Louisiana in the historic period, coupled with the hazard presented by Ship Shoal, has resulted in a large number of vessel losses in the region. Typically, accounts of historic, and even relatively recent, vessel losses are imprecise or incomplete such that there are questions about the exact location of loss, making it difficult to determine what vessels were actually lost in the project area. A recent study (Panamerican Consultants, Inc., 2003) reports twenty (20) known and unknown vessels and unidentified objects and obstructions that could represent vessels within a five-mile radius of the New Cut project area. The shipwreck and unidentified object table below provides the following information about each of these objects or obstructions:

- **Number:** The number assigned to the vessel or object in the Panamerican Consultants, Inc. (2003) report.
- **Vessel/Object**: The name of the vessel if known.

ARCHAEOLOGICAL ASSESSMENT

- **Location Reliability**: A numerical value placed on the reliability of the reported location of the vessel ranging from 1, very reliable, to 4, very unreliable.
- **Vessel Type**: The type of vessel if known.
- **Year Lost**: The year the vessel was lost, if known.
- **Year Built**: The year the vessel was built if known.
- **Lat. NAD27**: The latitude of the vessel in decimal degrees, NAD 27.
- **Long. NAD27**: The longitude of the vessel in decimal degrees, NAD 27.
- **Lease Block**: The offshore lease block in which the vessel or object falls.

Shipwrecks and Unidentified Objects Within Five Miles of the New Cut /Marsh Restoration Offshore Borrow Area

Number	Vessel / Object	Location Reliability*	Vessel Type	Year Lost	Year Built	Lat. NAD27	Lon. NAD27	Lease Block
378	Unknown Vessel	1	Unknown	-	-	28.939980	-90.725342	PL 11
379	Miss Natalie (?)	1	Tugboat	1983	-	28.911819	-90.717430	PL 11
380	Unknown Wooden Vessel	1	Unknown	-	-	28.910810	-90.584770	PL 14
1003	Coral Tide	2	Crew boat	1966	-	28.915239	-90.686752	PL 12
528	Allegro	2	Pleasure craft	1962	1953	28.893326	-90.723328	PL 20
529	**Carl Tide**	**2**	**Unknown**	**1965**	**1957**	**28.900000**	**-90.666656**	**PL 19**
530	Crane	3	Unknown	-	-	28.883333	-90.716660	PL 20
1186	Mellow Max	3	Unknown	1970	1955	28.959999	-90.629997	PL 8
1380	H. G. Newberry	2	Unknown	1992	-	28.928055	-90.692780	PL 12
1393	Jack-up rig	2	Unknown	1985	-	28.924999	-90.561668	PL 14
1437	Sargent	3	Motor vessel	1985	-	28.963333	-90.631668	PL 8
11981	Object	1	Unknown	-	-	28.913334	-90.571945	PL 14
12507	Obstruction	4	Unknown	-	-	28.913568	-90.572029	PL 14
14235	Unknown Vessel	4	Unknown	-	-	28.925234	-90.561752	PL 14
14236	Unknown Vessel	4	Unknown	-	-	28.883570	-90.716759	PL 20
14237	**Obstruction**	**4**	**Unknown**	**-**	**-**	**28.921741**	**-90.658035**	**PL 12**
14238	Obstruction	4	Unknown	-	-	28.896902	-90.708977	PL 20
14464	Obstruction	4	Unknown	-	-	28.938286	-90.589066	PL 14
14717	Obstruction	4	Unknown	-	-	28.884623	-90.713455	PL 20
14719	**Obstruction**	**4**	**Unknown**	**-**	**-**	**28.903315**	**-90.659630**	**PL 12**

1 equals highest and 4 equals lowest reliability (source: Panamerican Consultants, Inc., 2003). (Note: Bolded items are within Project Survey Site.)

It is important to recognize that not all of the vessels in this list necessarily fall in this area, because the reported locations of loss of many are unreliable. Additionally, there may by other

discrepancies in the table because of the often inconsistent or confusing information available on shipwrecks. For example, the vessels named *Carl Tide* and *Coral Tide* may very well be the same craft that appears under slightly different names in different sources of information. Also, these sources provide different locations and dates of loss for these similarly named vessels.

Several sunken vessels have been identified during previous remote-sensing surveys in the near vicinity of the project area. One such wreck, tentatively identified as the tugboat *Miss Natalie*, was documented in Block 11, South Pelto Area, just to the west of the project area (Fugro, John E. Chance & Associates, Inc., 1995).

The previous table includes only vessels that have been reported in the readily available literature or are included in databases of shipwrecks maintained by various governmental agencies. It can be assumed that some presently unknown number of vessels has been lost on Ship Shoals and never reported. This would be particularly true of vessels lost during the early historic period when reporting of losses was often haphazard and incomplete and of small vessels whose losses are often not reported, even in fairly recent times. Despite problems with the historical record on vessel losses, the information presented here indicates the relatively high potential that the project area and Ship Shoal as a whole have for containing historic shipwrecks.

The potential for preservation of any vessels lost in the project area will be related to a variety of phenomena, including the type of vessel, the nature of the loss event and the post-wreck environmental setting. In general, the relatively shallow waters of the project area represent a high-energy environment; an environment that is not generally conducive to the preservation of shipwreck remains. Waves, particularly those produced during strong storms such as hurricanes, disturb and churn up the upper portions of Ship Shoal, and they would similarly act to breakup and disperse a sunken vessel. This would be particularly true of wooden-hulled vessels. Iron or steel-hulled vessels are more likely to withstand the battering from waves, but over time even these vessels are likely to be broken up and scattered widely. Heavy and durable portions of either type of vessel could become buried within the sands of Ship Shoal and remain in or near their original loss position for a considerable period of time. Even so, the constant reworking of the shoal sands would probably, over time, move, re-expose and rebury even large objects. Thus, it is anticipated that vessels lost in the shallower waters of the New Cut project area will become widely scattered and dispersed and many if not most, vessel pieces will be periodically buried and exposed. Side scan sonar, therefore, may or may not be useful in detecting these vessels, depending upon the distinctiveness of any portion of the wreck exposed on the surface. The magnetic signature of wrecks in this setting would generally consist of a "cluster" of individual anomalies of varying amplitudes (Arnold, 1982; Garrison et al., 1989; Saltus, 1982). Garrison et al. (1989) suggest that vessel debris in high-energy settings will be scattered over an area greater than 100,000 square feet. Although this proposition has not been verified, it is likely that the pattern and area of dispersal of wreckage will probably vary considerably among vessel types and environments of sinking.

Vessels or portions of vessels are less likely to be impacted by wave forces in the deeper waters of the project area, such as along the southern edge of Ship Shoal (Garrison et al. 1989). However, beneath the project area, these areas contain a relatively thin layer of sand and other loose sediments on top of moderately stiff deltaic clays, where the potentials for burial are

somewhat lessened. Wooden materials coming to rest in this setting are likely to deteriorate fairly rapidly, if they remain unburied. Metal-hulled vessels can remain intact in these settings for a longer period of time, as indicated by the discovery of the apparently reasonably well preserved vessel, tentatively identified as the tugboat *Miss Natalie* in South Pelto 11, just to the west of the project area (Fugro, John E. Chance & Associates, Inc., 1995). The *Miss Natalie* was lost in 1983.

5.0 ASSESSMENT OF DATA

5.1 Bathymetry Record and Surface Features

Water depths in the survey area, determined using an Echotrac DF3200 fathometer and referenced to Mean Lower Low Water (MLLW) using predicted tides from the Wine Island tide station, ranged from slightly less than 26 feet to just over 48 feet. The shallowest depths are in the extreme northwestern corner of the project area and the deepest are at the southern tip. The northern, or inshore, edge of the shoal with its steep slope is obvious along and just outside of the northwestern edge of the project area. Here the top (crest) of the shoal slopes from a water depth of 24 feet to a depth of 34 feet over a distance of 1300 feet, a gradient of 1:130. Elsewhere in the project area, the surface of the shoal above 28 feet MLLW is relatively flat, showing a slight slope toward the south-southeast. Below 28 feet MLLW, the gradient of this slope increases slightly.

5.2 Assessment of Magnetic Records

Seven hundred seventy-three (773) magnetic anomalies were recorded in the New Cut borrow area. The majority of these can be associated directly with the eight pipelines crossing the area and the several well sites and platforms located in the southwestern corner of the project area, or with objects immediately adjacent to these oilfield structures that represent debris associated with their construction, use or maintenance. Three hundred fifty six (356) magnetic anomalies were recorded that could not be reliably associated with identified oilfield structures and remain unidentified. As shown on the Archaeological and Hazard Map (Sheet 2) these magnetic anomalies are scattered widely over the project area. Most of these magnetic targets produce low amplitude deflections of less than 25 gammas or so, were recorded on only a single survey line, and their signature covered an area (e.g., "duration") of less than 150 feet along that line. These types of magnetic signatures are typically related to single, individual ("point source") ferrous objects of varying sizes. It is impossible to identify the sources of these "point source" anomalies with certainty, but in most cases, these objects can be classified as modern objects or debris. Numerous studies have shown that quantities of modern debris can be expected in settings where commercial boat traffic or oil extraction activities have been intensive or long term and that this debris typically appears as scattered, single source magnetic anomalies, just as is seen in the project area. This phenomenon is particularly characteristic of older offshore lease blocks where well or pipeline construction occurred prior to the mid 1970s when more stringent regulations concerning the disposal and dumping of materials in marine waters were enacted. Development began in all of the lease blocks in the New Cut borrow area prior to the 1970s and there is no doubt that a variety of large objects, such pieces of pipe, rig and platform elements, and steel cable, as well as small items ranging from nuts and bolts to worn out tools, have been purposefully thrown or accidentally lost in the project area. These items are believed to represent the sources for most of the unidentified magnetic anomalies recorded.

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It is impossible to positively associate any specific magnetic signature with a shipwreck, but the size and characteristics of a magnetic signature does provide a starting point for distinguishing between shipwrecks and modern debris. Generally, shipwrecks that have been scattered and dispersed, as is anticipated in most of the project area, will appear as a closely-spaced cluster of magnetic anomalies of varying amplitudes covering an area of greater than 100,000 square feet (Garrison et al., 1989). Typically, larger pieces of wreckage or large items from vessels will produce magnetic amplitudes of moderate to high intensity (>50 gammas) when the magnetometer sensor is within 75 or 80 feet or so, the distance the sensor would have been from any object in this survey. Additionally, the magnetic signature of scattered wreckage will be relatively large, covering an area of more than 100 feet across. Relying on these assumptions, criteria were established for identifying those magnetic anomalies (actually groups or clusters of anomalies) that might represent scattered vessel remains. These are magnetic anomalies that displayed amplitudes greater than 50 gammas and covered an area greater than 150 feet in all directions. This means that these consist of groups or "clusters" of magnetic anomalies that extended more than 150 feet along a single survey line and appeared as adjacent anomalies on more than one survey line and produced a magnetic deviation of greater than 50 gammas on one of the lines. Magnetic anomalies with amplitudes of greater than 50 gammas and durations of greater than 150 feet along only a single survey line are not included, because it is believed that these types of signatures are most likely to be associated with single, point source objects. Although these clusters of magnetic anomalies might represent shipwreck remains, this cannot be verified without physical examination. Even if these magnetic clusters do not represent wreckage, they probably reflect pieces or concentrations of ferrous debris of sufficient size to constitute a hazard to the proposed sand dredging.

Eleven clusters of magnetic anomalies were identified in the New Cut Project borrow area that met these criteria for vessel wreckage or potential hazard. A description of these clusters is provided below and a summary of the clusters is provided in the following table. Cluster No. 1 is located near the north central boundary of the project area. It is comprised of six anomalies ranging in size from 4 to 79 gammas. Anomaly No. 31 is the largest anomaly in this cluster at 79 gammas and a duration of 120 feet. Cluster No. 1 may be associated with Sonar Contact No. 6. Cluster No. 2 is located near the northwest margin of the project area. It is made up of three anomalies ranging in size from 4 to 654 gammas. Anomaly No. 59 is the largest with a deflection of 654 gammas and a duration of 255 feet. Cluster No. 3 is also in the northwest portion of the survey area. It is comprised of seven anomalies ranging in size from 8 to 2,467 gammas. Anomaly No. 79 (2,467 gammas with a duration of 498 feet) and Anomaly No. 70 (1,674 gammas with a duration of 780 feet) are the two largest anomalies in this cluster. Cluster No. 3 is associated with Sonar Contact No. 9, which is identified as a debris field (See Cluster table below) and correlates to the position of a previously reported obstruction (See previous Shipwreck table, Reference No. 14237). Cluster No. 4 is near the eastern margin of the project area. It is comprised on six anomalies ranging in size from 3 to 54 gammas. The largest deflection is seen in Anomaly No. 75 (54 gammas with a duration of 253 feet). This cluster is associated with Sonar Contact No. 2, identified as a 15-by-11-foot piece of debris (see Cluster table below). Cluster No. 5 is located just to the south of Cluster No. 4 and could be associated with that cluster. Cluster No. 5 is a grouping of three anomalies ranging in size from 21 to 113 gammas. Anomaly No. 105 (113 gammas with a duration of 141 feet) is the largest of the

anomalies in this cluster. Cluster No. 6 consists of two anomalies and is located in the east-central portion of the survey area. Anomaly No. 115 is the larger of the two anomalies with a deflection of 511 gammas and a duration of 462 feet. The second anomaly in this group, Anomaly No. 120, has a deflection of 12 gammas and a duration of 659 feet. Cluster No. 7 is located near the west-central boundary of the project area and is the largest cluster of anomalies identified in the project area. Eleven anomalies ranging in size from 5 to 1,932 gammas make up this north-to-south oriented cluster. The largest is Anomaly No. 189 with a deflection of 1,932 gammas and a duration of 1,174 feet. There are no sonar contacts associated with Cluster No. 7. Cluster No. 8 is located near the southeastern margin of the project area and is composed of three anomalies. The three anomalies range in size from 5 to 49 gammas with Anomaly No. 198 (49 gammas with a duration of 333 feet) being the largest. Cluster No. 9 is located southwest of Cluster No. 8 along the southeastern margin of the project area. It is comprised of two anomalies, Anomaly No. 208 (53 gammas with a duration of 252 feet) and Anomaly No. 223 (2 gammas with a duration of 211 feet). Cluster No. 10 is located in the south-central part of the survey area and contains three anomalies. The anomalies range in size from 6 to 996 gammas with the largest being Anomaly No. 302 (996 gammas with a duration of 614 feet. Finally, Cluster No. 11, located in the southwestern part of the project area approximately 1, 968 feet south of Cluster No. 7, is composed of five anomalies ranging in size from 10 to 76 gammas. Anomaly No. 347 (76 gammas with a duration of 238 feet) is the largest anomaly in this cluster.

ARCHAEOLOGICAL ASSESSMENT

Clusters of Magnetic Anomalies that Exhibit Characteristics of Shipwrecks.

Cluster	Magnetic Anomalies and Amplitude (gammas)	Comments
Cluster 1	31 (79 gammas); 22 (6 gammas); 14 (4 gammas); 338 (2 gammas); 2 (4 gammas); 10 (3 gammas)	
Cluster 2	59 (654 gammas); 49 (4 gammas); 44 (4 gammas).	
Cluster 3	70 (1674 gammas); 65 (16 gammas); 79 (2467 gammas); 88 (8 gammas); 89 (11 gammas); 93 (5 gammas); 94 (48 gammas).	Side scan Target 9, identified as "Debris Zone," correlates with Anomaly 70. This cluster correlates with the previously reported position of an "Obstruction" (see Number 14237 in previous Shipwreck table).
Cluster 4	75 (54 gammas); 86 (7 gammas); 76 (18 gammas); 68 (17 gammas); 62 (3 gammas); 55 (5 gammas	Side scan Target 2, identified as 15.1 by 11.2-foot object correlates with Anomaly 75.
Cluster 5	105 (113 gammas); 97 (11 gammas); 108 (21 gammas)	Possibly part of Cluster 4
Cluster 6	115 (511 gammas); 120 (12 gammas)	
Cluster 7	180 (147 gammas); 179 (33 gammas); 170 (19 gammas); 169 (6 gammas); 168 (8 gammas); 171 (5 gammas); 188 (363 gammas); 189 (1932 gammas); 203 (72 gammas); 204 (15 gammas); 214 (9 gammas)	
Cluster 8	198 (49 gammas); 332 (10 gammas); 197 (5 gammas)	
Cluster 9	208 (53 gammas); 223 (2 gammas)	
Cluster 10	302 (996 gammas); 298 (9 gammas); 305 (6 gammas)	
Cluster 11	347 (76 gammas); 271 (38 gammas); 278 (10 gammas); 348 (30 gammas); 283 (10 gammas)	This cluster is in the near vicinity of the reported location of loss of the vessel *Carl Tide* (see Number 529 in Shipwreck table)

Several of these clusters are long, linear features oriented in a generally north-south direction. This is particularly evident in Clusters 4, 5 and 7. This could be a result of a wave-induced patterns of dispersal or it could simply mean that the source object or objects are elongated in shape, such as cable or pipe.

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5.3 Assessment of Side-Scan Sonar Records

Side Scan Sonar records display several identified man-made features and twelve (12) unidentified sonar contacts along the bottom surface (Appendix A, Figure Nos. 5 to 16). Five of the unidentified sonar contacts correlate with magnetic anomalies. Sonar Contact No. 2 may be associated with Anomaly No. 75 (Cluster No.4). Sonar Contact No. 3 may be associated with Anomaly No. 106. Sonar Contact No. 4 may be associated with a point source Anomaly No. 137. Sonar Contact No. 6 appears to correlate with Anomaly No. 3 or possibly Cluster No. 1, and Sonar Contact No. 9 is likely associated with Anomaly No. 70 (Cluster No. 3). The remaining unidentified sonar contacts likely represent non-ferrous debris or bottom features within the survey area. None of the sonar contacts could be identified as sunken vessels or parts of sunken vessels and most appear to be pieces of debris. The unidentified sonar contacts table below provides a description of the unidentified sonar contacts and they are also displayed on the Bathymetry and Hazard Maps.

Unidentified Sonar Contacts

No.	Line	Shot Point	Dimensions (ft)	Description	Sensor Height (ft)	Block Area	Louisiana South	
							X-Coord.	Y-Coord.
1	7	62	13x6x0	Debris	16	PL14	2,235,669'	94,115'
2	12	63	15x11x0	Debris	16	PL14	2,236,258'	93,456'
3	17	64-65	15x9x0	Debris	16	PL14	2,236,258'	93,456'
4	24	49	4x2x0	Debris	16	PL13	2,229,552'	91,473'
5	1	39-40	14x3x0	Debris	16	PL13	2,224,546'	94,960'
6	1	36-37	15x2x0	Debris	16	PL13	2,223,120'	95,239'
7	8	33	7x2x0	Debris	16	PL13	2,221,511'	93,847'
8	46	35-36	17x15	Debris	16	PL13	2,222,613'	87,637'
9	13	22-23	Debris Zone	Debris Zone	16	PL12	2,216,142'	93,250'
10	61	4-5	16x17x0	Debris	16	PL19	2,207,418'	85,184'
11	62	4-5	9x13x0	Debris	16	PL19	2,207,345'	85,035'
12	58	2-3	Debris Zone	Debris Zone	16	PL19	2,206,418'	85,717'

5.4 Assessment of Subbottom Records

Subbottom Profiler data was used to examine the near-surface subbottom features (Appendix A, Figure Nos. 2 to 4). The subbottom profiler record shows a cross sectional view of the subbottom strata within the survey area. The Mineral Management Service, Visual No. 3 (1983), indicates general seafloor sediments this portion of the South Pelto area are primarily silty clays. However, the subbottom profiler record from the immediate project area indicates the acoustic characteristics of the upper sediments are more typical of sand. The subbottom data did not show extensive relict channels in the area. In fact, only one portion of a channel was seen in the data (See Archaeological and Hazard Map) in the central portion of the survey area. This channel was relatively close to the surface within the Ship Shoal sands and exhibited extensive truncation along the upper portions.

ARCHAEOLOGICAL ASSESSMENT

6.0 CONCLUSIONS AND RECOMMENDATIONS

The assessment of the data from the survey area revealed only the partial remains of a relict channel within the Ship Shoal sands. The location of the channel within the Ship Shoal Sands suggests that it is likely a submarine channel possibly produced by marine currents or waves, making it impossible to determine the age of the channel. Since the channel was probably formed subaqueously, it has no relationship to potential human occupation of the area, and no potential for containing archaeological sites. This channel is not recommended for archaeological avoidance.

Eleven clusters of magnetic anomalies were identified within the New Cut Dune/Marsh project area that have characteristics similar to those associated with shipwreck sites. As discussed, the identity of the sources of these clusters of magnetic anomalies cannot be determined, but they do present magnetic signatures that are characteristic of shipwrecks, specifically vessels that have been broken up and dispersed as would be anticipated in the high-energy environment found on Ship Shoals. It is recommended that all eleven clusters be avoided due to archaeological potential. A list of the avoidance areas is provided in a table following this assessment below. Avoidance distances were based on the characteristics of the anomaly cluster (size, orientation, etc.) and the nature of activity this project involves. The avoidance distances also reflect the premise that the removal of several feet of sand from Ship Shoal will result in the displacement of surrounding sand deposits as they flow into the area excavated. Presumably, some of this displacement will occur during the sand removal process itself, but it will also continue for some time after the dredging is completed as waves and currents act to fill the excavated areas. Presently, it is impossible to determine how far away from any excavation sand stability will be affected. This is dependent upon a variety of factors, such as the lithology and content of the sand deposits and the depth of dredging; factors that require engineering assessments beyond the scope of the present study. Therefore, it is recommended that these factors be considered prior to excavations and that all identified magnetic anomaly clusters be avoided by a distance sufficient enough to insure that the sediments at the clusters will not be displaced by dredging. These same factors have to be considered when excavations are conducted in the vicinity of pipelines and other oilfield features. These features must be avoided by a sufficient distance to insure that the movement of sands resulting from the excavations will not uncover, undermine, or otherwise impact their structural integrity.

Twelve unidentified sonar contacts were also noted in the project area. The majority of these are interpreted as modern debris and are not recommended for avoidance based on archaeological potential. However, three (Sonar Contact Nos. 2,6, and 9) are associated with anomaly clusters and are recommended for avoidance on the basis of archaeological potential.

If the eleven identified magnetic clusters and associated sonar contacts cannot be avoided by the proposed operations, then they will have to be physically examined to determine their potential significance and National Register eligibility. This will require dive investigations and should follow the procedures established by the Minerals Management Service for diver investigations.

As discussed previously, the Ship Shoal deposits have the potential for containing cultural remains dating to the Middle Archaic period (circa 7,000 to 5,000 years B.P.). The present evidence indicates that these remains have been disturbed and will not be *in situ*, but they are

considered significant items because they can provide evidence of pre-5,000-year-old human occupation of deltaic and coastal settings in the region; evidence that is unique and has not been found elsewhere. Therefore, it is recommended that some attempt be made to examine the excavated Ship Shoal sediments for the presence of Middle Archaic artifacts and ecofacts. The techniques to be used in sand removal and placement onshore have not been finalized, so the recommendations for examining the excavated material presented here may have to be altered to fit the dredging techniques ultimately employed. At a minimum, we recommend that the excavated sand be visually monitored by an archaeologist. Monitoring can probably be most efficiently conducted by examining the sediments after they are placed onshore where it may be easier to locate and identify possible artifacts. Monitoring should be intensive and systematic. Under the assumption that sediments will be pumped ashore, and that the outflow pipe will be periodically shifted to distribute the sediments, we recommend that archaeologists examine the "fan" or "cone" of sediments produced at each location where sediments are pumped, after the outflow pipe has been shifted to another position. Experience at other locations, has shown that when dredged material flows onshore it often produces a fan- or cone-shaped pile of sediment that is partially size-graded (Sherwood Gagliano, personal communication 2003). This grading phenomenon tends to spatially concentrate items of similar size and mass, helping to sort any cultural materials that might be present. In this procedure it is important that the dredge outflow be shifted periodically to produce spatially distinct areas of disposed material. Additionally, it is important that the locations in Ship Shoal where individual piles of sediment are derived are recorded to the extent possible. This will be critical to ascertain if any spatial patterns exist in artifact distributions. It may be possible to mark individual outflow locations with flags that record where in Ship Shoal they were dredged. This would allow archaeologists to periodically visit the disposal locale to examine the material that has been deposited since a previous visit.

If heavy equipment (i.e., bulldozers, graders, etc.) is going to be used to distribute and form sediments after they are pumped ashore, we recommend that monitoring include a pedestrian survey of the entire project area after this has been done. This survey should be conducted after some rain has fallen or the area has been sprayed with water, which should help expose any artifacts at or near the prepared surface.

The type of monitoring described above will not discover all of the artifacts that may exist within the Ship Shoal sands that are deposited at the New Cut onshore project location. It will serve only as a gross examination and it may be that a more intensive assessment of sediments will be required to adequately assess their cultural content. Specifically, it is recommended that some portion of the sand outflow be examined in detail, if the initial stages of monitoring suggest this is necessary. For example, if the monitoring recovers large numbers of artifacts and/or ecofacts of various sizes, then it may not be necessary to undertake any additional examination of the dredged material. Some options for undertaking additional examination of the dredge material can be discussed now, but specific recommendations on techniques cannot be made until the dredging procedures are finalized. One option is that screening be conducted onshore using the outflow material, assuming this will be the technique used for sediment placement and assuming that it will be possible to determine the location in Ship Shoal where outflow sediments are derived. This would involve using a large, industrial screen (or screens) of the type typically used by the sand and gravel industry to sort aggregate. A mesh size of about one-half inch should be large enough to let sand easily pass through, but small enough to capture cultural

remains of interest. The objective would be to screen only a very small portion of outflow material; for instance, it may be necessary to divert outflow into the screen for only a few minutes a day, or possibly only every few days. The amount of material that can be screened within a reasonable amount of time and effort will have to be determined through field trials.

A second option would be to use a sluice box system on the onshore materials rather than a screen to separate the heavier artifacts from the lighter dredge material. A water pump or dredge would be used to provide the water supply to the sluice to assist in the separation of materials and a screen at the end of the sluice will ensure that any artifacts not caught by the sluice would not be lost. Both of these options are flexible in that either could be conducted on the barge or other vessel to be used as the sand is being dredged from the bottom. However, conducting the screening or sluicing on the barge during excavation may face logistical and safety problems that would not be encountered if the work is done at the onshore location.

ARCHAEOLOGICAL ASSESSMENT

TABLE OF ARCHAEOLOGICAL AVOIDANCE AREAS

MAGNETIC ANOMALIES							
Ref. No.	Line No.	Shot Point	Gamma/ Duration (ft)	Area/ Block	Louisiana South X Coord.	Louisiana South Y Coord.	Avoidance Criteria
31	5	36.6	79/120 Dipole	PL13	2,223,256'	94,450'	With 2,10,14,22, & 338 1000' x 500' minimum, Sheet No. 2
59	10	13.2	654/255 Dipole	PL12	2,211,740'	93,587'	With 44 & 49 750' minimum, Sheet No. 2
79	13	22.22	2467/498 Dipole	PL12	2,216,176'	93,110'	With 65,70,88,89,93, & 94, Sonar No. 9 1000' minimum, Sheet No. 2
75	12	63.08	54/253 Dipole	PL14	2,236,293'	93,351'	With 55,62,68,76, & 86 Sonar No. 2 1000' minimum, Sheet No. 2
105	16	62.6	113/141 Dipole	PL14	2,236,059'	92,695'	With 97 & 108 Avoidance distance designated on 500' minimum, Sheet No. 2
115	18	43.82	511/462 Dipole	PL13	2,226,816'	92,327'	With 120 500' minimum, Sheet No. 2
189	36	10.58	1932/1174 Dipole	PL12	2,210,470'	89,323'	With 168,169,170,171,179,180, 188,203,204, & 214 1000' minimum, Sheet No. 2
198	37	59.5	49/333 Dipole	PL14	2,234,538'	89,244'	With 197 & 332 500' minimum, Sheet No. 2
208	39	57.18	53/252 Monopole	PL14	2,233,398'	88,908'	With 223 500' minimum, Sheet No. 2
302	60	22.09	996/614 Dipole	PL19	2,216,146'	85,407'	With 298 & 305 500' minimum, Sheet No. 2
347	98	19.33	76/238 Monopole	PL12	2,210,971'	86,804'	With 271,278,283, & 348 500' minimum, Sheet No. 2

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APPENDIX A

Geophysical Data Reproductions

APPENDIX B

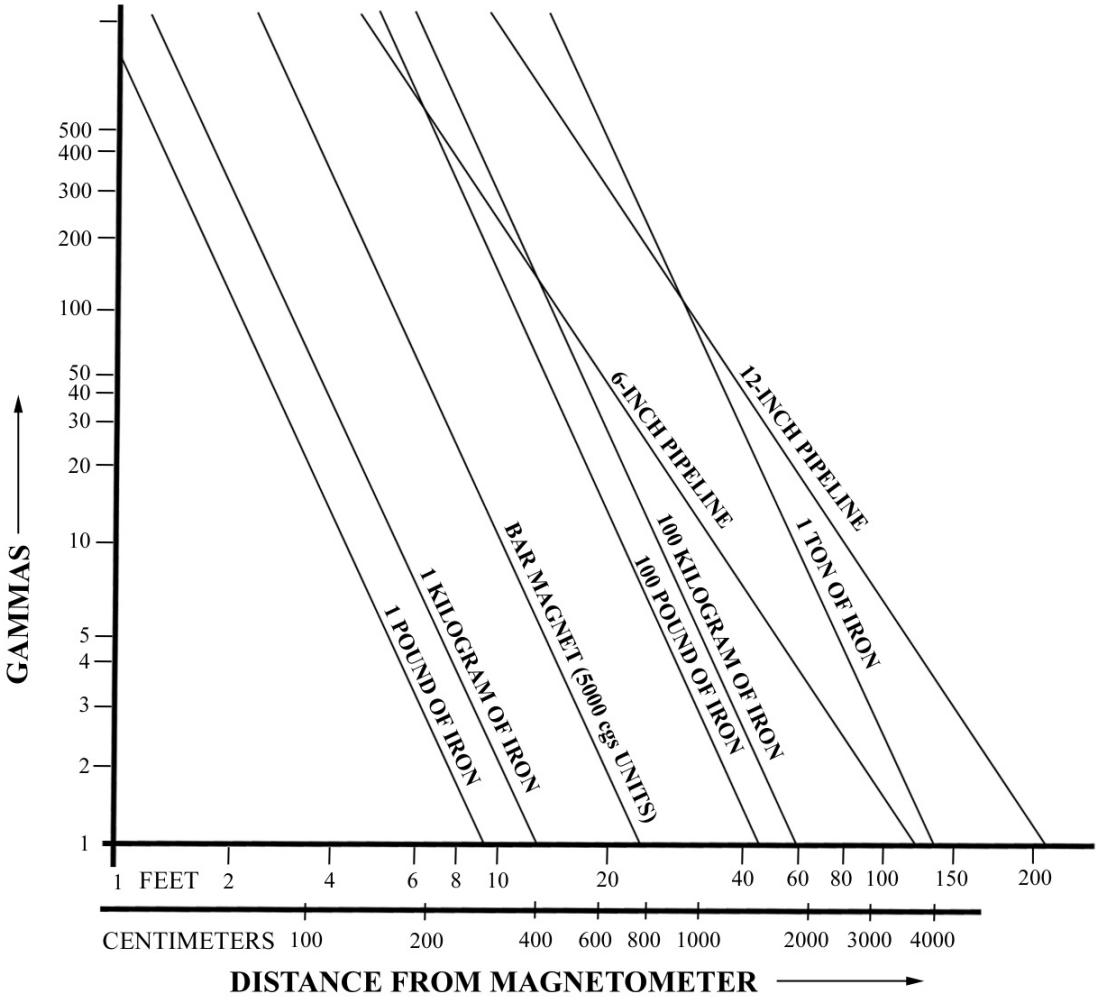
Nomogram

Identified Magnetic Anomalies

Unidentified Magnetic Anomalies

APPENDIX B

BREINER NOMOGRAM (1973)



INSTRUCTIONS FOR USE:

To use the nomogram, select a given weight or type of object from among the diagonal labeled lines. Then choose a distance along the bottom line (abscissa) of the graph and follow a vertical line upwards from that distance until it intersects the diagonal line of the selected object. At that point, move horizontally to the left to a value on the vertical axis (ordinate) of the graph and read the intensity in gammas.

At a given distance, the intensity is proportional to the weight of the object. Therefore, for an object whose weight is not precisely that of the labeled lines, simply multiply the intensity in gammas by the ratio of the desired weight to the labeled weight on the graph. If the distance desired does not appear on the graph, remember that for a typical object, the intensity is inversely proportional to the cube of the distance, and for a long pipeline, the intensity is inversely proportional to the square of the distance between magnetometer sensor and object. Due to the many uncertainties described herein, the estimates derived from this nomogram may be larger or smaller by a factor of 2 to 5 or perhaps more.

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
1	LN1	10.66	11.26	56	D	254	S-8017 Comstock 8"	17'
2	LN1	24.24	24.9	84	D	300	S-12030 Energy 6"	18'
3	LN1	25.47	26.06	6	M	450	Well #7	18'
4	LN1	27.58	28.18	96	D	212	S-6286 ANR 8"	18'
5	LN1	28.36	28.97	82	M	320	S-6173 Texaco 4"	18'
6	LN1	44.22	44.91	699	M	507	S-4006 Equilon 20"	17'
7	LN1	45.37	45.97	351	D	370	S-5013 Chevron 10"	17'
8	LN2	11.62	11.02	735	M	356	S-8017 Comstock 8"	17'
9	LN2	25.55	24.95	119	M	162	S-12030 Energy 6"	18'
10	LN2	29.00	28.39	280	D	265	S-6286 ANR 8"	18'
11	LN2	29.89	29.29	101	M	195	S-6173 Texaco 4"	18'
12	LN2	45.16	44.56	622	D	435	S-4006 Equilon 20"	18'
13	LN2	47.40	46.8	255	D	568	S-5013 Chevron 10"	18'
14	LN3	11.45	10.85	55	M	466	S-8017 Comstock 8"	16'
15	LN3	25.70	25.09	145	D	252	S-12030 Energy 6"	17'
16	LN3	29.21	28.6	171	D	293	S-6286 ANR 8"	17'
17	LN3	30.11	29.51	147	M	205	S-6173 Texaco 4"	17'
18	LN3	44.94	44.33	74	D	412	S-4006 Equilon 20"	17'
19	LN3	48.11	47.51	916	D	521	S-5013 Chevron 10"	18'
20	LN4	11.18	10.58	76	D	415	S-8017 Comstock 8"	17'
21	LN4	25.89	25.29	113	M	252	S-12030 Energy 6"	17'
22	LN4	29.40	28.8	90	D	237	S-6286 ANR 8"	17'
23	LN4	30.31	29.71	44	D	197	S-6173 Texaco 4"	17'
24	LN4	44.66	44.06	469	D	201	S-4006 Equilon 20"	17'
25	LN4	48.57	47.97	541	D	454	S-5013 Chevron 10"	17'
26	LN5	11.09	10.49	104	M	192	S-8017 Comstock 8"	15'
27	LN5	26.08	25.48	189	M	209	S-12030 Energy 6"	17'
28	LN5	29.58	28.97	370	M	133	S-6286 ANR 8"	17'
29	LN5	30.45	29.84	178	D	223	S-6173 Texaco 4"	17'
30	LN5	44.52	43.92	192	D	454	S-4006 Equilon 20"	17'
31	LN5	49.24	48.64	2122	D	717	S-5013 Chevron 10"	17'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
32	LN6	9.69	10.29	50	D	358	S-8017 Comstock 8"	16'
33	LN6	25.13	25.73	261	D	255	S-12030 Energy 6"	16'
34	LN6	28.60	29.2	306	D	250	S-6286 ANR 8"	17'
35	LN6	29.46	30.06	156	M	199	S-6173 Texaco 4"	17'
36	LN6	43.19	43.79	267	D	229	S-4006 Equilon 20"	17'
37	LN6	49.02	49.58	174	D	624	S-5013 Chevron 10"	17'
38	LN7	9.48	10.09	96	D	229	S-8017 Comstock 8"	5'
39	LN7	25.36	25.97	37	M	242	S-12030 Energy 6"	7'
40	LN7	28.79	29.39	166	D	223	S-6286 ANR 8"	7'
41	LN7	29.65	30.25	256	M	219	S-6173 Texaco 4"	7'
42	LN7	43.04	43.56	676	M	416	S-4006 Equilon 20"	8'
43	LN7	49.67	50.27	324	D	704	S-5013 Chevron 10"	8'
44	LN8	10.53	9.93	140	M	134	S-8017 Comstock 8"	15'
45	LN8	26.75	26.15	118	D	163	S-12030 Energy 6"	16'
46	LN8	30.15	29.55	121	D	225	S-6286 ANR 8"	17'
47	LN8	31.00	30.4	305	D	276	S-6173 Texaco 4"	17'
48	LN8	44.03	43.43	1090	M	326	S-4006 Equilon 20"	17'
49	LN8	51.39	50.79	598	D	641	S-5013 Chevron 10"	17'
50	LN9	9.14	9.75	152	M	237	S-8017 Comstock 8"	15'
51	LN9	25.81	26.41	141	D	177	S-12030 Energy 6"	16'
52	LN9	29.11	29.71	45	D	208	S-6286 ANR 8"	17'
53	LN9	29.93	30.54	113	M	376	S-6173 Texaco 4"	17'
54	LN9	42.62	43.23	256	D	313	S-4006 Equilon 20"	18'
55	LN9	50.76	51.36	570	M	554	S-5013 Chevron 10"	18'
56	LN10	10.25	9.64	398	D	345	S-8017 Comstock 8"	15'
57	LN10	27.20	26.6	114	M	181	S-12030 Energy 6"	16'
58	LN10	30.49	29.89	147	D	271	S-6286 ANR 8"	17'
59	LN10	31.34	30.74	163	D	231	S-6173 Texaco 4"	17'
60	LN10	43.68	43.08	444	D	353	S-4006 Equilon 20"	18'
61	LN10	52.42	51.82	159	D	804	S-5013 Chevron 10"	18'
62	LN11	8.89	9.49	125	D	186	S-8017 Comstock 8"	15'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
63	LN11	26.30	26.9	21	D	319	S-12030 Energy 6"	16'
64	LN11	29.58	30.18	447	M	207	S-6286 ANR 8"	17'
65	LN11	30.37	30.97	96	D	215	S-6173 Texaco 4"	17'
66	LN11	42.33	42.93	678	D	337	S-4006 Equilon 20"	18'
67	LN11	51.77	52.37	1843	D	592	S-5013 Chevron 10"	18'
68	LN12	9.99	9.39	815	M	315	S-8017 Comstock 8"	16'
69	LN12	27.61	27	127	D	211	S-12030 Energy 6"	17'
70	LN12	30.92	30.31	219	M	395	S-6286 ANR 8"	17'
71	LN12	31.75	31.15	287	M	252	S-6173 Texaco 4"	17'
72	LN12	43.37	42.77	762	D	363	S-4006 Equilon 20"	17'
73	LN12	53.40	52.8	392	D	495	S-5013 Chevron 10"	18'
74	LN13	8.73	9.33	168	D	321	S-8017 Comstock 8"	16'
75	LN13	26.66	27.26	95	D	238	S-12030 Energy 6"	17'
76	LN13	29.92	30.52	431	D	281	S-6286 ANR 8"	17'
77	LN13	30.75	31.35	139	M	258	S-6173 Texaco 4"	17'
78	LN13	42.01	42.61	483	M	455	S-4006 Equilon 20"	17'
79	LN13	52.72	53.32	428	D	280	S-5013 Chevron 10"	18'
80	LN14	8.93	8.33	243	D	236	S-7738 Murphy 6"	16'
81	LN14	9.82	9.22	733	M	291	S-8017 Comstock 8"	16'
82	LN14	28.21	27.61	154	D	177	S-12030 Energy 6"	17'
83	LN14	31.43	30.82	71	D	241	S-6286 ANR 8"	17'
84	LN14	32.23	31.63	101	M	187	S-6173 Texaco 4"	17'
85	LN14	42.89	42.29	717	D	275	S-4006 Equilon 20"	18'
86	LN14	54.77	54.18	152	D	630	S-5013 Chevron 10"	18'
87	LN15	7.94	8.55	151	D	266	S-7738 Murphy 6"	16'
88	LN15	8.62	9.22	348	M	234	S-8017 Comstock 8"	16'
89	LN15	27.16	27.76	60	M	140	S-12030 Energy 6"	16'
90	LN15	30.36	30.95	250	M	173	S-6286 ANR 8"	17'
91	LN15	31.14	31.75	127	D	245	S-6173 Texaco 4"	17'
92	LN15	41.58	42.18	436	D	372	S-4006 Equilon 20"	17'
93	LN15	54.03	54.64	1171	D	453	S-5013 Chevron 10"	18'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
94	LN16	8.99	8.39	288	D	311	S-5408 Vastar 8"	16'
95	LN16	9.69	9.08	98	D	184	S-8017 Comstock 8"	16'
96	LN16	28.73	28.14	236	D	285	S-12030 Energy 6"	16'
97	LN16	31.94	31.33	131	D	300	S-6286 ANR 8"	17'
98	LN16	32.69	32.09	18	D	252	S-6173 Texaco 4"	17'
99	LN16	42.26	41.66	2081	M	290	S-4006 Equilon 20"	18'
100	LN16	56.01	55.42	122	D	484	S-5013 Chevron 10"	18'
101	LN17	55.05	55.55	239	D	617	S-5013 Chevron 10"	19'
102	LN17	41.03	41.63	573	M	620	S-4006 Equilon 20"	18'
103	LN17	31.54	32.14	29	D	235	S-6173 Texaco 4"	17'
104	LN17	30.78	31.38	78	M	379	S-6286 ANR 8"	17'
105	LN17	27.64	28.24	120	D	328	S-12030 Energy 6"	17'
106	LN18	9.58	8.98	160	M	303	S-5408 Vastar 8"	16'
107	LN18	10.74	10.13	63	M	778	S-5408 Vastar 8"	16'
108	LN18	29.20	28.6	76	M	358	S-12030 Energy 6"	17'
109	LN18	32.35	31.75	196	M	426	S-6286 ANR 8"	17'
110	LN18	33.08	32.48	173	M	280	S-6173 Texaco 4"	17'
111	LN18	41.85	41.24	493	M	420	S-4006 Equilon 20"	18'
112	LN18	57.67	57.07	231	M	580	S-5013 Chevron 10"	19'
113	LN19	56.90	57.49	157	M	870	S-5013 Chevron 10"	18'
114	LN19	40.48	41.09	370	M	505	S-4006 Equilon 20"	18'
115	LN19	32.02	32.58	19	M	87	S-6173 Texaco 4"	17'
116	LN19	31.31	31.92	216	M	282	S-6286 ANR 8"	17'
117	LN19	28.18	28.78	43	M	286	S-12030 Energy 6"	16'
118	LN19	10.25	10.89	968	D	1200	S-5408 Vastar 8"	16'
119	LN19	8.38	8.98	286	M	300	S-8017 Comstock 8"	16'
120	LN20	9.52	8.92	150	M	314	S-8017 Comstock 8"	16'
121	LN20	12.33	11.73	1257	M	1023	S-5408 Vastar 8"	16'
122	LN20	29.60	29	132	M	304	S-12030 Energy 6"	17'
123	LN20	32.69	32.09	68	D	284	S-6286 ANR 8"	17'
124	LN20	33.46	32.86	135	M	261	S-6173 Texaco 4"	17'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
125	LN20	41.46	40.86	449	M	512	S-4006 Equilon 20"	18'
126	LN20	58.69	58.09	249	M	970	S-5013 Chevron 10"	19'
127	LN21	58.31	58.91	43	M	1422	S-5013 Chevron 10"	19'
128	LN21	40.02	40.57	450	M	499	S-4006 Equilon 20"	18'
129	LN21	32.48	33.08	111	M	330	S-6173 Texaco 4"	17'
130	LN21	31.76	32.36	208	M	316	S-6286 ANR 8"	17'
131	LN21	28.70	29.3	221	M	433	S-12030 Energy 6"	17'
132	LN21	12.05	12.55	121	M	915	S-5408 Vastar 8"	16'
133	LN21	8.32	8.92	200	M	290	S-8017 Comstock 8"	16'
134	LN22	9.47	8.87	79	M	208	S-8017 Comstock 8"	16'
135	LN22	13.71	13.1	941	M	517	S-5408 Vastar 8"	16'
136	LN22	30.02	29.42	59	D	384	S-12030 Energy 6"	17'
137	LN22	33.10	32.49	307	M	368	S-6286 ANR 8"	18'
138	LN22	33.84	33.24	141	M	310	S-6173 Texaco 4"	18'
139	LN22	41.02	40.43	1441	M	588	S-4006 Equilon 20"	18'
140	LN22	60.31	59.71	568	D	1258	S-5013 Chevron 10"	20'
141	LN23	60.01	60.62	526	M	1113	S-5013 Chevron 10"	19'
142	LN23	39.56	40.16	204	M	480	S-4006 Equilon 20"	18'
143	LN23	32.93	33.53	79	M	308	S-6173 Texaco 4"	17'
144	LN23	32.16	32.76	65	M	450	S-6286 ANR 8"	17'
145	LN23	29.15	29.75	122	M	354	S-12030 Energy 6"	17'
146	LN23	13.47	14.07	95	M	674	S-5408 Vastar 8"	16'
147	LN23	8.23	8.9	100	M	432	S-8017 Comstock 8"	16'
148	LN24	9.45	8.85	125	M	508	S-8017 Comstock 8"	17'
149	LN24	15.35	14.75	81	M	579	S-5408 Vastar 8"	16'
150	LN24	30.49	29.89	72	M	282	S-12030 Energy 6"	17'
151	LN24	33.43	32.82	246	M	326	S-6286 ANR 8"	18'
152	LN24	34.23	33.62	177	D	423	S-6173 Texaco 4"	18'
153	LN24	40.63	40.03	1097	M	508	S-4006 Equilon 20"	18'
154	LN24	61.63	61.04	165	M	1089	S-5013 Chevron 10"	20'
155	LN25	61.21	61.93	2167	D	624	S-5013 Chevron 10"	20'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
156	LN25	39.19	39.8	396	D	451	S-4006 Equilon 20"	18'
157	LN25	33.30	33.9	122	M	272	S-6173 Texaco 4"	18'
158	LN25	32.50	33.1	73	M	212	S-6286 ANR 8"	18'
159	LN25	29.58	30.18	120	M	296	S-12030 Energy 6"	18'
160	LN25	15.02	15.59	34	M	735	S-5408 Vastar 8"	16'
161	LN25	8.20	8.94	143	M	430	S-8017 Comstock 8"	16'
162	LN26	9.35	8.75	54	M	360	S-8017 Comstock 8"	17'
163	LN26	16.80	16.19	413	M	480	S-5408 Vastar 8"	17'
164	LN26	30.91	30.31	121	M	209	S-12030 Energy 6"	18'
165	LN26	33.78	33.17	1040	M	447	S-6286 ANR 8"	18'
166	LN26	34.58	33.98	40	M	208	S-6173 Texaco 4"	18'
167	LN26	40.24	39.63	424	D	495	S-4006 Equilon 20"	18'
168	LN26	62.91	62.3	235	M	866	S-5013 Chevron 10"	21'
169	LN27	62.35	62.96	461	M	615	S-5013 Chevron 10"	21'
170	LN27	38.80	39.4	660	M	501	S-4006 Equilon 20"	18'
171	LN27	33.62	34.23	104	M	400	S-6173 Texaco 4"	18'
172	LN27	32.79	33.4	685	M	432	S-6286 ANR 8"	18'
173	LN27	30.01	30.59	157	M	362	S-12030 Energy 6"	18'
174	LN27	16.37	16.96	104	M	915	S-5408 Vastar 8"	17'
175	LN27	8.17	8.77	83	M	387	S-8017 Comstock 8"	17'
176	LN28	9.34	8.74	90	M	372	S-8017 Comstock 8"	17'
177	LN28	18.33	17.73	257	D	480	S-5408 Vastar 8"	17'
178	LN28	31.37	30.77	45	D	546	S-12030 Energy 6"	18'
179	LN28	34.16	33.56	846	M	429	S-6286 ANR 8"	18'
180	LN28	34.98	34.38	80	D	297	S-6173 Texaco 4"	18'
181	LN28	39.80	39.2	323	M	282	S-4006 Equilon 20"	19'
182	LN28	64.05	63.45	235	D	821	S-5013 Chevron 10"	22'
183	LN29	64.43	65.03	34	D	407	S-5013 Chevron 10"	21'
184	LN29	63.34	63.95	154	M	771	S-5013 Chevron 10"	21'
185	LN29	38.47	39.07	521	D	465	S-4006 Equilon 20"	18'
186	LN29	34.00	34.6	334	M	296	S-6173 Texaco 4"	18'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
187	LN29	33.19	33.79	56	D	322	S-6286 ANR 8"	18'
188	LN29	30.43	31.03	200	M	379	S-12030 Energy 6"	18'
189	LN29	17.90	18.5	628	M	909	S-5408 Vastar 8"	17'
190	LN29	8.16	8.76	43	M	254	S-8017 Comstock 8"	17'
191	LN30	9.22	8.62	355	M	441	S-8017 and S-8017A Comstock 8"	17'
192	LN30	19.85	19.25	38	M	392	S-5408 Vastar 8"	17'
193	LN30	20.29	19.69	209	D	671	S-5408 Vastar 8"	18'
194	LN30	31.98	31.37	180	D	384	S-12030 Energy 6"	18'
195	LN30	34.65	34.05	522	M	431	S-6286 ANR 8"	18'
196	LN30	35.48	34.87	60	M	329	S-6173 Texaco 4"	18'
197	LN30	39.26	38.66	321	D	546	S-4006 Equilon 20"	15'
198	LN30	65.12	64.52	19	D	883	S-5013 Chevron 10"	18'
199	LN30	66.28	65.68	383	M	708	S-5013 Chevron 10"	18'
200	LN31	65.13	65.73	186	M	761	S-5013 Chevron 10"	23'
201	LN31	38.04	38.56	96	M	504	S-4006 Equilon 20"	19'
202	LN31	34.38	34.98	160	M	203	S-6173 Texaco 4"	19'
203	LN31	33.56	34.16	123	M	344	S-6286 ANR 8"	18'
204	LN31	30.85	31.45	40	D	225	S-12030 Energy 6"	18'
205	LN31	19.51	20.11	38	M	278	S-5408 Vastar 8"	18'
206	LN31	19.33	19.92	72	M	410	S-5408 Vastar 8"	18'
207	LN31	8.03	8.57	198	M	278	S-8017 and S-8017A Comstock 8"	17'
208	LN32	8.86	8.26	482	M	373	S-8017 and S-8017A Comstock 8"	13'
209	LN32	21.94	21.34	83	D	689	S-5408 Vastar 8"	14'
210	LN32	32.43	31.83	61	M	257	S-12030 Energy 6"	14'
211	LN32	35.08	34.48	278	D	465	S-6286 ANR 8"	14'
212	LN32	35.95	35.34	31	M	293	S-6173 Texaco 4"	14'
213	LN32	38.82	38.21	441	D	784	S-4006 Equilon 20"	15'
214	LN32	67.37	66.78	192	D	494	S-5013 Chevron 10"	18'
215	LN33	37.58	38.18	393	M	572	S-4006 Equilon 20"	19'
216	LN33	34.84	35.44	92	M	323	S-6173 Texaco 4"	19'
217	LN33	34.01	34.6	694	M	354	S-6286 ANR 8"	19'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
218	LN33	31.47	32.08	66	M	316	S-12030 Energy 6"	19'
219	LN33	21.21	21.93	265	D	603	S-5408 Vastar 8"	18'
220	LN33	7.59	8.19	325	M	316	S-8017 and S-8017A Comstock 8"	17'
221	LN34	8.55	7.95	367	M	544	S-8017 and S-8017A Comstock 8"	13'
222	LN34	23.30	22.7	30	M	727	S-5408 Vastar 8"	14'
223	LN34	32.94	32.34	105	D	383	S-12030 Energy 6"	14'
224	LN34	35.51	34.91	203	M	314	S-6286 ANR 8"	14'
225	LN34	36.30	35.7	38	D	354	S-6173 Texaco 4"	15'
226	LN34	38.36	37.76	198	M	645	S-4006 Equilon 20"	15'
227	LN35	37.01	37.61	559	M	674	S-4006 Equilon 20"	15'
228	LN35	35.30	35.9	257	M	378	S-6173 Texaco 4"	15'
229	LN35	34.51	35.11	93	D	381	S-6286 ANR 8"	15'
230	LN35	32.04	32.56	149	D	285	S-12030 Energy 6"	15'
231	LN35	22.64	23.25	224	M	980	S-5408 Vastar 8"	14'
232	LN35	7.18	7.78	213	M	437	S-8017 and S-8017A Comstock 8"	13'
233	LN36	8.09	7.49	104	M	307	S-8017 and S-8017A Comstock 8"	13'
234	LN36	24.80	24.2	763	M	1121	S-5408 Vastar 8"	14'
235	LN36	33.39	32.78	135	M	443	S-12030 Energy 6"	15'
236	LN36	33.39	32.78	135	M	423	S-12030 Energy 6"	15'
237	LN36	35.92	35.32	331	M	369	S-6286 ANR 8"	15'
238	LN36	36.75	36.14	138	M	381	S-6173 Texaco 4"	15'
239	LN36	37.97	37.37	304	D	507	S-4006 Equilon 20"	15'
240	LN37	36.53	37.13	724	M	392	S-4006 Equilon 20"	15'
241	LN37	35.81	36.41	138	M	293	S-6173 Texaco 4"	15'
242	LN37	34.93	35.54	508	M	488	S-6286 ANR 8"	15'
243	LN37	32.45	33.05	133	M	460	S-12030 Energy 6"	15'
244	LN37	24.28	24.88	26	M	682	S-5408 Vastar 8"	14'
245	LN37	6.76	7.36	140	M	436	S-8017 and S-8017A Comstock 8"	13'
246	LN38	7.79	7.18	95	M	430	S-8017 and S-8017A Comstock 8"	14'
247	LN38	26.20	25.6	54	D	241	S-5408 Vastar 8"	15'
248	LN38	33.80	33.2	61	M	369	S012030 Energy 6"	11'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
249	LN38	36.25	35.65	396	M	506	S-6286 ANR 8"	14'
250	LN38	37.14	36.54	59	M	253	S-6173 Texaco 4"	16'
251	LN38	37.56	36.96	826	M	312	S-4006 Equilon 20"	16'
252	LN39	36.14	36.74	462	M	461	S-6173 Texaco 4"	16'
253	LN39	35.31	35.9	121	M	212	S-6286 ANR 8"	15'
254	LN39	32.88	33.48	166	D	383	S-12030 Energy 6"	15'
255	LN39	25.86	26.46	38	M	470	S-5408 Vastar 8"	15'
256	LN39	6.44	7.04	200	M	332	S-8017 and S-8017A Comstock 8"	13'
257	LN40	7.56	6.96	122	D	275	S-8017 and S-8017A Constock 8"	14'
258	LN40	27.70	27.1	75	D	451	S-5408 Vastar 8"	16'
259	LN40	34.26	33.65	219	M	359	S-12030 Energy 6"	15'
260	LN40	36.64	36.04	275	M	277	S-6286 ANR 8"	16'
261	LN40	37.20	36.59	348	M	228	S-4006 Equilon 20"	16'
262	LN40	37.57	36.98	92	M	181	S-6173 Texaco 4"	16'
263	LN41	36.62	37.22	118	M	354	S-6173 Texaco 4"	16'
264	LN41	35.74	36.34	2195	M	631	S-6286 ANR 8" and S-4006 Equilon 20"	16'
265	LN41	33.32	33.92	70	M	343	S-12030 Energy 6"	15'
266	LN41	27.35	27.94	854	D	950	S-5408 Vastar 8"	15'
267	LN41	6.19	6.79	266	M	597	S-8017 and S-8017A Comstock 8"	14'
268	LN42	7.24	6.64	277	M	384	S-8017 and S-8017A Comstock 8"	13'
269	LN42	29.15	28.54	745	D	1060	S-5408 Vastar 8"	14'
270	LN42	34.62	34.02	101	D	364	S-12030 Energy 6"	14'
271	LN42	36.81	36.21	552	M	663	S-4006 Equilon 20"	15'
272	LN42	37.93	37.33	83	D	245	S-6173 Texaco 4"	15'
273	LN43	37.01	37.62	60	M	333	S-6173 Texaco 4"	16'
274	LN43	36.09	36.69	159	D	277	S-6286 ANR 8"	17'
275	LN43	35.38	35.98	637	M	482	S-4006 Equilon 20"	16'
276	LN43	33.74	34.33	108	M	257	S-12030 Energy 6"	16'
277	LN43	28.76	29.36	135	M	667	S-5408 Vastar 8"	16'
278	LN43	5.85	6.45	66	M	348	S-8017 and S-8017A Comstock 8"	14'
279	LN44	6.86	6.26	170	D	409	S-8017 and S-8017A Comstock 8"	13'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
280	LN44	30.82	30.21	35	M	760	S-5408 Vastar 8"	15'
281	LN44	35.07	34.46	87	M	266	S-12030 Energy 6"	15'
282	LN44	36.39	35.79	272	M	480	S-4006 Equilon 20"	15'
283	LN44	37.42	36.82	291	M	272	S-6286 ANR 8"	15'
284	LN44	38.37	37.77	196	M	263	S-6173 Texaco 4"	15'
285	LN45	37.42	38.02	246	M	391	S-6173 Texaco 4"	15'
286	LN45	36.44	37.04	54	D	194	S-6286 ANR 8"	15'
287	LN45	35.00	35.61	118	D	387	S-4006 Equilon 20"	15'
288	LN45	34.15	34.75	111	D	304	S-12030 Energy 6"	15'
289	LN45	30.43	31.03	107	D	635	S-5408 Vastar 8"	15'
290	LN45	5.51	6.12	190	D	408	S-8017 and S-8017A Comstock 8"	13'
291	LN46	6.34	5.74	193	M	440	S-8017 and S-8017A Comstock 8"	13'
292	LN46	32.50	31.9	137	M	627	S-5408 Vastar 8"	16'
293	LN46	35.66	35.06	161	M	239	S-12030 Energy 6"	16'
294	LN46	35.97	35.37	511	M	215	S-4006 Equilon 20"	16'
295	LN46	37.88	37.28	104	M	296	S-6286 ANR 8"	16'
296	LN46	38.89	38.3	81	M	304	S-6173 Texaco 4"	16'
297	LN48	5.61	5.01	105	M	441	S-8017 and S-8017A Comstock 8"	13'
298	LN48	34.52	33.92	252	D	545	S-5408 Vastar 8"	16'
299	LN48	35.18	34.58	896	M	1041	S-5408 Vastar 8"	16'
300	LN48	35.53	34.93	155	M	206	S-4006 Equilon 20" and S-5408 Vastar 8"	16'
301	LN48	36.22	35.62	81	M	227	S-12030 Energy 6"	16'
302	LN48	38.34	37.75	53	M	349	S-6286 ANR 8"	16'
303	LN48	39.35	38.75	217	M	438	S-6173 Texaco 4"	16'
304	LN47	37.84	38.44	162	M	348	S-6173 Texaco 4"	16'
305	LN47	36.83	37.44	119	M	323	S-6286 ANR 8"	16'
306	LN47	34.66	35.26	146	M	408	S-12030 Energy 6"	16'
307	LN47	32.09	32.69	781	D	710	S-5408 Vastar 8"	16'
308	LN47	4.91	5.51	377	M	353	S-8017 and S-8017A Comstock 8"	13'
309	LN49	38.28	38.88	149	M	411	S-6173 Texaco 4"	17'
310	LN49	37.25	37.88	51	M	271	S-6286 ANR 8"	16'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
311	LN49	35.16	35.75	35	M	271	S-12030 Energy 6"	16'
312	LN49	34.24	34.9	627	M	790	S-4006 Equilon 20" and S-5408 Vastar 8"	16'
313	LN49	4.21	4.92	219	M	482	S-8017 and S-8017A Comstock 8"	14'
314	LN50	4.99	4.38	310	M	478	S-8017 and S-8017A Comstock 8"	13'
315	LN50	35.12	34.52	145	M	280	S-4006 Equilon 20"	16'
316	LN50	36.70	36.1	80	M	385	S-12030 Energy 6"	16'
317	LN50	38.78	38.18	56	M	306	S-6286 ANR 8"	16'
318	LN50	39.76	39.16	246	M	400	S-6173 Texaco 4"	16'
319	LN51	38.60	39.2	46	M	362	S-6173 Texaco 4"	18'
320	LN51	37.69	38.29	103	M	217	S-6286 ANR 8"	17'
321	LN51	35.62	36.22	29	M	197	S-12030 Energy 6"	17'
322	LN51	33.79	34.39	123	M	374	S-4006 Equilon 20"	17'
323	LN51	3.60	4.2	175	M	282	S-8017 and S-8017A Comstock 8"	14'
324	LN52	4.54	3.94	378	M	472	S-8017 and S-8017A Comstock 8"	13'
325	LN52	34.67	34.07	296	M	329	S-4006 Equilon 20"	16'
326	LN52	37.15	36.55	74	M	302	S-12030 Energy 6"	16'
327	LN52	39.19	38.6	107	D	331	S-6286 ANR 8"	17'
328	LN52	40.13	39.52	334	M	299	S-6173 Texaco 4"	17'
329	LN53	39.03	39.64	111	M	292	S-6173 Texaco 4"	18'
330	LN53	38.17	38.77	85	M	219	S-6286 ANR 8"	18'
331	LN53	36.21	36.81	133	M	315	S-12030 Energy 6"	17'
332	LN53	33.32	33.93	261	M	376	S-4006 Equilon 20"	17'
333	LN53	3.24	3.9	584	M	285	S-8017 and S-8017A Comstock 8"	14'
334	LN54	4.13	3.53	91	M	187	S-8017 and S-8017A Comstock 8"	13'
335	LN54	34.31	33.71	361	D	397	S-4006 Equilon 20"	17'
336	LN54	37.66	37.05	84	M	279	S-12030 Energy 6"	17'
337	LN54	39.54	38.94	64	M	285	S-6286 ANR 8"	17'
338	LN54	40.45	39.85	144	D	278	S-6173 Texaco 4"	18'
339	LN55	39.41	40.01	289	M	342	S-6173 Texaco 4"	18'
340	LN55	38.58	39.18	89	M	264	S-6286 ANR 8"	18'
341	LN55	36.69	37.29	93	M	322	S-12030 Energy 6"	18'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
342	LN55	32.88	33.49	123	D	387	S-4006 Equilon 20"	17'
343	LN55	2.76	3.36	295	M	502	S-8017 and S-8017A Comstock 8"	14'
344	LN56	2.97	2.37	117	M	748	Platform "34"	14'
345	LN56	3.72	3.12	123	M	173	S-8017 and S-8017A Comstock 8"	14'
346	LN56	33.91	33.3	288	M	568	S-4006 Equilon 20"	17'
347	LN56	38.09	37.49	44	D	349	S-12030 Energy 6"	18'
348	LN56	39.99	39.39	31	M	240	S-6286 ANR 8"	19'
349	LN56	40.84	40.24	138	M	281	S-6173 Texaco 4"	19'
350	LN57	39.76	40.36	72	M	241	S-6173 Texaco 4"	19'
351	LN57	39.03	39.57	29	M	228	S-6286 ANR 8"	19'
352	LN57	37.14	37.74	60	M	328	S-12030 Energy 6"	18'
353	LN57	32.53	33.14	130	D	394	S-4006 Equilon 20"	17'
354	LN57	1.78	2.39	1258	M	901	Platform "34"	13'
355	LN58	2.94	2.34	430	M	239	Platform "34"	14'
356	LN58	33.54	32.93	192	D	373	S-4006 Equilon 20"	18'
357	LN58	38.57	37.97	74	M	343	S-12030 Energy 6"	19'
358	LN59	37.60	38.2	44	M	307	S-12030 Energy 6"	20'
359	LN59	32.10	32.7	159	M	499	S-4006 Equilon 20"	18'
360	LN60	4.90	4.3	55	M	1229	Platform "37"	16'
361	LN60	33.15	32.55	337	M	506	S-4006 Equilon 20"	17'
362	LN61	31.71	32.31	437	M	397	S-4006 Equilon 20"	19'
363	LN61	3.65	4.25	277	M	1390	Platform "37"	15'
364	LN62	4.85	4.26	1193	M	985	Platform "37"	15'
365	LN62	32.68	32.07	134	M	404	S-4006 Equilon 20"	18'
366	LN63	31.22	31.82	80	M	434	S-4006 Equilon 20"	18'
367	LN64	6.85	6.25	16	M	789	Well #36	15'
368	LN64	32.25	31.65	39	M	425	S-4006 Equilon 20"	15'
369	LN65	30.87	31.46	154	D	498	S-4006 Equilon 20"	19'
370	LN66	31.88	31.29	217	M	506	S-4006 Equilon 20"	15'
371	LN67	30.47	31.07	448	M	318	S-4006 Equilon 20"	16'
372	LN68	31.52	30.92	52	M	108	S-4006 Equilon 20"	16'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
373	LN69	30.09	30.69	194	M	570	S-4006 Equilon 20"	17'
374	LN70	31.01	30.41	197	M	124	S-4006 Equilon 20"	17'
375	LN71	29.59	30.19	377	D	667	S-4006 Equilon 20"	18'
376	LN72	30.58	29.98	258	M	550	S-4006 Equilon 20"	17'
377	LN73	29.23	29.83	93	D	420	S-4006 Equilon 20"	19'
378	LN74	30.17	29.56	95	M	563	S-4006 Equilon 20"	18'
379	LN75	28.72	29.33	278	M	628	S-4006 Equilon 20"	19'
380	LN76	29.67	29.07	202	M	638	S-4006 Equilon 20"	13'
381	LN77	28.35	28.95	95	M	434	S-4006 Equilon 20"	19'
382	LN78	29.26	28.66	162	M	543	S-4006 Equilon 20"	14'
383	LN80	28.93	28.33	50	M	477	S-4006 Equilon 20"	14'
384	LN81	27.52	28.12	225	M	711	S-4006 Equilon 20"	15'
385	LN82	28.50	27.9	112	M	574	S-4006 Equilon 20"	15'
386	LN83	27.09	27.69	30	M	198	S-4006 Equilon 20"	15'
387	LN84	28.04	27.44	83	M	509	S-4006 Equilon 20"	16'
388	LN85	26.73	27.33	94	M	489	S-4006 Equilon 20"	15'
389	LN86	27.63	27.03	99	M	633	S-4006 Equilon 20"	16'
390	LN87	26.15	26.76	103	D	568	S-4006 Equilon 20"	16'
391	LN88	25.97	26.57	191	D	544	S-4006 Equilon 20"	16'
392	LN89	11.61	12.21	149	D	696	S-5013 Chevron 10"	11'
393	LN90	9.98	9.38	371	M	757	S-5013 Chevron 10"	10'
394	LN91	5.89	6.49	76	M	184	S-5013 Chevron 10"	8'
395	LN92	3.93	3.33	1142	D	549	S-5013 Chevron 10"	7'
396	LN93	6.86	7.46	1132	D	919	S-4006 Equilon 20"	8'
397	LN94	14.11	13.51	65	M	378	S-6173 Texaco 4"	9'
398	LN94	15.47	14.87	150	D	540	S-6286 ANR 8"	10'
399	LN94	17.49	16.88	532	M	699	S-4006 Equilon 20"	12'
400	LN94	18.89	18.29	43	M	357	S-12030 Energy 6"	14'
401	LN95A	26.06	26.67	194	D	945	S-4006 Equilon 20"	17'
402	LN95A	15.90	16.5	94	D	469	S-5408 Vastar 8"	7'
403	LN95A	9.30	9.89	119	M	412	S-12030 Energy 6"	3'

IDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	DURATION	DESCRIPTION	SENSOR HEIGHT
404	LN95A	4.63	5.23	164	D	401	S-6286 ANR 8"	3'
405	LN95A	3.20	3.8	182	M	485	S-6173 Texaco 4"	4'
406	LN96	14.59	13.99	34	D	474	S-5408 Vastar 8"	17'
407	LN97	10.84	11.45	120	M	311	S-5408 Vastar 8"	4'
408	LN98	1.99	1.4	240	D	530	S-8017 Comstock 8"	5'
409	LN98	9.52	8.93	1180	M	491	S-5408 Vastar 8"	3'
410	LN99	22.92	23.52	19	M	1332	Well #36	7'
411	LN99	16.97	17.57	133	M	558	S-8017 and S-8017A Comstock 8"	7'
412	LN100	8.98	8.37	10	M	205	S-12030 Energy 6"	8'
413	LN100	9.07	8.46	13	M	200	S-12030 Energy 6"	8'
414	LN100	11.54	10.94	86	M	248	S-6286 ANR 8"	8'
415	LN100	12.18	11.58	21	M	115	S-6173 Texaco 4"	8'
416	LN100	12.45	11.85	18	M	80	S-6173 Texaco 4"	7'
417	LN101	6.26	5.66	467	M	528	S-4006 Equilon 20"	8'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
1	LN1	29.66	30.26	33	D	136	Debris	2,220,125.10	95,100.55	18.0'
2	LN1	34.81	35.41	4	D	82	Debris	2,222,661.33	95,089.85	18.0'
3	LN1	35.85	36.45	4	D	85	Debris	2,223,172.06	95,106.44	18.0'
4	LN1	41.60	42.2	30	D	131	Debris	2,226,003.26	95,109.26	17.0'
5	LN1	46.80	47.4	4	M	96	Debris	2,228,561.51	95,125.22	17.0'
6	LN1	51.23	51.91	12	M	241	Debris	2,230,782.92	95,144.25	17.0'
7	LN1	56.61	57.21	8	D	157	Debris	2,233,387.86	95,142.98	17.0'
8	LN2	24.12	23.51	12	M	75	Debris	2,216,811.51	94,929.37	17.5'
9	LN2	31.76	31.17	5	M	94	Debris	2,220,581.15	94,939.91	17.5'
10	LN2	35.91	35.3	3	M	87	Debris	2,222,615.80	94,940.42	17.5'
11	LN3	14.87	14.27	3	M	58	Debris	2,212,266.15	94,740.72	16.0'
12	LN3	15.20	14.6	10	M	88	Debris	2,212,428.17	94,744.95	16.0'
13	LN3	19.13	18.53	4	M	60	Debris	2,214,363.89	94,744.45	17.0'
14	LN3	36.56	35.96	4	D	84	Debris	2,222,939.81	94,784.50	17.0'
15	LN3	37.47	36.87	4	M	66	Debris	2,223,385.58	94,785.26	17.0'
16	LN3	46.58	45.97	29	M	130	Debris	2,227,869.10	94,792.96	17.0'
17	LN3	53.59	52.99	60	M	133	Debris	2,231,322.21	94,805.55	18.0'
18	LN4	15.24	14.64	8	D	114	Debris	2,212,449.83	94,576.03	17.0'
19	LN4	19.04	18.43	26	D	141	Debris	2,214,311.90	94,586.27	17.0'
20	LN4	20.89	20.29	25	M	168	Debris	2,215,230.78	94,594.33	17.0'
21	LN4	34.97	34.37	6	M	75	Debris	2,222,156.36	94,611.03	17.0'
22	LN4	37.12	36.52	6	M	58	Debris	2,223,213.42	94,614.00	17.0'
23	LN4	37.70	37.1	6	M	74	Debris	2,223,499.40	94,616.44	17.0'
24	LN4	40.05	39.46	3	M	73	Debris	2,224,664.52	94,626.16	17.0'
25	LN4	42.82	42.21	3	D	56	Debris	2,226,016.12	94,627.37	17.0'
26	LN4	46.51	45.91	38	M	154	Debris	2,227,836.07	94,632.89	17.0'
27	LN4	55.59	54.98	43	M	108	Debris	2,232,303.96	94,644.67	17.0'
28	LN5	16.87	16.26	7	M	52	Debris	2,213,243.91	94,412.87	15.0'
29	LN5	20.85	20.25	9	D	320	Debris	2,215,210.16	94,431.25	16.6'
30	LN5	33.12	32.52	6	M	76	Debris	2,221,247.46	94,459.25	16.5'
31	LN5	37.20	36.6	79	D	120	Debris	2,223,256.55	94,450.30	17.0'
32	LN5	37.79	37.19	7	M	133	Debris	2,223,547.57	94,450.22	17.0'
33	LN5	43.01	42.41	17	M	93	Debris	2,226,115.05	94,471.42	17.0'
34	LN5	46.37	45.77	12	M	85	Debris	2,227,770.13	94,473.52	17.4'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
35	LN5	53.53	52.93	3	M	56	Debris	2,231,291.28	94,487.12	17.3'
36	LN6	49.55	50.15	13	D	74	Debris	2,229,917.07	94,327.58	17.0'
37	LN6	56.17	56.76	18	D	113	Debris	2,233,172.30	94,330.78	18.0'
38	LN6	60.42	61.02	5	M	76	Debris	2,235,269.71	94,328.30	18.0'
39	LN7	16.40	17	3	D	78	Debris	2,213,600.58	94,094.13	5.2'
40	LN7	44.94	45.54	3	M	144	Debris	2,227,650.73	94,139.31	16.0'
41	LN7	56.27	56.87	24	D	118	Debris	2,233,223.15	94,174.45	7.7'
42	LN7	60.37	60.97	8	M	62	Debris	2,235,244.12	94,174.95	7.7'
43	LN8	9.00	8.4	8	D	96	Debris	2,209,379.44	93,903.19	14.8'
44	LN8	13.73	13.13	4	M	93	Debris	2,211,708.94	93,912.30	14.8'
45	LN8	33.83	33.23	3	M	74	Debris	2,221,596.59	93,962.28	16.8'
46	LN8	44.59	43.99	82	D	208	Debris	2,226,892.71	93,975.92	17.4'
47	LN8	46.65	46.05	17	D	110	Debris	2,227,908.69	93,984.51	17.4'
48	LN8	55.80	55.19	52	D	141	Debris	2,232,408.55	93,998.50	17.3'
49	LN9	12.67	13.27	4	M	179	Debris	2,211,769.71	93,754.70	14.9'
50	LN9	19.80	20.4	3	M	135	Debris	2,215,277.81	93,776.08	16.2'
51	LN9	23.43	24.03	7	D	85	Debris	2,217,065.84	93,766.90	16.2'
52	LN9	41.02	41.62	5	M	118	Debris	2,225,720.92	93,803.23	17.6'
53	LN9	56.49	57.09	4	D	76	Debris	2,233,335.85	93,844.24	17.8'
54	LN9	60.26	60.88	21	M	153	Debris	2,235,202.02	93,836.30	17.9'
55	LN9	63.45	64.05	5	M	93	Debris	2,236,759.46	93,841.69	17.9'
56	LN9	64.78	65.38	6	M	86	Debris	2,237,415.96	93,851.46	17.9'
57	LN10	11.11	10.51	10	D	75	Debris	2,210,415.78	93,590.13	15.1'
58	LN10	12.64	12.04	377	M	171	Debris	2,211,170.82	93,570.93	15.5'
59	LN10	13.80	13.2	654	D	255	Debris	2,211,740.00	93,587.99	15.5'
60	LN10	42.13	41.53	9	D	104	Debris	2,225,685.24	93,650.89	17.5'
61	LN10	61.36	60.76	32	M	136	Debris	2,235,149.18	93,684.01	17.7'
62	LN10	64.51	63.91	3	M	85	Debris	2,236,700.00	93,689.12	17.7'
63	LN11	18.70	19.3	5	D	90	Debris	2,214,738.70	93,447.58	16.2'
64	LN11	19.42	20.02	3	D	59	Debris	2,215,090.97	93,449.07	16.2'
65	LN11	21.40	22.01	16	D	434	Debris	2,216,071.85	93,454.34	16.2'
66	LN11	54.09	54.68	3	M	38	Debris	2,232,150.06	93,510.92	17.9'
67	LN11	60.04	60.64	11	M	115	Debris	2,235,082.13	93,518.31	18.0'
68	LN11	63.12	63.73	17	M	123	Debris	2,236,603.17	93,515.58	18.0'
69	LN12	12.15	11.55	4	M	190	Debris	2,210,932.78	93,269.41	15.6'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
70	LN12	22.69	22.09	1674	M	780	Debris	2,216,119.87	93,281.40	16.7'
71	LN12	21.99	21.39	19	D	106	Debris	2,215,776.32	93,276.39	16.7'
72	LN12	54.49	53.89	6	D	84	Debris	2,231,769.85	93,335.79	18.1'
73	LN12	56.15	55.54	9	D	104	Debris	2,232,581.49	93,334.49	18.1'
74	LN12	61.08	60.47	11	M	156	Debris	2,235,008.37	93,348.45	19.5'
75	LN12	63.68	63.08	54	D	253	Debris	2,236,293.85	93,351.28	19.5'
76	LN12	64.16	63.56	18	M	72	Debris	2,236,529.25	93,349.53	19.5'
77	LN12	64.77	64.17	6	M	66	Debris	2,236,828.60	93,348.41	19.5'
78	LN13	9.93	10.53	9	D	168	Debris	2,210,421.82	93,092.55	15.6'
79	LN13	21.62	22.22	2467	D	498	Debris	2,216,176.87	93,110.48	15.4'
80	LN13	22.47	23.08	30	D	98	Debris	2,216,597.05	93,118.99	15.4'
81	LN13	22.70	23.3	6	M	62	Debris	2,216,705.67	93,121.49	15.4'
82	LN13	39.76	40.37	6	D	81	Debris	2,225,108.24	93,152.50	17.2'
83	LN13	52.33	52.93	26	D	117	Debris	2,231,289.76	93,176.41	18.0'
84	LN13	55.78	56.38	3	D	86	Debris	2,232,988.96	93,169.38	18.0'
85	LN13	59.74	60.34	8	M	75	Debris	2,234,937.52	93,187.50	18.0'
86	LN13	62.77	63.37	7	M	105	Debris	2,236,427.04	93,187.97	18.0'
87	LN14	22.08	21.47	20	D	101	Debris	2,215,815.78	92,958.24	16.6'
88	LN14	23.01	22.41	8	D	68	Debris	2,216,276.33	92,957.66	16.6'
89	LN14	23.25	22.65	11	M	86	Debris	2,216,394.61	92,957.74	16.6'
90	LN14	48.97	48.37	4	M	185	Debris	2,229,052.83	92,997.56	18.1'
91	LN14	60.72	60.11	5	M	74	Debris	2,234,835.24	93,024.68	19.8'
92	LN14	68.46	67.86	119	M	76	Debris	2,238,648.54	93,030.70	19.8'
93	LN15	21.24	21.89	5	D	117	Debris	2,216,011.97	92,786.17	16.4'
94	LN15	21.45	22.06	48	M	81	Debris	2,216,095.18	92,786.46	16.4'
95	LN15	36.42	37.02	5	M	139	Debris	2,223,461.65	92,819.03	17.4'
96	LN15	53.28	53.87	28	M	195	Debris	2,231,753.76	92,848.68	17.8'
97	LN15	62.25	62.89	11	M	122	Debris	2,236,192.46	92,854.78	17.8'
98	LN16	16.46	15.87	5	D	69	Debris	2,213,060.60	92,606.00	15.9'
99	LN16	17.69	17.08	7	M	85	Debris	2,213,658.79	92,608.99	15.9'
100	LN16	18.68	18.07	5	D	87	Debris	2,214,145.62	92,615.82	16.4'
101	LN16	20.19	19.59	12	M	68	Debris	2,214,893.39	92,623.21	16.4'
102	LN16	21.63	21.03	5	M	136	Debris	2,215,602.35	92,628.21	16.4'
103	LN16	50.23	49.63	5	D	110	Debris	2,229,676.76	92,664.88	18.3'
104	LN16	57.38	56.78	6	M	68	Debris	2,233,195.15	92,684.03	18.3'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
105	LN16	63.20	62.6	113	D	141	Debris	2,236,059.43	92,695.27	18.3'
106	LN16	64.89	64.29	16	M	131	Debris	2,236,891.14	92,695.76	18.3'
107	LN17	63.71	64.31	3	M	204	Debris	2,236,892.84	92,536.79	20.3'
108	LN17	62.01	62.62	21	M	174	Debris	2,236,059.46	92,532.40	20.3'
109	LN17	48.87	49.47	2	M	53	Debris	2,229,589.51	92,503.89	17.8'
110	LN17	36.90	37.5	19	D	189	Debris	2,223,695.38	92,485.99	17.0'
111	LN17	20.50	21.1	6	D	187	Debris	2,215,627.99	92,458.82	16.7'
112	LN17	17.90	18.51	2	M	62	Debris	2,214,351.81	92,453.98	16.7'
113	LN18	18.44	17.84	1	M	47	Debris	2,214,030.65	92,288.98	16.5'
114	LN18	19.06	18.46	12	M	180	Debris	2,214,336.73	92,285.07	16.5'
115	LN18	44.42	43.82	511	D	462	Debris	2,226,816.54	92,327.59	17.6'
116	LN19	62.21	62.8	4	M	82	Debris	2,236,152.16	92,206.60	19.1'
117	LN19	47.56	48.16	3	M	79	Debris	2,228,943.54	92,180.68	17.8'
118	LN19	46.44	47.04	2	M	71	Debris	2,228,393.55	92,175.94	17.8'
119	LN19	45.03	45.58	2	M	84	Debris	2,227,674.97	92,177.14	17.8'
120	LN19	43.25	43.89	12	D	659	Debris	2,226,844.14	92,172.48	17.8'
121	LN19	25.55	26.15	3	D	95	Debris	2,218,115.11	92,135.46	16.4'
122	LN20	7.32	6.72	3	D	96	Debris	2,208,556.54	91,941.62	16.0'
123	LN20	10.16	9.56	9	M	190	Debris	2,209,957.11	91,951.17	16.0'
124	LN20	19.08	18.48	5	D	93	Debris	2,214,349.23	91,956.52	17.2'
125	LN20	21.52	20.92	3	D	93	Debris	2,215,549.73	91,966.19	17.2'
126	LN20	39.94	39.34	8	M	120	Debris	2,224,615.70	92,006.09	17.3'
127	LN21	66.72	67.32	4	M	108	Debris	2,238,377.34	91,891.79	19.3'
128	LN21	61.80	62.4	19	D	455	Debris	2,235,954.97	91,868.81	19.3'
129	LN21	47.15	47.75	16	M	121	Debris	2,228,746.21	91,853.19	17.7'
130	LN22	11.67	11.07	3	D	124	Debris	2,210,700.37	91,619.86	16.0'
131	LN22	19.07	18.47	5	M	93	Debris	2,214,344.59	91,632.10	17.3'
132	LN22	37.17	36.57	2	M	72	Debris	2,223,250.36	91,670.69	17.5'
133	LN22	37.70	37.09	5	M	95	Debris	2,223,507.02	91,671.74	17.5'
134	LN22	50.73	50.13	3	D	125	Debris	2,229,923.38	91,690.20	18.0'
135	LN23	63.23	63.91	8	M	152	Debris	2,236,697.41	91,554.19	19.4'
136	LN23	50.59	51.2	3	M	158	Debris	2,230,443.15	91,521.09	18.3'
137	LN23	48.59	49.2	16	M	119	Debris	2,229,458.04	91,516.16	18.3'
138	LN23	42.02	42.58	5	D	168	Debris	2,226,199.09	91,508.48	17.8'
139	LN23	35.85	36.46	2	M	103	Debris	2,223,186.80	91,498.23	17.2'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
140	LN23	15.58	16.18	5	D	451	Debris	2,213,207.26	91,464.67	16.2'
141	LN24	8.26	7.65	6	M	121	Debris	2,209,020.80	91,288.66	16.5'
142	LN24	17.01	16.41	9	M	123	Debris	2,213,331.99	91,303.91	16.4'
143	LN24	35.03	34.43	7	D	125	Debris	2,222,198.65	91,343.25	17.7'
144	LN24	37.54	36.95	9	D	158	Debris	2,223,439.93	91,339.54	17.7'
145	LN24	42.89	42.29	4	M	95	Debris	2,226,068.56	91,354.70	18.0'
146	LN24	56.47	55.86	3	D	95	Debris	2,232,747.95	91,377.57	19.8'
147	LN24	58.81	58.21	16	D	141	Debris	2,233,900.97	91,368.02	19.8'
148	LN25	50.30	50.9	20	D	136	Debris	2,230,297.75	91,204.36	18.9'
149	LN25	7.70	8.3	12	M	108	Debris	2,209,331.70	91,124.15	16.4'
150	LN26	14.05	13.45	17	M	152	Debris	2,211,873.49	90,977.28	17.1'
151	LN26	47.52	46.92	58	D	248	Debris	2,228,350.34	91,031.02	19.1'
152	LN27	41.09	41.69	6	M	96	Debris	2,225,768.35	90,856.68	18.1'
153	LN27	28.60	29.21	2	D	85	Debris	2,219,625.43	90,834.74	17.5'
154	LN27	26.34	26.94	2	D	115	Debris	2,218,508.17	90,829.21	17.5'
155	LN27	23.64	24.23	2	M	114	Debris	2,217,174.33	90,825.41	17.5'
156	LN27	22.73	23.33	7	D	292	Debris	2,216,729.07	90,836.51	16.9'
157	LN28	6.15	5.55	5	M	117	Debris	2,207,987.29	90,652.49	16.8'
158	LN28	16.23	15.63	15	D	132	Debris	2,212,947.28	90,643.07	17.1'
159	LN28	52.63	52.03	6	D	125	Debris	2,230,865.42	90,709.35	21.6'
160	LN29	47.72	48.32	11	D	200	Debris	2,229,031.38	90,541.58	18.3'
161	LN29	46.44	47.04	9	D	187	Debris	2,228,400.69	90,539.08	18.3'
162	LN29	12.39	12.99	14	D	115	Debris	2,211,642.66	90,474.34	16.7'
163	LN29	8.73	9.33	2	D	81	Debris	2,209,842.37	90,479.42	16.7'
164	LN30	32.81	32.21	4	M	97	Debris	2,221,112.57	90,347.27	18.2'
165	LN30	33.73	33.12	11	D	176	Debris	2,221,560.36	90,349.14	18.2'
166	LN30	50.75	50.15	20	D	171	Debris	2,229,941.25	90,395.69	14.7'
167	LN31	28.61	29.21	2	D	78	Debris	2,219,628.08	90,176.88	18.3'
168	LN31	10.48	11.09	8	M	67	Debris	2,210,709.62	90,150.06	16.9'
169	LN31	10.37	10.97	6	M	86	Debris	2,210,650.95	90,149.98	16.9'
170	LN32	11.19	10.59	19	M	1427	Debris	2,210,470.73	89,975.90	12.8'
171	LN32	11.74	11.15	5	D	65	Debris	2,210,745.18	89,976.67	12.8'
172	LN32	25.80	25.2	18	D	137	Debris	2,217,661.79	90,007.35	13.5'
173	LN32	33.48	32.89	18	M	134	Debris	2,221,445.65	90,021.63	14.2'
174	LN32	50.47	49.86	36	M	153	Debris	2,229,798.48	90,049.80	14.5'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
175	LN32	64.38	63.77	3	M	82	Debris	2,236,646.53	90,066.49	18.4'
176	LN33	63.18	63.78	3	D	121	Debris	2,236,642.63	89,921.67	23.4'
177	LN33	49.30	49.9	5	D	197	Debris	2,229,806.89	89,890.64	19.0'
178	LN33	39.35	39.96	6	D	126	Debris	2,224,919.41	89,870.16	19.0'
179	LN33	10.03	10.57	33	M	1811	Debris	2,210,451.48	89,812.61	17.3'
180	LN34	11.18	10.58	147	M	1836	Debris	2,210,468.64	89,656.50	13.1'
181	LN34	15.35	14.75	5	M	122	Debris	2,212,520.03	89,654.50	13.1'
182	LN34	15.67	15.07	1	D	78	Debris	2,212,677.39	89,657.50	13.1'
183	LN34	31.88	31.28	3	M	58	Debris	2,220,654.96	89,691.08	14.2'
184	LN34	61.81	61.22	6	D	123	Debris	2,235,388.56	89,742.09	14.6'
185	LN35	30.20	30.8	29	M	309	Debris	2,220,412.64	89,523.97	14.7'
186	LN35	30.28	30.88	13	M	324	Debris	2,220,452.13	89,523.58	14.7'
187	LN35	17.22	17.91	5	M	80	Debris	2,214,064.96	89,503.36	14.0'
188	LN35	10.03	10.63	363	M	1564	Debris	2,210,486.02	89,486.86	13.5'
189	LN36	11.19	10.58	1932	M	1174	Debris	2,210,470.23	89,323.54	13.3'
190	LN36	13.34	12.74	12	M	131	Debris	2,211,529.51	89,329.60	13.3'
191	LN36	17.63	17.02	22	D	202	Debris	2,213,638.25	89,340.14	13.6'
192	LN36	18.44	17.84	5	D	108	Debris	2,214,039.66	89,340.68	13.6'
193	LN36	30.57	29.97	22	M	674	Debris	2,220,011.71	89,351.83	14.6'
194	LN36	40.68	40.08	3	M	64	Debris	2,224,985.77	89,371.75	15.0'
195	LN36	42.36	41.76	3	D	101	Debris	2,225,814.93	89,379.31	15.0'
196	LN36	49.00	48.4	3	M	116	Debris	2,229,082.99	89,394.10	15.0'
197	LN36	60.18	59.58	5	M	255	Debris	2,234,582.00	89,412.79	15.0'
198	LN37	58.90	59.5	49	M	333	Debris	2,234,538.21	89,244.52	14.9'
199	LN37	52.62	53.22	2	M	123	Debris	2,231,449.29	89,225.65	14.9'
200	LN37	48.33	48.93	17	M	284	Debris	2,229,332.69	89,231.40	14.9'
201	LN37	48.18	48.78	10	M	282	Debris	2,229,258.83	89,231.21	14.9'
202	LN37	27.01	27.59	8	M	297	Debris	2,218,830.55	89,184.02	14.2'
203	LN37	10.01	10.61	72	M	1126	Debris	2,210,475.78	89,156.87	13.3'
204	LN38	11.21	10.61	15	M	784	Debris	2,210,486.10	89,004.68	13.5'
205	LN38	15.20	14.6	22	M	147	Debris	2,212,447.27	89,001.49	14.1'
206	LN38	38.61	38.01	5	M	90	Debris	2,223,970.22	89,042.90	15.5'
207	LN38	49.54	48.94	9	M	269	Debris	2,229,348.92	89,071.96	15.5'
208	LN39	56.58	57.18	53	M	252	Debris	2,233,398.77	88,908.44	18.0'
209	LN39	48.30	48.9	9	M	83	Debris	2,229,321.47	88,900.74	16.5'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
210	LN39	47.83	48.43	18	M	202	Debris	2,229,091.80	88,897.35	16.5'
211	LN39	27.02	27.62	6	D	194	Debris	2,218,846.30	88,864.17	14.6'
212	LN39	16.73	17.33	10	D	263	Debris	2,213,782.73	88,840.88	13.3'
213	LN39	13.05	13.55	2	M	60	Debris	2,211,922.95	88,840.04	13.3'
214	LN39	10.40	11	9	M	111	Debris	2,210,669.12	88,835.75	13.3'
215	LN39	8.14	8.74	3	D	114	Debris	2,209,554.43	88,830.66	13.3'
216	LN40	13.61	13.01	15	D	189	Debris	2,211,666.56	88,667.83	14.1'
217	LN40	22.02	21.42	6	M	91	Debris	2,215,803.68	88,694.75	15.6'
218	LN40	26.20	25.59	8	M	103	Debris	2,217,861.25	88,690.90	15.6'
219	LN40	30.71	30.1	3	M	96	Debris	2,220,080.73	88,725.19	15.6'
220	LN40	48.01	47.4	10	D	154	Debris	2,228,594.53	88,743.73	15.7'
221	LN40	49.47	48.87	3	M	76	Debris	2,229,313.93	88,750.64	15.7'
222	LN40	55.19	54.58	9	M	120	Debris	2,232,124.08	88,756.13	15.7'
223	LN40	57.77	57.17	2	M	211	Debris	2,233,400.82	88,758.22	15.7'
224	LN41	54.27	54.87	22	M	232	Debris	2,232,263.16	88,585.05	18.1'
225	LN41	48.03	48.63	22	M	187	Debris	2,229,189.61	88,572.62	17.2'
226	LN41	15.31	15.92	2	D	83	Debris	2,213,088.90	88,508.38	14.1'
227	LN41	10.45	11.05	148	D	343	Debris	2,210,693.84	88,502.49	14.1'
228	LN41	7.11	7.71	58	D	212	Debris	2,209,051.29	88,504.76	13.7'
229	LN42	27.29	26.69	29	M	146	Debris	2,218,402.35	88,366.29	14.2'
230	LN42	42.49	41.89	3	D	104	Debris	2,225,879.31	88,409.68	14.8'
231	LN42	53.46	52.86	4	M	99	Debris	2,231,279.43	88,414.15	14.8'
232	LN42	55.65	55.05	4	M	111	Debris	2,232,358.54	88,423.46	14.8'
233	LN43	52.21	52.81	9	M	215	Debris	2,231,250.93	88,251.50	16.4'
234	LN43	50.03	50.57	7	D	117	Debris	2,230,147.31	88,239.22	16.4'
235	LN43	26.87	27.47	13	D	259	Debris	2,218,777.52	88,202.69	15.8'
236	LN43	24.66	25.26	7	D	132	Debris	2,217,688.38	88,206.27	15.8'
237	LN43	23.55	24.15	3	M	174	Debris	2,217,142.80	88,208.19	15.8'
238	LN43	7.46	8.06	46	D	304	Debris	2,209,223.69	88,173.13	14.6'
239	LN44	32.77	32.16	2	M	47	Debris	2,221,095.49	88,052.26	14.8'
240	LN44	42.75	42.14	7	M	162	Debris	2,226,005.25	88,066.45	15.2'
241	LN44	54.16	53.57	4	D	109	Debris	2,231,632.42	88,087.13	15.2'
242	LN45	47.54	48.14	19	M	145	Debris	2,228,952.83	87,915.78	17.1'
243	LN45	44.70	45.3	13	M	199	Debris	2,227,555.77	87,907.42	17.1'
244	LN45	15.11	15.71	4	D	125	Debris	2,212,989.42	87,856.49	12.9'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
245	LN46	26.02	25.42	16	M	98	Debris	2,217,778.71	87,711.46	15.7'
246	LN46	27.90	27.3	4	M	99	Debris	2,218,703.95	87,709.60	15.7'
247	LN46	30.66	30.06	9	D	109	Debris	2,220,059.62	87,716.92	15.7'
248	LN46	43.46	42.85	4	D	97	Debris	2,226,359.49	87,743.89	15.7'
249	LN46	43.71	43.11	7	M	121	Debris	2,226,487.45	87,744.21	15.7'
250	LN46	45.29	44.69	17	M	204	Debris	2,227,263.12	87,740.03	15.7'
251	LN48	16.51	15.91	4	M	103	Debris	2,213,095.99	87,357.02	13.3'
252	LN48	36.77	36.16	14	M	205	Debris	2,223,065.70	87,401.07	16.0'
253	LN48	46.82	46.23	3	D	108	Debris	2,228,019.32	87,414.03	16.2'
254	LN48	50.70	50.1	5	M	161	Debris	2,229,925.31	87,426.45	16.2'
255	LN47	33.85	34.45	45	D	215	Debris	2,222,216.63	87,560.52	15.5'
256	LN47	26.43	27.03	10	D	152	Debris	2,218,560.24	87,548.76	15.5'
257	LN47	16.55	17.15	5	M	110	Debris	2,213,698.55	87,528.57	13.3'
258	LN47	13.40	14	8	D	135	Debris	2,212,153.06	87,519.98	13.3'
259	LN47	8.68	9.28	4	M	173	Debris	2,209,827.70	87,521.07	13.3'
260	LN47	6.02	6.58	12	M	206	Debris	2,208,498.43	87,501.10	13.3'
261	LN49	41.72	42.32	3	D	135	Debris	2,226,088.40	87,249.80	16.7'
262	LN49	35.58	36.18	16	M	181	Debris	2,223,069.63	87,233.59	16.2'
263	LN49	29.22	29.92	6	D	117	Debris	2,219,987.14	87,228.03	16.2'
264	LN49	21.12	21.72	3	D	114	Debris	2,215,948.75	87,215.21	16.2'
265	LN49	19.82	20.42	3	M	81	Debris	2,215,310.39	87,205.14	16.2'
266	LN49	19.52	20.13	2	D	79	Debris	2,215,168.53	87,203.46	16.2'
267	LN50	11.20	10.6	5	D	103	Debris	2,210,487.91	87,022.63	13.3'
268	LN50	28.35	27.75	4	D	201	Debris	2,218,926.19	87,053.03	16.1'
269	LN50	29.27	28.67	2	M	76	Debris	2,219,380.84	87,054.52	16.1'
270	LN51	29.81	30.41	2	D	81	Debris	2,220,229.98	86,892.38	16.7'
271	LN51	11.04	11.64	38	M	251	Debris	2,210,990.08	86,854.95	14.6'
272	LN51	10.05	10.56	3	M	82	Debris	2,210,458.76	86,860.27	14.6'
273	LN51	8.58	9.18	4	D	84	Debris	2,209,781.97	86,865.10	13.7'
274	LN51	7.34	7.95	5	M	121	Debris	2,209,173.86	86,866.16	13.7'
275	LN52	7.34	6.74	17	D	173	Debris	2,208,589.30	86,674.61	13.7'
276	LN52	9.75	9.14	27	M	187	Debris	2,209,770.33	86,682.27	13.7'
277	LN52	10.24	9.63	6	D	131	Debris	2,210,009.86	86,685.10	13.7'
278	LN52	12.28	11.68	10	D	167	Debris	2,211,019.23	86,701.13	13.7'
279	LN52	24.39	23.79	2	M	102	Debris	2,216,979.87	86,733.56	16.0'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
280	LN52	32.02	31.41	2	M	72	Debris	2,220,730.64	86,748.25	16.0'
281	LN53	30.55	31.15	5	D	133	Debris	2,220,592.86	86,567.00	16.8'
282	LN53	20.13	20.74	4	D	127	Debris	2,215,470.46	86,548.52	16.8'
283	LN53	10.92	11.52	10	D	381	Debris	2,210,932.17	86,538.74	13.6'
284	LN54	5.70	5.11	9	D	139	Debris	2,207,786.22	86,363.27	13.2'
285	LN55	35.17	35.77	2	M	114	Debris	2,222,871.88	86,245.45	17.7'
286	LN55	30.47	31.07	17	M	169	Debris	2,220,557.40	86,239.40	17.0'
287	LN55	15.47	16.08	2	D	98	Debris	2,213,176.47	86,213.57	13.8'
288	LN55	14.03	14.58	5	M	97	Debris	2,212,442.29	86,207.31	13.8'
289	LN55	7.57	8.17	4	M	94	Debris	2,209,285.97	86,208.43	13.8'
290	LN55	1.25	1.88	11	D	126	Debris	2,206,190.29	86,198.11	13.8'
291	LN57	16.01	16.62	5	D	118	Debris	2,213,445.98	85,897.16	13.3'
292	LN57	8.89	9.49	2	M	67	Debris	2,209,936.06	85,865.18	13.3'
293	LN57	8.59	9.19	2	M	108	Debris	2,209,787.24	85,864.58	13.3'
294	LN58	12.87	12.28	5	M	91	Debris	2,211,317.20	85,719.09	13.9'
295	LN58	16.70	16.1	7	D	168	Debris	2,213,196.84	85,727.70	13.9'
296	LN59	35.28	35.89	2	D	70	Debris	2,222,929.97	85,573.40	19.7'
297	LN59	29.46	30.07	28	D	276	Debris	2,220,064.38	85,584.23	17.5'
298	LN59	21.50	22.1	9	D	528	Debris	2,216,144.52	85,555.65	17.5'
299	LN59	6.36	6.97	36	D	324	Debris	2,208,695.18	85,542.08	14.7'
300	LN60	15.05	14.45	6	M	144	Debris	2,212,386.36	85,400.15	15.9'
301	LN60	15.72	15.11	2	D	171	Debris	2,212,713.40	85,403.62	15.9'
302	LN60	22.69	22.09	996	D	614	Debris	2,216,146.18	85,407.73	15.9'
303	LN61	32.44	33.04	26	M	159	Debris	2,221,530.10	85,265.28	18.5'
304	LN61	28.37	28.98	9	D	177	Debris	2,219,534.02	85,257.74	18.5'
305	LN61	21.48	22.08	6	D	692	Debris	2,216,137.00	85,242.20	18.5'
306	LN61	8.35	8.95	4	M	144	Debris	2,209,674.85	85,221.82	14.8'
307	LN62	14.42	13.82	17	M	178	Debris	2,212,080.16	85,064.25	15.7'
308	LN62	25.44	24.84	2	D	148	Debris	2,217,500.26	85,086.78	18.2'
309	LN62	33.77	33.17	6	M	122	Debris	2,221,599.99	85,093.64	18.2'
310	LN63	32.23	32.83	12	D	252	Debris	2,221,427.67	84,934.45	17.8'
311	LN63	12.87	13.48	5	M	105	Debris	2,211,903.01	84,898.31	17.8'
312	LN64	13.94	13.34	3	D	171	Debris	2,211,842.92	84,732.52	15.3'
313	LN64	16.65	16.05	2	M	90	Debris	2,213,178.62	84,733.87	15.3'
314	LN64	34.52	33.93	3	M	63	Debris	2,221,974.32	84,777.16	15.3'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
315	LN65	35.17	35.77	27	D	321	Debris	2,222,875.39	84,610.66	20.0'
316	LN65	32.55	33.15	12	D	193	Debris	2,221,584.79	84,600.90	19.0'
317	LN65	25.06	25.67	10	D	175	Debris	2,217,904.14	84,592.35	19.0'
318	LN65	17.32	17.92	31	D	256	Debris	2,214,093.55	84,583.96	16.9'
319	LN65	7.59	8.19	4	D	182	Debris	2,209,302.81	84,561.72	16.9'
320	LN66	35.45	34.85	40	M	216	Debris	2,222,428.84	84,431.56	15.2'
321	LN67	32.39	32.98	32	D	287	Debris	2,221,506.85	84,283.92	16.8'
322	LN68	24.96	24.36	3	M	121	Debris	2,217,268.64	84,102.63	16.0'
323	LN69	17.35	17.95	5	D	219	Debris	2,214,108.52	83,925.65	17.0'
324	LN69	12.74	13.34	8	M	189	Debris	2,211,838.29	83,904.61	17.0'
325	LN70	14.65	14.05	2	D	129	Debris	2,212,194.95	83,753.34	16.9'
326	LN72	14.51	13.91	8	D	249	Debris	2,212,129.30	83,435.38	17.4'
327	LN72	15.93	15.33	12	D	160	Debris	2,212,826.51	83,434.06	17.4'
328	LN72	27.82	27.22	2	M	97	Debris	2,218,676.35	83,446.04	17.4'
329	LN88	24.98	25.59	3	M	183	Debris	2,217,880.12	80,819.92	15.7'
330	LN89	12.89	13.5	2	M	162	Debris	2,237,541.21	89,680.07	0.0'
331	LN89	6.58	7.19	2	M	103	Debris	2,237,533.92	92,784.29	0.0'
332	LN90	14.91	14.3	10	M	271	Debris	2,234,594.27	89,276.96	9.6'
333	LN91	6.39	6.99	19	M	219	Debris	2,231,623.48	92,881.72	8.0'
334	LN91	5.16	5.76	2	M	81	Debris	2,231,620.99	93,486.85	8.0'
335	LN92	9.80	9.19	6	D	134	Debris	2,228,674.85	91,796.44	7.0'
336	LN93	13.60	14.2	3	D	121	Debris	2,225,730.04	89,334.72	8.0'
337	LN94	2.32	1.72	3	D	88	Debris	2,222,785.07	95,471.63	9.3'
338	LN94	3.36	2.76	2	D	66	Debris	2,222,748.24	94,957.63	9.3'
339	LN94	11.67	11.07	8	D	118	Debris	2,222,765.63	90,871.04	9.3'
340	LN94	21.16	20.57	4	D	110	Debris	2,222,783.97	86,192.10	14.2'
341	LN94	24.29	23.69	28	M	270	Debris	2,222,769.95	84,658.57	20.0'
342	LN95A	13.72	14.32	33	M	225	Debris	2,219,819.70	89,276.38	5.0'
343	LN97	13.69	14.29	5	D	118	Debris	2,213,956.90	89,293.81	4.0'
344	LN97	13.36	13.96	6	D	96	Debris	2,213,960.80	89,455.93	4.0'
345	LN97	2.84	3.44	24	M	157	Debris	2,213,928.42	94,631.09	8.0'
346	LN98	14.33	13.73	10	M	1381	Debris	2,210,974.57	89,559.78	8.0'
347	LN98	19.93	19.33	76	M	238	Debris	2,210,971.55	86,804.86	8.0'
348	LN98	20.37	19.77	30	M	242	Debris	2,210,968.34	86,588.87	8.0'
349	LN99	23.15	23.75	9	D	127	Debris	2,207,990.48	84,635.56	7.0'

UNIDENTIFIED MAGNETIC ANOMALY TABLE

REF. NO.	LINE NO.	RECORDED SHOT POINT	CORRECTED SHOT POINT	AMPLITUDE (GAMMAS)	SIGNATURE TYPE	SIGNATURE WIDTH	DESCRIPTION	X COORDINATE	Y COORDINATE	SENSOR HEIGHT
350	LN99	20.61	21.21	3	M	86	Debris	2,207,999.56	85,885.71	7.0'
351	LN100	7.80	7.21	2	D	76	Debris	2,219,425.34	91,096.02	8.0'
352	LN100	20.70	20.1	3	M	81	Debris	2,224,829.86	94,420.94	7.3'
353	LN101	11.29	10.68	6	D	121	Debris	2,228,391.08	92,145.73	7.9'
354	LN101	11.79	11.19	3	M	69	Debris	2,228,592.65	91,999.03	7.9'
355	LN101	14.80	14.2	7	D	106	Debris	2,229,798.49	91,135.58	7.9'
356	LN102	7.61	7.01	4	M	119	Debris	2,230,132.08	89,084.87	13.5'

APPENDIX C

Personnel

Boat Setback Diagram

Equipment Descriptions

Instrument Settings

APPENDIX C

PERSONNEL

Field Personnel

Charlie Pearson – Archaeologist, Coastal Environments, Inc.

Lon Theriot – Crew Chief

David Aucoin – Geophysical Supervisor

Brad Daigle – Geophysical Operator

Sam Allemande – Geophysical Operator, Systems Administrator

Ben Moore – Geophysical Operator

John Grosvenor – Contract Geophysical Operator

Office Personnel

Charlie Pearson – Archaeologist, Coastal Environments, Inc.

Scott McBay – Chief Project Manager

Ralph Coleman – Database Calculations

Tony George – Geophysicist; Manager, Geophysical Interpretation

Dan Warren – Marine Archaeologist

Rob Church – Marine Archaeologist

Lynn Samuel – Geologist

Jesslyn Belanger – Geologist

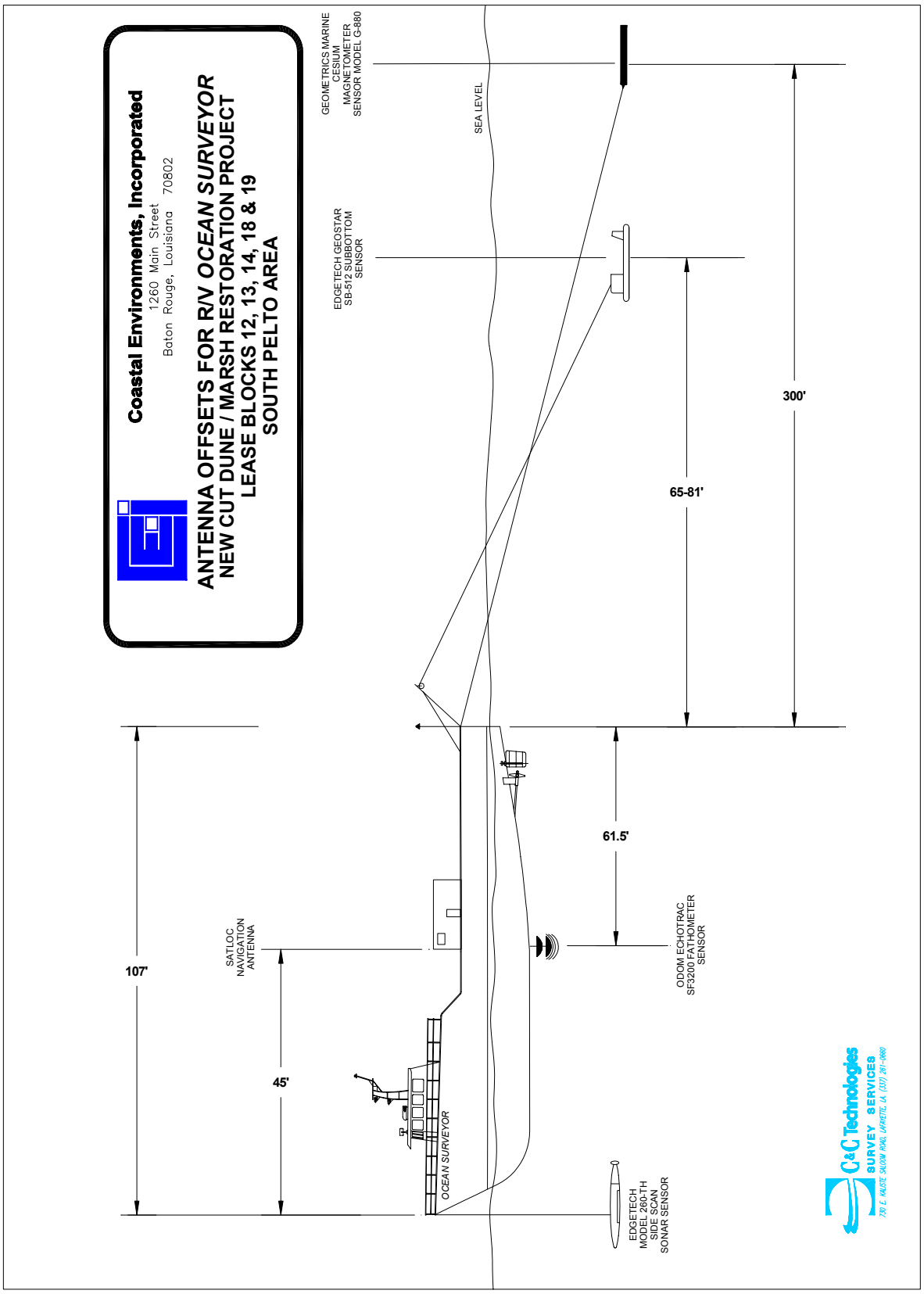
Jennifer Peacock - Geophysicist

Doug Pierottie – AutoCAD Supervisor

Chester Spencer – AutoCAD Mapping

Lionel Fontenot – Administrative Assistant

APPENDIX C


Coastal Environments, Incorporated
1260 Main Street
Baton Rouge, Louisiana 70802
ANTENNA OFFSETS FOR R/V OCEAN SURVEYOR
NEW CUT DUNE / MARSH RESTORATION PROJECT
LEASE BLOCKS 12, 13, 14, 18 & 19
SOUTH PELTO AREA
GEOMETRICS MARINE CESIUM MAGNETOMETER SENSOR MODEL G-880
SEA LEVEL
EDGETECH GEOSTAR SB-512 SUBBOTTOM SENSOR
300'
65-81'
61.5'
107'
45'
SATLOC NAVIGATION ANTENNA
ODOM ECHOTRAC SF3200 FATHOMETER SENSOR
OCEAN SURVEYOR
EDGETECH MODEL 260-TH SIDE SCAN SONAR SENSOR
C&C Technologies
SURVEY SERVICES

APPENDIX C

MARINE CESIUM MAGNETOMETER MODEL G-880

The Geometrics cesium magnetometer provides a scalar measurement of the earth's magnetic field intensity expressed in nano-Teslas (nT) or gammas (γ). In the marine environment, geology and man made objects create an external magnetic field, which disturbs the earth's primary magnetic field. This change affects the rate of energy transition (Larmor frequency) of cesium atoms from a higher to a lower excitation level in which case, the magnetic field is determined exclusively by the strength of the external field.

The G-880 Cesium magnetometer has a very high sensitivity and sample rate due to the accuracy of the Larmor frequency counter, (i.e. 0.001 nT at 10 samples per second). The frequency readings can be acquired and concatenated from up to six individual sensors to provide a sequential RS-232 data stream for transmittal through a tow cable as long as 2500 ft. Additionally, the system is capable of providing digital readings such as depth, altitude and water temperature by providing each Larmor counter with up to eight A/D converters that allow analog inputs from transducers or sensors. The data can be transmitted locally to a host CPU to interface with Side Scan Sonar or a ROV system. Also, one of the main advantages of the cesium magnetometer design is that the "Doppler Effect" given by the rotation of the sensor in rough seas is an order of magnitude less for cesium since it has inherent low noise characteristics; therefore, the system is more tolerable to movement reducing the source of troublesome noise.

Adjustments to get the Cesium sensor in the operating "active zone" include mounting the sensor in such a way that the earth's magnetic field is not less than 15 degrees from the sensor's center lines of length and width. This is generally achieved at the beginning of a survey by tilting or rolling the sensor, or rotating the shifting keel weight. When two or more sensors are used, magnetic gradient data is obtained, which offers enhanced detection of small anomalies, diurnal free total field profiles and improved noise rejection.

The system ready for operations consists of:

- Tow "fish" with sensor and electronics, depth transducer and interconnecting underwater cables and connectors.
- Tow cable with terminations to shipboard cable and the "fish".
- On-board power/signal cable connecting the computer to the tow cable.
- Power supply that operates off 115/220 V AC, or 28-30 V batteries for shorter cables.
- 486 based computer with two COM ports, large capacity hard disk, and floppy disk.
- Software for data logging and control functions.

APPENDIX C

ODOM ECHOTRAC SF3200

The EchoTrac SF3200 echo sounder by ODOM Hydrographic Systems, Inc. collects analog paper records as well as digitized depth information for output to a data logger. Digital depth data can be logged directly to the navigation computer along with date, time, and position for later post processing and mapping. The system can be deployed on a small workboat or inflatable, and includes a recording unit with built in digitizer and transceiver, and a side mounted transducer. The unit utilizes a combination of dynamic gating and velocity fit to track the true bottom through advanced microprocessor technology, solving the normal problems associated with conventional depth sounders. For example, if the "fixed gate" mode is activated, signal digitizing can be restricted to a user-defined range, rejecting unwanted returns during bar-check calibrations.

The acoustic pulse is generated with the Model OHS 200/9 transducer, which operates with a beam width of 9° at 200 kHz. The shipboard transceiver automatically adjusts power output in proportion to the return signal yielding a clear, unambiguous record in shallow as well as deep water. The self -adjusting power varies from 1 to 225 watts at 200 kHz. Time Varied Gain (TVG) and Automatic Gain Control optimize return signals.

A thermal paper recording is printed in real-time where automated scale changes prevent the bottom from "running" off the chart. Scale widths are selectable in meters, 2 to 1,000, or feet, 10 to 3,000; however, routine operating scales are 10 to 100 feet. Key system parameters, i.e. velocity of sound, draft, and time, are input from the recorder's front panel. A tide correction may be introduced without altering the analog record in any way. A line is added to the chart to indicate where the bottom would be if corrected for water level.

Recording resolutions of the EchoTrac, ranging from 8 mm to 4 meters dependent upon the selected scale width, permit detailed assessments of local water depths. Reference to a tidal datum permits the evaluation of navigable waterways, subsidence and scour features around seafloor based structures, and pre/post dredging or construction water bottom conditions.

APPENDIX C

EDGETECH GEOSTAR SB-0512 SUBBOTTOM PROFILER

The GeoStar Full Spectrum Digital SubBottom Profiler "GeoStar" is a wideband FM (Frequency Modulated) high-resolution subbottom profiler. It generates cross-sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges. GeoStar transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called a "chirp pulse") – for example 2-16 kHz over 20 milliseconds. The acoustic return received at the hydrophone is matched filtered with the outgoing FM pulse generating a high-resolution image of the subbottom stratigraphy.

Because the FM pulse is generated by a digital to analog converter with a wide dynamic range and a transmitter with linear components, the energy, amplitude, and phase characteristics of the acoustic pulse can be precisely controlled. This precision produces high repeatability and signal definition required for sediment classification.

GeoStar combines a precision wide band, low noise, low distortion analog sonar front end with a powerful RISC workstation and a Digital Signal Processing (DSP) pipeline array co-processor. The high frequency end of the system is capable of resolving layers down to 8 cm. The swept frequency modulated pulse improves the signal-to-noise ratio by more than 20 dB and there are no spatial side lobes.

Features

- Simple to operate
- Rack mountable
- Lightweight, portable
- AC or DC operation
- Built-in NMEA 0183 interface
- Rugged Construction
- Towfish power and control
- Outputs to printer
- Navigation input (NMEA0183)

Features (cont.)

- Choice of data storage devices
- External trigger output
- Responder trigger output
- Adaptability to other

Towfish Model SB-0512

Frequency Range 500 Hz-12kHz

Pulse Bandwidth 500-5000 kHz
1-5 kHz, 40ms
1-6kHz, 40ms
1.5-7.5kHz,40ms
2-8kHz, 40ms
2-10kHz, 20ms
2-12kHz, 20ms

APPENDIX C

software processors
- Window 95 Graphical User Interface
- Display of towfish depth, voltage and heading
- economical sub-bottom profiling
- Resolve layers to 4cm
- 20 dB improved SNR using swept FM pulse
- No spatial side-lobes
- Dual overlapping frequencies
- Digital correlation filter
- Small and portable system
- 300dB maximum attenuation at 1 MHz
- Digital output port available
- works with cable lengths up to 3000 meters
- Installs directly into a PC
- High speed digital interfaces
- Lightweight and portable

Vertical Resolution	40cm 500-5000Hz 30cm 1-5 kHz 12cm 1.5-7.5 kHz 8cm 2-12 kHz
Penetration (typical) **Coarse calcareous sand**	20m
Clay	200m
Beam Width (depends on center freq.)	10° to 30°
Transmitters	4
Receive Arrays	4
Output Power	2KW
Size (cms)	210L x 134W x 46H
Weight (kgs)	186
Cable Requirements	3 Shielded twisted pairs (all used)
Notes	Long cable amplifier 300m. maximum water depth Designed for sediment layer classification. UNIBOOM type penetration with superior resolution

APPENDIX C

EDGETECH MODEL 260-TH SIDE SCAN SONAR

The sonar imagery produced from the system utilizes the latest advances in sonar technology to produce images that are corrected for slant range, ship speed, and signal amplitude. The acoustics, signal processing, data recording, and graphic recording are consistent with a pixel size of 1/800 of the range to each side and amplitude dynamic range of 64 dB (of backscattering strength variation). The side scan sonar image of reflected acoustic energy is much like an image produced through radar. Darker returns represent areas where more acoustic energy is returned to the sonar, such as hard debris targets, rock ledges, or sand ridges, and light returns are representatives of low reflectivity zones.

High-power, short-duration acoustic pulses are transmitted from two transducers mounted in a compact towfish. The pulses are emitted in a thin, fan-shaped pattern that spreads downward to either side of the fish in a plane perpendicular to its path. As the fish follows the tow vessel's track, this beam scans a bottom segment ranging from the point directly beneath the fish outward as near as 25 meters or as far as 600 meters on each side. The optimal sonar image is obtained when the towfish is flown at a height above the seafloor of 10% to 20% of the selected sonar range. Acoustic energy reflected from the seafloor is received by the same set of transducers, and amplified and transmitted as electrical energy to the towing vessel. The electrical signals are processed, amplified, and converted to hard copy by the side scan recorder.

The basic system configuration consists of the Model 260-TH Recorder, Model 272-T Tow Fish, Speed Log, and Tow Cable. A dual magnetic-tape drive with digital cartridge is available as an option. The data can be played back and interpreted on a color-video display with target logging. The video images may be enhanced with the addition of color. Two frequencies, 100kHz or 500 kHz, can be selected with the flip of a switch.

Automatic bottom tracking is available which allows for the necessary slant range correction of the data. The plan view hard copy is corrected for true horizontal distance as well as speed corrected. Target sizes can be measured directly from the records in both the athwartship and alongship direction. The hard copy is printed on thermosensitive paper with 16 gray tones

available. Record divisions are annotated every 25 meters and event marks can be triggered through a navigation system.

Model 260 Recorder Features:

- Fully sonar images
- Thermal printer provides clean, quiet operation
- Simple to operate
- Rack mountable
- Lightweight and portable
- AC or DC Operation
- Built-in NMEA 0183 interface
- Rugged Construction
- 100/500 kHz operations

APPENDIX C

EDGETECH MODEL 260-TH SIDE SCAN SONAR

Model 272 Towfish Features:

- 100/500 kHz operations
- Time Varied Gain
- Saf-T-Line TM towing arm
- Breakaway tail fins
- Lightweight for one-person deployment/recovery
- Corrosion resistant
- Rugged, modular construction for ease of maintenance

APPENDIX C

EPC MODEL GSP-1086 RECORDER

The EPC Model GSP-1086 is an all-purpose, continuous image printer. Photographic quality images are printed using a 2048 pixel thermal print head with dot density of eight dots/millimeter. Pixel depth is selectable up to eight bits.

Two LCD displays and a sealed membrane control panel provide the operator with a simple user interface which displays system status at all times. Because the control panel is software defined, the printer can easily be configured for a wide range of custom applications.

Sonar and imaging applications are easily accommodated by the 1086's standard interface suite: Dual Channel Analog, Centronics Compatible Parallel, and RS-232 Serial I/O. Further flexibility is provided by the addition of optional interfaces: RS-422 Differential and Video Capture (NTSC or PAL). Custom integration is also possible through EPC Labs.

Keeping with EPC tradition, the 1086 is packaged in a rugged, field-ready sheet metal case. An optional transport case and rack mount kit is available for ship-of-opportunity and fixed base operations, respectively.

Hardware

- Host Processor: 486DX2/66 MHZ
- CPU Bus: 16 Bit Industry Standard Architecture (ISA)
- Control Panel: Sealed membrane type, software defined
- Displays: Twin 2x40 LCD displays with LED backlights

Power

- Power Supply: 350 Watt, auto-sensing, universal input, 84-265 VAC, 50-60 Hz
- Power Consumption: 80 Watts non-printing, 130 Watts Peak

APPENDIX C

EPC MODEL GSP-1086 RECORDER

Physical

- Dimensions & Weight: 17.6"W x 19.3"H x 6.7"D; 50 LBS.
- Media: Heat sensitive thermal paper or high-grade plastic film; -23 dB dynamic range.
- Paper Length: 150 feet
- Film Length: 130 feet
- Temperature (non-condensing):
  Operating 0-deg. to 65-deg. C
  Storage -28-deg. to 65-deg. C

Printing

- Gray Levels & Resolution Selectable: 8, 16, 32, 64 Levels
- Printhead: 2048 Pixels @203 DPI
- Maximum Line Speeds (nominal) @ 8 Shades: 15 mS
  @ 16 Shades: 18 mS
  @ 32 Shades: 26 mS
  @ 64 Shades: 43 mS
  - Chart Speeds (Lines Per Inch) Fixed: 75, 80, 100, 120, 150, 200, 240, 300
  - Variable: 1.6 kHz max clock, BNC input, 1/1200th inch per clock

Parallel Interface

- Interconnect: 25 Pin Sub D, metal shell
- Data Input (Pins 2-9) Eight Bit Centronics Compatible
  2048 bytes per raster line
  White = 0x00; Black = selectable
- Handshake Low Active host/STB on Pin 1
  Low Active printer/ACK on Pin 10
  High Active printer BUSY on Pin 11
  BUSY cycles on end of line (2048 bytes)
  /ACK cycles on every /STB
  Burst Rate Bandwidth: Over 250 kHz
  Sustained Bandwidth: Based on gray levels

APPENDIX C

C-NAV DIFFERENTIAL GPS

C-Nav is a globally corrected differential GPS system owned and operated by C&C Technologies, Inc. The C-Nav GPS Receiver combines a dual-frequency, geodetic grade, GPS Receiver with an integrated L-BAND communication RF detector and decoder all linked by an internal microprocessor. C-Nav uses monitoring stations strategically located around the globe to provide worldwide accuracies on the order of 0.25m (1 sigma)*.

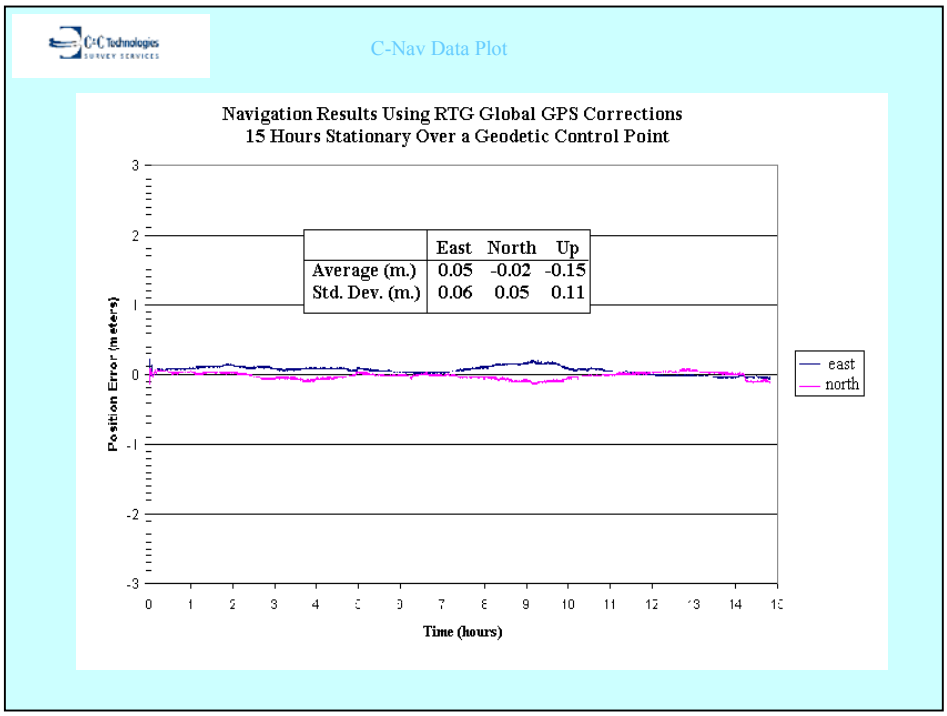
The technique, developed by the Jet Propulsion Lab for the National Aeronautics Space Administration, uses a global network of references stations to track the entire constellation of GPS satellites. The raw GPS observations are transmitted via the Internet back to the Network Control Center where the GPS constellation satellite orbital corrections and clock offset values are calculated and modeled in real-time. These corrections are universally valid and can be applied to GPS measurements from any location on earth.

The multi-function antenna assembly is capable of receiving the L1 and L2 GPS frequencies as well as the Inmarsat L-BAND receive frequency band. The gain pattern of this antenna is designed to be relatively constant even at lower elevations. This allows for an efficient link budget when the unit is operated at higher latitudes where the elevation of the geo-stationary communication satellite is low and close to the horizon. Atmospheric delays are eliminated from local measurements by comparing the L1 and L2 frequencies in the internal GPS receiver.

The C-Nav GPS System provides an output of RTCM (Type 1) pseudorange differential correction messages via a second RS232 interface. Raw GPS observation information can be collected from the C-Nav GPS Receiver system for recording and analysis. The raw GPS observation information can be converted to RINEX ASCII data (observation and navigation) file format as and when required.

The C-Nav GPS Receiver requires at least four (4) usable GPS satellites to compute a three dimensional (3D) solution. The C-Nav GPS Receiver will yield an autonomous horizontal position accuracy of 2 to 5 meters (1 sigma), depending on the GPS satellite geometry configuration and tracking (DOP index values).

APPENDIX C
C-NAV DIFFERENTIAL GPS



Receiver Specifications:

Features:

- Real-time sub meter accuracy
- Single integrated package – simple installation
- Rugged, waterproof housing
- Wide-range (10-40VDC) power supply
- RTCM and NMEA {GGA, GSA, RMC, VTG, ZDA) outputs
- Patented multipath mitigation significantly reduces noise
- Geodetic quality dual frequency GPS virtually eliminates ionospheric effects

Performance:

- L-band receiver frequency
- Automatically selected 1525 to 1560 MHz
- GcGPS Accuracy:
  Position (H): <30cm
  Position (V): <70cm
  {1–sigma and HDOP ≤ 1}
  Velocity <0.02m/s
- Time to first fix: Cold Start: 90 sec (typical)
- Reacquisition: Coast for 30 sec with GPS lock <2sec
  L-band loss with less than 30 sec with GPS lock <30 sec

C-NAV DIFFERENTIAL GPS

APPENDIX C

Physical/Environments, Inc.:

- Size: 9.2 in (H) x 7.2 in (D) (24.8 x 18.7 cm)
- Weight: 5.5 lbs (2.4 kg)
- Power: Input voltages: 10-40 VDC
  Consumption: <10W average power
  1.2 A max @12 VDC
- I/O Connector: 8 pin waterproof connector
- Temperature: Operating: -20°C to +70°C
  Storage: -40°C to 85°C
- Humidity: 100% non-condensing

Display Unit Specifications:

Features:

- 4 x 20 character LCD screen
- 12 key membrane button input pad
- Rugged, stainless steel housing
- Wide-range (20-40VDC) power supply
- RTCM and NMEA and raw data outputs

Physical/Environmental:

- Size: 9.6 in (L) x 6.7 in (W) x 3.3 in (H) (24.4 x 17.0 x 3.3 cm)
- Weight: 3.8 lbs (1.75 kg)
- Power: Input voltages: 20-40 VDC
  Consumption: <1W average power
  100 mA max @28 VDC typical
- I/O Connectors: 3 db-9, 1 cat-5 and 1 8 pin waterproof connector
- Temperature: Operating: -20°C to +70°C
  Storage: -40°C to 85°C
- Humidity: 100% non-condensing

APPENDIX C

SEACAT SBE 19-01

The Seacat SBE 19-01 Profiler from Sea-Bird Electronics, Inc., measures electrical conductivity and temperature versus pressure (depth) in marine environments to depths up to 6,800 meters (22,309 feet). The maximum sampling rate is 2 scans per second. Self-powered and self-contained, the SBE 19 features proven Sea-Bird conductivity and temperature sensors and a precision semiconductor strain-gauge pressure transducer. A 64-kilobyte solid-state memory allows 1.5 hours of recording (6 hours with optional 256 kilobyte memory) while sampling at two scans per second. Set-up, check-out, and data extraction are performed without opening the housing. Simultaneous real time monitoring is possible using the Seacat Profiler's two wire RS-232C transmit capability. Sea-Bird's powerful Seasoft CTD software derives salinity, density, sound velocity, and other ocean parameters from stored CTD (conductivity, temperature, depth) and may be used for data analysis, plotting and archival. Small external sensors may be powered and their frequency or voltage outputs acquired by the SBE 19.

Seacat Profiler options include 1) aluminum housings for use to 3,400 or 6,800 meters; 2) 256 kilobyte memory; 3) an extra bulkhead connector for auxiliary inputs; 4) SBE 5 submersible pump for pumped conductivity; 5) an opto-isolated junction box for supplying power and interconnecting Seacat Profiler and a companion computer which is necessary when using the Profiler in real-time mode.

Use of conductivity, temperature, and depth measurement for determination of sound velocity is appealing because these instruments are simpler and more rugged; and because resolution, accuracy, and stability lead to better precision than can be obtained with direct sound velocity measuring devices. Three equations are widely used for deriving sound velocity from CTD data (Wilson, 1959; Del Grosso, 1972; Millero and Chen, 1977). Absolute sound velocities derived from these equations differ on the order of .5 meter/second for various combinations of water temperature, salinity, and pressure. The work of Millero and Chen is the most modern and builds upon and attempts to incorporate the work of the earlier investigators. Millero and Chen's 1977 equation is used in the Sea-Bird Seasoft software, and is the one which is endorsed by the

Unesco/SCOR/ICES/IASPO Joint Panel on Oceanographic Tables and Standards, which comprises the internationally recognized authority for measurements of ocean parameters.

Specifications:

	Measurement Range	Initial Accuracy	Resolution	Sensor Calibration
Conductivity	0 to 7 S/m	+/- 0.001 S/m	+/- 0.0001 S/m	0 – 7 S/m Physical calibration over the range 1.4 to 6 S/m, plus zero conductivity (air)
Temperature (ºC)	-5 to + 35	+/- 0.01	+/-0.001	-1 to +31 (Measurements outside this range may be at slightly reduces accuracy due to extrapolation errors)
Depth	68 to 1000 m	+/- 0.25%	+/- 0.015%	Minimum 5 values between 0 and full scale

APPENDIX C

RECORDED INSTRUMENT SETTINGS

EDGETECH GEOSTAR SB-0512 SUBBOTTOM PROFILER
Record Length = 50 milliseconds
Record Divisions = 10 milliseconds
Delay = 0 milliseconds
Setback = +65 to 81 feet from antenna
Frequency = 2-10kHz, 20ms
Pulse BandWidth 2-10kHz, 20ms

ODOM ECHOTRAC BATHYMETRIC SYSTEM
Record Length = 60 feet
Record Divisions = 5 feet
Setback = +0.5 feet from antenna
Power = 2 kiloWatts
Frequency = 200 kiloHertz
Transducer Depth = 8 feet below sea level
Velocity Input = Harmonic Mean

GEOMETRICS CESIUM MAGNETOMETER
Sensitivity = ± .1 gamma
Sampling rate = .1 second
Scales = 100 gammas and 1000 gammas
Setback = 300 feet

EG&G 260 SIDE SCAN SONAR
Range = 50 meters per channel
Record Divisions = 25 meters
Frequency = 500 kiloHertz
Setforward = -45 feet ahead of antenna (on bow)

SURVEY VESSEL
M/V *Ocean Surveyor*
Average speed during survey = 3.5 knots
Navigation center = 61.5 feet ahead of stern
Survey sea state = 1- to 5-foot seas

APPENDIX D

Tide Data

Sound Velocity Profiles

Sound Velocity Data

APPENDIX D

DAILY TIDES Friday Aug 1, 2003 Central Daylight Time

Wine Island, Terrebonne Bay, Louisiana — 29ø05'N 90ø37'W — Sunrise 06:23 — Sunset 19:55

HIGH		LOW	
12:59	1.41	23:55	.39

*** DAYLIGHT SAVING *** Tide Height in FEET

```
TIME:  -.25     0     0.25     0.5    0.75     1.0    1.25     1.5    1.75

------+-+-------+-------+-------+-------+-------+-------+-------+-------+----

00:00   |       ******             m                    h                   .17
00:40   |       *******                                                     .19
01:20   |       ********           m                    h                   .22
02:00   |       *********                                                   .26
02:40   |       ***********        m                    h                   .31
03:20   |       *************                                               .38
04:00   |       ***************    m                    h                   .45
04:40   |       ******************                                          .52
05:20   |       ********************                     h                   .60
06:00   |       ************************                                    .68
06:40   |       *************************              h                   .77
07:20   |       ******************************                              .86
08:00   |       ********************************       h                   .95
08:40   |       **********************************                         1.04
09:20   |       **********************************   h                   1.13
10:00   |       ***********************************                       1.21
10:40   |       ***********************************                       1.28
11:20   |       ********************************************              1.34
12:00   |       *********************************************             1.38
12:40   |       *********************************************             1.41
13:20   |       *********************************************             1.41
14:00   |       *********************************************             1.38
14:40   |       ********************************************              1.34
15:20   |       ***********************************                       1.28
16:00   |       ********************************** h                     1.21
16:40   |       *********************************                         1.12
17:20   |       *******************************      h                   1.03
18:00   |       ****************************                               .94
18:40   |       **************************           h                   .84
19:20   |       ************************                                  .75
20:00   |       **********************               h                   .66
20:40   |       ********************                                      .58
21:20   |       ******************   m               h                   .51
22:00   |       ****************                                          .45
22:40   |       **************     m                 h                   .41
23:20   |       *************                                             .39
24:00  -+-------**************--+--m----+-------+-------h-------+-------+-  .39
TIME:  -.25     0     0.25     0.5    0.75     1.0    1.25     1.5    1.75
```

APPENDIX D

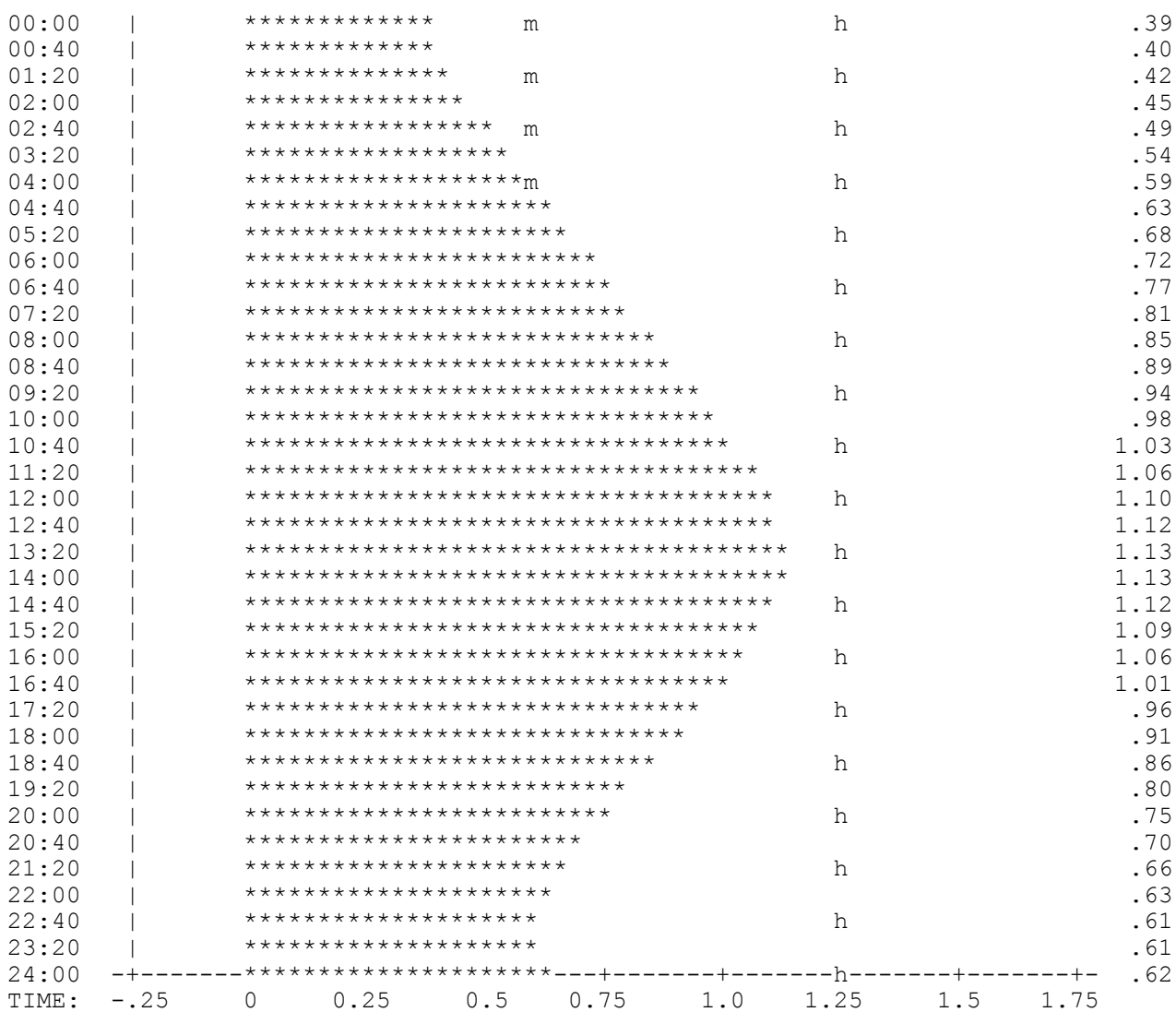
DAILY TIDES Saturday Aug 2, 2003 Central Daylight Time

Wine Island, Terrebonne Bay, Louisiana — 29ø05'N 90ø37'W — Sunrise 06:24 — Sunset 19:54

HIGH		LOW	
13:37	1.13	23:18	.61

*** DAYLIGHT SAVING ***

Tide Height in FEET



APPENDIX D

DAILY TIDES	Sunday	Aug 3, 2003	Central Daylight Time
Wine Island, Terrebonne Bay		29ø05'N	Sunrise 06:25
Louisiana		90ø37'W	Sunset 19:53

HIGH		LOW	
06:11	.88	21:07	.72

*** DAYLIGHT SAVING ***

Tide Height in FEET

TIME:	-.25	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	
00:00		**********					h			.62
00:40		**********								.64
01:20		**********					h			.67
02:00		**********								.71
02:40		**********					h			.76
03:20		**********								.80
04:00		**********					h			.84
04:40		**********								.86
05:20		**********					h			.88
06:00		**********								.88
06:40		**********					h			.88
07:20		**********								.88
08:00		**********					h			.87
08:40		**********								.85
09:20		**********					h			.84
10:00		**********								.83
10:40		**********					h			.83
11:20		**********								.82
12:00		**********					h			.82
12:40		**********								.82
13:20		**********					h			.81
14:00		**********								.81
14:40		**********					h			.81
15:20		**********								.81
16:00		**********					h			.80
16:40		**********								.79
17:20		**********					h			.78
18:00		**********								.77
18:40		**********					h			.75
19:20		**********								.74
20:00		**********					h			.73
20:40		**********								.72
21:20		**********					h			.72
22:00		**********								.73
22:40		**********					h			.74
23:20		**********								.77
24:00		**********					h			.82
TIME:	-.25	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	

APPENDIX D

DAILY TIDES	Monday	Aug 4, 2003	Central Daylight Time
Wine Island, Terrebonne Bay Louisiana	29ø05'N 90ø37'W	Sunrise 06:25 Sunset 19:53	

HIGH		LOW	
04:59	1.13	16:36	.48

*** DAYLIGHT SAVING *** Tide Height in FEET

TIME:	-.25	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	
00:00		**********					h			.82
00:40		**********								.87
01:20		**********					h			.93
02:00		**********								.99
02:40		**********					h			1.04
03:20		**********								1.09
04:00		**********					h			1.12
04:40		**********								1.13
05:20		**********					h			1.13
06:00		**********								1.12
06:40		**********					h			1.09
07:20		**********								1.05
08:00		**********					h			1.00
08:40		**********								.95
09:20		**********					h			.89
10:00		**********								.83
10:40		**********					h			.77
11:20		**********								.71
12:00		**********					h			.66
12:40		**********								.61
13:20		**********m					h			.57
14:00		**********								.54
14:40		**********	m				h			.51
15:20		**********								.49
16:00		**********	m				h			.48
16:40		**********								.48
17:20		**********	m				h			.48
18:00		**********								.50
18:40		**********	m				h			.51
19:20		**********								.54
20:00		**********m					h			.57
20:40		**********								.61
21:20		**********					h			.66
22:00		**********								.72
22:40		**********					h			.79
23:20		**********								.87
24:00	-+	**********					h		+-	.95
TIME:	-.25	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	

APPENDIX D

```
+-------------------------------------------------------------------------------+
|      DAILY TIDES     Tuesday    Aug  5, 2003    Central Daylight Time         |
+-----------------------------------------+-------------------------------+
| Wine Island, Terrebonne Bay           29ø05'N  |        Sunrise 06:26        |
| Louisiana                             90ø37'W  |        Sunset  19:52        |
+-----------------------+-----------------------+-------------------------------+
+         HIGH          |          LOW          |                               +
+-----------------------+-----------------------+-------------------------------+
|   05:11       1.42    |   17:13        .18    |                               |
|                       |                       |                               |
+-----------------------+-----------------------+-------------------------------+
      *** DAYLIGHT SAVING ***                      Tide Height in   FEET
TIME:  -.25     0     0.25     0.5    0.75     1.0    1.25     1.5    1.75

------+-+-------+-------+-------+-------+-------+-------+-------+-------+----

00:00   |       ******************************         h                    .95
00:40   |       ********************************                           1.03
01:20   |       **********************************     h                   1.12
02:00   |       ************************************                       1.20
02:40   |       *************************************                      1.28
03:20   |       ******************************************                 1.34
04:00   |       *******************************************                1.38
04:40   |       *******************************************                1.41
05:20   |       ********************************************               1.42
06:00   |       *******************************************                1.40
06:40   |       ******************************************                 1.37
07:20   |       *****************************************                  1.31
08:00   |       ****************************************h                 1.24
08:40   |       ***********************************                        1.16
09:20   |       *********************************      h                   1.06
10:00   |       ******************************                              .96
10:40   |       ****************************           h                   .86
11:20   |       ************************                                    .75
12:00   |       **********************                 h                   .65
12:40   |       ******************                                          .55
13:20   |       ***************    m                  h                   .46
14:00   |       *************                                               .38
14:40   |       ***********        m                  h                   .31
15:20   |       *********                                                   .25
16:00   |       ********           m                  h                   .21
16:40   |       *******                                                     .19
17:20   |       *******            m                  h                   .18
18:00   |       *******                                                     .20
18:40   |       ********           m                  h                   .22
19:20   |       *********                                                   .27
20:00   |       ***********        m                  h                   .33
20:40   |       ***************                                           .40
21:20   |       *****************  m                  h                   .48
22:00   |       ********************                                        .58
22:40   |       ************************               h                   .69
23:20   |       *************************                                 .80
24:00  -+-------*******************************-+-------h-------+-------+-  .92
TIME:  -.25     0     0.25     0.5    0.75     1.0    1.25     1.5    1.75
```

APPENDIX D

```
+-------------------------------------------------------------------------------+
|      DAILY TIDES     Wednesday  Aug  6, 2003    Central Daylight Time         |
+-----------------------------------------------+-------------------------------+
| Wine Island, Terrebonne Bay           29ø05'N |        Sunrise 06:26          |
| Louisiana                             90ø37'W |        Sunset  19:51          |
+-----------------------+-----------------------+-------------------------------+
+         HIGH          |          LOW          |                               +
+-----------------------+-----------------------+-------------------------------+
|   05:49       1.67    |   18:02       -.05    |                               |
|                       |                       |                               |
+-----------------------+-----------------------+-------------------------------+
      *** DAYLIGHT SAVING ***                      Tide Height in   FEET
TIME:  -.5      0      0.5      1      1.5      2      2.5      3      3.5

------+-+-------+-------+-------+-------+-------+-------+-------+-------+----

00:00   |       ****************    h                                        .92
00:40   |       *****************                                          1.05
01:20   |       ******************** h                                      1.17
02:00   |       **********************                                     1.29
02:40   |       ************************                                   1.40
03:20   |       *************************                                  1.49
04:00   |       *************************                                  1.57
04:40   |       **************************                                 1.63
05:20   |       **************************                                 1.66
06:00   |       **************************                                 1.67
06:40   |       **************************                                 1.65
07:20   |       *************************                                  1.60
08:00   |       *************************                                  1.53
08:40   |       ************************                                   1.44
09:20   |       **********************                                     1.33
10:00   |       ********************                                       1.20
10:40   |       ******************  h                                      1.07
11:20   |       ****************                                           .92
12:00   |       *************       h                                      .78
12:40   |       ***********                                                .63
13:20   |       *********m          h                                      .49
14:00   |       *******                                                    .36
14:40   |       *****    m          h                                      .25
15:20   |       ***                                                        .15
16:00   |       **       m          h                                      .06
16:40   |       *                                                          .00
17:20   |      **        m          h                                     -.04
18:00   |      **                                                         -.05
18:40   |      **        m          h                                     -.04
19:20   |       *                                                          .00
20:00   |       **       m          h                                      .05
20:40   |       ***                                                        .13
21:20   |       *****    m          h                                      .23
22:00   |       ******                                                     .35
22:40   |       ******** m          h                                      .48
23:20   |       ***********                                                .61
24:00  -+-------**************--+---h---+-------+-------+-------+-------+-  .76
TIME:   -.5      0      0.5      1      1.5      2      2.5      3      3.5
```

APPENDIX D

DAILY TIDES	Thursday Aug 7, 2003	Central Daylight Time
Wine Island, Terrebonne Bay Louisiana	29ø05'N 90ø37'W	Sunrise 06:27 Sunset 19:50

HIGH		LOW	
06:39	1.86	18:55	-.20

*** DAYLIGHT SAVING *** Tide Height in FEET

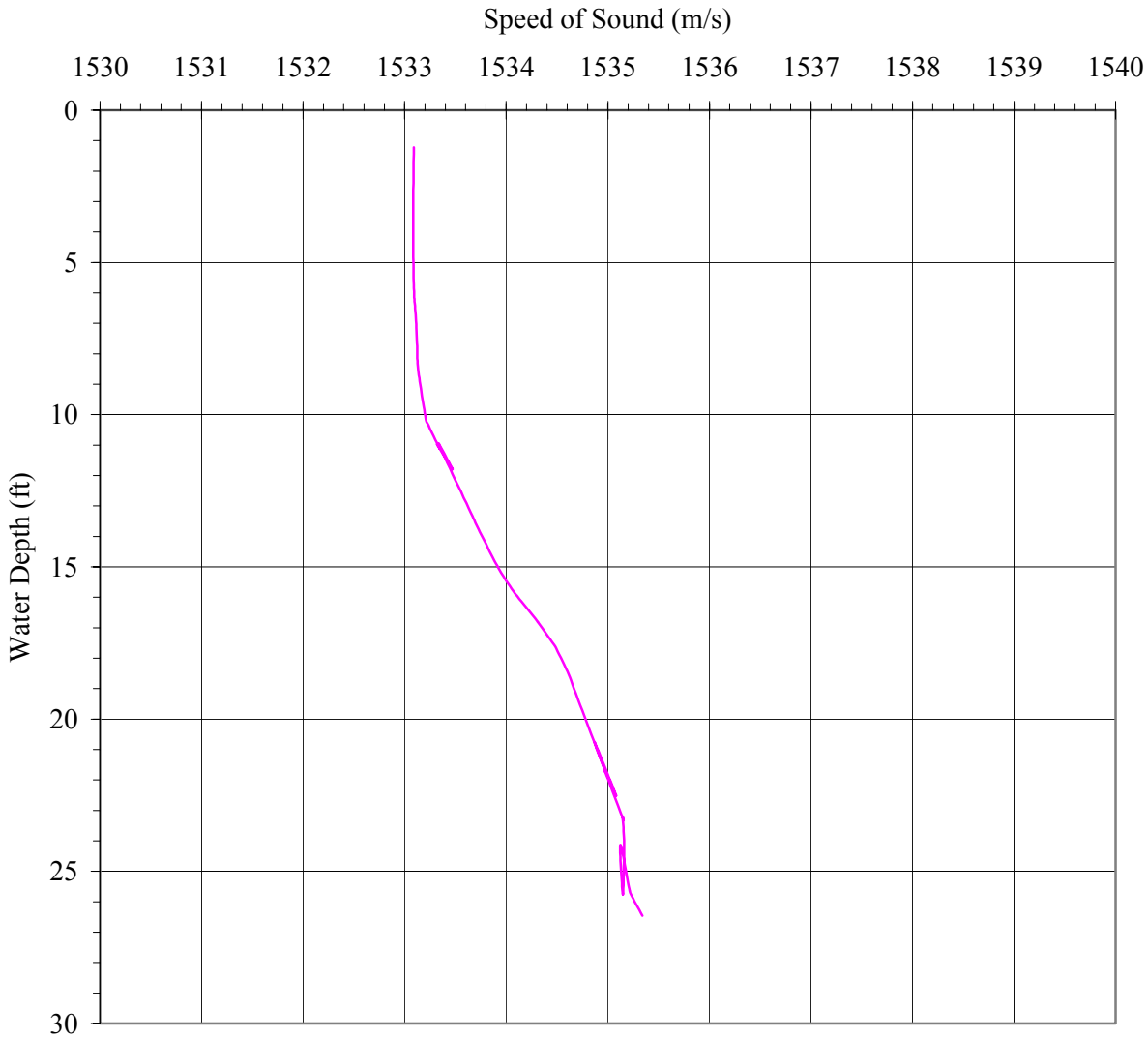
```
TIME:  -.5      0      0.5      1      1.5      2      2.5      3      3.5

------+-+-------+-------+-------+-------+-------+-------+-------+-------+----

00:00   |       ************       h                                        .76
00:40   |       ***************                                             .92
01:20   |       ******************  h                                     1.07
02:00   |       ********************                                      1.22
02:40   |       ************************                                  1.37
03:20   |       *************************                                 1.51
04:00   |       ***************************                               1.63
04:40   |       ****************************                              1.73
05:20   |       *****************************                             1.80
06:00   |       ******************************                            1.85
06:40   |       ******************************                            1.86
07:20   |       ******************************                            1.85
08:00   |       *****************************                             1.80
08:40   |       ****************************                              1.72
09:20   |       *************************                                 1.62
10:00   |       ************************                                  1.49
10:40   |       **********************                                    1.35
11:20   |       ********************                                      1.19
12:00   |       *****************   h                                     1.02
12:40   |       **************                                            .85
13:20   |       ************       h                                      .67
14:00   |       *********                                                 .50
14:40   |       ******   m          h                                     .34
15:20   |       ****                                                      .20
16:00   |       **       m          h                                     .07
16:40   |      **                                                        -.04
17:20   |     ***        m          h                                    -.12
18:00   |    ****                                                        -.17
18:40   |    ****       m          h                                    -.20
19:20   |    ****                                                        -.19
20:00   |    ****       m          h                                    -.16
20:40   |     ***                                                        -.10
21:20   |       *        m          h                                    -.02
22:00   |       **                                                        .09
22:40   |       ****     m          h                                     .22
23:20   |       *******                                                   .36
24:00  -+-------**********------+---h---+-------+-------+-------+-------+-  .52
TIME:  -.5      0      0.5      1      1.5      2      2.5      3      3.5
```

APPENDIX D

SOUND VELOCITY PROFILE
Archaeological, Engineering and Hazard Study
New Cut Dune/Marsh Restoration Project



Profile: 080203_0
08/02/03 13:57 UTC
Location: N28d 56'33", W09d 30'19"
Block 13, South Pelto Area
Water depth: 26'

APPENDIX D

Sound Velocity Profile Data

depth m	Vel m/s	Harm Vel m/s	cumul time ms	depth ft
0.607	1530.73	1530.7	0.40	1.99
1.105	1530.73	1530.7	0.72	3.63
1.64	1530.73	1530.7	1.07	5.38
2.095	1530.73	1530.7	1.37	6.87
2.095	1530.73	1530.7	1.37	6.87
2.593	1530.74	1530.7	1.69	8.51
2.382	1530.72	1530.7	1.56	7.81
2.382	1530.72	1530.7	1.56	7.81
2.593	1530.71	1530.7	1.69	8.51
2.841	1530.71	1530.7	1.86	9.32
3.128	1530.7	1530.7	2.04	10.26
3.377	1530.69	1530.7	2.21	11.08
3.836	1530.84	1530.7	2.51	12.59
4.081	1531.4	1530.8	2.67	13.39
4.368	1532.36	1530.8	2.85	14.33
4.368	1533.2	1530.8	2.85	14.33
4.578	1532.49	1530.9	2.99	15.02
4.329	1531.91	1530.8	2.83	14.20
5.075	1533.43	1531.1	3.31	16.65
5.075	1536.15	1531.1	3.31	16.65
5.362	1537.15	1531.4	3.50	17.59
5.573	1537.47	1531.6	3.64	18.28
5.856	1536.69	1531.9	3.82	19.21
5.821	1535.12	1531.9	3.80	19.10
6.104	1535.23	1532.0	3.98	20.03
6.353	1537.09	1532.2	4.15	20.84
6.314	1537.1	1532.2	4.12	20.72
6.314	1535.28	1532.2	4.12	20.72
6.353	1534.97	1532.2	4.15	20.84
6.353	1536.09	1532.2	4.15	20.84
6.601	1537.32	1532.3	4.31	21.66
6.601	1538.79	1532.3	4.31	21.66
6.353	1538.93	1532.1	4.15	20.84
6.314	1539.01	1532.0	4.12	20.72
6.314	1538.64	1532.0	4.12	20.72
6.353	1537.15	1532.1	4.15	20.84
6.353	1536.91	1532.1	4.15	20.84
6.353	1536.79	1532.1	4.15	20.84
6.601	1537.39	1532.3	4.31	21.66
6.353	1538.8	1532.0	4.15	20.84

APPENDIX E

Daily Progress Reports

Survey Logs

APPENDIX E

Daily Progress Report #1
July 31 2003

C&C:
ces@cctechnol.com, jgn@cctechnol.com, jef@cctechnol.com,
tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**Dock Side**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La		
Commence Primary Route Work		
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00			
12:00			
18:00			
24:00			

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES

APPENDIX E

FROM	TO	SP	DIR	ACTIVITIES
0000	0700			Stand-by at office
0700	2100			Mobbing for job
2100	2400			Waiting on client rep.

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date
Mobilisation	14		
Transit			
Check in / SV Profile / equip tuning			
Block Survey WC457-458			
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client	10		
Totals	**24**		

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	0	0	0

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**		07-31-03
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:

Mobbing Ocean Surveyor for job and awaiting client rep to arrive at boat.

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #2
August 1, 2003

C&C:
ces@cctechnol.com, jgn@cctechnol.com, jef@cctechnol.com,
tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 101290 E2264627**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work		
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00			
12:00			
18:00			
24:00	S	5-10kts	1-2ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST)

FROM	TO	SP	DIR	ACTIVITIES
0000	1700			Waiting on client rep.
1700	2200			Wait on survey crew change
2200	2230			Transit to check in
2230	2300			Check in

APPENDIX E

FROM	TO	SP	DIR	ACTIVITIES
2300	2400			Transit to job site

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date
Mobilisation		14	14
Transit	1.5		1.5
Check in / SV Profile / equip tuning	.5		.5
Block Survey WC457-458			
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by, waiting on client & other	22	10	32
Totals	**24**	**24**	**48**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	0	0	0

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:

Stand-by waiting on client rep. After client arrived at boat we had to wait for a survey member to get off of the boat due to having chest pains. Once that was done we where able to depart the dock and transit to the job site.

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #3
August 02, 2003

C&C:
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tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 93654 E 2226547**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	5-10kts	1-3ft
12:00	N	0-5kts	1-3ft
18:00	N	5-10kts	1-3ft
24:00	S	5-10kts	1-2ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	0100			Transit to job site
0100	0130			Do velo cast
0130	0700			Deploy and tune gear
0700	2400			Running survey

APPENDIX E

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date
Mobilisation		14	14
Transit	1	1.5	2.5
Check in / SV Profile / equip tuning	6	.5	6.5
Survey Primary Route Work	17		17
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**48**	**72**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	67.66	67.66	325.85

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:

Transit to job site, do SV cast, deploy and tune gear. Started survey and data are looking good. If we continue to get 60 line miles a day we are looking at 6 days to complete this job area.

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #4
August 03, 2003

C&C:
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tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 90956 E 2208726**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	5-10kts	2-3ft
12:00	S	5-10kts	2-3ft
18:00	N	0-5kts	1-3ft
24:00	S	0-5kts	1-2ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	2400			Running survey

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date

APPENDIX E

Mobilisation		14	14
Transit		2.5	2.5
Check in / SV Profile / equip tuning		6.5	6.5
Survey Primary Route Work	24	17	41
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**72**	**96**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	81.55	149.21	244.30

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:
Running survey

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #5
August 04, 2003

C&C:
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tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc**.
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 88326 E 2207360**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	10-15kts	1-3ft
12:00	E	5-10kts	1-3ft
18:00	E	5-10kts	1-3ft
24:00	SE	5-10kts	1-3ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	2400			Running survey

EE CUMULATIVE TIMES

APPENDIX E

	DAILY	CUMULATIVE	To Date
Mobilisation		14	14
Transit		2.5	2.5
Check in / SV Profile / equip tuning		6.5	6.5
Survey Primary Route Work	24	41	65
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**96**	**120**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	100.19	249.40	144.11

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:
Running survey

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #6
August 05, 2003

C&C:
ces@cctechnol.com, jgn@cctechnol.com, jef@cctechnol.com,
tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 84758 E 2218396**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	5-10kts	1-3ft
12:00	E	5-10kts	1-3ft
18:00	E	5-10kts	1-3ft
24:00	SE	5-10kts	1-3ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	2400			Running survey

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date

APPENDIX E

Mobilisation		14	14
Transit		2.5	2.5
Check in / SV Profile / equip tuning		6.5	6.5
Survey Primary Route Work	24	65	89
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**120**	**144**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	83.98	333.38	60.13

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:
Running survey

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #7
August 06, 2003

C&C:
ces@cctechnol.com, jgn@cctechnol.com, jef@cctechnol.com,
tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	**Coastal Environments, Inc.**
Project No	**4037**
Scope of Work	**Block Study / PL 12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 95833 E 2226093**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work		
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	5-10kts	1-3ft
12:00	E	5-10kts	1-3ft
18:00	E	15-20kts	2-3ft
24:00	SE	10-15kts	2-3ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	2400			Running survey

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date

APPENDIX E

Mobilisation		14	14
Transit		2.5	2.5
Check in / SV Profile / equip tuning		6.5	6.5
Survey Primary Route Work	24	89	113
Survey of Development Route			
Reruns			
Patch Test			
Waiting on Weather			
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**144**	**168**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	58	391.38	2.13

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:
Running survey

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

Daily Progress Report #8
August 07, 2003

C&C:
ces@cctechnol.com, jgn@cctechnol.com, jef@cctechnol.com,
tsc@cctechnol.com, tdr@cctechnol.com, jeff.sides@cctechnol.com

Client	Coastal Environments
Project No	**4037**
Scope of Work	**Block Study / PL,12,13,14,18,19**
Vessel	**RV *"Ocean surveyor***
Midnight Location	**N 104873 E 2119289**

Note: All times CST

	Date	Time
Commenced Mobilization	07-31-02	0700
Sail from Port Fourchon La	08-01-03	2200
Commence Primary Route Work	08-02-03	0700
Completed Primary Route Work	08-07-03	1030
Completed Demobilization		
Commence Patch Test		
Completed Patch Test		

AA SAFETY

First aid cases	**0**	**Date of last safety meeting**	**03 June 20**
Medical treatment cases	**0**	**Date of last safety committee**	**03 June 20**
Restricted work cases	**0**	**Date of last fire drill**	**03 June 20**
Fatalities	**0**	**Date of last abandon ship drill**	**03 June 20**
Lost time incidents	**0**	**Date of last man overboard drill**	**03 June 20**

BB WEATHER – Last 24 hours

	Wind Direction	Wind Speed	Sea State
06:00	S	10-15ktskts	3-5ft
12:00	S	10-15ktskts	3-5ft
18:00	S	10-15ktskts	3-5ft
24:00	S	10-15ktskts	3-5ft

DD DAILY CHRONOLOGY SUMMARY (ACTIVITIES LAST 24HRS. Times in CST

FROM	TO	SP	DIR	ACTIVITIES
0000	0400			Running survey
0400	1030			Running reruns
1030	1100			Job done picking up gear
1100	1300			Transit to new job site in SS88

APPENDIX E

FROM	TO	SP	DIR	ACTIVITIES
1300	1330			Ck in and do velo cast
1330	2400			WOW

EE CUMULATIVE TIMES

	DAILY	CUMULATIVE	To Date
Mobilisation		14	14
Transit	2	2.5	4.5
Check in / SV Profile / equip tuning	.5	6.5	7
Survey Primary Route Work	4	113	117
Survey of Development Route			
Reruns	7		7
Patch Test			
Waiting on Weather	10.5		10.5
Vessel Downtime			
Equipment Downtime			
De-mobilisation			
Standing-by and waiting on client & other		32	32
Totals	**24**	**168**	**192**

Line Miles

To do miles	Miles Daily	Total miles done	Miles Left
393.51	2.13	393.51	0

HH PERSONNEL

Name	Position	Company	Joined	Departed
L.Theriot	**Field Project Manager**	**C&C**	07-31-03	
D.Acoin	**Senior Operator**	**C&C**	08-01-03	
J.Grosvenor	**Senior Operator**	**Contractor**	07-31-03	08-01-03
S.Alleman	**Senior Operator**	**C&C**	07-31-03	
B.Moore	**Junior Operator**	**C&C**	07-31-03	
B.Daigle	**Senior Operator**	**C&C**	07-31-03	

JJ COMMENTS:

Running survey, run reruns, Job complete transit to Ship Shoal Block 88.

	Scott Mcbay **Chief Project Manager** **C&C Representative**	**Lon Theriot** **Party Chief** **C&C Representative**

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 02 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geometrics 880 MAG**
Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**			Page No.
ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)			1

Time	Heading	Fix. No.	Line No.	Remarks
0700				
1100				
2100				
0000				
1700				
2150				
2230				
2300				
0000	New	Day	08/02/03	Saturday
				WX @ N101290, E2264627
				Winds S 5-10 Knots, Seas 1'-2'
				N 28d56'33", W 090d30'19"
0058				Sound velocity cast
0145				Deploying gear
0400				Tuning gear
0600				WX @ N93835, E2224203
				Winds S 5-10 seas 1'-3'
0654	270	69	Ln1	SOL MAG – no paper record sp 69-65
0819	270	9	Ln1	EOL
0823	090	9	Ln4	SOL
0938	090	69	Ln4	EOL
0944	270	69	Ln7	SOL
1104	270	8	Ln7	EOL
1110	090	9	Ln3	SOL
1200				WX @ N94808, E2229409
				Seas 1'-3', Winds N 0-5 Knots
1226	090	69	Ln3	EOL
1235	270	69	Ln6	SOL
1324	270	37	Ln6	Started logging ln6a on subbottom
1401	270	9	Ln6	EOL
1411	090	9	Ln2	SOL
1528	090	69	Ln2	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 02 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**

Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle** — Page No.

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST) — 2

Time	Heading	Fix. No.	Line No.	Remarks
1539	270	69	9	SOL
1657	270	8	9	EOL
1707	090	9	5	SOL
1800				WX@ N 94481 E2230239
				Winds N 5-10 Knots, Seas 1'-3'
1825	090	69	5	EOL
1833	270	69	11	SOL
2002	270	8	11	EOL
2012	090	8	8	SOL
2135	090	69	8	EOL
2145	270	69	13	SOL
2307	270	8	13	EOL
2314	090	8	10	SOL
0000				New Day 08/03/03, N93654 E2226547
				Winds South 5-10 Knots Seas 1'-2'
0034	090	69	10	EOL
0039	270	69	15	SOL
0201	270	7	15	EOL
0210	090	8	12	SOL
0329	090	69	12	EOL
0338	270	69	17	SOL
0506	270	7	17	EOL
0520	090	7	14	SOL
0600				Winds S 5-10 Knots Seas 2'-3'
				WX@ N92997, E2229097
0635	090	69	14	EOL
0644	270	69	19	SOL
0812	270	7	19	EOL
0817	090	7	16	SOL
0933	090	69	16	EOL
0940	270	69	21	SOL
1107	270	6	21	EOL
1114	090	7	18	SOL
1242	090	69	18	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 03 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**

Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle** — Page No. 3

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Heading	Fix. No.	Line No.	Remarks
1253	270	69	23	SOL
1418	270	6	23	EOL
1428	090	6	20	SOL
1555	090	69	20	EOL
1605	270	69	25	SOL
1730	270	6	25	EOL
1738	090	6	22	SOL
1903	090	69	22	EOL
1800				WX @ N 91724 E 2239161
				SEAS 1’-3’; WINDS N 5 Knots
1914	270	69	27	SOL
2040	270	5	27	EOL
2051	090	6	24	SOL
2213	090	69	24	EOL
2223	270	69	29	SOL
2349	270	5	29	EOL
2358	090	5	26	SOL
0000				START OF NEW DAY 07/04/03
				WX @ N 90970, E 2209884
				WINDS SE 5-6Knots SEAS; 1’-2’
0121	090	69	26	EOL
0131	270	69	31	SOL
0258	270	5	31	EOL
0306	090	5	28	SOL
0427	090	69	28	EOL
0438	270	67	33	SOL
0600				WX @ N 89805 E 2208776
				WINDS S 10-15 Knots SEAS; 1’-3’
0605	270	4	33	EOL
0613	090	5	30	SOL
0733	090	69	30	EOL
0742	270	65	35	SOL
0907	270	4	35	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 04 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**

Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle** — Page No. 4

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Heading	Fix. No.	Line No.	Remarks
0913	090	4	32	SOL
1039	090	68	32	EOL
1051	270	63	37	SOL
1200				WX @ N 89165 E 2213714
				WINDS E 5-10 KNOTS, SEAS 1'-'3
1208	270	4	37	EOL
1215	090	4	34	SOL
1339	090	66	34	EOL
1352	270	61	39	SOL
1505	270	3	39	EOL
1513	090	4	36	SOL
1633	090	64	36	EOL
1646	270	58	41	SOL
1800	270	3	41	EOL
1800				WX @ N 88496, E2206734
				WINDS E 5-10 KNOTS, SEAS 1'-3'
1807	090	3	38	SOL
1900	090	38	38	SUBBOTTOM LOGGING 38q
1929	090	62	38	EOL
1940	270	56	43	SOL
2052	270	3	43	EOL
2101	090	3	40	SOL
2218	090	60	40	EOL
2233	270	54	45	SOL
2347	270	2	45	EOL
2356	090	3	42	SOL
2400	090		42	WX @ N 88326 E 2207360
				START OF NEW DAY 08/05/03
				WINDS SE 5-10 KNOTS; SEAS 1'-3'
0106	090	57	42	EOL
0119	270	52	47	SOL
0222	270	2	47	EOL
0229	090	3	44	SOL
0337	090	55	44	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG			
Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 05 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**
Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**			Page No.
ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)			5

Time	Heading	Fix. No.	Line No.	Remarks
0349	270	50	49	SOL
0453	270	2	49	EOL
0454	090	2	46	SOL
0600	N87036	E2231645		Winds S 5-10 Knots, seas 1'-3'
0603	090	53	46	EOL
0616	270	48	51	SOL
0720	270	2	51	EOL
0725	090	2	48	SOL
0826	090	51	48	EOL
0839	270	45	53	SOL
0940	270	1	53	EOL
0945	090	2	50	SOL
1047	090	49	50	EOL
1102	270	43	55	SOL
1158	270	1	55	EOL
1202	090	1	52	SOL
1300	090	47	52	EOL
1200				WX @ N86708 E2205761
				Seas: 1'-3'; Winds E 5-10 Knots
1314	270	41	57	SOL
1406	270	1	57	EOL
1411	090	1	54	SOL
1509	090	44	54	EOL
1521	270	39	59	SOL
1607	270	2	59	EOL
1614	090	1	56	SOL
1708	090	42	56	EOL
1721	270	38	61	SOL
1809	270	3	61	EOL
1800				WX @ N85578 E2204988
				Seas: 1'-3'; Winds E 5-10 Knots
1817	090	1	58	SOL; offline 30' due to platforms
1911	090	40	58	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 05 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**

Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle** — Page No.

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST) — 6

Time	Heading	Fix. No.	Line No.	Remarks
1919	270	37	63	SOL
2003	270	5	63	EOL
2012	090	3	60	SOL
2059	090	39	60	EOL
2109	270	36	65	SOL
2148	270	6	65	EOL
2154	090	4	62	SOL
2238	090	38	62	EOL
2246	270	36	67	SOL
2325	270	8	67	EOL
2232	090	6	64	SOL
0000				New Day 07/06/03
				WX @ N 84758 E 2218396
				Winds SE 5-10 Knots; Seas 1'-2'
0013	090	37	64	EOL
0026	270	35	69	SOL
0058	270	10	69	EOL
0114	090	7	66	SOL
0153	090	36	66	EOL
0200	270	36	71	SOL
0231	270	11	71	EOL
0239	090	9	68	SOL
0315	090	36	68	EOL
0324	270	34	73	SOL
0354	270	13	73	EOL
0403	090	10	69	SOL
0435	090	35	69	EOL
0443	270	33	70	SOL
0510	270	14	70	EOL
0520	090	12	75	SOL
0547	090	34	75	EOL
0555	270	32	77	SOL
0600				WX @ N 82638 E 2218851
				Winds S 5-10 Knots; Seas 1'-2'

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 06 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**
Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**			Page No.
ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)			7

Time	Heading	Fix. No.	Line No.	Remarks
0617	270˚	16	77	EOL
0625	090˚	14	74	SOL
0649	090˚	33	74	EOL
0803	270˚	32	79	SOL
0823	270˚	17	79	EOL
0830	090˚	15	76	SOL
0852	090˚	33	76	EOL
0902	270˚	31	81	SOL
0919	270˚	19	81	EOL
0926	090˚	17	78	SOL
0944	090˚	32	78	EOL
0956	270˚	30	83	SOL
1007	270˚	20	83	EOL
1018	090˚	18	80	SOL
1034	090˚	31	80	EOL
1043	270˚	33	85	SOL
1053	270˚	22	85	EOL
1101	090˚	19	82	SOL
1116	090˚	31	82	EOL
1125	270˚	29	87	SOL
1133	270˚	24	87	EOL
1143	090˚	21	84	SOL
1154	090˚	30	84	EOL
1202	270˚	29	88	SOL
1200	270˚		88	N 80816 E 2219918
				WINDS E 5-10Kts; SEAS: 1’-3’
1209	270˚	24	88	EOL
1215	090˚	23	86	SOL
1223	090˚	29	86	EOL
1233	000˚	32	95	SOL
1237	000˚	29	95	EOL; ABORT LINE DUE TO SUBB
1307	000˚	32	95a	SOL
1347	000˚	1	95a	EOL

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 06 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**
Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**			Page No.
ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)			8

Time	Heading	Fix. No.	Line No.	Remarks
1403	180	1	96	SOL
1444	180	32	96	EOL
1500	000	32	97	SOL
1539	000	1	97	EOL
1555	180	1	98	SOL
1630	180	27	98	EOL
1643	000	24	99	SOL
1704	000	9	99	EOL
1744	090	1	45a	SOL
1800	090			WX @ N 87874 E 2215743
				WINDS E 15-20; SEAS: 2'-3'
1845	090	54	45a	EOL
1904	000	14	89	SOL
1922	000	1	89	EOL
1935	180	1	90	SOL
1957	180	17	90	EOL
2015	000	19	91	SOL
2041	000	1	91	EOL
2056	180	1	92	SOL
2123	180	21	92	EOL
2139	000	22	93	SOL
2207	000	1	93	EOL
2225	180	1	94	SOL
2256	180	26	94	EOL
2332	058	1	100	SOL
0001	058	22	100	EOL START OF NEW DAY 07/07/03
				WX@ N 95841, E 226123
				WINDS SE 10-15 KNOTS SEAS 2'-3'
0018	126	1	101	SOL
0037	126	15	101	EOL
0355	166	1	102	SOL
0405	166	9	102	EOL
0453	270	69	1a	SOL
0600				WX @ N 95067, E 2210845

APPENDIX E

C & C TECHNOLOGIES SURVEY LOG

Job Number **4037**	Client **Coastal Environments, Inc.**	Vessel Ocean Surveyor	Survey Equipment Trimble, MBX, WASS, C-Nav
Date **08/ 07 /03**	**AREA WC 68 / EC 2**	Remote	Operating Geophysical Equipment: **500 Khz260 SSS, EchoTrac DF 3200, 2-16 SB Towfish, Geomet 880 mag**

Personnel: **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle** | Page No. 9

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Heading	Fix. No.	Line No.	Remarks
0600				WINDS S 10-15 KNOTS SEAS 3'-5'
0622	270	69	1A	EOL SB ONLY
0626	090	8	7A	SOL
0738	090	69	7A	EOL
0859	270	14	49A	SOL SB ONLY
0918	270	2	49A	EOL
0938	090	12	46B	SOL
0945	090	20	46B	EOL SB+ SSS ONLY
1012	090	14	74A	SOL
1033	090	35	74A	EOL
1034				PICKING UP GEAR
1050				GEAR ON BOARD TANSIT TO NEXT JOB

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 02 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 1

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0654	270	69	28	+45	1	LN1	X		+65	360	10	Sol
0728	270	46	27	+45	1	LN1			+65	360	10	Mag contact Chevron 10” p/l
0729	270	45	27	+45	1	LN1			+65	360	10	Mag contact Equilon 20” p/l
0753	270	28	28	+45	1	LN1			+65	360	10	Mag contact Texaco 4” / AWR 8” p/l
0817	270	11	27	+45	1	LN1			+65	360	10	Mag contact Comstock 8” p/l
0819	270	9	27	+45	1	LN1		X	+65	360	10	EOL
0823	090	9	27	+45	4	LN4	X		+65	360	10	Sol
0825	090	11	27	+45	4	LN4			+65	360	10	Mag contact Comstock 8” p/l
0843	090	25	27	+45	4	LN4			+65	360	10	Mag contact energy 6” p/l
0849	090	30	27	+45	4	LN4			+65	360	10	Mag contact ANR 8” p/l / Texaco 4” p/l
0908	090	44	27	+45	4	LN4			+65	360	10	Mag contact Equilon 20” p/l
0911	090	48	27	+45	4	LN4			+65	360	10	Mag contact chevron 10” p/l
0938	090	69	28	+45	4	LN4		X	+65	360	10	EOL
0944	270	69	29	+45	7	LN7	X		+65	360	11	Sol A s/b layback 84’
1019	270	43	27	+45	7	LN7			+65	360	11	Mag contact Equilon 20” p/l
1104	270	8	25	+45	7	LN7		X	80	360	10	EOL
1110	090	9	26	+45	3	LN3	X		80	360	10	Sol
1114	090	11	26	+45	3	LN3			80	360	10	Mag contact Comstock 8” p/l
1131	090	25	27	+45	3	LN3			80	360	10	Mag contact energy 6” p/l
1137	090	29	27	+45	3	LN3			80	360	10	Mag contact ANR 8” p/l / Texaco 4” p/l
1156	090	45	27	+45	3	LN3			80	360	10	Mag contact Equilon 20” p/l
1158	090	48	28	+45	3	LN3			80	360	10	Mag contact chevron 10” p/l w/ unknown @ sp 47

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 02 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 2

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1207	090	54	28	+45	3	Ln3			80	360	10	Mag contact unknown
1226	090	69	30	+45	3	Ln3		X	80	360	10	EOL
1235	270	69	29	+45	6	Ln6	X		80	360	10	Sol
1255	270	56	28	+45	6	Ln6			80	360	10	Unknown mag hit possible associated SSS hit @ sp 57
1305	270	49	27	+45	6	Ln6			80	360	10	Mag hit chevron 10” & 15gamma unknown
1309	270	47	27	+45	6	Ln6			80	360	10	Possible unknown SSS hit
1314	270			+45	6	Ln6			76	360	10	C/I subbottom
1315	270			+45	6	Ln6				360	10	C/o subbottom
115	270	44	27	+45	6	Ln6			80	360	10	Mag hit Equilon 20” p/l
1315	270	44	27	+45	6	Ln6			76	360	10	C/I SBP Key rate 50 ms. Sweep 70 ft. delay 10 ft. some stickers labeled wrong
1324	270	36		+45	6	Ln6				360	10	Stopped recording fssb to adjust ms record 100 – 50
1324	270	36		+45	6	Ln6			76	360	10	Start recording fssb file name 6a
1334	270	29	27	+45	6	Ln6			76	360	10	Texaco 4” p/l mag hit
1335	270	28	27	+45	6	Ln6			76	360	10	Mag hit ANR 8” p/l
1340	270	25	26	+45	6	Ln6			76	360	10	Mag hit energy 6” p/l
1401	270	10	25.5	+45	6	Ln6			76	360	10	Mag hit Comstock 8” p/l
1401	270	9	25.5	+45	6	Ln6		X	76	360	10	EOL
1411	090	9	26.9	+45	2	Ln2	X		76	360	10	Sol
1414	090	11	26.7	+45	2	Ln2			76	360	10	Mag hit Comstock 8” p/l
1431	090	24	27.5	+45	2	Ln2			76	360	10	Mag hit unknown 10gamma
1432	090	25	27.6	+45	2	Ln2			76	360	10	Mag hit energy 6” p/l
1436	090	29	27.8	+45	2	Ln2			76	360	10	Mag hit ANR 8” p/l
1437	090	29.9	27.5	+45	2	Ln2			76	360	10	Mag hit Texaco 4” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 02 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 3

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1458	090	45	27.6	+45	2	Ln2			76	360	10	Mag hit Equilon 20” p/l
1500	090	47	27.8	+45	2	Ln2			76	360	10	Mag hit chevron 10” p/l
1533	090	69	31	+45	2	Ln2		X	76	360	10	EOL
1539	270	69	31	+45	9	Ln9	X		76	360	10	Sol
1551	270	61	27.9	+45	9	Ln9			76	360	10	Mag hit unknown 15gamma
1602	270	51	27.8	+45	9	Ln9			76	360	10	Mag hit chevron 10” p/l
1613	270	43	27.6	+45	9	Ln9			76	360	10	Mag hit Equilon 20” p/l
1629	270	60	26.6	+45	9	Ln9			76	360	10	Mag hit Texaco 4” p/l
1630	270	29	26.5	+45	9	Ln9			76	360	10	Mag hit ANR 8” p/l
1634	270	26	26.2	+45	9	Ln9			76	360	10	Mag hit energy 6” p/l
1655	270	9	24.9	+45	9	Ln9			76	360	10	Mag hit Comstock 8” p/l
1657	270	8	24.8	+45	9	Ln9		X	76	360	10	EOL
1707	090	9	25.2	+45	5	Ln5	X		76	360	10	Sol
1710	090	11	25	+45	5	Ln5			76	360	10	Mag hit Comstock 8” p/l
1730	090	26	26.6	+45	5	Ln5			76	360	10	Mag hit energy 6” p/l
1734	090	29	26.6	+45	5	Ln5			76	360	10	Mag hit ANR 8” p/l
1735	090	30	26.5	+45	5	Ln5			76	360	10	Mag hit Texaco 4” p/l
1745	090	37	27	+45	5	Ln5			76	360	10	Mag hit unknown
1751	090	43	27	+45	5	Ln5			76	360	10	Mag hit unknown
1753	090	44	27.4	+45	5	Ln5			76	360	10	Mag hit Equilon 20” p/l
1756	090	46	27.4	+45	5	Ln5			76	360	10	Mag hit unknown
1759	090	49	27.3	+45	5	Ln5			76	360	10	Mag hit chevron 10” p/l
1826	090	69	28.6	+45	5	Ln5		X	76	360	10	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 02 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 4

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. C/O	Mag Dph	Remarks
1833	270	69	29.8	+45	11	Ln11	X		76	360	10	Sol
1841	270	63	28	+45	11	Ln11			76	360	10	Mag hit unknown
1842	270	63	28	+45	11	Ln11			76	360	10	Ss hit unknown N28485 E681632
1858	270	51	27.9	+45	11	Ln11			76	360	10	Mag hit chevron 10” p/l
1911	270	42	27.5	+45	11	Ln11			76	360	10	Mag hit Equilon 20” p/l
1929	270	30	26.8	+45	11	Ln11			76	360	10	Mag hit Texaco 4” p/l
1930	270	29	26.9	+45	11	Ln11			76	360	10	Mag hit ANR 8” p/l
1935	270	26	26.2	+45	11	Ln11			76	360	10	Mag hit energy 6” p/l
2001	270	9	25.4	+45	11	Ln11			76	360	10	Mag hit Comstock 8” p/l
2003	270	8	25.3	+45	11	Ln11		X	76	360	10	EOL
2012	090	8	24.9	+45	8	Ln8	X		76	360	10	Sol
2016	090	10	24.8	+45	8	Ln8			76	360	10	Mag hit Comstock 8” p/l
2038	090	26	26.1	+45	8	Ln8			76	360	10	Mag hit energy 6” p/l
2043	090	30	26.5	+45	8	Ln8			76	360	10	Mag hit ANR 8” p/l
2044	090	31	26.8	+45	8	Ln8			76	360	10	Mag hit Texaco 4” p/l
2101	090	44	27.4	+45	8	Ln8			76	360	10	Mag hit Equilon 20” p/l & unknown 50gamma
2111	090	51	27.2	+45	8	Ln8			76	360	10	Mag hit chevron 10” p/l
2118	090	56	27.3	+45	8	Ln8			76	360	10	Mag hit unknown 40 gamma
2135	090	69	29.3	+45	8	Ln8		X	76	360	10	EOL
2145	270	69	29.2	+45	13	Ln13	X		76	360	10	Sol
2207	270	52	28	+45	13	Ln13			76	360	10	Mag hit chevron 10” p/l
2221	270	42	27.2	+45	13	Ln13			76	360	10	Mag hit Equilon 20” p/l
2237	270	30	26.6	+45	13	Ln13			76	360	10	Mag hit Texaco 4” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 02 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 5

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
2238	270	30	26.6	+45	13	Ln13			76	360	10	MAG HIT ANR 8” P/L
2242	270	26	26.7	+45	13	Ln13			76	360	10	MAG HIT ENERGY 6” P/L
2249	270	22	25.4	+45	13	Ln13			76	360	10	SS + MAG HIT UNKNOWN N28422.6 E675495.3m
2306	270	8	25.6	+45	13	Ln13			76	360	10	MAG HIT COMSTOCK 8” P/L
2307	270	7	25.6	+45	13	Ln13		X	76	360	10	EOL
2314	090	8	25.0	+45	10	Ln10	X		76	360	10	SOL
2314	090	8	25	+45	10	Ln10			76	360	10	MAG HITMURPHY 6”P/L
2317	090	10	25.1	+45	10	Ln10			76	360	10	MAG HITCOMSTOCK 8”P/L
2321	090	12	25.5	+45	10	Ln10			76	360	10	MAG HIT UNKNOWN
2322	090	13	25.5	+45	10	Ln10			76	360	10	MAG HIT UNKNOWN
2340	090	27	26.2	+45	10	Ln10			76	360	10	MAG HITENERGY6”P/L
2344	090	30	26.8	+45	10	Ln10			76	360	10	MAG HIT ANR 8”P/L
2345	090	31	26.9	+45	10	Ln10			76	360	10	MAG HIT TEXACO 4”P/L
0000	090	43	27.5	+45	10	Ln10			76	360	10	CHANGE SONAR HEIGHT OFF BOTTOM MAG CONTACT EQUILON 20”P/L
0013	090	52	27.7	+45	10	Ln10			76	360	10	MAG CONTACT CHEVERON 10”P/L
0034	090	69	30.0	+45	10	Ln10		X	76	360	10	EOL
0039	270	69	29.8	+45	15	Ln15	X		76	360	10	SOL
0059	270	54	27.8	+45	15	Ln15			76	360	10	MAG CONTACT CHEVERON 10”P/L
0115	270	42	27.4	+45	15	Ln15			76	360	10	MAG CONTACT EQUILON 20”P/L
0129	270	31	26.6	+45	15	Ln15			76	360	10	MAG CONTACT TEXACO 4”P/L
0134	270	28	26.4	+45	15	Ln15			76	360	10	MAG CONTACT ENERGY6”P/L
0200	270	9	25.6	+45	15	Ln15			76	360	10	MAG CONTACT COMSTOCK 8”P/L
0201	270	7	25.6	+45	15	Ln15		X	76	360	10	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 6

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0210	090°	8	25.4	+45’	12	LN12	√		76’	360’	10’	SOL MAG CONTACT MURPHY 6” P/L
0212	090°	10	25.6	+45’	12	LN12			76’	360’	10’	MAG CONTACT COMSTOCK 8” P/L
0241	090°	31	26.7	+45’	12	LN12			76’	360’	10’	MAG CONTACT ANR 8” / TEXACO 4” P/L
0257	090°	43	27.4	+45’	12	LN12			76’	360’	10’	MAG CONTACT EQUILON 20” P/L
0309	090°	53	28.1	+45’	12	LN12			76’	360’	10’	MAG CONTACT CHEVRON 10” P/L
0329	090°	69	29.5	+45’	12	LN12		√	76’	360’	10’	EOL
0338	270°	69	30.3	+45’	17	LN17	√		76’	360’	10’	SOL
0357	270°	55	28.5	+45’	17	LN17			76’	360’	10’	MAG CONTACT CHEVRON 10” P/L
0416	270°	42	27.8	+45’	17	LN17			76’	360’	10’	MAG CONTACT EQUILON 20” P/L
0430	270°	32	27.0	+45’	17	LN17			76’	360’	10’	MAG CONTACT TEXACO 4” / ANR 8” P/L
0435	270°	28	26.7	+45’	17	LN17			76’	360’	10’	MAG CONTACT ENERGY 6” P/L
0503	270°	9	25.7	+45’	17	LN17			76’	360’	10’	MAG CONTACT COMSTOCK 8” / VASTAR 8” P/L
0506	270°	7	25.7	+45’	17	LN17		√	76’	360’	10’	EOL
0520	090°	7	25.8	+45’	14	LN14	√		76’	360’	10’	SOL
0523	090°	9	25.7	+45’	14	LN14			76’	360’	10’	MAG CONTACT MURPHY 6” / COMSTOCK 8” P/L
0539	090°	22	26.6	+45’	14	LN14			76’	360’	10’	MAG CONTACT UNKNOWN
0545	090°	28	26.7	+45’	14	LN14			76’	360’	10’	MAG CONTACT ENERGY 6” P/L
0549	090°	31	26.8	+45’	14	LN14			76’	360’	10’	MAG CONTACT ANR 8” / TEXACO 4” P/L
0603	090°	43	27.5	+45’	14	LN14			76’	360’	10’	MAG CONTACT EQUILON 20” P/L
0617	090°	54	28.1	+45’	14	LN14			76’	360’	10’	MAG CONTACT CHEVRON 10” P/L
0635	090°	69	29.8	+45’	14	LN14		√	76’	360’	10’	EOL
0644	270°	69	30.8	+45’	19	LN19	√		76’	360’	10’	SOL
0701	270°	57	29.1	+45’	19	LN19			76’	360’	10’	MAG CONTACT CHEVRON 10” P/L

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 7

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0725	270	41	27.8	+45	19	Ln19			76	360	10	SOL MAG CONTACT EQUILON 20” P/L
0738	270	32	27.2	+45	19	Ln19			76	360	10	MAG CONTACT TEXACO 4” /ANR 8” P/L
0743	270	29	26.4	+45	19	Ln19			76	360	10	MAG CONTACT ENERGY 6” P/L
0808	270	11	25.9	+45	19	Ln19			76	360	10	MAG CONTACT VASTAR 8” P/L
0810	270	9	25.8	+45	19	Ln19			76	360	10	MAG CONTACT COMSTOCK 8” P/L
0812	270	7	25.8	+45	19	Ln19		X	76	360	10	EOL
0817	090	7	25.7	+45	16	Ln16	X		76	360	10	SOL
0820	090	9	25.9	+45	16	Ln16			76	360	10	MAG CONTACT VASTAR 8” P/L
0842	090	28	26.4	+45	16	Ln16			76	360	10	MAG CONTACT ENERGY 6” P/L
0847	090	32	26.7	+45	16	Ln16			76	360	10	MAG CONTACT TEXACO 4” /ANR 8” P/L
0900	090	42	27.7	+45	16	Ln16			76	360	10	MAG CONTACT EQUILON 20” P/L
0917	090	56	28.3	+45	16	Ln16			76	360	10	MAG CONTACT CHEVERON 10”P/L
0933	090	69	29.6	+45	16	Ln16		X	76	360	10	EOL
0940	270	69	30.7	+45	21	Ln21	X		76	360	10	SOL
0955	270	59	29.3	+45	21	Ln21			76	360	10	MAG CONTACT CHEVERON 10”P/L
1021	270	40	27.7	+45	21	Ln21			76	360	10	MAG CONTACT EQUILON 20” P/L
1032	270	32	27.4	+45	21	Ln21			76	360	10	MAG CONTACT TEXACO 4” /ANR 8” P/L
1037	270	29	26.9	+45	21	Ln21			76	360	10	MAG CONTACT ENERGY 6” P/L
1059	270	12	26.0	+45	21	Ln21			76	360	10	MAG CONTACT VASTAR 8” P/L
1105	270	9	25.8	+45	21	Ln21			76	360	10	MAG CONTACT COMSTOCK 8” P/L
1107	270	6	25.7	+45	21	Ln21		X	76	360	10	EOL
1114	090	7	25.7	+45	18	Ln18	X		76	360	10	SOL
1119	090	9	25.7	+45	18	Ln18			76	360	10	MAG CONTACT COMSTOCK 8” P/L

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1122	090	12	25.7	+45	18	Ln18			78	360	10	C/o subbottom 78’
1144	090	29	26.5	+45	18	Ln18			78	360	10	Mag contact energy 6” p/l
1150	090	32	27.1	+45	18	Ln18			78	360	10	Mag contact ANR 8” p/l
1151	090	33	27.1	+45	18	Ln18			78	360	10	Mag contact Texaco 4” p/l
1203	090	41.9	27.8	+45	18	Ln18			78	360	10	Mag contact Equilon 20” p/l
1207	090	44.3	27.6	+45	18	Ln18			78	360	10	Mag contact unknown +100gamma
1226	090	57	28.9	+45	18	Ln18			78	360	10	Mag contact chevron 10” p/l
1245	270	69	30.7	+45	18	Ln18		X	78	360	10	EOL
1253	270	69	30.9	+45	23	Ln23	X		78	360	10	Sol
1305	270	60	29.4	+45	23	Ln23			78	360	10	Mag contact chevron 10” p/l
1321	270	48	28.3	+45	23	Ln23			78	360	10	Mag hit unknown 15gamma
1334	270	39.6	27.8	+45	23	Ln23			78	360	10	Mag hit Equilon p/l
1343	270	32	27.2	+45	23	Ln23			78	360	10	Mag hit Texaco 4” p/l
1344	270	33	27.2	+45	23	Ln23			78	360	10	Mag hit ANR 8” p/l
1348	270	29	27.1	+45	23	Ln23			78	360	10	Mag hit energy 6” p/l
1409	270	13.5	26.2	+45	23	Ln23			78	360	10	Mag hit vaster 8” p/l
1415	270	8	26.1	+45	23	Ln23			78	360	10	Mag hit Comstock 8” p/l
1420	270	6	25.9	+45	23	Ln23		X	78	360	10	EOL
1428	090	6	25.6	+45	20	Ln20	X		78	360	10	Sol
1433	090	9	26	+45	20	Ln20			78	360	10	Mag hit Comstock 8” p/l
1437	090	12	26	+45	20	Ln20			78	360	10	Mag hit vaster 8” p/l
1501	090	29	27.2	+45	20	Ln20			78	360	10	Mag hit energy 6” p/l
1505	090	32	27.2	+45	02	Ln02			78	360	10	Mag hit ANR 8” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1506	090	33	27.3	+45	20	Ln20			78	360	10	Mag hit Texaco 4” p/l
1517	090	41	27.8	+45	20	Ln20			78	360	10	Mag hit Equilon 20” p/l
1540	090	58	29.4	+45	20	Ln20			78	360	10	Mag hit chevron 10” p/l
1556	090	69	30.5	+45	20	Ln20		X	78	360	10	EOL
1605	270	69	31.0	+45	25	Ln25	X		78	360	10	Sol
1615	270	62	30.2	+45	25	Ln25			78	360	10	Mag hit chevron 10” p/l
1630	270	50	28.9	+45	25	Ln25			78	360	10	Mag hit unknown
1645	270	39	27.8	+45	25	Ln25			78	360	10	Mag hit Equilon 20” p/l
1653	270	33	27.6	+45	25	Ln25			78	360	10	Mag hit Texaco 4” p/l
1654	270	32	27.6	+45	25	Ln25			78	360	10	Mag hit ANR 8” p/l
1659	270	25	27.3	+45	25	Ln25			78	360	10	Mag hit energy 6” p/l
1719	270	15	26.4	+45	25	Ln25			78	360	10	Mag hit vaster 8” p/l
1727	270	8	26.4	+45	25	Ln25			78	360	10	Mag hit Comstock 8” p/l
1730	270	6	26.1	+45	25	Ln25		X	78	360	10	EOL
1738	090	6	25.8	+45	22	Ln22	X		78	360	10	Sol
1740	090	6	25.9	+45	22	Ln22			78	360	10	Mag hit unknown
1743	090	9	26.0	+45	22	Ln22			78	360	10	Mag hit Comstock 8” p/l
1749	090	13	26.4	+45	22	Ln22			78	360	10	Mag hit vaster 8” p/l
1811	090	29	27.3	+45	22	Ln22			78	360	10	Mag hit energy 6” p/l
1815	090	33	27.5	+45	22	Ln22			78	360	10	Mag hit ANR 8” p/l
1816	090	33	27.5	+45	22	Ln22			78	360	10	Mag hit Texaco 4” p/l
1826	090	41	28.0	+45	22	Ln22			78	360	10	Mag hit Equilon 20” p/l
1851	090	60	29.6	+45	22	Ln22			78	360	10	Mag hit chevron 10” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1903	090	69	30.9	+45	22	Ln22		X	78	360	10	EOL
1914	270	68.5	31.6	+45	27	Ln27	X		78	360	10	Sol
1923	270	62	30.5	+45	27	Ln27			78	360	10	Mag hit chevron 10” p/l
1955	270	38	28.1	+45	27	Ln27			78	360	10	Mag hit Equilon 20” p/l
2002	270	34	27.6	+45	27	Ln27			78	360	10	Mag hit Texaco 4” p/l
2003	270	33	27.6	+45	27	Ln27			78	360	10	Mag hit ANR 8” p/l
2007	270	30	27.5	+45	27	Ln27			78	360	10	Mag hit energy 6” p/l
2024	270	16	26.9	+45	27	Ln27			78	360	10	Mag hit vaster 8” p/l
2036	270	8	26.5	+45	27	Ln27			78	360	10	Mag hit Comstock 8” p/l
2041	270	5	26.2	+45	27	Ln27		X	78	360	10	EOL
2051	090	6	26.2	+45	24	Ln24	X		78	360	10	Sol
2056	090	9	26.5	+45	24	Ln24			78	360	10	Mag hit Comstock 8” p/l
2103	090	15	26.4	+45	24	Ln24			78	360	10	Mag hit Vastar 8” p/l
2123	090	30	27.2	+45	24	Ln24			78	360	10	Mag hit energy 6” p/l
2127	090	33	27.7	+45	24	Ln24			78	360	10	Mag hit ANR 8” p/l
2127	090	34	27.7	+45	24	Ln24			78	360	10	Mag hit Texaco 4” p/l
2136	090	40	28	+45	24	Ln24			78	360	10	Mag hit Equilon 20” p/l
2200	090	59	29.8	+45	24	Ln24			78	360	10	Mag hit unknown 12 gamma
2204	090	62	30.1	+45	24	Ln24			78	360	10	Mag hit chevron 10” p/l
2213	090	69	31.2	+45	24	Ln24		X	78	360	10	EOL
2223	270	69	32.3	+45	29	Ln29	X		78	360	10	Sol
2230	270	64	31.3	+45	29	Ln29			78	360	10	Mag hit chevron 10” p/l
2303	270	38	28.3	+45	29	Ln29			78	360	10	Mag hit Equilon 20” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 03 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
2309	270	34	28.2	+45	29	Ln29			78	360	10	MAG HIT TEXACO 4” P/L
2310	270	33	28.1	+45	29	Ln29			78	360	10	MAG HIT ANR 8” P/L
2315	270	30	27.8	+45	29	Ln29			78	360	10	MAG HIT ENERGY 6” P/L
2332	270	18	27.3	+45	29	Ln29			78	360	10	MAG HIT VASTAR 8”P/L
2345	270	8	26.7	+45	29	Ln29			78	360	10	MAG HIT COMSTOCK 8”P/L
2349	270	5	26.6	+45	29	Ln29		X	78	360	10	EOL
2358	090	5	26.4	+45	26	Ln26	X		78	360	10	SOL CHANGE BODY ON MAG NEW DAY 08/04/03
0005	090	9	26.6	+45	26	Ln26			78	360	10	MAG CONTACT COMSTOCK 8”P/L
0014	090	16	27.1	+45	26	Ln26			78	360	10	MAG CONTACT VASTAR 8”P/L
0032	090	30	27.7	+45	26	Ln26			78	360	10	MAG CONTACT ENERGY 6” P/L
0035	090	33	27.9	+45	26	Ln26			78	360	10	MAG CONTACT ANR 8” P/L
0036	090	34	28.0	+45	26	Ln26			78	360	10	MAG CONTACT TEXACO 4” P/L
0045	090	40	28.3	+45	26	Ln26			78	360	10	MAG CONTACT UNKNOWN 30 GAMMAS
0054	090	47	29.1	+45	26	Ln26			78	360	10	MAG CONTACT EQUILON 20”P/L
0113	090	62	31.0	+45	26	Ln26			78	360	10	MAG CONTACT CHEVERON 10”P/L
0121	090	69	31.6	+45	26	Ln26		X	78	360	10	EOL
0131	270	69	33.1	+45	31	Ln31	X		78	360	10	SOL
0136	270	66	32.5	+45	31	Ln31			78	360	10	MAG CONTACT CHEVERON 10”P/L
0214	270	38	28.8	+45	31	Ln31			78	360	10	MAG CONTACT EQUILON 20”P/L
0219	270	35	28.6	+45	31	Ln31			78	360	10	MAG CONTACT TEXACO 4” P/L
0220	270	34	28.4	+45	31	Ln31			78	360	10	MAG CONTACT ANR 8” P/L
0224	270	31	28.3	+45	31	Ln31			78	360	10	MAG CONTACT ENERGY 6” P/L
0239	270	20	27.7	+45	31	Ln31			78	360	10	MAG CONTACT VASTAR 8”P/L

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0254	090	8	26.9	+45	31	Ln31			78	360	10	MAG CONTACT COMSTOCK 8” P/L
0258	090	5	27.0	+45	31	Ln31		X	78	360	10	EOL
0306	270	5	26.6	+45	28	Ln28	X		78	360	10	SOL
0312	270	9	26.8	+45	28	Ln28			78	360	10	MAG CONTACT COMSTOCK 8” P/L
0325	270	18	27.1	+45	28	Ln28			78	360	10	MAG CONTACT VASTAR 8” P/L
0341	270	31	28.0	+45	28	Ln28			78	360	10	MAG CONTACT ENERGY 6” P/L
0345	270	34	28.1	+45	28	Ln28			78	360	10	MAG CONTACT ANR 8” P/L / TEXACO 4” P/L
0352	270	39	28.5	+45	28	Ln28			78	360	10	MAG CONTACT EQUILON 20” P/L
0422	270	64	31.6	+45	28	Ln28			78	360	10	MAG CONTACT CHEVERON 10” P/L
0427	090	69	32.3	+45	28	Ln28		X	78	360	10	EOL
0438	270	67	33.4	+45	33	Ln33	X		78	360	10	SOL MAG CONTACT CHEVERON 10” P/L
0518	270	38	29.0	+45	33	Ln33			78	360	10	MAG CONTACT EQUILON 20” P/L
0522	270	35	28.9	+45	33	Ln33			78	360	10	MAG CONTACT TEXACO 4” P/L / ANR 8” P/L
0527	270	32	28.8	+45	33	Ln33			78	360	10	MAG CONTACT ENERGY 6” P/L
0541	270	22	28.1	+45	33	Ln33			78	360	10	MAG CONTACT VASTAR 8” P/L
0600	270	8	27.3	+45	33	Ln33		X	78	360	10	MAG CONTACT COMSTOCK 8” P/L
0605	270	4	27.0	+45	33	Ln33	X		78	360	10	EOL
0613	090	5	26.9	+45	30	Ln30			78	360	10	SOL
0618	090	9	27.0	+45	30	Ln30			78	360	10	MAG CONTACT COMSTOCK 8” P/L
0632	090	20	27.6	+45	30	Ln30			78	360	10	MAG CONTACT VASTAR 8” P/L
0647	090	32	28.2	+45	30	Ln30			78	360	10	MAG CONTACT ENERGY 6” P/L
0650	090	34	28.4	+45	30	Ln30			78	360	10	MAG CONTACT ANR 8” P/L
0651	090	35	28.4	+45	30	Ln30			78	360	10	MAG CONTACT TEXACO 4” P/L

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0656	090	39	28.7	+45	30	Ln30			78	360	14	Mag contact Equilon 20” p/l
0729	090	66	32.1	+45	30	Ln30			78	360	14	Mag contact
0733	090	69	32.5	+45	30	Ln30		X	78	360	14	EOL
0742	270	65	33.0	+45	35	Ln35	X		78	360	14	Sol
0821	270	38	29.0	+45	35	Ln35			78	360	14	Mag contact Equilon 20” p/l
0823	270	36	28.9	+45	35	Ln35			78	360	14	Mag contact Texaco 4” p/l
0824	270	35	28.8	+45	35	Ln35			78	360	14	Mag contact ANR 8” p/l
0828	270	32	28.7	+45	35	Ln35			78	360	14	Mag contact energy 6” p/l
0840	270	23	28.0	+45	35	Ln35			78	360	14	Mag contact vaster 8” p/l
0900	270	10	27.5	+45	35	Ln35			78	360	14	Mag contact unknown 350 gammas
0903	270	8	27.2	+45	35	Ln35			78	360	14	Mag contact Comstock 8” p/l
0907	270	4	27.1	+45	35	Ln35		X	78	360	14	EOL
0913	090	4	26.6	+45	32	Ln32	X		78	360	14	Sol
0920	090	8	26.8	+45	32	Ln32			78	360	14	Mag contact Comstock 8” p/l
0937	090	21	27.5	+45	32	Ln32			78	360	14	Mag contact vaster 8” p/l
0952	090	32	28.2	+45	32	Ln32			78	360	14	Mag contact energy 6” p/l
0955	090	35	28.4	+45	32	Ln32			78	360	14	Mag contact ANR 8” p/l / Texaco 4” p/l
1000	090	39	28.5	+45	32	Ln32			78	360	14	Mag contact Equilon 20” p/l
1038	090	67	32.4	+45	32	Ln32			78	360	14	Mag contact chevron 10” p/l
1039	090	68	32.5	+45	32	Ln32		X	78	360	14	EOL
1051	270	63	33.2	+45	37	Ln37	X		78	360	14	Sol
1126	270	37	28.9	+45	37	Ln37			78	360	14	Mag contact Equilon 20” p/l
1127	270	36	28.9	+45	37	Ln37			78	360	14	Mag contact Texaco 4” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1128	270	35	28.9	+45	37	Ln37			78	360	14	Mag contact ANR 8” p/l
1132	270	33	28.7	+45	37	Ln37			78	360	14	Mag contact energy 6” p/l
1142	270	25	28.2	+45	37	Ln37			78	360	14	Mag contact Vastar 8” p/l
1201	270	10	27.3	+45	37	Ln37			78	360	14	Mag contact unknown with possible SSS hit
1205	270	7	27	+45	37	Ln37			78	360	14	Mag hit Comstock 8” p/ls
1209	270	4	26.9	+45	37	Ln37		X	78	360	14	EOL
1215	090	4	26.7	+45	34	Ln34	X		78	360	14	Sol
1222	090	8	26.7	+45	34	Ln34			78	360	14	Mag hit Comstock 8” p/ls
1226	090	11	27.1	+45	34	Ln34			78	360	14	Mag hit unknown 110 gamma
1241	090	23	27.9	+45	34	Ln34			78	360	14	Mag hit vaster 8” p/l
1255	090	33	28.2	+45	34	Ln34			78	360	14	Mag hit energy 6” p/l
1258	090	35	28.2	+45	34	Ln34			78	360	14	Mag hit ANR 8” p/l
1259	090	36	28.5	+45	34	Ln34			78	360	14	Mag hit Texaco 4” p/l
1302	090	38	28.6	+45	34	Ln34			78	360	14	Mag hit Equilon 20” p/l
1339	090	66	32.4	+45	34	Ln34		X	78	360	14	EOL
1352	270	61	33.4	+45	39	Ln39	X		78	360	14	Sol
1358	270	57	32	+45	39	Ln39			78	360	14	Mag hit unknown 50 gamma
1409	270	48	30.5	+45	39	Ln39			78	360	14	Mag hit unknown (2) 8gamma 15gamma
1424	270	36	29.6	+45	39	Ln39			78	360	14	Mag hits Equilon 20” p/l & Texaco 4” p/l
1425	270	35	28.8	+45	39	Ln39			78	360	14	Mag hit ANR 8” p/l
1428	270	32	29.1	+45	39	Ln39			78	360	14	Mag hit energy 6” p/l
1436	270	27	28.6	+45	39	Ln39			78	360	14	Mag hit vaster 6” p/l
1501	270	6	27.3	+45	39	Ln39			78	360	14	Mag hits Comstock 8” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1505	270	3	27.1	+45	39	Ln39		X	78	360	14	EOL
1513	090	4	26.7	+45	36	Ln36	X		78	360	14	Sol
1519	090	8	27.0	+45	36	Ln36			78	360	14	Mag hit Comstock 8” p/l
1523	090	11	27.3	+45	36	Ln36			78	360	14	Unknown mag contact
1532	090	17	27.6	+45	36	Ln36			78	360	14	Mag hit unknown 10+ gamma
1541	090	24	28.1	+45	36	Ln36			78	360	14	Mag hit vaster 8” p/l; let out SSS cable 2’ @ sp26, 15:42
1549	090	31	28.6	+45	36	Ln36			78	360	14	Mag hit unknown 15 gamma
1553	090	33	28.6	+45	36	Ln36			78	360	14	Mag hit energy 6” p/l
1555	090	35	28.8	+45	36	Ln36			78	360	14	Mag hit ANR 8” p/l
1557	090	36	28.9	+45	36	Ln36			78	360	14	Mag hit Texaco 4” p/l
1558	090	38	29.0	+45	36	Ln36			78	360	14	Mag hit Equilon 20” p/l
1633	090	64	32.9	+43	36	Ln36		X	78	360	14	EOL
1646	270	58	33.2	+43	41	Ln41	X		78	360	14	Sol
1651	270	54	32.1	+43	41	Ln41			78	360	14	Mag hit unknown 20 gamma
1700	270	48	31.2	+43	41	Ln41			78	360	14	Mag hit unknown 15gamma
1715	270	36	29.7	+43	41	Ln41			78	360	14	Mag hit Texaco 4” p/l
1716	270	35	29.7	+43	41	Ln41			78	360	14	Mag hit ANR 8” & Equilon 20” p/l
1720	270	33	29.4	+43	41	Ln41			78	360	14	Mag hit energy 6” p/l
1727	270	27	29.1	+43	41	Ln41			78	360	14	Mag hit vaster 8” p/l
1751	270	10	28.1	+43	41	Ln41			78	360	14	Mag hit unknown 100 gamma
1755	270	7	27.7	+43	41	Ln41			78	360	14	Mag hit unknown 5 gamma
1756	270	6	27.6	+43	41	Ln41			78	360	14	Mag hit Comstock 8” p/l
1800	270	3	27.5	+43	41	Ln41			78	360	14	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1807	090	3	27.3	+43	38	Ln38	X		78	360	14	Sol
1814	090	8	27.5	+43	38	Ln38			78	360	14	Mag hit 2 Comstock 8” p/l
1824	090	15	28.1	+43	38	Ln38			78	360	14	Mag hit unknown 15 gammas
1839	090	26	28.9	+43	38	Ln38			78	360	14	Mag hit vaster p/l
1850	090	33	25.1	+43	38	Ln38			78	360	14	Mag hit energy 6” p/l
1853	090	36	29.4	+43	38	Ln38			78	360	14	Mag hit ANR 8” p/l
1854	090	37	29.5	+43	38	Ln38			78	360	14	Mag hit Texaco 4” p/l
1855	090	37	29.6	+43	38	Ln38			78	360	14	Mag hit Equilon 20” p/l
1857	090	38		+43	38	Ln38			78	360	14	Printer problems on FSSB, missing sp 38-41
	090	41		+43	38	Ln38			78	360	14	Changes subbottom file name from 38 to 38a
1929	090	62	33.8	+43	38	Ln38		X	78	360	14	EOL
1940	270	56	33.8	+43	43	Ln43	X		78	360	14	Sol
2005	270	37	30.4	+43	43	Ln43			78	360	14	Mag hit Texaco 4” p/l
2007	270	36	30.7	+43	43	Ln43			78	360	14	Mag hit ANR 8” p/l
2008	270	35	30.1	+43	43	Ln43			78	360	14	Mag hit Equilon 20” p/l
2010	270	33	30.1	+43	43	Ln43			78	360	14	Mag hit Energy 6” p/l
2016	270	28	30	+43	43	Ln43			78	360	14	Mag hit Vastar 8” p/l
2019	270	26.8	29.8	+43	43	Ln43			78	360	14	Mag hit unknown 10 gamma
2046	270	7.4	28.6	+43	43	Ln43			78	360	14	Mag hit unknown
2048	270	5.8	28.3	+43	43	Ln43			78	360	14	Mag hit Comstock 8” p/l
2052	270	3	28.1	+43	43	Ln43		X	78	360	14	EOL
2102	090	3	27.8	+43	40	Ln40	X		78	360	14	Sol
2107	090	7	28.1	+43	40	Ln40			78	360	14	Mag hit Comstock 8” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 04 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
2134	090	27	29.6	+43	40	LN			78	360	14	Mag contact VASTAR 8” P/L
2143	090	35	29.3	+43	40	LN			78	360	14	Mag contact Energy 6” P/L
2146	090	36	29.6	+43	40	LN			78	360	14	Mag contact ANR 8” P/L
2146	090	37	29.6	+43	40	LN			78	360	14	Mag contact Equilon 20” P/L
2147	090	37	29.7	+43	40	LN			78	360	14	Mag contact Texaco 4” P/L
2218	090	60	33.9	+43	40	LN		X	78	360	14	EOL
2233	270	54	34.2	+43	45	LN	X		78	360	16	SOL Change buoy position on mag
2243	270	47		+43	45	LN			78	360	16	Mag contact Unknown 10 gammas
2246	270	45	33.1	+43	45	LN			78	360	16	Mag contact Unknown
2258	270	37	31.4	+43	45	LN			78	360	16	Mag contact Texaco 4” P/L
2259	270	36	31.2	+43	45	LN			78	360	16	Mag contact ANR 8” P/L
2302	270	35	31	+43	45	LN			78	360	16	Mag contact Equilon 20” P/L
2303	270	34	31	+43	45	LN			78	360	16	Mag contact Energy 6” P/L
2308	270	31	30.8	+43	45	LN			78	360	16	Mag contact VASTAR 8” P/L
2343	270	5	28.9	+43	45	LN			78	360	16	Mag contact Comstock 8” P/L
2347	270	2	27.7	+43	45	LN		X	78	360	16	EOL
2356	090	3	27.9	+43	42	LN	X		78	360	16	SOL New day 08/05/03
0002	090	7	28.5	+43	42	LN			78	360	16	Mag contact Comstock 8” P/L
0030	090	28	30.2	+43	42	LN			78	360	16	Mag contact VASTAR 8” P/L
0037	090	34	30.2	+43	42	LN			78	360	16	Mag contact Energy 6” P/L
0040	090	36	31.1	+43	42	LN			78	360	16	Mag contact Equilon 20” P/L / ANR 8” P/L
0042	090	38	30.8	+43	42	LN			78	360	16	Mag contact Texaco 4” P/L
0106	090	57	33.9	+43	42	LN		X	78	360	16	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0119	270	52	34.7	+43	47	Ln47			78	360	16	SOL
0137	270	38	32.3	+43	47	Ln47			78	360	16	MAG CONTACT TEXACO 4” P/L
0138	270	37	31.8	+43	47	Ln47			78	360	16	MAG CONTACT ANR 8” P/L
0141	270	35	31.5	+43	47	Ln47			78	360	16	MAG CONTACT ENERGY 6” P/L / EQUILON 20” P/L
0144	270	33	31.5	+43	47	Ln47			78	360	16	MAG CONTACT VASTAR 8’ P/L
0219	270	5	29.3	+43	47	Ln47			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0222	270	2	29.2	+43	47	Ln47		X	78	360	16	EOL
0229	090	3	28.5	+43	44	Ln44	X		78	360	16	SOL MAG CONTACT WELL G1
0235	090	7	29.1	+43	44	Ln44			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0307	090	31	30.8	+43	44	Ln44			78	360	16	MAG CONTACT VASTAR 8’ P/L
0312	090	35	31.0	+43	44	Ln44			78	360	16	MAG CONTACT ENERGY 6” P/L
0313	090	36	31.1	+43	44	Ln44			78	360	16	MAG CONTACT EQUILON 20” P/L
0314	090	37	31.1	+43	44	Ln44			78	360	16	MAG CONTACT ANR 8” P/L
0315	090	38	31.2	+43	44	Ln44			78	360	16	MAG CONTACT TEXACO 4” P/L
0337	090	55	34.0	+43	44	Ln44		X	78	360	16	EOL
0349	270	50	35.3	+43	49	Ln49	X		78	360	16	SOL
0405	270	39	32.7	+43	49	Ln49			78	360	16	MAG CONTACT TEXACO 4” P/L
0406	270	38	32.5	+43	49	Ln49			78	360	16	MAG CONTACT ANR 8” P/L
0409	270	36	32.2	+43	49	Ln49			78	360	16	MAG CONTACT ENERGY 6” P/L
0410	270	35	32.2	+43	49	Ln49			78	360	16	MAG CONTACT EQUILON 20” P/L
0451	270	5	29.6	+43	49	Ln49			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0453	270	2	29.4	+43	49	Ln49		X	78	360	16	EOL
0459	090	2	28.8	+43	46	Ln46	X		78	360	16	SOL MAG CONTACT WELL G1

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0504	090	6	29.2	+43	46	Ln46			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0512	090	12	30.0	+43	46	Ln46			78	360	16	SB R/R SONAR WIZ LOCKED UP SP 12-20
0523	090	20	30.5	+43	46	Ln46			78	360	16	START LOGGING 46a ON SB
0538	090	32	31.7	+43	46	Ln46			78	360	16	MAG CONTACT VASTAR 8” P/L
0541	090	35	31.7	+43	46	Ln46			78	360	16	MAG CONTACT ENERGY 6” P/L / EQUILON 20” P/L
0544	090	37	31.8	+43	46	Ln46			78	360	16	MAG CONTACT ANR 8” P/L
0545	090	38	31.7	+43	46	Ln46			78	360	16	MAG CONTACT TEXACO 4” P/L
0603	090	53	34.3	+43	46	Ln46		X	78	360	16	EOL
0616	270	48	35.5	+43	51	Ln51	X		78	360	16	SOL
0629	270	39	33.5	+43	51	Ln51			78	360	16	MAG CONTACT TEXACO 4” P/L
0630	270	38	33.2	+43	51	Ln51			78	360	16	MAG CONTACT ANR 8” P/L
0632	270	36	33.1	+43	51	Ln51			78	360	16	MAG CONTACT ENERGY 6” P/L
0637	270	34	32.7	+43	51	Ln51			78	360	16	MAG CONTACT EQUILON 20” P/L
0708	270	11	30.6	+43	51	Ln51			78	360	16	MAG CONTACT UNKNOWN 30 GAMMAS
0718	270	4	29.7	+43	51	Ln51			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0720	270	2	29.6	+43	51	Ln51		X	78	360	16	EOL
0725	090	2	29.0	+43	48	Ln48	X		78	360	16	SOL
0730	090	5	29.3	+43	48	Ln48			78	360	16	MAG CONTACT COMSTOCK 8” P/L
0806	090	34	31.5	+43	48	Ln48			78	360	16	MAG CONTACT VASTAR 8” P/L / EQUILON 20” P/L
0807	090	35	32.2	+43	48	Ln48			78	360	16	MAG CONTACT ENERGY 6” P/L
0811	090	37	32.0	+43	48	Ln48			78	360	16	MAG CONTACT ANR 8” P/L
0812	090	39	32.2	+43	48	Ln48			78	360	16	MAG CONTACT TEXACO 4” P/L
0826	090	51	34.6	+43	48	Ln48		X	78	360	16	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0839	270	45	35.1	+43	53	Ln53	X		78	360	16	Sol
0849	270	40	33.6	+43	53	Ln53			78	360	16	Mag contact Texaco 4” p/l
0850	270	39	33.5	+43	53	Ln53			78	360	16	Mag contact ANR 8” p/l
0852	270	37	33.3	+43	53	Ln53			78	360	16	Mag contact Energy 6” p/l
0856	270	34	32.8	+43	53	Ln53			78	360	16	Mag contact Equilon 20” p/l
0938	270	4	29.6	+43	53	Ln53			78	360	16	Mag contact Comstock 8” p/l
0940	270	1	29.5	+43	53	Ln53		X	78	360	16	EOL
0945	090	2	28.9	+43	50	Ln50	X		78	360	16	Sol
0949	090	5	29.3	+43	50	Ln50			78	360	16	Mag contact Comstock 8” p/l
1030	090	35	32.1	+43	50	Ln50			78	360	16	Mag contact Equilon 20” p/l
1031	090	36	32.1	+43	50	Ln50			78	360	16	Mag contact energy 6” p/l
1033	090	38	32.3	+43	50	Ln50			78	360	16	Mag contact ANR 8” p/l
1034	090	39	32.4	+43	50	Ln50			78	360	16	Mag contact Texaco 4” p/l
1047	090	49	34.0	+43	50	Ln50		X	78	360	16	EOL
1102	270	43	35.0	+43	55	Ln55	X		78	360	16	Sol
1107	270	40	34.1	+43	55	Ln55			78	360	16	Mag contact Texaco 4” p/l
1108	270	39	34.0	+43	55	Ln55			78	360	16	Mag contact ANR 8” p/l
1110	270	37	33.7	+43	55	Ln55			78	360	16	Mag contact Energy 6” p/l
1116	270	33	33.0	+43	55	Ln55			78	360	16	Mag contact Equilon 20” p/l
1156	270	2.8	29.8	+43	55	Ln55			78	360	16	Mag contact Comstock 8” p/l
1158	270	1	29.3	+43	55	Ln55		X	78	360	16	EOL
1202	090	1	28.8	+43	52	Ln52	X		78	360	16	Sol
1206	090	4	29.2	+43	52	Ln52			78	360	16	Mag contact Comstock 8” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1214	090	9	29.7	+43	52	Ln52			78	360	16	Mag hit unknown 20 gamma
1245	090	34	32	+43	52	Ln52			78	360	16	Mag hit Equilon 20” p/l
1248	090	37	32.4	+43	52	Ln52			78	360	16	Mag hit energy 6” p/l
1251	090	39	32.7	+43	52	Ln52			78	360	16	Mag hit ANR 8” p/l
1252	090	40	33	+43	52	Ln52			78	360	16	Mag hit Texaco 4” p/l
1300	090	47	34	+43	52	Ln52		X	78	360	16	EOL
1314	270	41	34.8	+43	57	Ln57	X		78	360	16	Sol
1317	270	39	34.5	+43	57	Ln57			78	360	16	Mag hit Texaco 4” p/l
1318	270	39	34.5	+43	57	Ln57			78	360	16	Mag hit ANR 8” p/l
1320	270	37	33.9	+43	57	Ln57			78	360	16	Mag hit energy 6” p/l
1326	270	32	33.1	+43	57	Ln57			78	360	16	Mag hit Equilon 20” p/l
1406	270	1	29.3	+43	57	Ln57			78	360	16	Mag hit well #37 & Comstock 8” p/l
1407	270	1	29.3	+43	57	Ln57		X	78	360	16	EOL
1411	090	1	29	+43	54	Ln54	X		78	360	16	Sol
1416	090	4	29.2	+43	54	Ln54			78	360	16	Mag hit Comstock 8” p/l
1456	090	34	32.5	+43	54	Ln54			78	360	16	Mag hit Equilon 20” p/l
1500	090	37	33.3	+43	54	Ln54			78	360	16	Mag hit energy 6” p/l
1503	090	39	33.2	+43	54	Ln54			78	360	16	Mag hit ANR 8” p/l
1504	090	40	33.5	+43	54	Ln54			78	360	16	Mag hit Texaco 4” p/l
1509	090	44	34.1	+43	54	Ln54		X	78	360	16	EOL
1521	270	39	35.4	+43	59	Ln59	X		78	360	16	Sol
1523	270	37	35.7	+43	59	Ln59			78	360	16	Mag hit Energy 6” p/l
1530	270	32	33.8	+43	59	Ln59			78	360	16	Mag hit Equilon 20” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1533	270	29	33.5	+43	59	Ln59			78	360	16	Mag hit unknown possible SSS hit 26046.7mN
-	-	-	-	-	-	-	-	-	-	-	-	676650.2m E
1602	270	6	30.7	+43	59	Ln59			78	360	16	Mag hit unknown 25gamma
1607	270	2	30.6	+43	59	Ln59		X	78	360	16	EOL
1614	090	1	29.4	+43	56	Ln56	X		78	360	16	Sol
1617	090	3	29.6	+43	56	Ln56			78	360	16	Mag hit well #34
1618	090	3	29.7	+43	56	Ln56			78	360	16	Mag hit Comstock 8” p/l
1658	090	34	33.3	+43	56	Ln56			78	360	16	Mag hit Equilon 20” p/l
1703	090	38	34.1	+43	56	Ln56			78	360	16	Mag hit energy 6” p/l
1706	090	40	34.5	+43	56	Ln56			78	360	16	Mag hit ANR 8” p/l
1707	090	40	34.7	+43	56	Ln56			78	360	16	Mag hit Texaco 4” p/l
1708	090	42	34.9	+43	56	Ln56		X	78	360	16	EOL
1721	270	38	36.0	+43	61	Ln61	X		78	360	16	Sol
1721	270	38	36.0	+43	61	Ln61			78	360	16	Mag hit energy 6” p/l
1729	270	33	34.6	+43	61	Ln61			78	360	16	Mag hit unknown 30 gamma
1730	270	32	34.5	+43	61	Ln61			78	360	16	Mag hit Equilon 20” p/l
1808	270	2.7	30.8	+43	61	Ln61			78	360	16	Mag hit & SSS platform #34
1809	270	3	30.8	+43	61	Ln61		X	78	360	16	EOL
1817	090	1	29.9	+43	58	Ln58	X		78	360	16	Sol; offline to south avoiding wells, mag hits
-	-	-	-	-	-	-	-	-	-	-	-	Wells #37 & 34 w/ Comstock 8” p/l’s
1901	090	33	34.3	+43	58	Ln58			78	360	16	Mag hit Equilon 20” p/l
1909	090	38	35.3	+43	58	Ln58			78	360	16	Mag hit energy 6” p/l
1911	090	40	35.7	+43	58	Ln58		X	78	360	16	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 23

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1919	270	37	37.3	+43	63	Ln63	X		78	360	18	Sol
1926	270	32	36	+43	63	Ln63			78	360	18	Mag hit unknown
1928	270	31	35.8	+43	63	Ln63			78	360	18	Mag hit Equilon 20” p/l
1940	-	-	-	+43	-	-			-	-	-	Numerous small fish near ship
2003	270	5	32.1	+43	63	Ln63		X	78	360	18	EOL
2012	090	3	30.8	+43	60	Ln60	X		78	360	18	Sol
2038	090	22	33.9	+43	60	Ln60			78	360	18	Mag hit unknown 500+ gamma
2052	090	33	35.3	+43	60	Ln60			78	360	18	Mag hit Equilon 20” p/l
2059	090	39	36.4	+43	60	Ln60		X	78	360	18	EOL
2109	270	36	38	+43	65	Ln65	X		78	360	18	Sol
2111	270	35	38	+43	65	Ln65			78	360	18	Mag hit unknown 20gamma
2116	270	31	37	+43	65	Ln65			78	360	18	Mag hit Equilon 20” p/l
2133	270	17	34.9	+43	65	Ln65			78	360	18	Mag hit unknown 20gamma
2148	270	6	33.3	+43	65	Ln65		X	78	360	18	EOL
2154	090	4	32.7	+43	62	Ln62	X		78	360	18	Sol well #37 mag and SSS hit
2207	090	14	33.7	+43	62	Ln62			78	360	18	Mag hit unknown 15gamma
2231	090	32	36.2	+43	62	Ln62			78	360	18	Mag hit Equilon 20” p/l
2238	090	38	37.4	+43	62	Ln62		X	78	360	18	EOL
2246	270	36	41	+43	67	Ln67	X		78	360	22	Sol change mag cable buoy
2251	270	33	38.9	+43	67	Ln67			81	360	22	C/o subbottom 3’
2252	270	32	38.8	+43	67	Ln67			81	360	22	Mag hit unknown 20 gamma
2254	270	30	38.2	+43	67	Ln67			81	360	22	Mag hit Equilon 20” p/l
2325	270	8	34.4	+43	67	Ln67			81	360	22	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 24

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
2332	090	6	33	+43	64	LN64	X		81	360	22	SOL
2340	090	12		+43	64	LN64			78	360	22	C/O to chain tether layback 78’
												Depth increase 3’
0007	090	32	37.3	+43	64	LN64			78	360	22	Mag contact Equilon 20 “ P/L New Day 08/06/03
0013	090	37	38.2	+43	64	LN64		X	78	360	22	EOL
0026	270	35	43.1	+43	69	LN69	X		78	360	23	SOL
0032	270	31	40.0	+43	69	LN69			78	360	23	Mag contact Equilon 20 “ P/L
0058	270	10	35.5	+43	69	LN69		X	78	360	23	EOL
0114	090	7	34.0	+43	66	LN66	X		78	360	23	SOL
0144	090	29	37.6	+43	66	LN66			81	360	23	C/I Sub-bottom decrease depth 5’ towing SB
0148	090	31	38.2	+43	66	LN66			81	360	23	Mag contact Equilon 20 “ P/L
0153	090	36	39.5	+43	66	LN66		X	81	360	23	EOL
0200	270	35	44.5	+43	71	LN71	X		81	360	24	SOL
0207	270	30	42.4	+43	71	LN71			81	360	24	Mag contact Equilon 20 “ P/L
0231	270	11	36.8	+43	71	LN71		X	81	360	24	EOL
0239	090	9	35.0	+43	68	LN68	X		81	360	24	SOL
0309	090	31	40.0	+43	68	LN68			81	360	24	Mag contact Equilon 20 “ P/L
0315	090	36	42.0	+43	68	LN68		X	81	360	24	EOL
0324	270	34	45.9	+43	73	LN73	X		81	360	25	SOL
0331	270	30	44.0	+43	73	LN73			81	360	25	Mag contact Equilon 20 “ P/L
0354	270	13	38.4	+43	73	LN73		X	81	360	25	EOL
0403	090	10	35.5	+43	70	LN70	X		81	360	25	SOL
0430	090	31	41.9	+43	70	LN70			81	360	25	Mag contact Equilon 20 “ P/L

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 05 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 25

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0435	090	35	43.5	+43	70	LN70		X	81	360	25	EOL
0443	270	33	46.5	+43	75	LN75	X		81	360	26	SOL
0449	270	29	45.0	+43	75	LN75			81	360	26	Mag contact Equilon 20 " P/L
0510	270	14	40.6	+43	75	LN75		X	81	360	26	EOL
0520	090	12	37.2	+43	72	LN72	X		81	360	26	SOL
0543	090	30	43.4	+43	72	LN72			81	360	26	Mag contact Equilon 20 " P/L
0547	090	34	44.4	+43	72	LN72		X	81	360	26	EOL
0555	270	32	47.0	+43	77	LN77	X		81	360	27	SOL
0600	270	29	45.8	+43	77	LN77			81	360	27	Mag contact Equilon 20 " P/L
0617	270	16	43.0	+43	77	LN77		X	81	360	27	EOL
0625	090	14	39.2	+43	74	LN74	X		81	360	27	SOL
0646	090	30	45.0	+43	74	LN74			81	360	27	Mag contact Equilon 20 " P/L
0649	090	33	45.3	+43	74	LN74		X	81	360	27	EOL
0803	270	32	47.3	+25	79	LN79	X		81	360	27	SOL change C/O SSS +25'
0808	270	28	46.4	+25	79	LN79			81	360	27	Mag contact Equilon 20 " P/L
0823	270	17	44.0	+25	79	LN79		X	81	360	27	EOL
0830	090	15	41.3	+25	76	LN76	X		81	360	32	SOL change body on MAG
0848	090	29	45.2	+25	76	LN76			81	360	32	Mag contact Equilon 20 " P/L
0852	090	33	45.6	+25	76	LN76		X	81	360	32	EOL
0902	270	31	47.4	+25	81	LN81	X		81	360	32	SOL
0907	270	28	46.8	+25	81	LN81			81	360	32	Mag contact Equilon 20 " P/L
0919	270	19	45.2	+25	81	LN81		X	81	360	32	EOL
0926	090	17	43.7	+25	78	LN78	X		81	360	32	SOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 06 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0940	090	39	45.8	+25	78	Ln78			81	360	32	Mag contact Equilon 20” p/l
0944	090	32	46.5	+25	78	Ln78		X	81	360	32	EOL
0954	270	30	47.7	+25	83	Ln83	X		81	360	32	Sol
0959	270	27	47.0	+25	83	Ln83			81	360	32	Mag contact Equilon 20” p/l
1007	270	20	45.9	+25	83	Ln83		X	81	360	32	EOL
1018	090	18	44.0	+25	80	Ln80	X		81	360	32	Sol
1032	090	28	46.3	+25	80	Ln80			81	360	32	Mag contact Equilon 20” p/l
1034	090	31	46.8	+25	80	Ln80		X	81	360	32	EOL
1043	270	30	47.9	+25	85	Ln85	X		81	360	32	Sol
1047	270	27	47.4	+25	85	Ln85			81	360	32	Mag contact Equilon 20” p/l
1053	270	22	46.7	+25	85	Ln85		X	81	360	32	EOL
1101	090	19	45.0	+25	82	Ln82	X		81	360	32	Sol
1112	090	28	46.6	+25	82	Ln82			81	360	32	Mag contact Equilon 20” p/l
1116	090	31	47.1	+25	82	Ln82		X	81	360	32	EOL
1125	270	29	48.2	+25	87	Ln87	X		81	360	32	Sol
1129	270	27	47.7	+25	87	Ln87			81	360	32	Mag contact Equilon 20” p/l
1133	270	24	47.4	+25	87	Ln87		X	81	360	32	EOL
1143	090	21	45.8	+25	84	Ln84	X		81	360	32	Sol
1152	090	28	47.5	+25	84	Ln84			81	360	32	Mag contact Equilon 20” p/l
1154	090	30	47.7	+25	84	Ln84		X	81	360	32	EOL
1202	270	29	48.3	+25	88	Ln88	X		81	360	32	Sol
1206	270	26	47.7	+25	88	Ln88			81	360	32	Mag contact Equilon 20” p/l
1209	270	24	475	+25	88	Ln88		X	81	360	32	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 06 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1215	090	23	46.6	+25	86	Ln86	X		81	360	32	Sol
1221	090	27	47.5	+25	86	Ln86			81	360	32	Mag hit Equilon 20” p/l
1223	090	29	47.7	+25	86	Ln86		X	81	360	32	EOL
1233	000	32	49	+25	95	Ln95	X		81	360	29	Sol; change mag buoy
1237	000	29	45.5	+25				X	81	360		EOL subbottom power malfunction abort
1307	000	32	49	+25	95	Ln95a	X		81	360	29	Sol
1314	000	26	42						81	360		Mag hit Equilon 20” p/l
1318	000	24	35	+43					81	360	23	C/I SSS increased boat speed
128	000	16		+43	95	Ln95a			81	360	23	Mag contact vaster 8” p/l
1336	000	10	26.3						81	360		Mag hit energy 6” p/l
1342	000	4	26	+45					81	360		Mag hit ANR 8” p/l C/I SSS
1344	000	3	27						81	360		Mag hit Texaco 4” p/l
1346	000	2	33						81	360		Mag & SSS hit platform #9
1347	000	1	34.3	+45	95	Ln95a		X	81	360	23	EOL
1403	180	1	33	+40	96	Ln96	X		81	360	23	Sol
1405	180	2		+45					81	360	23	C/I SSS
1422	180	15	28	+45					81	360	23	Mag hit vaster 8” p/l
1442	180	31	46	+43	96	Ln96			81	360	29	C/o SSS decrease vessel speed
1444	180	32	47	+43	96	Ln96		X	81	360	29	EOL
1500	000	30	45	+43	97	Ln97	X		81	360	29	Sol
1526	000	10	26	+43	97	Ln97			81	360	22	Mag hit vaster 8” p/l
1532	000	6	25	+45	97	Ln97			81	360	22	C/I SSS
1537	000	2	30	+45	97	Ln97			81	360	22	Mag hit unknown 15gamma

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 06 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
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ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
1540	000	1	36	+45	97	Ln97		X	81	360	22	EOL
1555	180	1	36	+45	98	Ln98	X		81	360	22	Sol
1556	180	2	27	+45	98	Ln98			81	360	22	Mag hit Comstock 8” p/l
1607	180	9	25	+45	98	Ln98			81	360	22	Mag hit vaster 8” p/l
1621	180	20	30	+45	98	Ln98			81	360	22	Mag hit unknown (2) 70gamma & 30gamma
1630	180	27	36	+45	98	Ln98		X	81	360	22	EOL
1643	000	24	32	+45	99	Ln99	X		81	360	20	Sol
1653	000	17	27	+45					81	360		Mag hit Comstock 8” p/l
1704	000	9	25	+45	99	Ln99		X	81	360	20	EOL
1736	090	2	28	+45	45	Ln45	X		81	360		Sol rerunning side scan only
1739	090	5	27	+46					81	360		C/I +46’ to CRP
1744	090	7	27.8	+35	45	Ln45			81	360		Switched to 50m range c/o SSS
1833	090	45.4	31.4	+35					81	360		Possible SSS target stbd channel
1845	090	54	33	+35	45	Ln45		X	81	360		EOL SSS rerun
1904	000	14	32.6	+35	89	Ln89	X		81	360	20	Sol SSS @ 75m range
1908	000	11	31	+35	89	Ln89			81	360	20	Mag hit chevron 10” p/l
1922	000	1	29	+35	89	Ln89		X	81	360	20	EOL
1935	180	1	29	+35	90	Ln90	X		81	360	20	Sol
1948	180	10	29.6	+35	90	Ln90			81	360	20	Mag hit chevron 10” p/l
1958	180	17	34.9	+35	90	Ln90		X	81	360	20	EOL
2015	000	19	36.4	+35	91	Ln91	X		81	360	20	Sol
2033	000	6	28	+35	91	Ln91			81	360	20	Mag hit unknown
2034	000	5	28	+35	91	Ln91			81	360	20	Mag hit chevron 10” p/l

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 06 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 29

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
2041	000	1	27.9	+35	91	Ln91		X	81	360	20	EOL
2056	180	1	28.3	+35	92	Ln92	X		81	360	20	SOL
2100	180	4	27	+35	92	Ln92			81	360	20	MAG HIT CHEVERON 10” p/l
2129	180	21	37	+35	92	Ln92			81	360	20	EOL
2139	000	22	36.8	+35	93	Ln93			81	360	20	SOL
2200	000	6	28	+35	93	Ln93			81	360	20	MAG HIT EQUILON 10” P/L
2207	000	1	29.6	+35	93	Ln93		X	81	360	20	EOL
2225	180	1	29.2	+35	94	Ln94	X		81	360	20	SOL
2242	180	14	29.3	+35	94	Ln94			81	360	20	MAG HIT TEXACO 4” P/L
2243	180	15	30.4	+35	94	Ln94			81	360	20	MAG HIT ANR 8” P/L
2246	180	17	31.8	+35	94	Ln94			81	360	20	MAG HIT EQUILON 10” P/L
2248	180	19	34.2	+35	94	Ln94			81	360	20	MAG HIT ENERGY 6” P/L
2254	180	25	40	+35	94	Ln94			81	360	20	MAG HIT UNKNOWN
2256	180	26	44	+35	94	Ln94		X	81	360	20	EOL
2332	058	1	28.5	+35	100	Ln100	X		81	360	20	SOL
2333	058	1	28.4	+35	100	Ln100			81	360	20	MAG HIT
2343	058	9	28	+35	100	Ln100			81	360	20	MAG HIT
2347	058	11	27.5	+35	100	Ln100			81	360	20	MAG HIT
2348	058	12	27.3	+35	100	Ln100			81	360	20	MAG HIT
0001	058	22	28	+35	100	Ln100		X	81	360	20	EOL NEW DAY 08/07/03
0018	126	1	28.1	+35	101	Ln101	X		81	360	20	SOL
0025	126	6	27.9	+35	101	Ln101			81	360	20	MAG CONTACT EQUILON 10” P/L
0037	126	15	29.5	+35	101	Ln101			81	360	20	EOL

C & C TECHNOLOGIES GEOPHYSICAL LOG

Job Number	Client:	Vessel	Operating Geophysical Equipment: **500 KHz 260 Side Scan, EchoTrac DF 3200, 2-16 Subbottom Towfish, Geometrics 880 mag**	
4037	**Coastal Environments, Inc.**	**R/V Ocean Surveyor**		
Date: **08/ 07 /2003**	Area: **PL12-PL14, PL18-PL19**	Remote	Job Description **Block Study**	Datum NAD 27
Personnel **L. Theriot, D. Aucoin, S. Alleman, B. Moore, B. Daigle**				Page No. 30

ALL TIMES ARE ENTERED IN CENTRAL STANDARD TIME (CST)

Time	Hdg	Fix. No.	Water Depth	Sonar C/O to Ant	Survey Line	File Name	SOL	EOL	Sub-Bottom Layback	Mag Ant. Dph C/O		Remarks
0355	166	1	28.9	+35	102	Ln102	X		81	360	20	SOL
0405	166	9	33.5	+35	102	Ln102		X	81	360	20	EOL
0453	270	69	31.2	+35	1	Ln1	X		81	360	20	SOL SUB-BOTTOM ONLY
0619	270	9	28.4	+35	1	Ln1		X	81	360	20	EOL
0676	090	8	25.7	+35	7	Ln7	X		81	360	20	SOL
0630	090	10	25.2	+35	7	Ln7			81	360	20	MAG CONTACT COMSTOCK 8” P/L
0648	090	26	26.8	+35	7	Ln7			81	360	20	MAG CONTACT ENERGY 6” P/L
0652	090	30	27.0	+35	7	Ln7			81	360	20	MAG CONTACT ANR 8 “ P/L
0709	090	45	28.2	+35	7	Ln7			81	360	20	MAG CONTACT EQUILON 20 “ P/L
0717	090	50	27.7	+35	7	Ln7			81	360	20	MAG CONTACT CHEVERON 10 “P/L
0738	090	69	30.0	+35	7	Ln7		X	81	360	20	EOL
0859	270	14	30.6	+35	49	Ln49	X		81	360	20	SOL SUB-BOTTOM ONLY
0918	270	2	29.3	+35	49	Ln49		X	81	360	20	EOL
0937	090	12	29.4	+35	46	Ln46	X		81	360	20	SOL SUB-BOTTOM ONLY
0945	090	20	30.7	+35	46	Ln46		X	81	360	20	EOL
1033	090	14	45.2	+35	74	Ln74	X		81	360	20	SOL SUB-BOTTOM ONLY

APPENDIX F

BORING LOGS

APPENDIX F

BORING 00-03

Project No.	Project Name	Project Site	Boring No.	Lat. NAD27	Long. NAD27	Type of Sampler	Date	Total Depth (ft)	Inspector
23028	New Cut-Whiskey Island	Pelto 12	00-03	28.912150	90.654083	Vibracore	08/29/00	6.3	Phil

Conversion to Boring Log	Source	Elev. Top of Hole (ft)	Stratum Top	Stratum Bottom	Class.	% Sand	Remarks
E. B. Kemp: 08/03	LGS/USGS	-26.9	0.0	0.5	SP	97.9	
			0.5	1.0	SP	98.2	
			1.0	1.5	SP		
			1.5	2.0	SP	98.8	lGr SP w/sl & slf thruout
			2.0	2.5	SP		
			2.5	3.0	SP	98.0	O @ 2.4' to 3.0'
			3.0	3.5	SP		
			3.5	4.0	SP		
			4.0	4.5	SP		sm (0.8 in) gr @ 4.9'
			4.5	5.0	SP	97.1	
			5.0	5.5	SP		
			5.5	6.0	SP	95.2	
			6.0	6.5	SP		Bottom of core @ 6.3'
			6.5	7.0			
			7.0	7.5			
			7.5	8.0			Drive to 8.2'

APPENDIX F

BORING 86-25

Project No.	Project Name	Project Site	Boring No.	Lat. NAD27	Long. NAD27	Type of Sampler	Date	Total Depth (ft)	Inspector
23028	New Cut-Whiskey Island	Pelto 13	86-25	28.925022	90.629975	Vibracore	11/30/87	44.2	J. Suter

Conversion to Boring Log	Source	Elev. Top of Hole (ft)	Stratum Top	Stratum Bottom	Class.	% Sand	Remarks
E. B. Kemp: 08/03	LGS/USGS	-7.6	0.0	0.5	SP	99.6	
			0.5	1.0	SP		
			1.0	1.5	SP		
			1.5	2.0	SP		
			2.0	2.5	SP		
			2.5	3.0	SP	99.6	Gr SP w/sl & slf thruout
			3.0	3.5	SP		
			3.5	4.0	SP		
			4.0	4.5	SP		
			4.5	5.0	SP		
			5.0	5.5	SP		
			5.5	6.0	SP		
			6.0	6.5	SP	96.1	sl & slf from 6.3 to 6.9'
			6.5	7.0	SP		
			7.0	7.5	SP		
			7.5	8.0	SP		
			8.0	8.5	SP		
			8.5	9.0	SP		
			9.0	9.5	SP	98.7	
			9.5	10.0	SP		
			10.0	10.5	SP		
			10.5	11.0	SP		Gr SP, sl & slf mud ly @ 10.9' to 11'
			11.0	11.5	SP		
			11.5	12.0	SP		

APPENDIX F

BORING 86-25

12.0	12.5	SP		
12.5	13.0	SP		
13.0	13.5	SP		
13.5	14.0	SP		
14.0	14.5	CL		Stratum change @ 14.3'
14.5	15.0	CL		
15.0	15.5	CL		
15.5	16.0	CL		So - M Gr CL
16.0	16.5	CL		
16.5	17.0	SP		Gr SP
17.0	17.5	SP		Stratum change @ 16.7'
17.5	18.0	SP		
18.0	18.5	SP		
18.5	19.0	SP		
19.5	20.0	SP	98.4	
20.0	20.5	CL		Stratum change @ 20.3'
20.5	21.0	CL		
21.0	21.5	CL		
21.5	22.0	CL		20.3' to 26.7' vert lys SP
22.0	22.5	CL		
22.5	23.0	CL		
23.0	23.5	CL		So - M Gr CL
23.5	24.0	CL		
24.0	24.5	CL		
24.5	25.0	CL		
25.5	26.0	CL		
26.0	26.5	CL		
26.5	27.0	CL		
27.0	27.5	CL		
27.5	28.0	CL		
28.0	28.5	CL		
28.5	29.0	CL		So - M Gr CL w/lns, lys & ars SP, lam ML

APPENDIX F

BORING 86-25

29.0	29.5	CL		
29.5	30.0	CL		
30.0	30.5	CL		
30.5	31.0	CL		
31.0	31.5	CL		
31.5	32.0	CL		
32.0	32.5	CL		
32.5	33.0	CL		
33.0	33.5	CL		
33.5	34.0	CL		
34.0	34.5	CL		
34.5	35.0	CL		
35.0	35.5	CL		
35.5	36.0	CL		
36.0	36.5	CL		
36.5	37.0	CL		
37.0	37.5	CL		So - M Gr CL w/ML & SP lys & lns
37.5	38.0	CL		
38.0	38.5	CL		
38.5	39.0	CL		
39.0	39.5	CL		
39.5	40.0	CL		
40.0	40.5	CL		
40.5	41.0	CL		
41.0	41.5	CL		
41.5	42.0	CL		
42.0	42.5	CL		
42.5	43.0	CL		
43.0	43.5	CL		So - M Gr CL w/ML & SP lys & lns
43.5	40.0	CL		Bottom @ 44.2'

APPENDIX F

BORING 00-02

Project No.	Project Name	Project Site	Boring No.	Lat. NAD27	Long. NAD27	Type of Sampler	Date	Total Depth (ft)	Inspector
23028	New Cut-Whiskey Island	Pelto 13	00-02	29.915933	90.615950	Vibracore	08/29/00	6.8	Myke B.

Conversion to Boring Log	Source	Elev. Top of Hole (ft)	Stratum Top	Stratum Bottom	Class.	% Sand	Remarks
E. B. Kemp: 08/03	LGS/USGS	-27.6	0.0	0.5	SP	100.0	
			0.5	1.0	SP		
			1.0	1.5	SP		
			1.5	2.0	SP	98.3	
			2.0	2.5	SP		
			2.5	3.0	SP	96.0	T, F - M SP, sh & slf thruout, decreases below top 1'
			3.0	3.5	SP		
			3.5	4.0	SP	96.9	
			4.0	4.5	SP		
			4.5	5.0	SP	98.2	
			5.0	5.5	SP		
			5.5	6.0	SP	96.6	
			6.0	6.5	SP		
			6.5	7.0	SP		Bottom @ 6.8'

APPENDIX F

BORING 00-05

Project No.	Project Name	Project Site	Boring No.	Lat. NAD27	Long. NAD27	Type of Sampler	Date	Total Depth (ft)	Inspector
23028	New Cut-Whiskey Island	Pelto 13	00-05	28.909117	90.614033	Vibracore	08/29/00	3.7	Phil

Conversion to Boring Log	Source	Elev. Top of Hole (ft)	Stratum Top	Stratum Bottom	Class.	% Sand	Remarks
E. B. Kemp: 08/03	LGS/USGS	-30.8	0.0	0.5	SP	96.4	
			0.5	1.0	SP	93.8	
			1.0	1.5	SP		lGr SP w/slf thruout, sl @ 1.7', 3.0' & 3.5'
			1.5	2.0	SP	90.0	
			2.0	2.5	SP		
			2.5	3.0	SP	96.4	
			3.0	3.5	SP		
			3.5	4.0	SP		Bottom @ 3.7'
			4.0	4.5			
			4.5	5.0			
			5.0	5.5			
			5.5	6.0			Drive to 5.8'