COPY

CONTRACT NO. 2004-0808/A3
AGENDA: DAB

MICHIGAN DEPARTMENT OF TRANSPORTATION

THE CORRADINO GROUP OF MICHIGAN, INC.

AMENDMENT

THIS AMENDATORY CONTRACT is made and entered into this date of _____ by and between the Michigan Department of Transportation, hereinafter referred to as the "DEPARTMENT," and The Corradino Group of Michigan, Inc., hereinafter referred to as the "CONSULTANT," for the purpose of amending Contract No. 2004-0808, dated December 27, 2004, as amended, hereinafter referred to as the "CONTRACT."

WITNESSETH:

WHEREAS, the CONTRACT provides for the CONSULTANT to perform professional planning, environmental, and engineering services for the Detroit River International Crossing Study; and

WHEREAS, the parties desire to amend the CONTRACT to provide for the performance of additional services and to increase the amount accordingly;

NOW, THEREFORE, the parties agree that the CONTRACT be and that the same is amended as follows:

1. In order to set forth the additional services and the additional costs, Exhibit A of the CONTRACT, dated December 10, 2004, as supplemented with Exhibit A-1, dated October 17, 2005, and with Exhibit A-2, dated May 19, 2006, pages 1 through 111, is supplemented with Exhibit A-3, dated October 23, 2006, pages 1 through 161, attached hereto and made a part hereof, and all references in the CONTRACT to Exhibit A will be construed to mean as supplemented with Exhibit A-1, dated October 17, 2005, Exhibit A-2, dated May 19, 2006, and Exhibit A-3, dated October 23, 2006.

2. In order to increase the amount of the CONTRACT by Nine Million Nine Hundred Eighty-Two Thousand Four Hundred Sixty-One Dollars ($9,982,461.00), for a revised total CONTRACT amount of Thirty-One Million Four Hundred Fifty-Eight Thousand Two Hundred Twenty-Six Dollars ($31,458,226.00), Section 15 of the CONTRACT is amended to read as follows:

   "15. Pay the CONSULTANT after receipt of billings, subject to verification of progress. Maximum compensation under this Contract will be as follows:

a. Compensation for the SERVICES will be on the basis of actual cost and a fixed fee for profit and, except as provided for in Section 40, will not exceed the maximum amount of Thirty-One Million Four Hundred Fifty-Eight Thousand Two Hundred Twenty-Six Dollars ($31,458,226.00), which amount includes a fixed fee for profit of One Million Nine Hundred Thirty-Seven Thousand One Hundred Thirty-Eight Dollars ($1,937,138.00).

b. It is expressly understood and agreed that of the Thirty-One Million Four Hundred Fifty-Eight Thousand Two Hundred Twenty-Six Dollars ($31,458,226.00) noted above, no more than a cumulative amount of Three Hundred Twenty-Five Thousand Dollars ($325,000.00) may be expended for the following three categories of costs: (1) costs of insurance for an evacuation that may need to be implemented in the event that an unwanted release of hydrogen sulfite (H_2S) occurs during the Detroit River International Crossing deep drilling program; (2) costs incurred for delay by the CONSULTANT after the initial mobilization of deep drilling equipment but prior to any actual drilling; such delay costs (as set forth in this subsection) will not exceed a maximum amount of Five Thousand Two Hundred Dollars ($5,200.00) per day for a maximum of five days, for a maximum amount of Twenty-Six Thousand Dollars ($26,000.00) for all delay costs as set forth above; and (3) costs not to exceed a maximum amount of Seventeen Thousand Dollars ($17,000.00) for the initial mobilization and demobilization of the deep drilling equipment in the event that actual drilling is not authorized.

c. It is expressly understood and agreed that if the insurance described in subsection (b) above is not obtained, no other costs authorized in Amendment 3 to this Contract will be payable to the CONSULTANT other than the costs authorized in subsection (b), subparts (2) and (3), above. It is also expressly understood and agreed that the CONSULTANT will not be deemed to be in default of this Contract as amended under Amendment 3 to include the conduct of the deep drilling program for failure to conduct the deep drilling program in the event that insurance cannot be obtained for the amount specified in subsection (b) above.

d. Proportional compensation for work performed as a result of the Dispute Resolution Process (DRP) will be on the basis of actual cost and a fixed fee for profit. The proportion of such costs incurred that will be reimbursed, if any, will be as determined by the DRP. The DEPARTMENT and the CONSULTANT will maintain separate RECORDS for the costs incurred relative to the DRP. The allowability of such costs will be as determined by the DEPARTMENT's auditor. The determination of allowability under the provisions of this section is limited to the acceptability of the expense relative to 48 CFR, Federal Acquisition Regulations, incorporated herein by reference as if the same were repeated in full herein. Such determination by the DEPARTMENT's auditor does not apply to the acceptability or completeness of work as determined by the DRP."

3. All other provisions of the CONTRACT, except as herein amended, remain in full force and effect as originally set forth.

4. The CONSULTANT agrees that the compensation noted above represents payment in full for all services requested by the DEPARTMENT and waives any and all claims it has or may have against the DEPARTMENT that arise out of the need to amend the CONTRACT.

5. In the event of any discrepancies between the provisions of this Amendment and any exhibit(s) hereto, the provisions of the Amendment will govern.

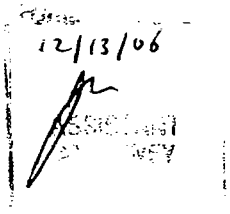
6. This Amendatory Contract will become binding on the parties and of full force and effect upon signing by the duly authorized representatives of the CONSULTANT and the DEPARTMENT and upon adoption of a resolution approving said Amendatory Contract and authorizing the signature(s) thereto of the respective representative(s) of the CONSULTANT, a certified copy of which resolution will be sent to the DEPARTMENT with this Amendatory Contract, as applicable.

IN WITNESS WHEREOF, the parties have caused this Amendatory Contract to be awarded.

THE CORRADINO GROUP OF MICHIGAN, INC.

By: _____
Title:

MICHIGAN DEPARTMENT OF TRANSPORTATION

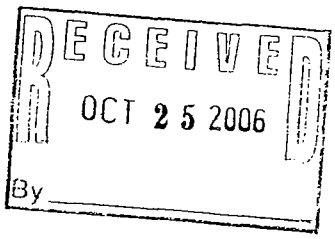


By: _____
Title: Department Director

CORRADINO

Exhibit A-3

October 23, 2006



Mr. Mohammed Alghurabi, PE
Michigan Department of Transportation
425 West Ottawa
Lansing, Michigan 48933

Re: Detroit River International Crossing
CS 82900 - JN 802330
Contract 2004-0808
Amendment 3

Dear Mr. Alghurabi:

By this letter we are responding to MDOT's request to amend Contract 2004-0808 by adding additional services. Attached is a copy of the Scope of Additional Services. Also included are Exhibit A (Corradino), Exhibits B (Parsons Transportation Group, NTH Consultants, and SOMAT Engineering. Exhibit C (summarizing Exhibits A and B), that show hours and cost data associated with the scope. Two copies are being sent under separate cover to Judy Kransz, MDOT Operations Contract Support.

Should you have any questions or need additional information, please feel free to call at 1.800.880.8241. Thank you for your attention to this matter.

Sincerely,

THE CORRADINO GROUP

Joe C. Corradino, PE
Chief Executive Officer

JCC:ems
I:\projects 3600\wp\letters Alghurabi Amend 3 Transmittal 10-23-06.doc
Attachments
cc: Ted Stone
Jim Hartman
Judy Kransz

FIRST TRUST CENTRE • SUITE 300 NORTH
200 S. FIFTH STREET • LOUISVILLE, KY 40202
TEL 502.587.7221 • FAX 502.587.2636
WWW.CORRADINO.COM

Detroit River International Crossing Study
Work Plan
Amendment #3

1. Introduction

The consultant team led by The Corradino Group of Michigan, Inc. (Corradino) submits this proposal in response to the RFP issued by the Michigan Department of Transportation (MDOT) for work in the following areas:

- Additional Geotechnical Analysis
- Additional Public Involvement - Drilling Program Ombudsman

2. Additional Geotechnical Analysis

The MDOT-approved contract amendment (November 2005) for brine well investigation includes the drilling of four 1,500-foot-deep test borings, combined with crosswell seismic imaging and evaluating the resulting data. MDOT has now requested a more intensive investigation be performed at two crossing corridors (X-10 and X-11) involving a total of 14 test borings. The money allocated in Amendment 1 for the boring and the crosswell seismic imaging for four holes will be withdrawn from that amendment and applied in Amendment 3.

The purpose of the test borings and related analysis is to investigate fully the deep rock profile that will ultimately support the proposed primary and secondary foundations for a new bridge across the Detroit River. Specifically, the investigation will examine for the presence of deep solution mining voids and related shallow distressed areas within the influence zone of the potential bridge foundations. The potential for such voids is known to exist in the crossing corridors.

Section 2.1 provides project background information related to the need for the deep test boring program. Section 2.2 covers the increased project scope anticipated when the program was first proposed. Section 2.3 covers additional scope items added after the Geotechnical Advisory Group of experts was engaged and made specific recommendations.

2.1 Project Background

The Border Transportation Partnership has identified two crossing corridors – X-10 and X-11 – for a new bridge between Detroit and Windsor. The proposed practical alternatives along the U.S. shore are near historically identified or suspected solution mining wells. MDOT has adopted a bridge foundation policy that requires the foundations to be located outside of the influence of any rock cavities such as those produced by solution mining activities. NTH, subconsultant to The Corradino Group, has developed this proposal to increase the work scope, as amended, to investigate the possible solution mining areas and the potential impact of the cavities created by the wells on the bedrock's capacity to support bridge foundations at Crossings X-10 and X-11 (Figure 1). (Solution mining voids are also a concern on the Canadian side of the river, and are being investigated by the Canadian team.)

LEGEND

- KNOWN BRINE WELL LOCATIONS
- SOLVAY DISPOSAL WELLS
- APPROXIMATE HISTORIC WELL LOCATIONS
- APPROXIMATE HISTORIC SALT BLOCK LOCATIONS
- AREA UNAVAILABLE FOR DEVELOPMENT
- APPROXIMATE BOUNDARY OF DEVELOPMENT CORRIDOR
- PARCELS RADIATING 150m (APPROX. 500 FEET) FROM LOCATION OF KNOWN SOLUTION MINING WELL
- 2 PARCELS RADIATING 225m (APPROX. 750 FEET) FROM LOCATION OF KNOWN SOLUTION MINING WELLS, SUSPECTED SOLUTION MINING WELLS, AND PROCESSING FACILITIES
- 3 PARCELS RADIATING 300m (APPROX. 1,000 FEET) FROM KNOWN OR SUSPECTED LOCATION OF SOLUTION MINING WELLS AND PROCESSING FACILITIES
- 4 PARCELS RADIATING 750m (APPROX. 2500 FEET) FROM KNOWN OR SUSPECTED SOLUTION MINING WELLS AND PROCESSING FACILITIES

GRAPHIC SCALE 1,000m 0 1,000m

N

NOTE
THIS FIGURE IS INTENDED FOR THE PURPOSES OF ILLUSTRATION ONLY, AND FOR PRELIMINARY REVIEW OF POTENTIAL GEOTECHNICAL AND GEOPHYSICAL TEST LOCATIONS.

FIGURE No. 1	POTENTIAL SOLUTION MINING FACILITIES DETROIT RIVER INTERNATIONAL CROSSING DETROIT, MI - WINDSOR, ON	NTH PROJECT No. 15-050014-00 DESIGNED BY CRJ DRAWN BY SHB CHECKED BY JBA	CAD FILE NAME D05001419 ISSUE DATE 05 JAN 2006 DRAWING SCALE AS SHOWN PLOT DATE 01 FEB 2006	NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services

2.1.1 Salt Mining Issues

The Michigan Basin is one of the largest areas of halite (salt-NaCl) deposition in the world. Salt has historically been mined either directly in solid form as rock salt or as natural or artificial brine pumped through solution mining wells. The area beneath Detroit and Windsor within the Michigan Basin is currently mined using both solution mining techniques and conventional room-and-pillar excavation methods. Generally, the solution wells extended to depths of 1,100 to 1,500 feet.

In general, solution mining consists of introducing water from the surface down a well casing between an outer casing and a central tube. The brine produced from the salt dissolving in the water is recovered through the central tube. Cavities using this method are usually greater at the top of the stratum than at the bottom because the fresh water, which tends to stratify above the denser salt brine in the cavity, dissolves salt more rapidly near cavity roofs than at the base of the cavities, which are in contact with saturated brine. This results in an inverted cone-shaped cavity.

Solution cavities often coalesce with adjacent cavities to form composite cavities called "galleries." When this occurred historically, one or more of the wells were then converted to water inlet wells and the brine was pumped out through other wells in the interconnected system. As production continued in the gallery, large spans of unsupported roofs were sometimes created, which in turn could cause sagging, downward flexure, and local separation of rock units resulting in local roof collapse and eventual surface subsidence, in some instances. This surface subsidence is commonly known as a "sinkhole."

Subsidence and/or collapse often progresses upwards as a chimney effect on an approximately 15-degree angle (or steeper) from vertical from the outside edges of the cavity. Several theories have been published on the subsidence progression to the surface, the more notable of which attributes surface daylighting to failure of the Sandstone Sylvania Formation at a depth of approximately 500 feet. According to the theory, the sandstone disintegrates under the induced compression from rock mass sagging, and the fragments filter downwards as granular material into voids below. This results in a void at a depth at approximately 500 feet instead of the original cavity depth. This mechanism would explain why theoretical "bulking" of broken rock pieces would not be sufficient to fill the cavities before daylighting occurs.

The solution mining areas are of concern for this project, as they present the potential for future ground collapse and related adverse effects on elements of the proposed crossing structure. Additionally, at least two previous collapses have occurred in the region: at Point Hennepin near Grosse Ile, Mich., and in Windsor, Canada, across from the X-10 crossing zone. Significant settlements have also occurred beneath a known well field in Wyandotte, MI.

While no solution mining activities were identified in the bridge foundation zones in earlier DRIC work, it can be reasonably concluded that, if salt cavities exist, they were created before record keeping was standardized. Therefore, it is suspected that mining would have been of the older, uncontrolled methods and, probably, before circa 1940. These early solution mines generally were of the uncontrolled type, mining salt from the F and D Units of the Salina Formation at approximate depths of 910 and 1,264 feet, respectively. Some mining may also have occurred in the lower B Unit of the Salina Formation at depths of 1,429 to 1,646 feet, although there is no specific record of this having occurred in the study area of crossing corridors X-10 and X-11. Nonetheless, it is not expected that mining would have occurred in the B Unit without mining in the upper F and D layers. Therefore, it is proposed the investigation concentrate on examining the F and D Unit zones but with limited examination of the B Unit.

A major subsurface layer affecting potential for future collapse is the Sylvania Sandstone layer located at a depth of approximately 516 to 538 feet. Previous collapses are thought to have occurred due to collapse

of this layer. Therefore, investigation of the rock zone between the salt layers and the sandstone for a "rubbleized" condition, indicating an ongoing collapse mechanism, is of substantial interest.

2.1.2 Recent Rock Cavity Detection Methods

Based on discussions and visual observations with industry leaders, use of crosswell seismic imaging techniques along with rock coring are proposed as the most promising and effective investigation method for this project. The NTH Draft Technical Report on "Comparison of Pseudo 3-D Surface Seismic, Vertical Seismic Profiling (VSP/RVSP) and Crosswell Reflection Tomography Geophysical Methods," dated March 21, 2006, support this approach. That report is attached to this work plan (Attachment B). Note that Section 2.3 reflects additional investigation methods recommended by the project's Geotechnical Advisory Group, beyond the measures covered in this section.

Crosswell seismic techniques use hydrophones placed in one borehole and a piezoelectric energy source placed in a second borehole. Two types of information are acquired and processed: 1) the direct arrivals between source and receivers; and, 2) reflection information from horizons above and below the source and receiver positions. Using many different source-receiver offset combinations, a two dimensional (2-D) image (similar to a medical MRI) is produced. The image shows the travel times of seismic raypaths, both by direct and reflective means, in the intervening ground between and beneath the boreholes. Based on variations in the velocity distribution, detailed images can be obtained of anomalous velocity zones, including rubbleized rock zones and cavities, such as cavities from solution mining or loosened/collapsing rock zones.

In preparing this proposal, NTH personnel, during the period of June 30 through July 2, 2005, viewed the implementation of crosswell seismic techniques in near-similar rock conditions as those present in the DRIC Study area. The survey was performed at the joint Massachusetts Institute of Technology (MIT), Michigan Technological University (MTU), and United States Department of Energy (DOE), Earth Resources Laboratory Reservoir Delineation Research Facility near Thompsonville, Michigan. Z-Seis Reservoir Seismic performed the series of surveys, under the direct guidance of Dr. Roger Turpening of MTU. Dr. Turpening created the test site when working for MIT approximately 30 years ago. The site consists of a series of three oil wells drilled to depths of approximately 6,000 feet situated over 2,000 linear feet apart. The formations, integrity, and seismic properties of the rock layers and formations are well known and documented. The use of crosswell seismic techniques with the rock layers present, both at the test facility and in available Detroit solution mining logs, has been proven as a reliable method for evaluating the potential for voids and caverns within the similar formations. The first cavity was imaged using a state of the art piezoelectric source, developed in direct cooperation with Shell Oil, delivering up to 3000 Hz through the horizon of interest at a distance of 2,000 linear feet. The ability to use a higher frequency allowed greater image resolution while maintaining spacing between boreholes. The spacing of the boreholes proposed for the DRIC Study area was determined based on the technology and equipment being used for this investigation. The borehole spacing derivation is described in the attached Z-Seis literature (Attachment C).

The proposed crosswell seismic imaging method consists of two distinct seismic wave acquisition methods. The first, and highest resolution method, is use of direct-path waves between the exciting source in a borehole and the receiving geophone in another borehole. Generally to collect reliable data with the direct-path waves, the borehole depth is required to be approximately 20 percent below the depth of interest for borings at a spacing of approximately 1,000 feet. Therefore, a 1,500-foot boring depth is recommended, so direct-path wave measurements will be possible for all zones within the F and D Unit layers as well as the zone between the salt and the sandstone. One boring per study corridor will extend past the B Unit to a depth of 1,750 feet.

The second wave acquisition method is by reflection, which is of slightly lower resolution than direct path, but still expected to provide very high-resolution data sets. Based on boring spacing and depths, cavities in the B Salt layer will be observable by reflection measurements. For this study, 1,000-foot spacing between boreholes will be used, to maximize image resolution within the areas of interest.

2.1.3 October 14, 2005 Proposal (Amendment 1)

NTH previously submitted a proposal to perform a brine well investigation program for the proposed bridge foundations in the X-10 and X-11 corridors. That proposal was approved by MDOT. It consisted of performing historical research and field investigation efforts for four boreholes. The proposed work plan contained herein transfers those efforts to Amendment 3 and expands on the needed efforts (see next section).

2.2 Geotechnical Work Plan – Pre-Advisory Group Recommendations

The work plan will be conducted to meet MDOT P/PMS Task 2330. All work relating to the proposed brine well geotechnical investigation will be performed under the direction of a registered professional engineer acting as Project Coordinator/Project Manager. To perform the site evaluation, NTH has assembled a team led by Mr. Fritz Klingler, P.E., of NTH as Project Manager. Advanced Energy, Inc. (Oil-Ex, Inc.) will perform rock coring and drilling, with NTH directing all drilling operations, logging the rock core holes, and preparing the documentation. Advanced Energy (Oil-Ex, Inc.) was selected as the drilling contractor after obtaining drilling quotes from two other drilling firms (Layne Christensen and Boart Longyear), which are attached for reference (Attachment D). Advanced Energy (Oil –Ex, Inc.) was found to be the least expensive and most qualified contractor to perform this work. It is noted that all drilling firms contacted were unwilling to provide a fixed price bid for the work, and were only willing to provide services on a time and material basis, which is the standard in the oil drilling industry, which governs this type of drilling. It is also noteworthy that conversations with the Canadian DRIC Team (not documented here) indicated the cost of the Canadian drilling program (not the associated analysis) is approximated twice the U.S. program's cost presented herein. If documentation of the Canadian cost is needed to MDOT in can be requested of the Ministry of Transportation Ontario.

Baker-Atlas (qualification and proposal attached – Attachment E) will perform supplemental geophysical well logging to further investigate and establish values of seismic formation velocity (delta-t), wireline gamma logging, and perform borehole deviation surveys in each test boring. The formation velocities are utilized in the forward and reverse finite-difference modeling to be completed in evaluation of crosswell data. The wireline gamma logging, performed in conjunction with the deviation surveys, will be used to better correlate the formation tops in the non-rock core borings.

Z-Seis Reservoir Seismic (qualifications and proposal attached – Attachment C) will conduct crosswell seismic imaging; Dr. Roger Turpening will provide technical consulting in planning the crosswell imaging investigation and providing expert analysis of crosswell data. In the event that cavities are directly encountered during drilling operations, 3-D acoustic sonar technology will be performed by SOCON to define the limits of the cavity (qualifications and proposal attached – Attachment F).

Dr. Edward Cording of the University of Illinois will provide technical consulting in planning the investigation, performing technical analysis of rock-void propagation, and providing expertise in determining final conclusions regarding the risk of existing voids negatively impacting the project.

To conduct the geotechnical analysis, the Michigan Department of Environmental Quality (MDEQ) requires an Act 451, Part 625 Mineral Wells permit be obtained. This decision significantly increases permitting efforts beyond that envisioned in the October 2005 scope of work. These efforts include:

- Meetings with the MDEQ to obtain clarifications and evaluations of permit requirements.
- Preparing the permit application including developing: 1) a hydrogen sulfide management and contingency plan; 2) surveying efforts; 3) drilling method documentation; and, 4) completing other permit forms used in the permitting process such as sedimentation control, erosion control, and blow-out prevention.
- Complying with required MDEQ hydrogen sulfide contingency plans also requires additional plan preparation, crew training, physicals, and safety efforts by the driller and the geotechnical consultant.
- Obtaining the required drilling bonds for the field work and submitting the required permit fees.
- Performing the drilling with a blow-out prevention device (BOP) which requires not only the device, but possible field modification efforts, such as excavating a cellar, where applicable, or elevating the drilling operation approximately five feet due to the additional height of the device.
- Substantially increased casing and casing/cementing procedures. The October 2005 proposal was based on installing and cementing only approximately 100 feet of 7-inch diameter surface casing and hanging 5.5-inch fiberglass casing in the borehole. The MDEQ is requiring the cementing of casing to a depth of 100 feet below the lowest freshwater aquifer, which may require installing and cementing 13-3/8-inch surface casing and then installing 9-5/8-inch intermediate casing inside the initial surface casing. The final 5.5-inch steel casing will be installed to the bottom of hole, and cemented fully to the surface.
- Disposing drilling fluids and cuttings at a landfill due to environmentally challenged areas.

MDOT also has requirements – Cavity Sonar Imaging and Formulation Acoustic Velocity. Additionally, with the boreholes defined specifically, requirements for site improvements (e.g., access roads), signage, and hauling water (some sites are too far from fire hydrants) are part of the program. Lastly, based on discussions with the City of Detroit, and a review of its files, it is now known that several sites are in areas of EPA and/or MDEQ remediation. Efforts added to the scope since October 2005 include: a noise and vibration monitoring program to verify that drilling operations stay within MDOT-specified parameters and a field site trailer to temporarily store field cores, allow a controlled atmosphere for field logging of boreholes, temporarily store paperwork, etc.

To perform the field efforts for Task 2330, an investigation program with boring locations shown on the attached Figures has been developed. The number of boreholes and crosswell seismic panels were chosen based on the crossing's proximity to areas of known and suspected high-density solution wells and processing facilities. Test boring locations were chosen based on the desired clear zone from structural elements, span lengths, and geophysical constraints. The desired clear zone is defined in the included Deep Boring Plan Memorandum, dated February 8, 2006, prepared by Parsons Transportation, The Corradino Group, and NTH (Attachment G). Field review and approximate boring location research has been performed, and boring locations have been adjusted based on changes to the plaza and bridge alignment, residences, utility conflicts, etc. At this time, it is expected that a main pier will be constructed at the river edge or landward (i.e., not within the water). Secondary piers, such as anchorage piers, if used, would be located back from the river. Because research indicated no brine wells were drilled in the river in this area, all test borings will be performed on land.

The October 2005 scope (Amendment 1) authorized two boreholes to be cored to approximately 1,500 feet using a minimum NQ/NX sized tooling, reamed to a minimum of six inches, and lined with minimum 4-inch diameter fiberglass or PVC casing to prevent rock collapsing. The October 2005 scope also

included two rotary-drilled borings (not cored) to 1,500 feet and also lined with casing. That work is now deleted from Amendment 1 and added to Amendment 3.

This new work plan for Amendment 3 adds two cored test borings and eight rotary (i.e., uncored) borings. Two of the cored holes (one at each crossing) will be drilled to 1,750 feet. All other borings will be drilled to 1,500 feet. All borings will be drilled using the MDEQ required protocol. In summary, four core and ten rotary holes will be drilled, all under Amendment 3.

The cored borings will be drilled using double or triple-tube, swivel-type tools designed to provide maximum core recovery in all types of formations. The outer diameter of the corehead will be sufficient to set the casing upon reaching the intended boring depth. The larger size corehead and corresponding double-tube system will allow recovery of a larger (approximately 4-inch diameter) core and eliminate the need to ream the hole to a larger diameter before casing installation and cementing. The rotary-drilled (not cored) borings will also be lined with casing. Drilling will be performed on a 24-hour basis.

2.2.1 Crossing X-10

The proposed investigation program for the Crossing X-10 study corridor consists of Borings No. 1 through 7 (Figure 2) (Note that since this figure was created, Hole 7, most distant from the river, has been moved to the river between holes 1 and 2 for more accurate analysis of the area where a primary pier would most likely go.) Crosswell seismic panels will be performed in the borings at approximate 1,000-foot spacings (adjacent), 1,500-foot spacings (diagonal), and 2,200-foot spacings (long-axis diagonal).

The drilling rig will be in service approximately 15 to 20 days to complete each borehole where coring is to be performed. Rotary-drilled holes with no rock core recovery are estimated to take seven to 10 days. Included in the drilling work is the proper disposal of rock cuttings and drilling fluid, treatment of potentially hydrogen sulfide-tainted groundwater, and the material and labor fees to abandon and cement the boreholes.

2.2.2 Crossing X-11

To explore the foundation zones for the X-11 corridor, the proposed investigation consists of seven borings covering the area bounded by Borings No. 10 through 16 on Figure 3. (Note that since this figure was created, Hole 16, most distant from the river, has been moved to the river between holes 10 and 11 for more accurate analysis of the area where a primary pier would most likely go.) Additional crosswell seismic panels will be performed in the borings in a manner similar to those at Crossing X-10.

2.2.3 Clarifications and Conditions

The following clarifications and conditions are made with respect to the proposed investigation:

- Drilling will be performed on a 24-hour basis with two shifts at 12 hours per shift per day. All drilling sites are assumed to have open access, allow 24-hour operations, and be a minimum size of 100 feet by 125 feet.

- Drilling fee estimates are based on relatively stable ground conditions during drilling. Unusual drilling conditions, collapsing conditions during drilling, or rubble/subsidence zones may affect drilling methods, extend drilling time, and increase costs.

NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	27 APR 2008	JBA	DETROIT, MI - WINDSOR, ON DETROIT RIVER INTERNATIONAL CROSSING X10 PRELIMINARY BORING LOCATIONS	FIGURE No. 2
	27 APR 2008	NONE		
	27 APR 2008	SHB		
	27 APR 2008	CRJ		
	D0500142\1			
			15-0500-14-00	

FIGURE No. 3	X11 PRELIMINARY BORING LOCATIONS	NTH PROJECT No. 15-050014-00	DWG FILE NAME D05001421	NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services
		DESIGNED BY CRJ	PICKUP DATE 27 APR 2006	
	DETROIT RIVER INTERNATIONAL CROSSING DETROIT, MI - WINDSOR, ON	DRAWN BY SHB	DRAWING SCALE NONE	
		CHECKED BY JBA	PLOT DATE 27 APR 2006	

- During drilling operations, all boreholes will be surface cased entirely through fill materials. Intermediate casing will be placed approximately 100 feet into bedrock. Full depth casing will be installed within all drilled holes upon completion to prevent caving and/or sloughing conditions in preparation for crosswell seismic imaging. Several intermediate casing strings may need to be utilized, due to unusual drilling conditions such as lost circulation, over-pressurized, or unusual artesian zones.

- All boreholes are assumed to be drilled with standard fresh-water based drilling fluids and/or saturated brine based fluids for portions of the borings that extend through salt beds. In the case of significant artesian groundwater conditions, collapsing borehole conditions, or zones where extensive dissolved hydrogen sulfide gas are encountered, specialized drilling fluids such as weighted mud, weighted brine solutions, or specialized drilling mud additives may be needed to maintain favorable drilling conditions. An additional fee would be required for such work.

- Borehole cuttings will be disposed of by roll-off dumpster and/or at a landfill with excess drill water to be disposed of in available sewers or disposal facilities. Treatment of potential hydrogen sulfide water is not anticipated to be a problem with use of our proposed drilling fluids and methods, although an additional permit may be required to disperse excess water into the sewer system.

- In the event of lost equipment due to adverse ground conditions during the drilling and crosswell seismic imaging portions of this project, the cost of all lost equipment will be considered an extra cost and will be billed to the project. For estimating purposes, additional insurance fees for costs of tooling while performing crosswell seismic testing (not drilling) have been included.

- All boreholes will be left open upon completion of crosswell seismic imaging. The boreholes will be abandoned and cemented after further analysis is no longer required. Over this period, a locking steel flush mounted cover placed at ground surface will protect each borehole location. Material and labor fees for abandonment are included in the estimate, including one additional mobilization/demobilization fee if required to perform hole abandonment services at a later date.

2.3 Additional Work Plan from Geotechnical Advisory Group

The following presents the scope for additional geotechnical and geophysical investigation recommended by the Geotechnical Advisory Group in their multi-day kick-off meeting culminating June 30, 2006.

The Geotechnical Advisory Group recommended three critical items be added to the scope of the geotechnical investigation, including: 1) relocating the northernmost boring for both of the alignments on the Detroit side of the river; 2) performing borehole gravity surveys; and 3) performing vertical seismic profiling (VSP) to address "shadow areas", not well covered by the cross-well surveys.

2.3.1 Relocation of Test Borings

In an effort to increase the area covered by the cross-well surveys and better cover the critical area near the river (also expected to be in the vicinity of the main pier on the U.S. side of the river), holes 7 and 16 on the

U.S. side will be shifted to be immediately adjacent to the Detroit River, between the two borings already planned for each alignment. Additional costs are expected for MDEQ permitting fees, and there will be additional environmental requirements for borings in contaminated areas. Berm construction is required by MDEQ for borings near the river and there will be additional effort related to obtaining right-of-entry for the new boring sites.

2.3.2 Borehole Gravity Surveys

Based on input from the Geotechnical Advisory Group, borehole gravity surveys are proposed for 10 of the test borings to independently confirm the results of the cross-well reflection and VSP surveys, using entirely different technology. This will increase the reliability of the fieldwork. The borehole gravity surveys will involve 2 to 3 days of data gathering at each borehole, with subsequent analysis and comparison with the cross-well and VSP data. In follow-up to the Geotechnical Advisory Group recommendation for using borehole gravity technology, NTH, in conjunction with Michigan Technological University, performed preliminary computer modeling on the gravity boreholes to access the ability of the technology to fulfill the intent. Based on preliminary results, it appears that borehole gravity will be able to detect a 100-foot diameter brine-filled void to a distance of about 300 feet from the borehole, but should be able to detect a void about 150-feet in diameter 100 percent of the time within the study area. In any case, the use of the borehole gravity would provide an independent verification of the crosswell technology.

2.3.3 Vertical Seismic Profiling

Based on input from the Geotechnical Advisory Group, it is recommended that VSP surveys be conducted for one location within each of the X-10 and X-11 alignments in the U.S. where "shadows" are present in the cross-well surveys. The VSP surveys will involve the use of seismic sources at selected locations on the ground surface, with receivers placed within the existing boreholes. The VSP data will be evaluated together with the cross-well data and borehole gravimeter data, to provide full coverage of the subject area.

3. Drilling Program Ombudsman

MDOT has decided to expand the public involvement effort from that in the original scope of work of the consultant. This has resulted from the need to provide coverage through an ombudsman of the drilling program. The Corradino Group will assist MDOT on a day-to-day basis in the communication aspects of the drilling program. A specially-marked vehicle will "cruise" the Delray area to be highly visible and to make personnel readily available to address questions and concerns that may arise. Additionally, in the drilling areas close to residences, door-to-door contact will be made to ensure that the opportunity is afforded to them to gain a full understanding of the drilling program.

In advance of the drilling, the consultant will distribute information flyers door-to-door. A community meeting will be dedicated solely to discussing the drilling program at which members of the MDOT team will be available to explain the program's details and answer questions. These meetings will be repeated, with another held one week after drilling begins and, then, no less frequently than monthly afterwards.

Specific roads will be designated over which hauling of materials to and from each drilling site will take place. Signing will be placed along these at other key areas/gateways to signal the drilling activity is taking place and provide appropriate contact information.

A slide presentation and a list of Frequently-Asked Questions will be prepared to announce the project to provide a consistent message. To ensure project information is readily available to first-responder agencies, contact will be made with police and fire department personnel serving the Delray area both in advance of the drilling program's beginning and weekly thereafter. Any inquiry of the media, including those received in the field by the drilling program team, will be directed to MDOT's Communication Office. Bi-weekly briefings will be held with MDOT Metro Region and TSC personnel to ensure field activities are well known to all.

i:\projects\3600\contracts\Amendment 3\Work Plan Amend 3 no geop.doc

Attachment A

Letters from firms indicating:

- commitment to the project
- statements of conflict of interest
- anticipated payment type

May 19, 2006

Mr. Mohammed Alghurabi, PE
Michigan Department of Transportation
425 West Ottawa Street
Lansing, Michigan 48933

Re: Detroit River International Crossing Study Amendment 2

Dear Mohammed:

1. Commitment to the Project

The Corradino Group of Michigan, Inc. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither The Corradino Group of Michigan, Inc. personnel nor The Corradino Group of Michigan, Inc. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

The Corradino Group of Michigan, Inc. understands it will be compensated on a cost-plus-fixed fee basis.

Very truly yours,

Joe C. Corradino, PE
Chief Executive Officer

i:\projects\3600\contracts\amendment 2\conflict of i letter-corradino.doc

20300 CIVIC CENTER DRIVE • SUITE 410
SOUTHFIELD, MI 48076
TEL 248.799.0140 • FAX 248.799.0146
WWW.CORRADINO.COM

PARSONS

28777 Central Park Boulevard Suite 275 · Southfield, Michigan 48076 (248) 262-0013 · Fax: (248) 262-0988 · www.parsons.com

May 18, 2006

Mr. Joseph Corradino
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

Mr. Corradino:

Parsons Transportation Group Inc. of Michigan (Parsons) is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither Parsons personnel nor Parsons as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. Parsons warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership;
- The Work/Services to be performed under future contractual agreements;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Parsons understands it will be compensated on a cost-plus-fixed fee basis.

Sincerely,

PARSONS

Mark C. Fialkowski, PE
Vice President

NTH Consultants, Ltd.

Infrastructure Engineering
and Environmental Services

480 Ford Field
2000 Brush Street
Detroit, MI 48226
313.237.3900
313.237.3909 Fax

Mr. Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

May 18, 2006
Project No. 15-050014-01

RE: Detroit River International Crossing
Detroit, Michigan

1. Commitment to the Project

NTH Consultants, Ltd. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither, NTH Consultants, Ltd.'s personnel or NTH Consultants, Ltd. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

NTH Consultants, Ltd. understands it will be compensated on a cost-plus-fixed fee basis.

Sincerely,

NTH Consultants, Ltd.

Fritz J. Klingler, P.E.
Vice President

FJK/lg/lh

S:\PROJ\2006\15\050014\01\0517-013-ltr.doc

NTH Consultants, Ltd.

Mr. Joseph Corradino, P.E.
The Corradino Group
2430 Civic Center Drive, Suite 410
Southfield, Michigan 48076

June 7, 2006
Project No. 154059.04

RE: Response to MDOT Commission Audit Questions
Proposal for Additional Geotechnical Services (Amendment 2)
Brine Well Cavity Investigation
Detroit River International Crossing Study
Detroit, Michigan

Dear Mr. Corradino

This letter is in response to questions that have been raised by the Michigan Department of Transportation (MDOT) Commission Audit Department regarding our proposal for additional geotechnical services (Amendment 2) related to the brine cavity investigation for the Detroit River International Crossing Study (DRIC). The questions and our responses are presented as follows.

1. Please provide a basis for the billing rates used in the NTH DoCP sheets.

   Response: An "Analysis of Cost By Billing Class" has been performed by our accounting group as of May 19, 2006, and is attached. For clarification, the corresponding DRIC project classifications have been shown on the table as well.

2. Please provide documentation to substantiate the "PL Insurance for Pass Through"

   Response: Our insurance costs are established each year as a percentage of our gross revenue and gross drilling costs. A recent audit for our professional liability insurance (copy attached) equates to $489,451 annually, and when compared to our gross revenue for 2005 of $38,997,711, equals about 1.26%. In addition, this line item includes a premium that our general liability insurance carrier charges (also shown on the audit) for subcontracted drilling work, of 0.24%. The adjusted total for additional insurance is about 1.5%.

3. Please provide backup for large and small equipment rates outlined in the "Project Fee Estimating Sheet For Lump Sum Items"

   Response: Bluebook sheets and cost calculations for the dozer and loader are attached for reference. In addition, our fee and rate schedules are attached to establish the fees for vibration monitoring equipment, sound monitoring equipment, gas detectors, SCBA equipment, and other equipment

4. Please provide explanation/backup for "Misc. Allowance for Site Access, etc." as shown under Task 6 of the "Project Fee Estimating Sheet For Lump Sum Items".

   Response: This item includes various incidentals that are expected, and or may occur, such as water level recording equipment, portable field computers, pH meter, Level D environmental

protection for workers, generators, survey equipment, other miscellaneous small equipment and expenses, etc. Only the actual backed-up charges would be submitted to MDOT.

5. Please provide explanation of Somat Engineering direct expense charges.

Response: NTH provided recommendations for these charges to Somat prior to their preparation of their DoCP sheets. The recommended direct expense charges were based on using a ratio of about 75% for Somat direct charges versus NTH direct charges, which is based on the fact that Somat has 6 holes to drill and NTH has 8 holes to drill. In some cases, the recommended charges for Somat were different, depending on the circumstances. Specific basis for the recommended charges that deviated from the general ratio of 75% are summarized as follows:

- **Site improvements:** Used a 100% ratio, as most of their borings would be in the neighborhoods, they would require slightly more for improvements vegetation tree removal etc.
- **Drill Cutting Removal:** Used a 200% ratio, as the NTH line item for this category only includes 4 holes (4 holes were included in Amendment 1), plus all Somat's holes are rotary and will produce more cuttings.
- **Site Restoration:** Used a 80% ratio, as they would require more restoration efforts upon completion of drilling because of their residential locations.
- **Estimated Expenses:** Used a 55% ratio, as Somat will not have many of the expenses that NTH has such as field trailer, warehouse, land rental, etc.

I certify that the above information is true and correct to the best of my knowledge. If you have any questions, please call.

Sincerely,

NTH Consultants, Ltd

Craig R. Johnson
Project Engineer

Fritz J. Klingler, P.E.
Vice President

CRJ FJK lh

cc: Jerry Armstrong - MDOT

NTH CONSULTANTS, LTD
Analysis of Cost by Billing Class
As of May 19, 2006

Billing Class	Code	Average	Minimum	Maximum	Corresponding DRIC Project Classification
Senior Officer	01	82.63	63.00	105.55	Project Director
Senior Principal Engineer	05	49.69	36.67	68.99	Project Manager
Principal Engineer	10	42.12	37.60	46.63	Task Manager (Price & Alberts)
Senior Project Professional	15	35.90	28.37	43.18	Task Manager (Kosnak)
Project Professional	20	26.98	22.02	35.82	Project Engineer
Senior Staff Professional	25	22.69	19.71	30.45	Not used
Staff Professional	30	20.55	15.44	33.70	Not used
Lab Technician	31	18.43	13.00	20.74	Not used
CADD Operator	32	22.98	17.81	26.00	CADD
Senior Technician II	33	21.64	18.80	25.87	Technician III
Senior Technician I	35	22.03	17.48	30.00	Not used
Technician III	40	16.06	14.00	18.76	Not used
Technician II	45	13.86	12.00	17.80	Not used
Technician I	50	12.44	10.00	14.00	Not used
Word Processor	55	16.28	12.36	19.09	Not used
Sr. Word Processor	55A	20.44	20.44	20.44	Clerical
Administrative	60	20.60	7.50	35.10	Not used
IT Professional	601	30.82	24.16	36.30	Not used

ST. PAUL TRAVELERS — INSURED'S COPY — ISSUED

INSURER: ST. PAUL MERCURY INS CO
385 WASHINGTON ST.
ST. PAUL MN 55102

REPORT OF AUDIT

FINAL AUDIT

POLICY NUMBER	from POLICY PERIOD to		PREV. COVERAGE	AGENCY
CK02102985	12/31/04	12/31/05	CK02102985	2109494

NAMED INSURED AND ADDRESS	AGENT
NEYER, TISEO, HINDO, LTD.; DBA NTH CONSULTANTS, LTD. 38955 HILLS TECH DR; ATTN: A/P CODE: SV907 FARMINGTON HILL MI 48333-9173	PROFESSIONAL CONCEPTS SUITE 402 2950 S STATE STREET ANN ARBOR MI 48104

ST	CLASS CODE	CLASS CODE DESCRIPTION	ACTUAL EXPOSURE	RATE	PREMIUM
		PREMISES			
MI	91135-001	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	512,912	3.377	1,732.00
MI	91135-001	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	512,912	.023	12.00
PA	91135-002	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	56,795	4.566	259.00
PA	91135-002	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	56,795	.031	2.00
MI	91581-001	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1,118,200	1.403	1,569.00
MI	91581-001	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1,118,200	.010	11.00
PA	91581-002	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1	1.271	0.00
PA	91581-002	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1	.009	0.00

ISSUE DATE 03/17/06

ST PAUL TRAVELERS — INSURED'S COPY — ISSUED

INSURER: ST. PAUL MERCURY INS CO
385 WASHINGTON ST.
ST. PAUL MN 55102

REPORT OF AUDIT

FINAL AUDIT

POLICY NUMBER	from POLICY PERIOD to	PREV. COVERAGE	AGENCY
CK02102985	12/31/04 12/31/05	CK02102985	2103494

NAMED INSURED AND ADDRESS	AGENT
NEYER, TISEO, HINDO, LTD.; DBA NTH CONSULTANTS, LTD. 38955 HILLS TECH DR; ATTN: A/P CODE: SV907 FARMINGTON HILL MI 48333-9173	PROFESSIONAL CONCEPTS SUITE 402 2950 S STATE STREET ANN ARBOR MI 48104

ST	CLASS CODE	CLASS CODE DESCRIPTION	ACTUAL EXPOSURE	RATE	PREMIUM
PA	92663-002	ENGINEERS OR ARCHITECTS-CONSULTING-NOT ENGAGED IN ACTUAL CONSTRUCTION EXPOSURE BASIS: PAYROLL	634,235	.053	34.00
OH	92663-003	ENGINEERS OR ARCHITECTS-CONSULTING-NOT ENGAGED IN ACTUAL CONSTRUCTION EXPOSURE BASIS: PAYROLL	132,746	4.149	551.00
OH	92663-003	ENGINEERS OR ARCHITECTS-CONSULTING-NOT ENGAGED IN ACTUAL CONSTRUCTION EXPOSURE BASIS: PAYROLL	132,746	.028	4.00
		PRODUCTS			
MI	91135-001	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	512,912	2.073	1,063.00
MI	91135-001	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	512,912	.014	7.00
PA	91135-002	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	56,795	1.823	104.00
PA	91135-002	ANALYTICAL CHEMISTS EXPOSURE BASIS: PAYROLL	56,795	.013	1.00
MI	91581-001	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1,118,200	.968	1,082.00

ISSUE DATE 03-17-06

• 0 1 5 CK02102985 0005 1 •

TRAVELERS INSURED'S COPY

INSURER: ST. PAUL MERCURY INS CO
385 WASHINGTON ST.
ST. PAUL MN 55102

REPORT OF AUDIT

FINAL AUDIT

POLICY NUMBER	from POLICY PERIOD to		PREV COVERAGE	AGENCY
CK02102985	12/31/04	12/31/05	CK02102985	2109494

NAMED INSURED AND ADDRESS	AGENT
NEYER, TISEO, HINDO, LTD.: DBA NTH CONSULTANTS, LTD. 38955 HILLS TECH DR; ATTN: A/P CODE: SV907 FARMINGTON HILL MI 48333-9173	PROFESSIONAL CONCEPTS SUITE 402 2950 S STATE STREET ANN ARBOR MI 48104

ST	CLASS CODE	CLASS CODE DESCRIPTION	ACTUAL EXPOSURE	RATE	PREMIUM
MI	91581-001	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1,118,200	.013	14.00
PA	91581-002	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1	.968	0.00
PA	91581-002	CONTRACTORS-SUBCONTRACTED-CONSTRUCTION,RECONSTRUCTION,REPAIR NOT BUILDINGS EXPOSURE BASIS: COST OF WORK	1	.013	0.00

ISSUE DATE 03/27/06

* C L 5 CK02102985 USOC*5 *

TERRA

DATE: MARCH 1, 2006

INSURED: Never, Tiseo & Hindo, Ltd.
38955 Hills Tech Drive
Farmington Hills, MI 48331

ATTENTION: Kevin Hoppe/Jackie Rochi

POLICY NUMBER: 206075

QUARTERLY PREMIUM REMITTANCE WORKSHEET

FOR THE TERM COMMENCING APRIL 1, 2006 - PREMIUM DUE APRIL 1

Gross Billings, including Environmental: [your fiscal quarter closing on or before 12/31/05, which ends *__ _____]	*$ 8,600,000.	
Gross Environmental Billings (for same quarter reported above)	*$ 3,100,000	
Quarterly Primary Premium:	238240 TWOII 0000-1500	$57,553.00
Quarterly Excess ($1m x $1m) Premium:		$11,470.75
Total Due and Enclosed:		$69,023.75

*To be completed by Insured

Please make check payable to: TERRA INSURANCE COMPANY
(A Risk Retention Group)

Envelope enclosed addressed as shown: Terra Insurance Company
Premium Lock Box Account
P. O. Box 473
Brattleboro, VT 05301-0473

Please note that this P. O. Box should be used for premium remittances only.

To avoid cancellation proceedings, premium must be received by APRIL 1, 2006. Please remit your check with the original copy of this form in the enclosed self-addressed envelope.

Please contact us if you have any questions: Terra Insurance Company
(800) 872-0077 or (415) 927-2901

Quarterly premium = $69,023.75 x 4 = $276,095
Excess from prior Yr Excess = $46,000
Total Annual Premium = $322,095

DATE	DECEMBER 19, 2005
INSURED	Nexteer Tierra & Hindu Ltd 38935 Hills Tech Drive Farmington Hills, MI 48331
ATTENTION:	Kevin Hoppe/Jackie Reed
POLICY NUMBER	206675

ANNUAL 2ND EXCESS ($3M PER CLAIM/$6M AGG. XS $2M PER CLAIM/$2M AGG.)
PREMIUM INVOICE
FOR THE PERIOD 01/01/2006 TO 12/31/2006 – PREMIUM DUE JANUARY 20

025333

Total Premium Due and Enclosed 213,356

00001500 Pay 01/13/06

Please make check payable to:	**TERRA INSURANCE COMPANY** **(A Risk Retention Group)**
Envelope enclosed addressed as shown:	**Terra Insurance Company** **Premium Lock Box Account** **P. O. Box 473** **Brattleboro, VT 05301-0473**

Please note that this P. O. Box should be used for premium remittances only.

To avoid cancellation proceedings, premium must be received by January 20, 2006. Please remit your check with the original copy of this form in the enclosed self-addressed envelope.

Please contact us if you have any questions.

Terra Insurance Company
(800) 872-0077 or (415) 927-2901

* [illegible] Determine Additional Costs for [illegible]
Pooling Pass through
[illegible] 0.24%

NTH Consultants, Ltd.
Infrastructure Engineering
and Environmental Services

Job	Project No.	Sheet No.
Subject	By	Date
[illegible]	Checked By	Date

[illegible] CAT 966 (1999 Rates)

[illegible] 1999 Blue Book	Daily Rate		$ 315/Day
Operating Cost	23.90/Hr	8(23.90)	191.20/Day
Operator	50.55/Hr	8.5(50.55)	429.68
			935.88 (1999)

+ 7 yrs inflation @ 4% = 1,227.[illegible] (2006)

CAT D8K

[illegible] 1999 Blue Book	[illegible]	[illegible]/Day
Operating Cost	38.20/Hr	305.60/Day
Operator	50.55/Hr	429.68/Day
		$1305.28/Day (1999)

+ 7 yrs inflation @ 4% = 1717.65 (2006)

[illegible]

[illegible] [illegible] [illegible] 33.80

[illegible] 50.55/Hr [illegible] 38.20

4-WD ARTICULATED WHEEL LOADERS (cont.)

(Includes General Purpose bucket and ROPS, unless otherwise noted.)

Model (Rebuilt)	Bucket Capacity	HP	Monthly $	Weekly $	Daily $	Hourly $	Estimated Operating Cost $/Hr.
DIESEL POWERED (CONT.)							
CASE (cont.) (Refer to DAVIS for other models.)							
W18B (1984)	1.75 CY	110.0	2,050.00	575.00	145.00	22.00	9.60
W18B (1984)	1.75 CY	110.0	2,105.00	590.00	150.00	23.00	9.75
W20 (1981)	2.00 CY	103.0	1,870.00	525.00	130.00	20.00	9.15
W20 (1981)	2.00 CY	103.0	1,920.00	540.00	135.00	20.00	9.25
▲(with EROPS)							
W20B (1983)	2.00 CY	103.0	1,955.00	545.00	135.00	20.00	9.15
W20B (1983)	2.00 CY	103.0	2,010.00	565.00	140.00	21.00	9.25
▲(with EROPS)							
▲(with EROPS)							
W24C (1984)	2.50 CY	132.0	2,525.00	705.00	175.00	26.00	11.50
W24C (1984)	2.50 CY	132.0	2,585.00	725.00	180.00	27.00	11.65
▲(with EROPS)							
CATERPILLAR							
IT18 (1987)	1.50 CY	85.0	2,145.00	600.00	150.00	23.00	8.80
▲(with EROPS)							
IT18 (1987)	1.50 CY	85.0	2,095.00	585.00	145.00	22.00	8.70
IT28 (1987)	2.00 CY	105.0	2,265.00	635.00	160.00	24.00	9.50
▲(with EROPS)							
IT28 (1987)	2.00 CY	105.0	2,220.00	620.00	155.00	23.00	9.40
920 (1985)	1.75 CY	80.0	2,025.00	565.00	140.00	21.00	8.45
▲(with EROPS)							
920 (1985)	1.75 CY	80.0	1,980.00	556.00	140.00	21.00	8.35
926 (1987)	2.00 CY	105.0	2,230.00	625.00	155.00	23.00	9.45
▲(with EROPS)							
926 (1987)	2.00 CY	105.0	2,180.00	610.00	155.00	23.00	9.35
930 (1985)	2.00 CY	100.0	2,140.00	600.00	150.00	23.00	9.20
▲(with EROPS)							
930 (1985)	2.00 CY	100.0	2,100.00	590.00	150.00	23.00	9.10
936 (1987)	2.50 CY	125.0	2,730.00	765.00	190.00	29.00	11.25
▲(with EROPS)							
936 (1987)	2.50 CY	125.0	2,680.00	750.00	190.00	29.00	11.15
950 (1981)	3.00 CY	130.0	2,585.00	725.00	180.00	27.00	11.70
▲(with EROPS)							
950 (1981)	3.00 CY	130.0	2,530.00	710.00	180.00	27.00	11.55
950B (1987)	3.00 CY	155.0	3,380.00	945.00	235.00	35.00	13.70
▲(with EROPS)							
950B (1987)	3.00 CY	155.0	3,270.00	915.00	230.00	35.00	13.45
966D (1987)	4.00 CY	200.0	4,470.00	1,250.00	315.00	47.00	18.95
▲(with EROPS)							
966D (1987)	4.00 CY	200.0	4,360.00	1,220.00	305.00	46.00	18.85
CDS, INC.							
640 (1986)	.75 CY	57.0	1,150.00	320.00	80.00	12.00	5.75
640 (1986)	.75 CY	57.0	1,200.00	335.00	84.00	13.00	5.85
▲(with EROPS)							
840D (1987)	1.70 CY	83.0	1,710.00	480.00	120.00	18.00	8.05
840D (1987)	1.70 CY	83.0	1,765.00	495.00	125.00	19.00	8.15
▲(with EROPS)							
724 (1987)	1.70 CY	100.0	1,620.00	455.00	115.00	17.00	8.25
CLARK (Refer to VOLVO/MICHIGAN for other models.)							
35C (1986)	1.50 CY	85.0	1,780.00	500.00	125.00	19.00	9.20
▲(with EROPS)							
45C (1986)	2.00 CY	99.0	2,040.00	570.00	145.00	22.00	9.35
▲(with EROPS)							
55B (1980)	2.50 CY	114.0	1,705.00	475.00	120.00	18.00	9.45

4-WD ARTICULATED WHEEL LOADERS (cont.)

(Includes General Purpose bucket and ROPS, unless otherwise noted.)

Model (Yr.Disc.)	Bucket Capacity	HP	Monthly $	Weekly $	Daily $	Hourly $	Estimated Operating Cost $/Hr.
DIESEL POWERED (CONT.)							
CLARK (cont.) (Refer to VOLVO/MICHIGAN for other models.)							
55C (1986)	2.50 CY	121.0	2,140.00	500.00	150.00	23.00	10.10
▲(with EROPS)							
75B (1980)	3.00 CY	154.0	2,315.00	650.00	165.00	25.00	12.60
75B (1980)	3.00 CY	154.0	2,460.00	670.00	170.00	26.00	12.85
▲(with EROPS)							
75C (1986)	3.00 CY	154.0	2,880.00	805.00	200.00	30.00	13.00
▲(with EROPS)							
125B (1980)	4.00 CY	210.0	2,960.00	830.00	210.00	32.00	17.65
125B (1980)	4.00 CY	210.0	3,046.00	855.00	215.00	32.00	17.95
▲(with EROPS)							
125C (1986)	4.00 CY	203.0	3,780.00	1,060.00	265.00	40.00	18.25
▲(with EROPS)							
175B (1980)	5.00 CY	273.0	3,895.00	1,090.00	275.00	41.00	24.50
175B (1980)	5.00 CY	273.0	3,970.00	1,110.00	280.00	42.00	24.75
▲(with EROPS)							
175C (1986)	5.00 CY	279.0	5,020.00	1,405.00	350.00	53.00	28.10
▲(with EROPS)							
275B (1980)	7.00 CY	360.0	5,105.00	1,430.00	360.00	54.00	33.70
275C (1986)	7.00 CY	360.0	6,935.00	1,940.00	485.00	73.00	36.70
▲(with EROPS)							
475B (1980)	12.00 CY	612.0	9,450.00	2,645.00	660.00	99.00	64.90
▲(with EROPS)							
475C (1986)	12.00 CY	612.0	12,620.00	3,535.00	885.00	135.00	69.90
▲(with EROPS)							
475C TURBO (1986)	12.00 CY	616.0	13,665.00	3,825.00	955.00	145.00	73.80
▲(with EROPS)							
DAVIS (Refer to CASE for other models.)							
W4 (1979)	.50 CY	32.0	720.00	200.00	50.00	8.00	3.90
DEERE							
444 (1981)	1.50 CY	85.0	1,610.00	450.00	115.00	17.00	8.05
444 (1981)	1.50 CY	85.0	1,670.00	470.00	120.00	18.00	8.15
▲(with EROPS)							
444C (1986)	1.50 CY	85.0	1,870.00	525.00	130.00	20.00	8.30
444C (1986)	1.50 CY	85.0	1,960.00	550.00	140.00	21.00	8.50
▲(with EROPS)							
444D (1988)	1.50 CY	90.0	1,800.00	505.00	125.00	19.00	8.30
444D (1988)	1.50 CY	90.0	1,930.00	540.00	135.00	20.00	8.40
▲(with EROPS)							
544B (1981)	2.00 CY	105.0	1,810.00	505.00	125.00	19.00	9.00
▲(with EROPS)							
544B (1981)	2.00 CY	105.0	1,760.00	495.00	125.00	19.00	8.90
544C (1986)	2.00 CY	105.0	2,015.00	565.00	140.00	21.00	9.10
544C (1986)	2.00 CY	105.0	2,090.00	585.00	145.00	22.00	9.30
▲(with EROPS)							
544D (1988)	2.00 CY	105.0	1,950.00	545.00	135.00	20.00	8.75
544D (1988)	2.00 CY	105.0	2,000.00	560.00	140.00	21.00	8.85
▲(with EROPS)							
644B (1981)	3.00 CY	145.0	2,345.00	655.00	165.00	25.00	11.85
▲(with EROPS)							
644B (1981)	3.00 CY	145.0	2,295.00	645.00	160.00	24.00	11.70
644C (1985)	3.00 CY	145.0	2,700.00	755.00	190.00	29.00	12.30
644C (1985)	3.00 CY	145.0	2,780.00	780.00	195.00	29.00	12.50
▲(with EROPS)							
644D (1988)	3.00 CY	156.0	2,525.00	705.00	175.00	26.00	11.95
644D (1988)	3.00 CY	155.0	2,575.00	720.00	180.00	27.00	12.05
▲(with EROPS)							

STANDARD CRAWLER DOZERS (cont.)

(Includes dozer blade and operator protection as listed.)

Model (Yr. Effec.)	Dozer	Operator Protection	HP	Monthly $	Weekly $	Daily $	Hourly $	Estimated Operating Cost $/Hr.
DIESEL POWERED (CONT.)								
CATERPILLAR (cont.)								
D6K (1984)	Angle	ROPS	300.0	8,245.00	2,310.00	580.00	87.00	30.80
D6K (1984)	Bulldozer	EROPS	300.0	8,600.00	2,410.00	605.00	91.00	31.45
D6K (1984)	Bulldozer	ROPS	300.0	8,200.00	2,295.00	575.00	86.00	30.70
D6K (1984)	Straight	EROPS	300.0	8,515.00	2,385.00	595.00	89.00	31.20
D6K (1984)	Straight	ROPS	300.0	8,115.00	2,270.00	570.00	86.00	30.55
D6H (1980)	Angle	EROPS	410.0	10,840.00	3,035.00	760.00	115.00	44.20
D6H (1980)	Angle	ROPS	410.0	10,470.00	2,930.00	735.00	110.00	43.35
D6H (1980)	Cushion	EROPS	410.0	10,790.00	3,020.00	755.00	115.00	44.05
D6H (1980)	Cushion	ROPS	410.0	10,415.00	2,915.00	730.00	110.00	43.20
D6H (1980)	Full-U	EROPS	410.0	10,925.00	3,060.00	765.00	115.00	44.40
D6H (1980)	Full-U	ROPS	410.0	10,550.00	2,955.00	740.00	110.00	43.55
D6H (1980)	Straight	EROPS	410.0	10,700.00	2,995.00	750.00	115.00	43.85
D6H (1980)	Straight	ROPS	410.0	10,325.00	2,890.00	725.00	110.00	43.00
D6L (1987)	Cushion	EROPS	460.0	13,575.00	3,800.00	950.00	145.00	49.65
D6L (1987)	Cushion	ROPS	460.0	13,295.00	3,725.00	930.00	140.00	49.05
D6L (1987)	Straight	EROPS	460.0	13,765.00	3,855.00	965.00	145.00	50.05
D6L (1987)	Straight	ROPS	460.0	13,480.00	3,775.00	945.00	140.00	49.45
D6L (1987)	U Blade	EROPS	460.0	13,800.00	3,865.00	965.00	145.00	50.15
D6L (1987)	U Blade	ROPS	460.0	13,515.00	3,785.00	945.00	140.00	49.55
D10 (1986)	Straight	EROPS	700.0	20,270.00	5,675.00	1,420.00	215.00	73.70
DEERE								
350C (1986)	Power Angle Tilt	EROPS	42.0	1,945.00	545.00	135.00	20.00	7.00
350C (1986)	Power Angle Tilt	ROPS	42.0	1,860.00	520.00	130.00	20.00	6.90
350D (1988)	Power Angle Tilt	EROPS	48.0	1,950.00	546.00	135.00	20.00	7.25
350D (1988)	Power Angle Tilt	ROPS	48.0	1,870.00	525.00	130.00	20.00	7.10
450C (1985)	Power Angle Tilt	EROPS	65.0	2,415.00	675.00	170.00	26.00	8.85
460C (1985)	Power Angle Tilt	ROPS	65.0	2,325.00	650.00	165.00	25.00	8.70
450D (1985)	Power Angle Tilt	EROPS	67.0	2,580.00	720.00	180.00	27.00	9.20
450D (1985)	Power Angle Tilt	ROPS	67.0	2,415.00	675.00	170.00	26.00	8.95
460E (1987)	Power Angle Tilt	ROPS	70.0	2,285.00	640.00	160.00	24.00	8.80
550 (1984)	6405 Inside Hyd	EROPS	72.0	2,725.00	765.00	190.00	29.00	9.70
550 (1984)	6405 Inside Hyd	ROPS	72.0	2,635.00	740.00	185.00	28.00	9.56
550 (1984)	6410 Outside Hyd	EROPS	72.0	2,665.00	745.00	185.00	28.00	9.60
550 (1984)	6410 Outside Hyd	ROPS	72.0	2,575.00	720.00	180.00	27.00	9.45
550 (1984)	Power Angle Tilt	EROPS	72.0	2,705.00	755.00	190.00	29.00	9.85
550 (1984)	Power Angle Tilt	ROPS	72.0	2,615.00	730.00	185.00	28.00	9.50
550A (1985)	Power Angle Tilt	EROPS	78.0	2,935.00	820.00	205.00	31.00	10.30
550A (1985)	Power Angle Tilt	ROPS	78.0	2,770.00	775.00	195.00	29.00	10.05
550B (1987)	Power Angle Tilt	EROPS	78.0	2,700.00	755.00	190.00	29.00	9.85
550B (1987)	Power Angle Tilt	ROPS	78.0	2,545.00	715.00	180.00	27.00	9.60
750 (1985)	Semi-U	EROPS	110.0	4,010.00	1,125.00	280.00	42.00	13.55
750 (1985)	Semi-U	ROPS	110.0	3,585.00	1,005.00	250.00	38.00	13.20
850 (1987)	Angle	EROPS	145.0	4,620.00	1,295.00	325.00	48.00	16.30
850 (1987)	Angle	ROPS	145.0	4,380.00	1,225.00	305.00	46.00	15.85
DRESSER (Refer to INTERNATIONAL for other models.)								
TD7E (1987)	Angle	ROPS	65.0	2,480.00	695.00	175.00	26.00	8.90
TD7E (1987)	Hydraulic Angle	ROPS	65.0	2,446.00	685.00	170.00	26.00	8.85
TD7E (1987)	Hydraulic Tilt Angle	ROPS	65.0	2,460.00	690.00	175.00	26.00	8.90
TD8E (1987)	Hyd Angle Man Tilt	ROPS	78.0	2,870.00	805.00	200.00	30.00	10.15
TD8E (1987)	Hydraulic Tilt Angle	ROPS	78.0	2,900.00	810.00	205.00	31.00	10.20
TD20E (1988)	Hyd Semi-U w/Tilt	EROPS	210.0	6,755.00	1,890.00	475.00	71.00	22.75
TD20E (1988)	Hyd Semi-U w/Tilt	ROPS	210.0	6,485.00	1,815.00	455.00	68.00	22.25
TD20E (1988)	Hydraulic Angle	EROPS	210.0	6,700.00	1,875.00	470.00	71.00	22.65
TD20E (1988)	Hydraulic Angle	ROPS	210.0	6,430.00	1,800.00	450.00	68.00	22.20
TD25E (1985)	Angle	EROPS	310.0	8,485.00	2,370.00	595.00	89.00	32.00

TRACTORS & EARTHMOVING

STANDARD CRAWLER DOZERS (cont.)

(Includes dozer blade and operator protection as listed.)

Model (Yr.Disc.)	Dozer	Operator Protection	HP	Monthly $	Weekly $	Daily $	Hourly $	Estimated Operating Cost $/Hr.
DIESEL POWERED (CONT.)								
DRESSER (cont.)								
(Refer to INTERNATIONAL for other models.)								
TD25E (1985)	Angle	ROPS	310.0	8,175.00	2,290.00	575.00	86.00	31.45
TD25E (1985)	Hyd Semi-U w/Tilt	EROPS	310.0	8,525.00	2,385.00	595.00	89.00	32.10
TD25E (1985)	Hyd Semi-U w/Tilt	ROPS	310.0	8,230.00	2,305.00	575.00	86.00	31.55
FIATALLIS								
88 (1985)	Hyd Angle w/Tilt	EROPS	88.0	3,020.00	845.00	210.00	32.00	11.00
88 (1985)	Hyd Angle w/Tilt	ROPS	88.0	2,840.00	795.00	200.00	30.00	10.70
88 (1985)	Hyd Semi-U w/Tilt	EROPS	88.0	2,975.00	835.00	210.00	32.00	10.95
88 (1985)	Hyd Semi-U w/Tilt	ROPS	88.0	2,795.00	785.00	195.00	29.00	10.65
88 (1985)	Hydraulic Angle	EROPS	88.0	2,995.00	840.00	210.00	32.00	10.95
88 (1985)	Hydraulic Angle	ROPS	88.0	2,815.00	790.00	200.00	30.00	10.70
88 (1985)	Straight w/Hyd Tilt	EROPS	88.0	2,980.00	835.00	210.00	32.00	10.95
88 (1985)	Straight w/Hyd Tilt	ROPS	88.0	2,800.00	785.00	195.00	29.00	10.65
108 (1979)	Hyd Semi-U w/Tilt	ROPS	110.0	2,925.00	820.00	205.00	31.00	12.36
168 (1981)	Hydraulic Angle	ROPS	195.0	4,795.00	1,345.00	335.00	50.00	19.25
168 (1981)	Straight	ROPS	195.0	4,760.00	1,335.00	336.00	50.00	19.20
21C (1981)	Angle	EROPS	273.0	7,325.00	2,060.00	515.00	77.00	28.75
21C (1981)	Angle	ROPS	273.0	6,880.00	1,955.00	490.00	74.00	28.10
21C (1981)	Hydraulic Angle	EROPS	273.0	7,370.00	2,065.00	515.00	77.00	28.80
21C (1981)	Hydraulic Angle	ROPS	273.0	7,035.00	1,970.00	495.00	74.00	28.15
21C (1981)	Hydraulic Semi-U	EROPS	273.0	7,365.00	2,060.00	515.00	77.00	28.80
21C (1981)	Hydraulic Semi-U	ROPS	273.0	7,030.00	1,970.00	495.00	74.00	28.15
21C (1981)	Hydraulic U	EROPS	273.0	7,345.00	2,055.00	515.00	77.00	28.75
21C (1981)	Hydraulic U	ROPS	273.0	7,010.00	1,966.00	490.00	74.00	28.10
21C (1981)	Semi-U	EROPS	273.0	7,285.00	2,040.00	510.00	77.00	28.65
21C (1981)	Semi-U	ROPS	273.0	6,950.00	1,945.00	486.00	73.00	28.00
31 (1982)	Cushion	EROPS	425.0	11,580.00	3,240.00	810.00	120.00	45.75
31 (1982)	Cushion	ROPS	425.0	11,260.00	3,155.00	790.00	120.00	46.05
31 (1982)	Hydraulic U	EROPS	425.0	11,405.00	3,195.00	800.00	120.00	45.35
31 (1982)	Hydraulic U	ROPS	425.0	11,085.00	3,105.00	775.00	115.00	44.85
31 (1982)	Semi-U	EROPS	425.0	11,320.00	3,170.00	795.00	120.00	45.15
31 (1982)	Semi-U	ROPS	425.0	11,000.00	3,080.00	770.00	115.00	44.45
FD40 (1968)	Cushion	ROPS	456.0	14,470.00	4,050.00	1,015.00	150.00	52.16
FD40 (1968)	Semi-U	ROPS	455.0	13,840.00	3,875.00	970.00	145.00	50.80
FD40 (1968)	U Blade	ROPS	455.0	13,940.00	3,905.00	975.00	145.00	51.00
41B (1982)	Cushion	EROPS	524.0	16,050.00	4,495.00	1,125.00	170.00	59.50
41B (1982)	Cushion	ROPS	524.0	15,770.00	4,415.00	1,105.00	165.00	58.90
41B (1982)	Hydraulic Semi-U	EROPS	524.0	15,775.00	4,415.00	1,105.00	165.00	58.90
41B (1982)	Hydraulic Semi-U	ROPS	524.0	15,495.00	4,340.00	1,085.00	165.00	58.30
41B (1982)	Hydraulic U	EROPS	524.0	16,095.00	4,505.00	1,125.00	170.00	59.80
41B (1982)	Hydraulic U	ROPS	524.0	15,815.00	4,430.00	1,110.00	165.00	59.00
INTERNATIONAL								
(Refer to DRESSER for other models.)								
TD7E (1985)	Hydraulic Angle	ROPS	65.0	2,345.00	655.00	165.00	25.00	8.75
TD7E (1985)	Hydraulic Tilt Angle	ROPS	65.0	2,375.00	665.00	165.00	25.00	8.80
TD8E (1985)	Hydraulic Angle	ROPS	78.0	2,765.00	775.00	195.00	29.00	10.05
TD8E (1985)	Hydraulic Tilt Angle	ROPS	78.0	2,800.00	785.00	195.00	29.00	10.15
TD12 (1985)	Angle w/Tilt	EROPS	110.0	4,075.00	1,140.00	285.00	43.00	13.80
TD12 (1985)	Angle w/Tilt	ROPS	110.0	3,845.00	1,075.00	270.00	41.00	13.40
TD12 (1985)	Straight w/Tilt	EROPS	110.0	3,960.00	1,110.00	280.00	42.00	13.60
TD12 (1985)	Straight w/Tilt	ROPS	110.0	3,730.00	1,045.00	260.00	39.00	13.20
TD15C (1985)	Angle	ROPS	140.0	4,410.00	1,235.00	310.00	47.00	15.95
TD15C (1985)	Hydraulic Semi-U	ROPS	140.0	4,365.00	1,220.00	305.00	46.00	15.85
TD20E (1985)	Hyd Semi-U w/Tilt	EROPS	210.0	6,695.00	1,875.00	470.00	71.00	22.90
TD20E (1985)	Hyd Semi-U w/Tilt	ROPS	210.0	6,420.00	1,800.00	450.00	68.00	22.45
TD20E (1985)	Hydraulic Angle	EROPS	210.0	6,750.00	1,890.00	475.00	71.00	23.00

SCHEDULE OF EQUIPMENT USAGE RATES

NTH Consultants, Ltd. will provide the following equipment for use on projects for which we are performing consulting services. The equipment will be charged to the project for the duration of its use on the project. In addition to personnel charges, the following rates will apply:

Usage Code				
		Geotechnical Equipment		
GT	105	Frequency Analyzer/DAT Recorder/Low Frequency Accelero	$ 4,000	/ Project
GT	110	Blast Monitoring Seismograph	$ 80	/ Day Plus paper
GT	162	Digitilt Inclinometer	$ 50	/ Day
GT	143	Power Auger Equipment	$ 50	/ Day
		Groundwater Monitoring and Sampling Equipment		
GW	586	Water Level Chart Recording Equipment	$ 25	/ Day
GW	156	Electric Data Logger with Transducer	$ 125	/ Day
GW	163	Portable Computer	$ 30	/ Day
GW	134	Pneumatic Piezometer Readout Control	$ 30	/ Day
GW	149	Inertial Lift Pump	$ 12	/ Day Plus Tubing
GW	183	Submersible Sampling Pump	$ 80	/ Day
GW	181	Grundfos Pump	$ 175	/ Day
GW	106	Interface Probe	$ 40	/ Day
GW	131	Water Level Recording Device	$ 25	/ Day
GW	226	Peristaltic Pump	$ 35	/ Day
GW	109	Sediment Sampler	$ 15	/ Day
		Geophysical Equipment		
GP	311	Ground Penetrating Radar (250 MHZ)	$ 250	/ Day
GP	128	Resistivity Meter	$ 40	/ Day
GP	127	Magnetometer	$ 160	/ Day
GP	129	Electromagnetic Utility Line Locator	$ 50	/ Day
		Environmental Monitoring Equipment		
EM	120	Photoionization (HNu) Meter	$ 100	/ Day - $400 / Week
EM	159	Flame Ionization Detector (FID)	$ 150	/ Day - $500 / Week
EM	122	Tri/Quad-Gas Meter	$ 42	/ Day
EM	863	Portable Air Sampling Pump	$ 60	/ Day
EM	135	pH Meter	$ 42	/ Day
EM	135	Specific Conductivity Meter	$ 42	/ Day
EM	135	Dissolved Oxygen Probe	$ 42	/ Day
EM	856	X-Ray Florescence Detector	$ 100	/ Day Plus $10 / Sample
EM	817	Small Bore Soil Sampling Probe	$ 75	/ Day

Equipment rented by NTH Consultants, Ltd. for use on any specific project will be charged at cost plus 15%.

NTH Consultants, Ltd.
EFFECTIVE 2006

SCHEDULE OF EQUIPMENT USAGE RATES

NTH Consultants, Ltd. will provide the following equipment for use on projects for which we are performing consulting services. The equipment will be charged to the project for the duration of its use on the project. In addition to personnel charges, the following rates will apply:

Usage Codes

			Environmental Health Personal Safety Protection Equipment	
→	EH	117	Level D	$ 35 / Person / Day
	EH	116	Level C	$ 80 / Person / Day
	EH	115	Level B	$ 170 / Person / Day
			Concrete / Asphalt Equipment	
	CA	730	Floor Profiling Device	$ 60 / Day
	CA	147	Windsor Probe Equipment	$ 30 / Day and $12 / Probe
	CA	160	Pacohmeter (R-Meter)	$ 25 / Day
	CA	194	Concrete Coring Equipment	$ 75 / Day
→	CA	223	Generator	$ 75 / Day
	CA	180	Rotary Hammer Drill	$ 25 / Day
	CA	185	Cut-off Saw (Plus Blades)	$ 40 / Day Plus Blades
	CA	190	Asphalt Field Marshall Test Equipment	$ 50 / Day
	CA	645	DR-Meter	$ 25 / Day
	CA	193	Borescope	$ 50 / Day
	CA	681	Light Meter	$ 15 / Day
	CA	683	Spotting Scope	$ 15 / Day
	CA	684	Swiss Hammer	$ 10 / Day
	CA	685	Tie Locator	$ 20 / Day
	CA	816	Moisture Emission Test Kit	$ 25 / Each
	CA	753	Ferroscan -- Steel Reinforcement Detection System	$ 75 / Day
	CA	752	Impact Echo Equipment (Thickness)	$ 50 / Day
	CA	647	Coating Thickness Gauge	$ 25 / Day
	CA	749	Thermocouples	$ 25 / Each
			Steel Equipment	
	SE	114	Ultrasonic Equipment	$ 60 / Day
	SE	221	Torque Wrench Calibration Apparatus (Skidmore)	$ 40 / Day
	SE	643	Paint Thickness Gauge	$ 25 / Day
	SE	720	Dye Penetrant Test Material	$ 20 / Each
	SE	721	Hardness Tester	$ 40 / Day
	SE	723	Magnetic Particle Equipment - Prods	$ 50 / Day
	SE	722	Magnetic Particle Equipment - Yoke	$ 25 / Day
	SE	724	Torque Multiplier	$ 12 / Day

Equipment rented by NTH Consultants, Ltd. for use on any specific project will be charged at cost plus 15%.

NTH Consultants, Ltd.
FEBRUARY 2006

SCHEDULE OF EQUIPMENT USAGE RATES

NTH Consultants, Ltd. will provide the following equipment for use on projects for which we are performing consulting services. The equipment will be charged to the project for the duration of its use on the project. In addition to personnel charges, the following rates will apply:

Usage Code			
		Roofing Equipment	
RE	207	Infrared Moisture Detection Equipment	
		Mobilization	$ 200 / Project
		Project Usage	$ 250 / Day
RE	215	Electrical Capacitance Moisture Detection Equipment	$ 50 / Day
RE	220	Troxler Nuclear Roof Moisture Gauge	$ 50 / Day
RE	118	Photographic Equipment	$ 10 / Day + Film + Development
RE	168	Video Recorder	$ 50 / Day
RE	217	Roof Wind Uplift Equipment	$ 50 / Day
		Various Test and Field Equipment	
VE	190	Troxler Nuclear Moisture Density Gauge	$ 50 / Day
VE	267	Housel Penetrometer	$ 20 / Day
VE	258	Vacuum Box for Field Testing of Geosynthetics	$ 30 / Day
VE	690	Field Proctor Set	$ 40 / Day
VE	139	Four-Wheel Drive Vehicle Excluding Mileage	$ 60 / Day
VE	195	Field Office Trailer	$ 240 / Month
		Field Laboratory	
VE	201	Soils Only	$ 325 / Month
VE	202	Soils and Concrete	$ 500 / Month
VE	204	Asphalt	$ 50 / Day or $ 325 / Month
→ VE	848	Cellular Phone (Field Projects)	$ 12 / Day
VE	727	Metal Detector	$ 12 / Day
VE	728	Air Compressor	$ 30 / Day
→ VE	156	Survey Equipment	$ 20 / Day
		Tunnel Inspection Equipment	
		Tunnel Safety Equipment Including Lights, Breathing Apparatus, Gas Meters, Fall Control Device, Rope Ladder	
TI	208	Walking Sticks, Boots and Protective Equipment	$ 500 / Day
TI	209	10 Minute ELSEA Escape Pack	$ 25 / Day
TI	210	5 Minute ELSEA Escape Pack	$ 15 / Day
→ TI	200	30 Minute SCBA	$ 50 / Day
TI	211	Cascade Respirator System (8 Person Maximum)	$ 200 / Day
TI	212	50 Foot Fall Control Device	$ 100 / Day
TI	213	40 Foot Rope Ladder	$ 25 / Day
TI	216	Tunnel Ventilator	$ 75 / Day

Equipment rented by NTH Consultants, Ltd. for use on any specific project will be charged at cost plus 15%.

NTH Consultants, Ltd.
FEB/91 - 10005

Somat Engineering, INCORPORATED

May 17, 2006

Mr. Ted Stone, Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

Dear Mr. Stone:

Herein are statements in regards to the following:

1. Commitment to the Project

SOMAT Engineering, Inc. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither SOMAT Engineering, Inc. personnel nor SOMAT Engineering, Inc. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed, or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

SOMAT Engineering, Inc. understands it will be compensated on a cost-plus-fixed fee basis.

Sincerely,
SOMAT Engineering, Inc.

G. Ramanujam, P.E. (Ram)
President

660 Woodward Ave, Suite 1243, Detroit, Michigan 48226 web: www.somateng.com phone 313-963-2721 fax. 313-963-2736 email: info@somateng.com

Infrastructure Engineering Solutions

Oil-Ex Inc.

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

1. Commitment to the Project

Oil Ex, Inc. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither Oil Ex, Inc. personnel or Oil Ex, Inc. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

Oil Ex, Inc. understands it will be compensated on a time and materials basis.

T. E. Haines

415 S. Union 2nd Floor Suite 1 • Traverse City, Michigan 49684
231-941-4601 Fax 231-941-4272

Z-Seis Corporation
6209 Windfern
Houston, Texas 77040
Tel: 832-236-4517
Fax 713-690-5970

Bruce P. Marion
President
bmarion@z-seis.com

May 17, 2006

Mr. Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

Dear Mr. Stone:

Z-Seis Corporation is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither Z-Seis personnel nor Z-Seis Corporation as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Z-Seis Corporation understands it will be compensated on a time and materials basis.

Very truly yours,

Bruce P. Marion
President

SOCON Sonar Well Services, Inc.

May 18, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202
Cell: 502.396.2131
Phone: 502.587.7221

1. Commitment to the Project

SOCON Sonar Well Services, Inc. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither SOCON Sonar Well Services, Inc. personnel or SOCON Sonar Well Services, Inc. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

SOCON Sonar Well Services, Inc. understands it will be compensated on a time and materials basis.

Sincerely,

Jason McCartney
Vice President

11133 I-45 South, Ste.E
Conroe, TX 77302

Office: (936) 441-5801
Fax: (936) 539-6847

AMERICAN DRILLING & TESTING CO., INC.

4041 Martel ♦ P.O. Box 3059 ♦ Melvindale, Michigan 48122 ♦ (313) 389-5300
Fax (313) 389-5346 ♦ E-mail americandrill80@aol.com ♦ Web americandrilling.org

October 31, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

RE: American Drilling and Testing Soil Boring Services

Dear Mr. Stone,

American Drilling and Testing is pleased to be on the consulting team working on the Detroit River International Crossing Project.

American Drilling and its employees do not have a conflict of interest or potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. American Drilling warrants that it does not have any special knowledge of or access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership
- The Work/Service to preformed under future contractual agreement
- Pricing of the Work Service to be performed; or
- The letter of Interest evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to American Drilling.

American Drilling and Testing understands it will be compensated on a time and materials basis.

Sincerely,

John C. Corbin
Vice President/Secretary

MichiganTech
Michigan Technological University

Research & Sponsored Programs
308 Administration Building
1400 Townsend Drive
Houghton, Michigan 49931-1295
906-487-2225 • Fax 906-487-2245

October 25, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

RE: MTU Proposal #061081, "DRIC Gravity Measurement Interpretation"
PI: Jimmy Diehl

Dear Mr. Stone,

Michigan Technological University (MTU) is pleased to be part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither MTU personnel nor MTU as a firm has a conflict of interest or potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership
- The Work/Service to preformed under future contractual agreement
- Pricing of the Work Service to be performed; or
- The Letter of Interest evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Michigan Technological University understands it will be compensated on a time and materials basis, reimbursement for actual expenditures including their federally approved indirect cost rate.

Sincerely,

Anita Quinn

Anita Quinn
Director, Research & Sponsored Programs

ALQ/klb

BAKER HUGHES

Baker Atlas

Baker Atlas
2222 Enterprise Dr.
Mt. Pleasant, Mi. 48858
Tel (989) 773-7992
Fax (989) 772-5083
E-mail:
Ken.moss@bakeratlas.com

Ken Moss
Account Manager

October 31, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

Dear Mr. Stone,

Baker Atlas, a division of Baker Hughes Oilfield Operations, Inc. ("Baker Atlas") is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither Baker Atlas personnel nor Baker Atlas as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Baker Atlas understands it will be compensated on a time and materials basis.

Sincerely,

Ken Moss
Account Manager
Mt. Pleasant, Michigan

Edward J. Cording Geotechnical Consultant
P. 0. Box 125 4 College Park Court Savoy, IL 61874
Phone 217 351 8709 **Fax 217 351 8700**

May 19, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202
Cell: 502.396.2131
Phone: 502.587.7221

Dear Mr. Stone:

Edward J. Cording is pleased to be part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither Edward J. Cording, as an individual, nor Edward J. Cording (sole proprietor) as a firm, has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Edward J. Cording understands he will be compensated on a unit cost plus directs basis.

Sincerely yours,

Edward J. Cording

TURPENINE

Michigan Technological University

Research and Sponsored Programs

308 Administration Building
1400 Townsend Drive
Houghton, Michigan 49931-1295
906-487-2225 • Fax 906-487-2245

June 6, 2006

Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202

Dear Mr. Stone:

Michigan Technological University is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

Neither Michigan Technological University personnel or Michigan Technological University as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

* The Ontario-Michigan Border Transportation Partnership,
* The Work/Services to performed under future contractual agreement;
* Pricing of the Work Services to be performed; or
* The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

Michigan Technological University understands it will be compensated on a time and materials basis, reimbursed for actual expenditures including their federally approved indirect cost rate.

Sincerely,

Anita Quinn

Anita Quinn
Director

WWW.MICROGLACOSTE.COM

Date: 23 October 2006

To: Ted Stone
Vice President
The Corradino Group
200 S. Fifth Street, Suite 300N
Louisville, KY 40202
Cell: 502.396.2131
Phone: 502.587.7221

1. Commitment to the Project

Micro-g LaCoste, Inc. is pleased to be a part of the consultant team working on the Detroit River International Crossing Project and is committed to working on the project.

2. Conflict of Interest

Neither Micro-g LaCoste, Inc. personnel or Micro-g LaCoste, Inc. as a firm has a conflict of interest or a potential conflict of interest as defined in the Letter of Interest request issued by the Michigan Department of Transportation for the Detroit River International Crossing Project. The consultant warrants that it does not have any special knowledge of or exceptional access to confidential information concerning:

- The Ontario-Michigan Border Transportation Partnership,
- The Work/Services to be performed under future contractual agreement;
- Pricing of the Work/Services to be performed; or
- The Letter of Interest evaluation process and/or Request for Proposal evaluation process, where such special knowledge of or exceptional access to confidential information may prejudice the Michigan Department of Transportation or constitute an unfair advantage to the consultant.

3. Basis of Payment

Micro-g LaCoste, Inc. understands it will be compensated on a time and materials basis.

Best regards,

Timothy M. Niebauer
President, Micro-g LaCoste Inc.

Attachment B

NTH Draft Technical Report on "Comparison of Pseudo 3-D Surface Seismic, Vertical Seismic Profiling (VSP/RVSP) and Crosswell Reflection Tomography Geophysical Methods"

DRAFT:

Technical Report on Comparison of Pseudo 3-D Surface Seismic, Vertical Seismic Profiling (VSP/RVSP) and Crosswell Reflection Tomography Geophysical Methods

Proposed Detroit River International Crossing

Prepared by:

NTH Consultants, Ltd.
In cooperation with Mr. Bruce Marion of Z-Seis Reservoir Seismic and Dr. Roger Turpening of Michigan Technological University

Prepared for:

The Corradino Group
In Partnership with
Parsons Transportation Group

Project No. 15-050014-01
March 21, 2006

Mr. Joseph Corradino, P.E.
The Corradino Group
First Trust Center, Suite 300 North
Louisville, KY 40202

March 21, 2006
Project No. 15-050014-01

Re: DRAFT Technical Report on Comparison of Pseudo 3-D Surface Seismic, Vertical Seismic Profiling (VSP/RVSP) and Crosswell Reflection Tomography Geophysical Methods
Proposed Detroit River International Crossing
Detroit, Michigan

Dear Mr. Corradino:

In accordance with your request, we are pleased to submit the attached technical report in comparison of Pseudo 3-D surface seismic, vertical seismic profiling (VSP/RVSP), and crosswell reflection tomography geophysical methods. The purpose of this report is to provide a technical overview of the advantages and disadvantages of the methods as it relates to the proposed Brine Well Cavity Investigation for the Detroit River International Crossing. This report technically explains and confirms our intended investigation methods, as illustrated in our October 14, 2005 Revised Proposal for Geotechnical Services, Brine Well Investigation; as well as subsequent communications.

We look forward to our continuing involvement with this project. If you have any questions regarding this report, please call.

Sincerely,

NTH Consultants, Ltd.

Craig R. Johnson
Assistant Project Engineer

Joseph B. Alberts, P.E.
Principal Engineer

Fritz J. Klingler, P.E.
Vice President, Project Manager

CRJ/JBA/FJK/
Attachments
cc: Ms. Regine Beauboeuf, P.E. – Parsons Transportation

1.0 INTRODUCTION

The Michigan Department of Transportation (MDOT) has identified the need for a new crossing of the Detroit River between Southeast, Michigan and Southwest, Ontario. At this time, the project team is in the process of defining Practical Alternatives. As part of earlier work, a number of alternatives were considered, with corridors designated as X-10 and X-11 currently under selection. Both of these corridors are contained within the areas north of Zug Island and the existing Ambassador Bridge in southeast Detroit. A bridge has been identified as the practical crossing structure type within these corridors.

The general area that contains the two corridors has been known to contain or be near to suspected solution-mining areas. Therefore, work was approved to further investigate the historical solution mining activities for one of the corridors in the area, and to assess the competence and suitability of bedrock formations in these areas to support bridge foundations. Known areas of solution mining, preliminarily identified and discussed in NTH's Geotechnical Evaluation report dated December 28, 2005, are located on Zug Island and to the southern end of the project study area. The solution mining areas are further identified and discussed in NTH's Draft Preliminary Report on Historical Solution Mining Activities, dated January 23, 2006.

1.1 Summary of Overburden Information

The bedrock along the project corridor is overlain by approximately 100 feet of glacially deposited soils (drift), which have been deposited either directly by glacial ice (till), by glacial meltwater streams (glaciofluvial), or by glacial lakes (lacustrine deposits). The upper soil formations along the alignment generally consist of a relatively thick mantle of Wisconsin aged lacustrine clays (10,000 to 50,000 years ago) that, with the exception of the near-surface deposits, are typically medium to stiff in consistency. The lacustrine soils were deposited as sediments from a series of glacial lakes impounded between the ice front and the Inner Defiance Moraine located near the northwest corner of Wayne County. The upper 10 to 20 feet of these deposits have been desiccated during historical low water periods, resulting in soils of very stiff to hard consistency near the surface. The clay soils frequently contain intermittent sand and gravel layers that were produced from glacial rivers carrying coarser sediments as lake levels fluctuated. Localized alluvial soils are also present in test borings performed adjacent to the existing Detroit River, but tend to pinch-out with distance from the river. In some locations, relatively thick layers of sand and gravel identify lake shorelines.

The lacustrine deposits are typically underlain by a thin layer of highly over-consolidated glacial till, generally consisting of sand, silt, and gravel within a matrix of clay. This formation is locally termed "hardpan" and usually overlies the bedrock formation. Depending on the amount of clay binder contained in the hardpan, the material may range in nature from cohesive to granular. The hardpan is generally believed to be from the Illinoian Ice age (200,000 years ago) and can also contain calcium carbonate, producing a cemented condition.

1.2 Summary of Bedrock Information

The proposed crossing corridor is located at the geologically termed southeast margin of the Michigan Basin and within the Erie-Huron lowland. The Michigan Basin is termed as such due to the structural basin shape of the bedrock, in which layers of sedimentary rock dip inwards to the center of the Southern Peninsula from each direction as a series of bowls. The youngest

layers of bedrock are located in the center of the state, with older rock layers progressing outwards to the outer margins. Lowland areas occur where the bedrock surface is relatively low compared to other areas of the basin.

The upper bedrock at approximately 5,200 meters (17,000 feet) in thickness in the crossing corridor area is sedimentary and primarily composed of materials deposited in salty seas during the Middle Epoch of the Devonian Period of the Paleozoic Era, or approximately 260 million years ago. As the bedrock was being formed during this time, each layer subsided towards the center of the state and new layers formed on top and within the depression. Due to the size of the seas and the distance to the shorelines from the Detroit area, soils were generally deposited on the seabeds resulting in fairly uniform bedrock layers. The seas regressed late in the Paleozoic era and are thought to have never returned.

Table No 1, as follows, defines the horizons at which each rock formation is anticipated at the proposed bridge crossing locations, along with it's corresponding expected seismic velocity. This information is based mostly on a large volume of test data from Michigan Technological University's Reservoir Delineation Test Site in Thompsonville Michigan. The expected formation seismic velocity contrast will be utilized in the imaging of brine well cavities, "bulked up" cavities, or collapsing and rubbleized zones. Seismic and reflection based geophysical methods rely on the signal attenuation and/or reflection at theses boundaries for target detection.

Formation	Anticipated Depth to Formation Top (feet)	Expected Formation Seismic Velocity (fps)
Dundee Limestone	100	17,200
Detroit River Group	167	20,000
Sylvania Sandstone	462	18,000
Bois Blanc Formation	548	17,500
Bass Islands Group	592	20,500
Salina G-Unit	847	17,500
Salina F-Unit ("First Salt")	910	14,000
Salina E-Unit	1,152	13,000-17,000
Salina D-Unit	1,255	13,000-17,000
Salina C-Unit	1,295	13,000-17,000
Salina B-Unit ("B-Salt")	1,428	12,000
Saturated Brine	900 - 1,500	5,900

Table 1. Anticipated Depth to Formations Tops with Expected Formation Seismic Velocities.

1.3 Solution Mining History

The Michigan Basin is one of the largest areas of halite (salt-NaCl) deposition in the world. Halite has historically been mined either directly in solid form as rock salt or as natural or artificial brine pumped through solution mining wells. The area beneath Detroit and Windsor within the Michigan Basin is currently mined using only conventional room and pillar excavation methods. Historically, beginning in the late 1880s, solution mining was used to mine for salt. Generally, the solution wells are thought to extend to depths of 1,100 to 1,300 feet in the study area according to available historic information. Available historic information also suggests that the potential solution mining cavities created in the study areas were produced with uncontrolled methods. The tops of the cavities are assumed to be irregular, poor seismic reflectors, and approximately 50 to 200 feet in diameter. Solution mining in the Detroit area was discontinued in the late 1950s to early 1960s as a result of

increasing concerns of surface subsidence. Known areas of solution mining, preliminarily identified and discussed in NTH's Geotechnical Evaluation report dated December 28, 2005, are located on Zug Island and to the southern end of the project study area. However, the occurrence of other undocumented brine wells throughout the corridor was not precluded primarily because solution mining companies are known to have owned many parcels along the river in addition to those where brine wells are documented.

With continued production using this method, solution cavities often coalesce with adjacent cavities to form composite cavities called galleries. As production continues in the gallery, large spans of unsupported roofs are sometimes created, which in turn could cause sagging, downward flexure, and local separation of rock units resulting in local roof collapse and eventual surface subsidence in some instances. Uncontrolled solution mining near the top of a salt layer commonly left overlying weak or weakened rocks exposed at the top of the cavity, which increased potential for roof collapses.

Based on the literature, the subsidence and/or collapse typically progresses upwards in a "chimney effect" on an acute angle from vertical outside edges of the cavity. It is believed that in many cases, even where brine cavity roof collapses occur, "bulking" of the collapsed rock above the cavity prevents the collapsed zone from progressing to the surface. However, several large sinkholes are known to have occurred immediately over brine well mining areas, and are attributed to progression of brine cavities to the surface.

Several theories have been published on subsidence progression to the surface in the Detroit area, the more notable of which attributes surface daylighting to failure of the Sylvania Sandstone formation at a depth of approximately 400 feet. According to the theory, the sandstone disintegrates under the induced compression from rock mass sagging, and the fragments filter downwards as granular material into voids below. This results in a void at a depth at approximately 400 feet instead of at the original cavity depth. This mechanism would explain why theoretical "bulking" of broken rock pieces would not be sufficient to fill the cavities before daylighting occurs.

The solution mining areas may be of concern for the proposed crossing locations, as they present the potential for future ground collapse and related adverse effects on elements of the proposed crossing structure. As such, we understand that it will be important to identify and address these issues in the planning and design for the project. As part of the investigation, geophysical methods have been chosen to identify the existence of solution mining caverns within the study area. The methods have been further refined to essentially "clear" a zone free of solution mining cavities and rubbleized or collapsing rock zones in which to locate bridge foundations. For a complete explanation of the proposed geophysical investigation methods, refer to NTH's Revised Proposal for Geotechnical Services, dated October 14, 2005.

2.0 DISCUSSION OF PROPOSED GEOPHYSICAL METHODS

In selecting an appropriate geophysical exploration method for this project, the design team must consider many factors. In situations like those presented in this area, the need for increased resolution becomes the defining point of this type of investigation. As cavity tops are relatively small, irregular, and poor seismic reflectors compared with their depth below ground surface, high resolution becomes necessary to detect and define the limits of the cavities, rubbleized, or collapsing rock zones

under the potential bridge foundation locations. The proposed geophysical method must be capable of adapting the challenging conditions of the environment in which it is implemented. The chosen method must be capable of retaining detailed image resolution, while combating the effects of a noisy city environment, noisy river environment, relatively thick glacial till layers, and the potential for multiple shallow reflectors. The geophysical methods currently under discussion are pseudo 3-D surface seismic, vertical seismic profiling (VSP/RVSP) and crosswell seismic (tomography) with reflection imaging. The following is a discussion of the advantages and disadvantages of the proposed methods currently under discussion.

3.0 SURFACE SEISMIC METHODS

3.1 Advantages of Surface Seismic Methods

Surface seismic methods, including pseudo 3-D surface seismic, have become accepted methods for characterizing large-scale features in the subsurface over large areas. In oil and gas exploration, Pseudo 3-D surface seismic is a standard tool to define large structures that may hold hydrocarbons. Such a method, where surface access is readily available and surface noise levels are low, can be used to rapidly and cost-effectively achieve a gross view of a large area to define targets for more detailed analysis and drilling.

3.2 Disadvantages of Surface Seismic Methods

The disadvantages of surface methods can be summarized as follows: lack of resolution which may make definition of solution mining areas difficult and uncertain. The limited resolution is due to the distance from seismic sources and receivers to the target zone and is compounded by a number of unique aspects of the proposed DRIC crossing locations as identified as follows: urban high noise environment, inaccessibility of the surface for sources and receivers due to urbanization and local population, excessive near-surface attenuation due to the glacial till at the surface, scattering of energy near the surface due to the presence of fill and debris from former industrial operations including concrete chunks, seawalls, buried foundation elements including footings, slabs, basements, etc., and the irregular nature of the top of the solution mining voids. The sections below describe in detail the technical issues and difficulties in using surface seismic methods in the DRIC setting.

3.2.1 Resolution Limitations of Surface Seismic—The Disadvantage of Low Frequency Energy

One of the major disadvantages of surface seismic methods is the fact that only low frequency energy is present due to the long and attenuative travelpaths. High frequency energy, even if it could be generated by surface sources, would be attenuated by the long propagation path and the fact that it must pass through the thick glacial till (100 ft. thick in the survey region) as well a potential weathered bedrock layer. Therefore surface methods, everywhere in the world, are relegated to the low frequency band from 10's of Hertz (Hz.) to 100 or 150Hz. with surveys in Michigan occupying the lower portion of that band due to a relatively thick layer of glacial till.

Three major disadvantages result from this low frequency band.

- Noise from vehicular traffic are in the same band
- Poor detection of targets (if data can be acquired at all)
- Poor resolution (if data can be acquired at all)

The first of these problems is documented here by reprinting verbatim a segment of a paper by Peter Kirk (1981). Below, in the course of discussing the properties of vibrator sweeps (which are also used in downhole sources, thus not solely an advantage for surface sources), Kirk states that noise from vehicular traffic is in the frequency range of 10 to 40 Hz., precisely in the surface seismic signal band, typical of surface surveys performed in Michigan. The section, printed below in its entirely, suggests a way of working around this traffic problem, however his idea is based on sporadic, light, infrequent traffic. Such efforts at working around traffic and other industrial noise common 24-hours per day in the target area, are likely unworkable in the area of Detroit under consideration.

2.3. The Effect of Sweep Length on Noise

The signal-to-noise ratio of Vibroseis records is further improved by the cross-correlation process, and the resultant improvement is dependent on the length of the input sweep. Landrum[3] developed the following relationship for the improvement of signal-to-noise ratio when the noise is of a random nature:

$$\text{S/N improvement} = 20\log_{10}[T(fn_2 - fn_1)]^{1/2}\,\text{dB}$$

$$\text{when} \quad fn_1 < f_1 \qquad \text{and} \qquad fn_2 > f$$

where T = input sweep length in seconds, f_1, f_2 = start and end frequencies of sweep in Hz, and $fn_2 - fn_1$ = bandwidth of the noise in Hz. For 'white' noise, fn_1 and fn_2 will be the lower and upper limits of the recording system: probably the low-cut and anti-alias filters.

All noise with frequencies outside the sweep bandwidth will not correlate at all with the sweep and so will be completely removed. If we ignore the signal-to-noise improvement obtained by removing frequencies outside the

sweep bandwidth (since we would not process such frequencies anyway), the previous equation becomes

$$\text{S/N improvement} = 20[\log_{10}(T\Delta)^{1/2}]\,\text{dB}$$

where Δ = input sweep bandwidth $= f_2 - f_1$.

Inserting some typical figures into the above equation, for a 10–60 Hz sweep the S/N improvement would be 24 dB for a 5 s sweep and 30 dB for a 20 s sweep. Such improvements would be sufficient to eliminate ambient random noise caused by wind, rain, animal movement and normal ground unrest, but not noise caused by heavy vehicles: hence the need for the methods of noise reduction mentioned earlier. It is also important to realise that such figures do not take into account the loss of signal due to earth filtering, especially at the high end of the spectrum. The sweep bandwidth could be doubled, but this would not improve the S/N ratio if little or no signal is recovered at the higher frequencies

Frequency analyses of traffic noise show that it is not truly random but is very band-limited—almost monochromatic. However, it is not possible to predict the frequency a particular vehicle emits since this depends upon the type of vehicle and its engine speed. Unfortunately the noise frequencies generally lie between 10 and 40 Hz: right in the middle of the useful seismic frequency range The length of time during which a vehicle affects a particular channel is also important and for traffic moving at normal speeds this tends to vary between 5 and 10 s Given these facts, we can see that there is a probability of a vehicle passing a particular recording station whilst the vibrators are not vibrating at the noise frequencies which the vehicle is emitting, and furthermore that this probability is directly related to the sweep length. When this occurs the vehicle noise will not correlate with the recorded sweep and thus will not appear on the final record. In this respect, the cross-correlation process acts as a powerful time-variant filter. The process may be illustrated with a plot of time versus frequency (Fig. 4).

In Fig. 4 it can be seen that vehicle 1 passed the recording station whilst frequencies of around fn_1 were being vibrated and recorded. As a result, the output correlated trace will be contaminated with noise of frequency fn_1 However, when vehicle 2 passed the recording station the frequencies being vibrated and recorded were much higher than frequency fn_2. As a result, the noise from vehicle 2 arrived too late on the trace to correlate with the sweep and did not appear on the output correlated trace.

The sweep length which can actually be recorded is limited by two factors. The first is the number of data samples which can be handled by the computer which performs the cross-correlation process. This is likely to be

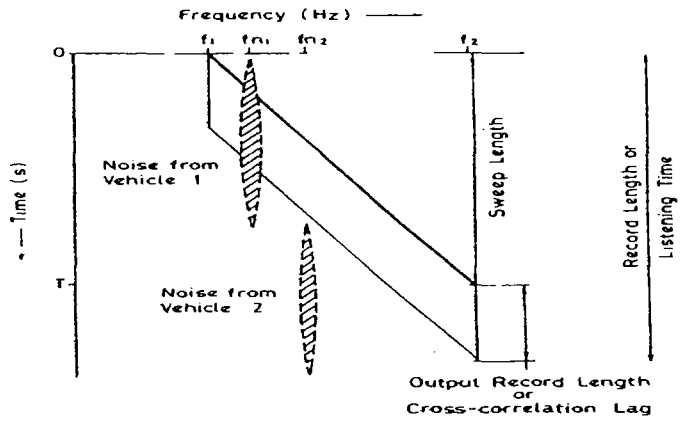


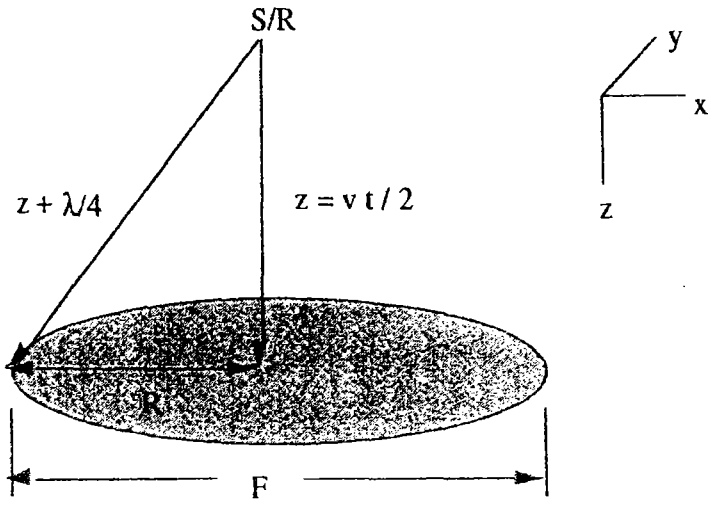
FIG. 4. Time v. frequency plot of a Vibroseis recorded trace.

about 16 000 samples (64 s at 4 ms sampling rate) for a computer based at a processing centre and much less, say 4000 samples, for a field-based correlator. The second factor is the required rate of production. For example, if we are allowed approximately two minutes per vibrator point we could vibrate four 30 s sweeps or eight 16 s sweeps. In other words, we must strike a compromise between sweep length and the number of sweeps per vibrator point. In order to optimise the signal-to-noise ratio, we should ensure that the number of sweeps is sufficient to allow the noise reduction process to work efficiently and to give us an efficient source array, and that the sweep length is longer than the time it takes a vehicle to pass a recording station.

Reprinting this section of Kirk's paper serves the dual purpose of highlighting the improvement in signal to noise ratio that will be achieved in cross well reflection imaging through the use of a swept frequency source. We will be using a wide, high frequency sweep of 100 Hz. to 3,000Hz, which has been proven over long distances (2,000 +ft.) at the joint Department of Energy / Michigan Technological University's Traverse City Test Site, and sweep lengths of 0.35 sec. Kirk's equation states that we will enjoy a 30db improvement in signal to noise ratio. This will be restated in the *Advantages of Cross Well Reflection Imaging*, below.

3.2.2 Poor Detection of Small Targets

Another disadvantage of the fact that surface seismic methods must occupy a low frequency band is the resultant large Fresnel zone.



$F = [(2VZ)/f]^{1/2}$

Where: F = diameter of the first Fresnel zone
V = average velocity
Z = depth of target
f = predominate frequency of seismic signal

At the DRIC location, the parameters V, Z, and f yield a diameter of the first Fresnel zone (F) of approx. 650 ft. What does this mean?

The Fresnel zone is the area on a reflector illuminated by the seismic energy, i.e. the area that gives rise to the signal detected by the receivers on the surface. Two major consequences follow from this simple statement—a detection consequence and a resolution consequence.

First, if the target of interest is small compared to this diameter, the reflected signal will not "sense" its presence— essentially the reflected signal will be representative of "everything around the target" instead of the target. This is the detection issue, i.e. does the reflected signal convey or contain the information about the presence of a target?

Secondly, if one wishes to resolve or separate two targets from each other in the seismic image, the Fresnel zone is a measure of the quality of what the resolution will be. Now, subsequent processing, 2-D or 3-D migration can change that resolution, but it can never be better than one half of the predominate wavelength (λ). Again, for parameters at the DRIC crossing locations, the wavelengths are very large, approximately 200 ft. to 300 ft. Thus, resolution can never be better than 100 ft. to 150 ft. and for many reasons such as noise (again the major issue in Detroit), poor migration algorithms, poor velocity information, and spatial aliasing, the value of one half a wavelength is never achieved.

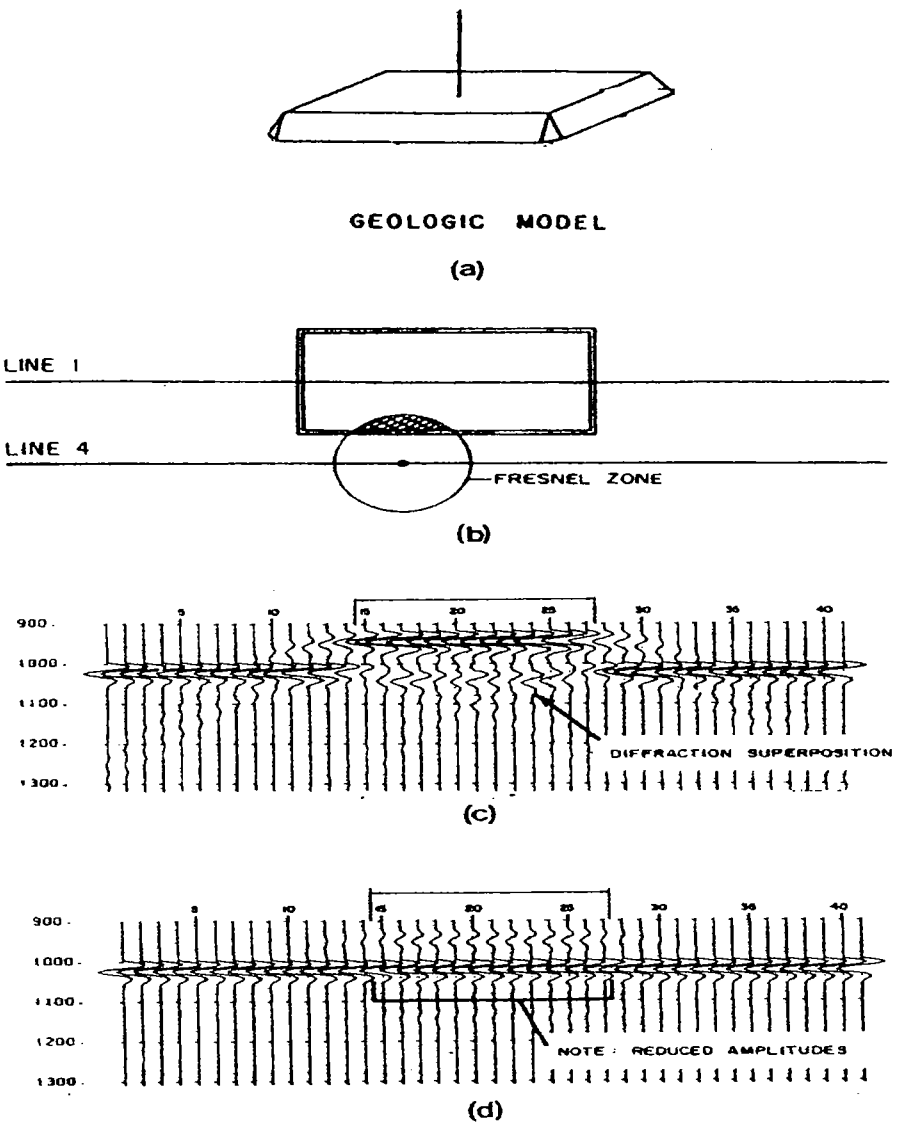


Figure 1
Synthetic seismic traces from a physical model experiment showing the effect of a large Fresnel zone and a small target. Here the phenomena is represented by a Fresnel zone that overlies a small portion of the target. In line (d) one can see the weak event from the top of the box. Even a modest amount of noise would completely obscure this signal (after Neidell and Poggiagliolmi, 1977).

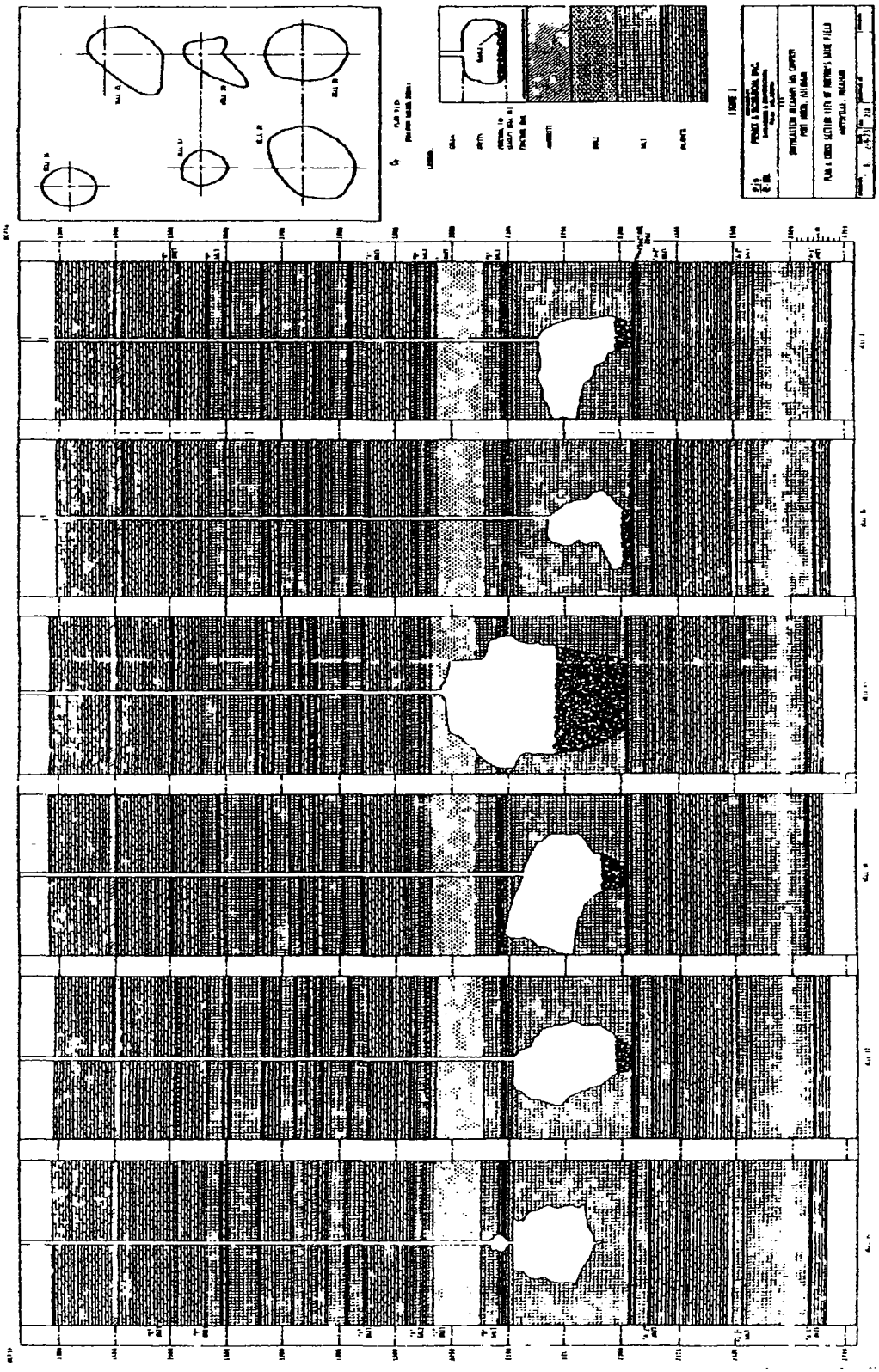


Figure 2 Cross section of solution mining cavities in the Marysville, Mich. area. Note that the tops of the cavities are irregular making them poor seismic reflectors. The figures in the upper left corner are maximum radii without regard to depth and are not "tops".

But, the more serious issue for salt cavity detection is the question of whether a cavity is even detected in the first place. Figure 1 shows the consequences of a large Fresnel zone and a small target. Here this is shown as the Fresnel zone missing most of the target. The seismic signal in (d) shows a weak indication of the presence of the box.

The tops of salt cavities full of brine (Figure 2) are obviously poor reflectors. Cavities "bulked up" (which by now, 50 to 100 years after solution mining took place, represents at least some and possibly all of the cavities we seek) would be even worse reflectors. Thus, they represent a small fraction of the area of a Fresnel zone, thereby producing little or no reflected signal.

The cavity tops seen in Figure 2. are depicted in two dimensions, presenting an optimistic reflector size. Even in this overly optimistic view, they are nevertheless small compared to Fresnel zone diameters computed from equation 1. Representing approximately 10% to 20% the size of a Fresnel zone. Returning to Figure 1., it is clear that the reflected signal would not be seen in the presence of noise.

In summary:

- Surface seismic reflection methods force data into a low frequency band, eliminating the high frequency energy and high-resolution capabilities
- High velocity carbonates occupy nearly the entire stratigraphic column beneath the glacial till and above the salt. High velocity carbonate layers create large wavelengths, again forcing the data to be low frequency energy.
- Cavities are found at depths of 1,100 to 1,200 feet.
- Tops of brine filled cavities are poor seismic reflectors due to small, irregular interface
- Most or all cavities in this survey are potentially even more difficult to detect. They are "bulked up" i.e. full of large blocks of roof creating a low reflection contrast with the surrounding formations

All contrive to make the detection of a cavity with surface seismic methods unlikely to impossible. This observation is supported by the experience of SEMCO, a gas company in southeastern Michigan, who has repeatedly attempted to define the upper limits of solution mining cavities for potential gas injection reservoirs. The attempts were made in near identical subsurface conditions as presented in the DRIC study areas using surface seismic reflection techniques and processed with advanced data processing equipment. The attempts were eventually stopped, as high frequency/high resolution data could not be achieved.

3.2.3 Ambient Noise and Array Theory

Seismic noise in a city is several orders of magnitude greater than that seen in the open country outside the city. Large trucks and other industrial noise that are common 24 hours per day in this area (Yellow Freight, US Steel, I-75 Expressway, etc.) create visible motion that is 10^4 to 10^5 times larger than the noise levels experienced in surface seismic work outside the city. In this area of Detroit, the situation is also worse because of the Detroit River and the large Great Lakes boats that may navigate the river; moreover the seismic surveys in question must be performed on the shore of that river.

Arrays of geophones are always used to reduce seismic noise, but the noise cannot be eliminated. When the noise level is very high, seismic array (or group) performance is insufficient by several orders of magnitude. Furthermore, using seismic arrays, or groups, greatly increases the number of geophones needed in any given survey.

Array Theory

Ambient seismic noise is predominately surface waves and arrays, or groups, function by summing the output of geophones that have been spaced at specific intervals on the earth. The intervals are chosen such that the surface waves are summed out of phase while

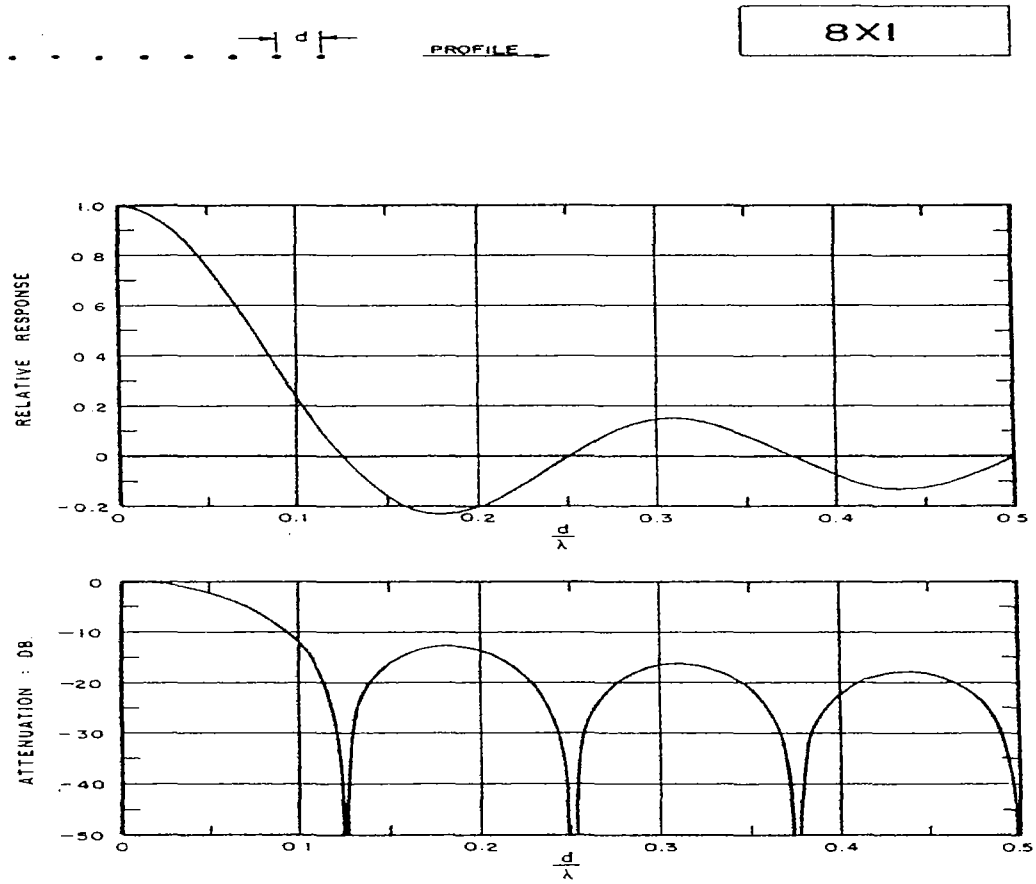
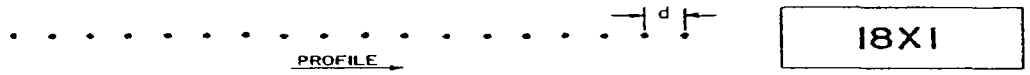


Figure 3 Array response for a group of eight geophones, with a spacing of d, in a straight line (top of the figure. The group is in line with the seismic profile. Here it is assumed that the seismic source for the profile is the source of noise (groundroll). Note that complete rejection of noise only occurs for four discrete wavelength values for a given value of d. Seismic noise is broadband.

simultaneously summing the desired signal in phase. This is possible because the signal is incident upon the array from below (perpendicular to the array) while seismic noise, as mentioned, propagates along the surface of the earth. However, much must be known or assumed about both the signal and the noise before the summation is even moderately effective—perfect cancellation of broadband noise does not occur.

It assumes that here is only one source of noise and its position is known, this only occurs when the seismic source is also the only noise source, then the array can be pointed at the noise source. This is indicated in all of the figures by the "profile" arrow. Figure 3 displays the response of an array of eight geophones. It is clear that over a broad range of noise wavelengths (λ) (directly related to frequency, given knowledge of velocity) the array reduces the noise merely by 20db to 25db (a factor of 10 to 18).



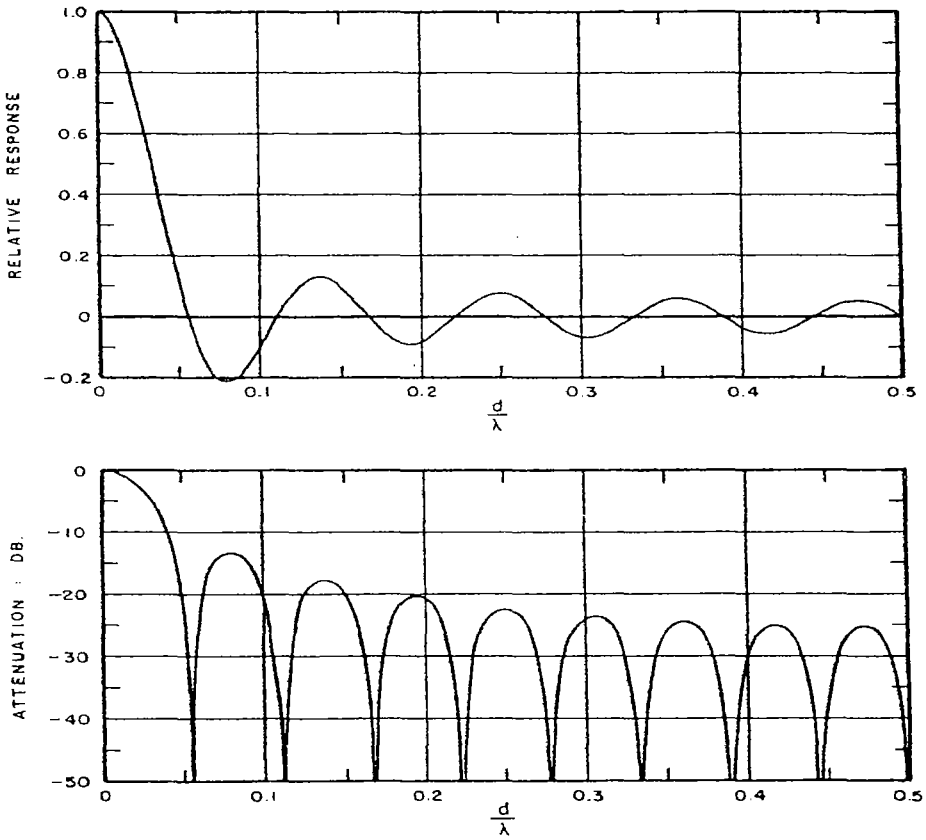


Figure 4 Array response for a group of eighteen geophones (top of the figure) with an element spacing of d. Over a broad range of wavelengths (λ) the array rejects noise by 25db to 30 db (a factor of 18 to 32)

If the array contains more elements (geophones) then the rejection improves (Figure 4) but this is only a minor improvement compared to the problem at hand. Moreover, it assumes that all of the noise is coming from one direction; clearly not true in a city.

Spatially distributed arrays of geophones can be deployed (Figure 5) to address the problem of noise propagating in many directions. Again, the number of geophones that must be handled goes up but the performance of the array is poor because the number of

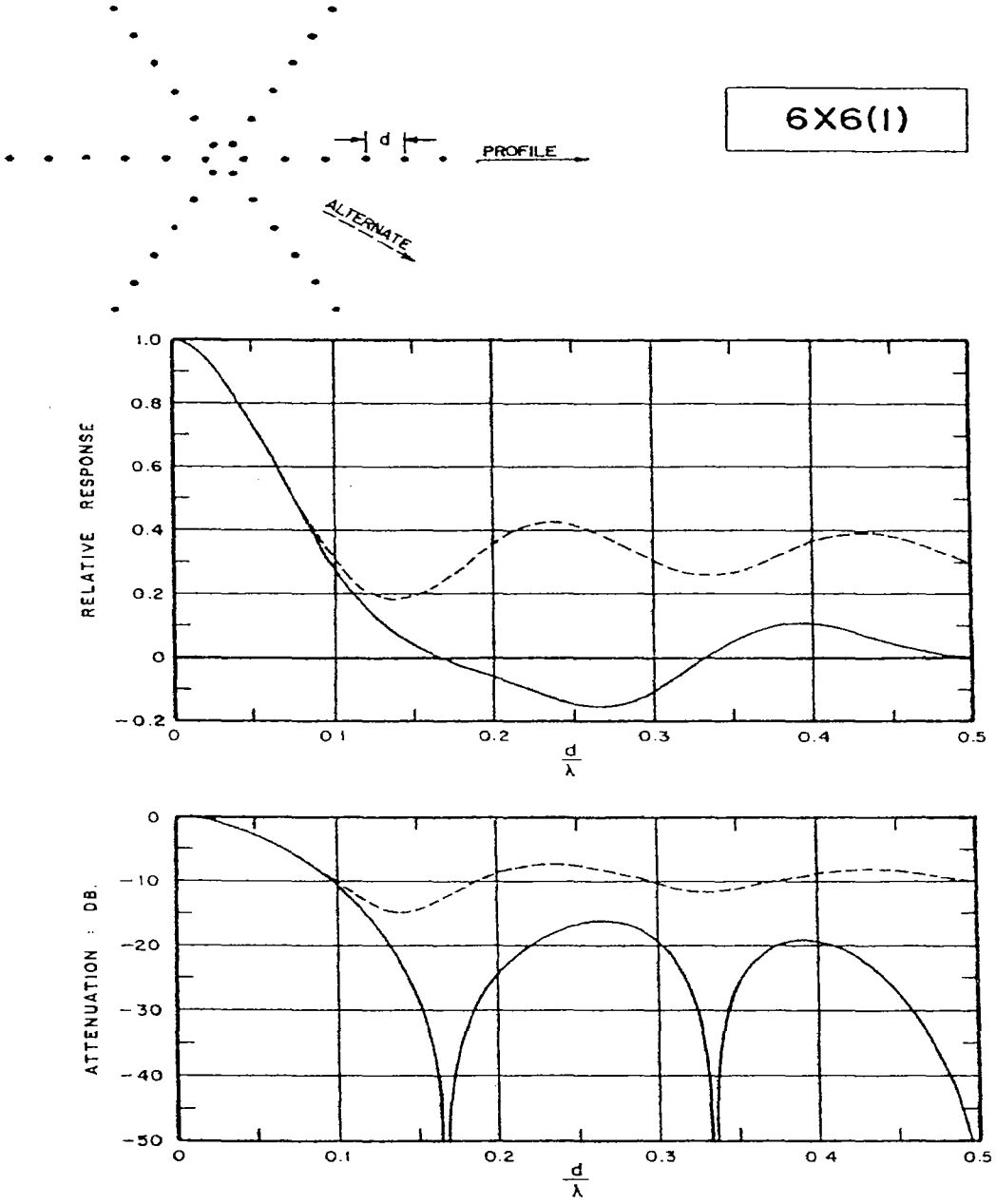


Figure 5 Array response for a group of 36 geophones arranged in a star pattern with an element spacing of d. The performance of the array varies dramatically as a function of direction with the noise being reduced by only a factor of 10db (factor of 3.2) in some directions (labeled "alternate" above).

geophones along any specific direction is small. In Figure 5, we see that the best performance is a rejection of approximately 20db to 25db (a factor of 10 to 18db), however, the performance is only 10db (a factor of 3.2) in many directions.

To achieve even the modest rejection of noise seen here, requires a large number of geophones. A small recording system deploying only 500 to 1,000 channels would require 18,000 to 36,000 geophones, which, in turn, requires several technicians to deploy and pickup the spread. This increases the cost and logistics of the survey, not to mention the need for vast amounts of unobstructed surface area.

Given that seismic noise levels in a city can be many orders of magnitude greater than that outside of town one can see that the performance of arrays, or groups of geophones (factors of 3 to 32) is of little use.

In summary, geophone arrays or groups are always used in surface seismic work, but their performance is poor compared to the seismic noise levels, especially omni directional noise levels that exist in a city, especially in a city on a major active river. It is also commonplace to acquire data at night, but again, along this area of the Detroit River, this practice is of little value. Lastly, the use of large arrays, especially spatial arrays greatly increases the number of geophones that must be deployed.

4.0 DOWNHOLE GEOPHYSICAL METHODS

4.1 Vertical Seismic Profiling and Reverse Vertical Seismic Profiling

Vertical Seismic Profiling (VSP) is essentially the application of surface seismic techniques applied in a dilled borehole situation. Seismic receivers are placed at known levels throughout the borehole in combination with seismic sources place at specific intervals on the surface. In "Reverse" Vertical Seismic Profiling (RVSP), sources are placed at known intervals with the borehole, in combination with arrays of seismic receivers placed on the surface. As the theory behind both VSP and RVSP are identical, both methods will be referenced under VSP for convenience in the reminder of this paper.

VSP has become an accepted technique for characterizing large-scale features in the subsurface at depth and for characterizing small targets in the very near surface environment. In oil and gas exploration, VSP is a standard tool to define large structures within existing well fields where drilled wells are already available. Such a method, where existing wells are readily available and surface noise levels are low, can be used achieve a gross view of a large area to define targets for more detailed analysis and drilling. VSP is a specialty seismic service used in the oilfield to provide a better tie of the surface seismic data to well control. The conventional VSP provides a 1-D seismic bandwidth velocity survey (checkshot) to provide time-to–depth conversion for surface seismic data, and also provides a reflection trace at the well to assist in tying surface seismic data to the well.

4.1.1 Disadvantages of VSP and RVSP Methods

The disadvantages of VSP and RVSP are essentially the same as surface seismic methods and can be summarized as follows: lack of resolution, which will make definition of solution mining areas difficult and uncertain. The limited resolution is due to the distance from seismic sources and receivers to the target zone and is compounded by a number of unique aspects of the proposed DRIC crossing locations as identified as follows: urban high noise environment, inaccessibility of the surface for sources and receivers due to urbanization and local population, excessive near-surface attenuation due to the glacial till at the surface, scattering of energy near the surface due to the presence of fill and debris from former industrial operations including

concrete chunks, seawalls, buried foundation elements including footings, slabs, basements, etc., and the irregular nature of the top of the solution mining voids. The section below describes in detail the technical issues and difficulties in using VSP methods in the DRIC setting

4.1.2 Resolution Limitations of VSP—The Disadvantage of Low Frequency Energy
The major disadvantages of VSP is the fact that only low frequency energy is present due to the long and attenuative travelpaths, however, there is only a one-way path through the attenuative near-surface layers as opposed to a two-way path for conventional surface seismic methods. The elimination of one path through the near-surface can result in up to 50% more bandwidth and enhancement in resolution relative to surface seismic data. However, high frequency energy, even if it could be generated by surface or downhole airgun sources, would be attenuated by the long propagation path and the fact that it must pass through the thick glacial till (100 ft. thick in the survey region) as well a potential weathered bedrock layer. Therefore VSP, everywhere in the world, are relegated to the low frequency band from 10's of Hertz (Hz.) up to a maximum of 200 Hz., with surveys in Michigan occupying the lower portion of that band due to a relatively thick layer of glacial till.

Three major disadvantages result from this low frequency band.

- Noise from vehicular traffic and other industrial noise in same band is not completely eliminated.
- Poor detection of small irregular targets, if data can be acquired
- Poor resolution, as high frequency is till attenuated, if data can be acquired

4.1.3 Survey Area -The Disadvantage of Urban Environments
In conventional VSP, a surface source is required with attendant surface access issues. The result, using a single surface source position offset from the surface location of the borehole, is an Offset VSP, or 2-D line extending up to about 70% of the target depth from the wellbore, which may be difficult to obtain in urban settings.

A recent experimental approach is 3-D VSP, in which many receivers are placed in the well and surface sources are fired in a grid on the surface all around the well. The result is a pseudo 3-D image. In the DRIC crossing application, the image will be in a radius of less than 1,000 feet around the receiver borehole. The image will have the same low-frequency characteristic as VSP and there will be significant impact of a full surface grid of source points covering about 4,000,000 square feet of the surface. In an urban location, 3-D VSP data acquisition is next to impossible, due to the large volume of geophones and the inherent difficulty of urban surface features such as roads, streets houses, power lines, active industry, shallow reflectors, etc. High frequency content, similar to surface methods, is drastically lowered as the potential reflector is moved away from the borehole position. The result is low resolution away from the borehole due to signal attenuation within the glacial till layers. This principle essentially lowers the affective diameter of the survey, thus creating the chance for voids to be missed as you move further away from the source location.

4.0 PRINCIPLES AND ADVANTAGES OF CROSS WELL SEISMIC METHODS

In crosswell seismic, seismic sources and receivers are placed in boreholes near to the target interval as shown in Figure 6. The downhole placement of sources and receivers has several advantages:

1. The seismic signals do not propagate through the attenuative weathered near-surface layer, in this case the seismically notorious Michigan till.
2. Travelpaths are minimized with sources and receivers close to the target.
3. Travelpaths are through deeper, more-competent formations. In this case the travelpaths will be through low-attenuation Michigan carbonate formations.

Two types of information are present: in addition to seismic reflectivity data from the dotted paths in Figure X1, crosswell also provides the direct travelpaths from source to receiver. With the measured traveltimes along these paths, irregularly shaped velocity perturbations within the earth can be imaged using tomographic inversion algorithms. Both "bulked up" cavities and uncollapsed brine-filled cavities can be imaged using the direct travelpaths from crosswell imaging.

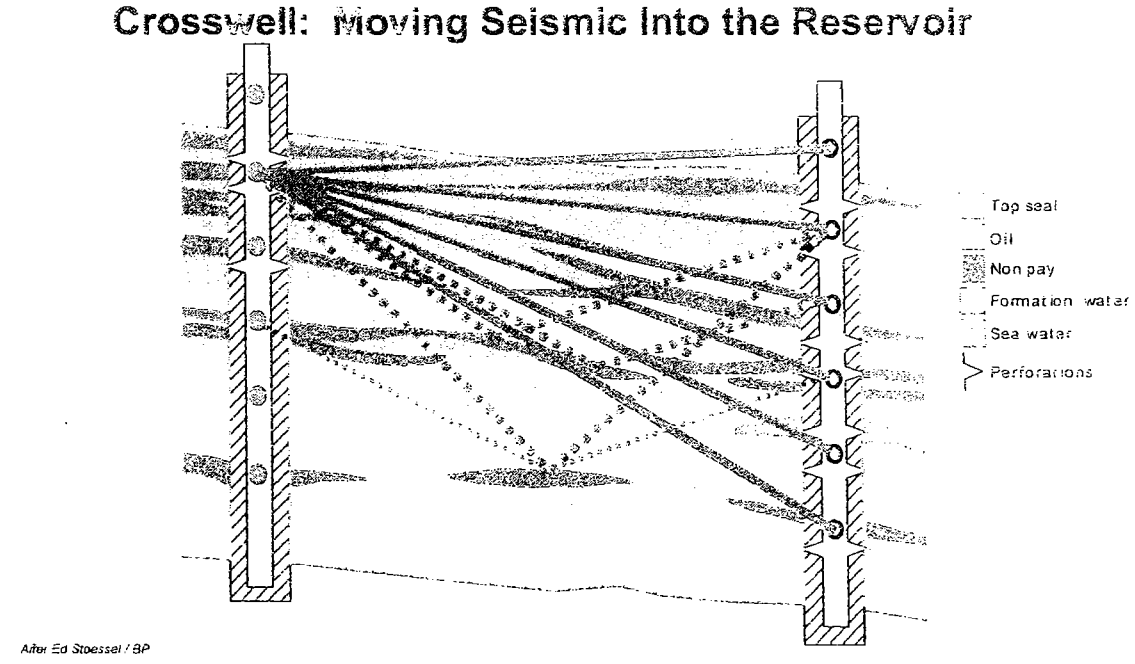


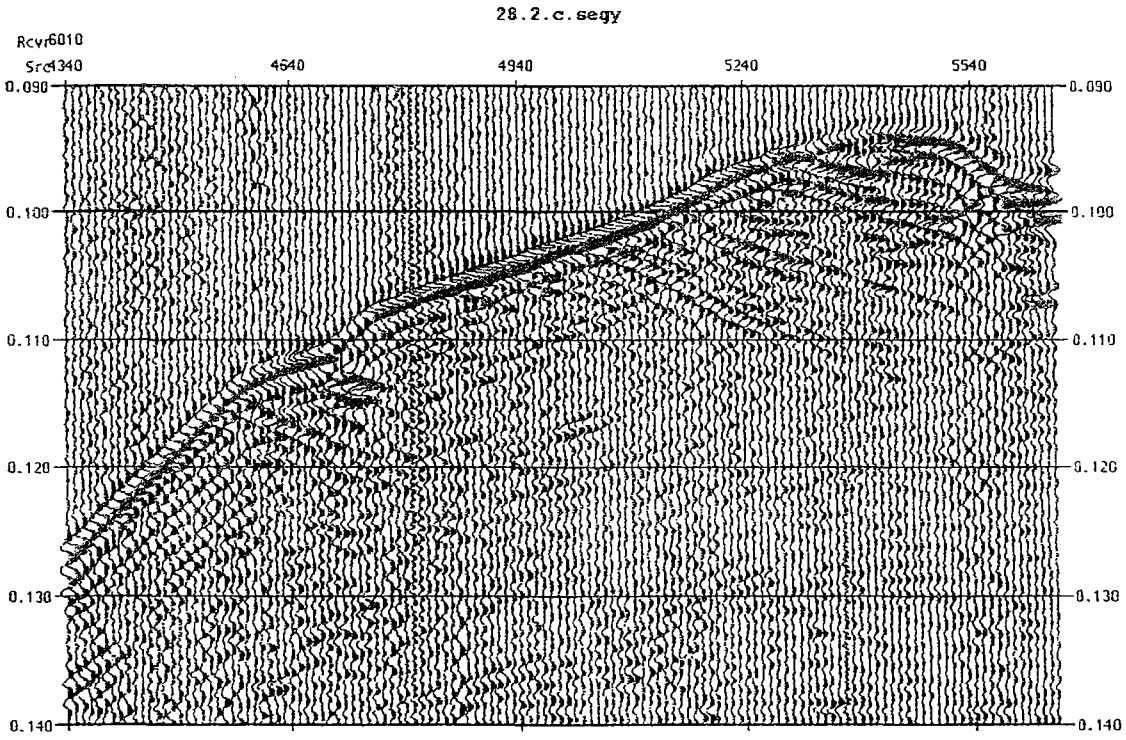
Figure 6

4.1 Crosswell Enhances Resolution

Crosswell is applied in applications where high resolution is required, for imaging detailed reservoir architecture in oil and gas applications, and for pinpointing deeply buried features in engineering and mining applications Enhanced resolution, typically 10 to 100 times the

resolution of surface seismic methods, is routinely obtained due to the factors identified as follows: shorter travelpaths, the lack of travelpaths through high attenuation layers (till), and the inherent characteristics of the crosswell geometry This enhanced resolution is directly the result of higher frequencies present in the crosswell data.

The objective is to produce at least 2 kHz energy in the DRIC imaging application. The proposed source is a high-power piezoelectric source developed for oilfield applications in strategic alliance with Shell Oil. The source has been used in perhaps ten times as many oilfield applications as other sources such as airguns, sparkers, or etrema. In direct comparative proprietary tests, the piezoelectric source has been seen to be several times stronger than a sparker or etrema source. The source is routinely used in oilfield applications at well spacings of up to 3,000 ft (approximately 1 km). We have demonstrated up to 3 kHz frequency content at a well spacing of 2,000 feet in the same stratigraphic section expected in the Detroit River crossing at Michigan Tech's test wells in northern Michigan. A typical common receiver gather showing the data quality is shown in Figure 7 together with a typical spectrum showing frequency content to 3 kHz.



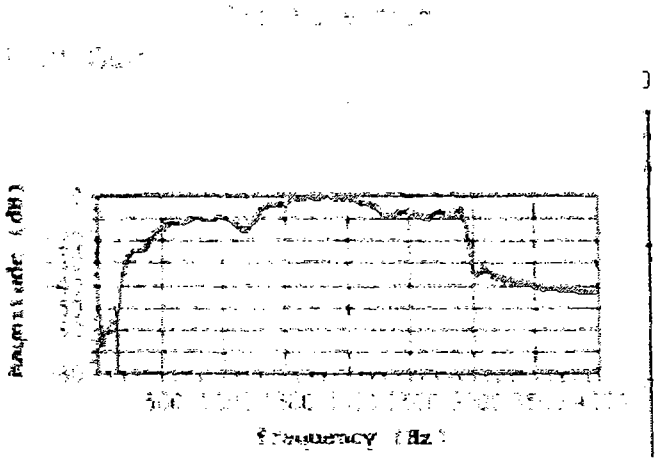


Figure 7 Seismic data and spectrum from Michigan Tech test site in similar sediments to the Detroit River Crossing area, demonstrating 3 kHz upper frequency at 2000 feet between wells.

The Fresnel zone considerations described above also show that the Fresnel zone is linearly decreased in size with increased frequency. Therefore, the 30:1 to 50:1 frequency advantage of crosswell over surface seismic in the DRIC application reduces the Fresnel zone by a factor of 30 to 50 and increases the resolution proportionately. In addition, the crosswell piezoelectric source is a vibratory correlative source, in which we expect a 30dB improvement in signal to noise ratio based on Kirk's equation as described above.

4.2 Reduced Noise Susceptibility

Another advantage of the crosswell geometry with receivers placed deep in the earth is that surface-generated noise such as the urban and cultural noise including traffic and shipping at the proposed crossing sites is 1000 feet away from the receivers. Any such surface-generated noise in addition to being inherently low frequency as described above is further reduced in high-frequency content by propagating through the 100 feet of glacial till at the surface. Therefore, the near-surface attenuation, which is a strong disadvantage for surface seismic methods, is a strong advantage for the crosswell method since it further reduces high-frequency noise. The expected upper frequency of surface noise as measure downhole is less than 100 Hz. The piezoelectric source sweep will be 100 Hz to at least 2 kHz. Therefore, the crosswell signal band and the surface noise band do not overlap.

4.3 Surface Access Limitations

Crosswell operations do not require surface access. Portable wireline winches and recording cabins are placed in direct proximity to the borehole wellheads. Inter-unit communication between the source and receiver equipment is achieved either with a single fiber optic surface cable, or where necessary, using a line-of-sight infrared link, which does not requires access to the ground between the source and receiver wells.

4.4 Improved Integration

Crosswell seismic is conducted between two boreholes, therefore the seismic velocity and reflectivity images can be ground-truthed to core measurements and/or logs at each of the two wells. In this application, lithology and formation seismic velocity information will already be compiled before the crosswell techniques are implemented, further refining the ability of the method to produce the desired affects.

4.5 Disadvantages of Cross Well Seismic Methods

Crosswell seismic imaging between two vertical boreholes produces a 2-D image of seismic velocity (a tomogram) as well as a 2-D reflectivity section between the two boreholes. To produce a 3-D image and interpretation, crosswell profiles are conducted between several pairs of boreholes along several azimuths. Two or more profiles can be acquired at one time by using one source and receivers in two or more adjacent boreholes. Additional boreholes outside the original investigation area would need to be performed prior to additional crosswell imaging if features outside the original scope are to be imaged.

5.0 CONCLUSIONS

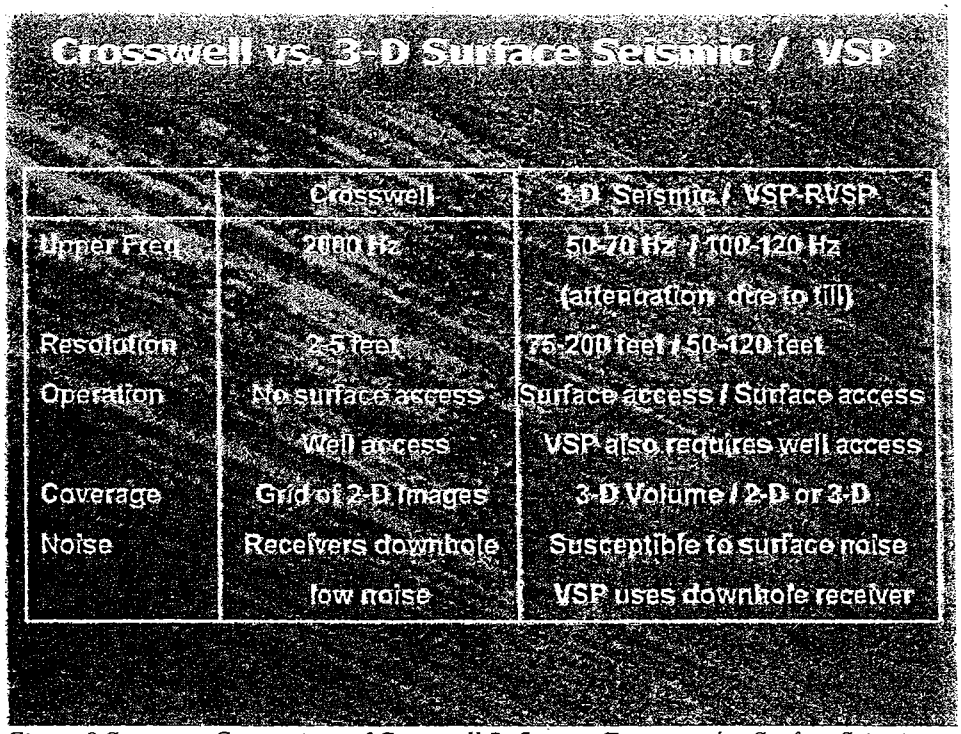


Figure 8 Summary Comparison of Crosswell Reflection Tomography, Surface Seismic, and VSP Geophysical Methods

The main factors that affect the intended geophysical methods are: the need for high-resolution data, urban high noise environment, inaccessibility of the surface for sources and receivers due to urbanization and local population, excessive near-surface attenuation due to the glacial till at the

surface, scattering of energy near the surface due to the presence of fill and debris from former industrial operations including concrete chunks, seawalls, buried foundation elements including footings, slabs, basements, etc., and the irregular nature of the top of the solution mining voids. Refer to figure No 8, as follows, for an estimate of the data quality that can be expected based on the factors previously mentioned in this paper.

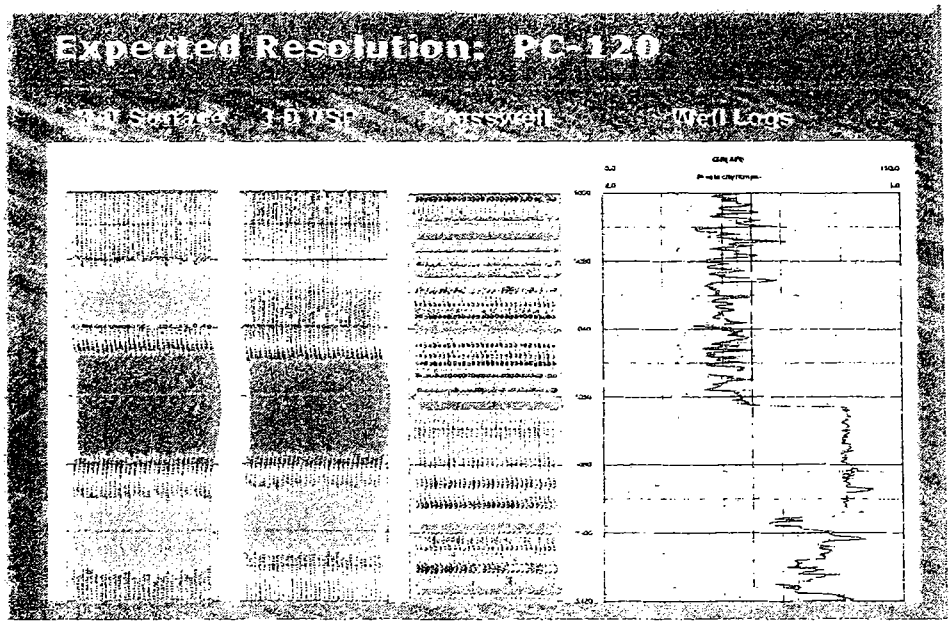
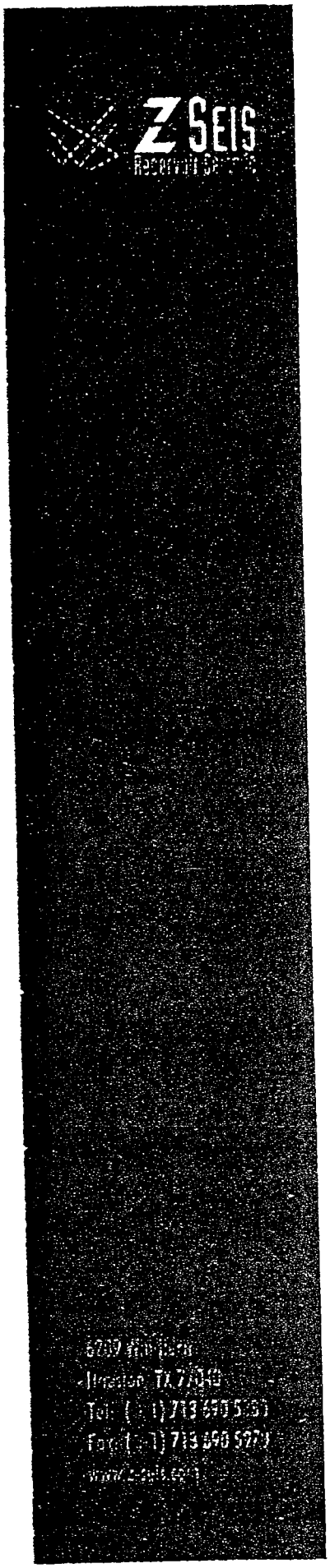


Figure 9 Expected resolution of various geophysical detection methods for the DRIC project area.

Based on the above discussion and the defining factors of the proposed investigation, it is clear that surface seismic techniques and/or VSP will likely not be able to detect old solution mining cavities, especially, "bulked up" cavities. Therefore, crosswell seismic techniques should be utilized for the detection of voids in the proposed DRIC crossing locations.

Attachment C

Proposal for Crosswell Seismic Services
Z SEIS



NTH CONSULTANTS
IMAGING SOLUTION MINING ZONES

PROPOSAL FOR
CROSSWELL SEISMIC SERVICES

JULY 12, 2005

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PROJECT OBJECTIVE

This proposal provides specific pricing and information regarding the project approach developed during a meeting between NTH, Layne Christensen and Z-Seis on 12 July 2005. The approach is to drill 2 boreholes and conduct a single crosswell profile between the boreholes in each of 3 areas. The boreholes will be 1000 feet apart and about 1500 feet in depth. The target zone of interest is from about 400 feet (an upper potential collapse zone) to about 1200 feet including the potential cavities/galleries in the salt formation.

As to the maximum distance between boreholes, three factors were considered: imaging coverage, resolution and signal-to-noise ratio. Based on geology information and logs received from NTH and Dr. Roger Turpening, we expect high frequency data to be generated to distances well in excess of 1,000 feet between wells. Therefore, we expect high vertical resolution for well spacings to 1,500 or even 2,000 feet. Signal-to-noise ratio may, however, be a limiting factor, due to the shallowness of the wells and the proximity to cultural noise in the river environment. Horizontal resolution also decreases as a function of distance. As long as the cavities have significant lateral extent, any reduction in horizontal resolution may not be a significant concern.

Imaging coverage appears to be the primary driver in determining the maximum well separation. We have run preliminary survey plans for 1500-foot deep wells, with a zone of interest from 400 to 1200 feet. We would like to achieve reasonably uniform coverage for imaging angles from 50 to 80 degrees from the vertical. To maximize the well separation we consider using both upgoing and downgoing reflection imaging coverage. Upgoing coverage uses source and receiver positions above the imaged zone and downgoing coverage uses source and receiver positions below the imaged zone. Therefore, we would image the salt cavity zone using upgoing reflection data and downgoing reflection data to image the upper collapse zone at about 400 feet.

In the survey plan section below we have considered two well separations: 1,000 feet and 1,500 feet. At 1,000 feet separation, we see uniform coverage from 400 to 1200 feet with the crossover point between downgoing and upgoing coverage at about 800 feet. At 1,500 feet separation, we have a gap in uniform coverage from about 500 to 1100 feet. We believe that 1,000 foot separation should provide good resolution, likely adequate SNR and gives full coverage of the interval from 400 to 1200 feet in depth.

These survey plans also give a conservative estimate of survey duration. We have provided a project price estimate in the Pricing section below.

PRICING AND ESTIMATE

The following special pricing is provided to NTH based on the current scope of work. If gyroscopic deviation surveys are purchased from a 3rd party, Z-Seis can operated the gyro survey tools on its wireline at the acquisition daily rate. Typically, 2 boreholes can be logged for gyro surveys in 0.5 acquisition days or charges of $4,000 / gyro survey for Z-Seis services in addition to the charges of the gyro survey contractor.

Pricing

Planning and Project Setup, Mobilization & Demobilization each crew/equipment mobilization[1]	$ 30,000.00	U.S.
Lump sum pricing per profile for wells spaced 1,000 feet apart as in the survey plan given below, including up to 2.5 days of acquisition and/or standby days and data processing including tomography and reflection imaging (upgoing and downgoing) but not including mobilization and demob [1,5]	$ 50,000.00	U.S.
Tool insurance per profile (pair of wells) [1,6]	$ 25,000.00	U.S.
Additional Acquisition Operating Day [1,2]	$ 16,000.00	U.S.
Additional Stand-By Day[1,3]	$ 10,000.00	U.S.
Third Party Services [1,4]	at cost + 15%	

Notes:

1. All prices are:
   - In U.S. dollars ($) based on the proposed scope of work;
   - Exclusive of all and any taxes and duties, including but not limited to, sales tax. In the event that such taxes, duties or fees apply, these shall be borne by client;
   - Subject to standard terms and conditions attached;
   - Subject to the pricing inclusions and exclusions below;
   - Payment terms: Project Set-Up and Mobilization/Demobilization upon mobilization of equipment, Acquisition upon completion of data acquisition, Processing upon completion of processing. In the event of extended data acquisition or processing, charges will be invoiced on a monthly and pro-rata basis.
   - This quotation is valid for 90 days and is based on information available.
2. Acquisition Days are calculated as the number of 24-hour operating days from and including the day the equipment arrives at the well site to and including the day of all equipment is rigged down from all wells. Excluded from this calculation are the number of hours of down time directly attributable to Z-Z-Seis. Acquisition Days are rounded up to the nearest half day. Within each Acquisition Day, 3 hours are reserved for routine maintenance and equipment servicing.

3. Stand-By Days are calculated as the number of days Z-Seis crew and equipment are required by to remain without operating. Stand-by Days are rounded up to the nearest half day.
4. Other third party services required for performance of the services are not included in the price (see pricing inclusions and exclusions below). Should Z-Seis be required to organize and provide these services then the surcharge listed will apply.
5. Lump sum pricing is for a typical set of logging conditions for the conditions as described to Z-Seis. If additional acquisition time is required to enhance SNR due to unexpected attenuation or high noise, additional operating day charges will apply.
6. Tool insurance is for the repair/replacement of tools lost in the well. Unless tool insurance is elected in writing at the start of the project, equipment liabilities shall be the Clients as stated in the standard terms and conditions. When tool insurance is elected, Z-Seis has the right to suspend operation in any situation in which Z-Seis personnel judge there to be a risk of tool loss. If the Client elects to proceed when so warned of a potential risk of tool loss, the equpment liability shall revert to Client as in the standard terms and conditions.

Pricing Inclusions & Exclusions

Included in the prices (i.e. to be provided by Z-Seis) are:

Downhole seismic equipment

- Crosswell seismic source
- TARS receiver system

Personnel

- Field crew

Crosswell seismic recording system

- Inter-unit communications & remote triggering system
- Source power amplifier
- Wellsite QC workstation

Auxiliary acquisition hardware

- Correlation logging system
- Source wireline hoist w/cable
- Receiver wireline hoist or hoists w/ cable

Services provided by Z-Seis

- Equipment Preparation, Staging, Mobilization and Demobilization
- Crosswell data recording
- Field QC of data
- Tomographic Processing of the data
- Generation of final reports

Excluded from pricing (to be provided by Client or arranged as third party services by Z-Seis).

- Preparation of wells
- Equipment for moving equipment to and from and on location
- Pressure control equipment and wellhead flanges if required
- Safety information
- Information for survey planning, including: Well logs, reservoir data, wellhead connections, pressure control requirements, fluid levels.
- Cranes for well access
- Gyroscopic deviation surveys
- Light plants or equivalent for night operations
- Special deployment and operating equipment needed for operation where wellheads are located in water, including but not limited to barge(s).

Pricing Estimate

The following pricing estimate is based on the preliminary survey plans given below and current project information. The example is for 1 profile in each of 3 areas with boreholes 1000 feet apart and 1500 feet deep. The zone of interest is from 400 to 1200 feet. No tool insurance is shown for downhole tools in this example.

No other third party charges are shown in the estimate.

	Vertical Well Crosswell Operations
Project Set-up / Mob / Demob	$ 30,000.00
Project Scope (profiles)	3 1,000 foot well distance Profiles
Lump sum acquisition and processing of 3 profiles.	$ 150,000.00
Total ($ U.S.)	**$ 180,000.00**

SURVEY PLANS

Survey plans describe in concise form different parameters of a crosswell profile. Outputs such as the estimated seismic coverage and time frame of each profile are used to plan the survey more effectively. Note that survey plans are often updated in the field, as new acquisition information becomes available. All coverage charts are computed assuming straight ray paths.

In this section, we provide preliminary survey plans for two 1500 foot boreholes, separated be either 1,000 or 1,500 feet. The level spacing is set to a conservative 5 feet and plans were run using a 20-level receiver system. To familiarize the reader with the form and content of the survey plan, below is a description of some of the pertinent plots.

Acquisition parameters/statistics

The planned acquisition parameters are noted in the upper left of the chart. Details such as interval of interest, source shooting parameters, well spacing and other parameters that affect the speed of acquisition are listed.

Shooting Chart

The shooting chart is a graphical representation of the source/receiver positions that are to be occupied during the survey. The horizontal axis is receiver depth and vertical axis is source depth. A tabular form is also created with depth intervals for source and receiver clearly detailed.

Direct Fold

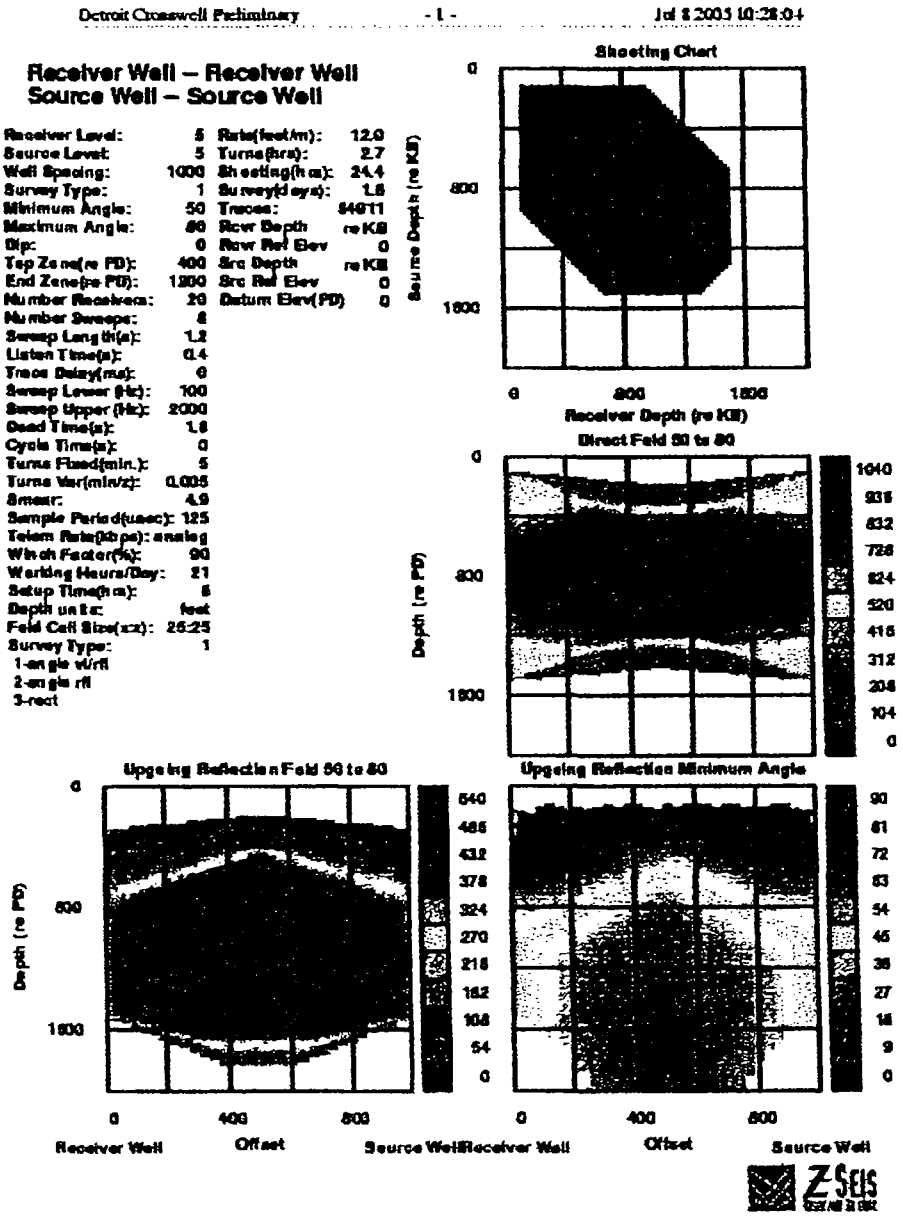
This chart shows the number of rays crossing each bin (see Fold Cell size) assuming straight raypaths. This shows the approximate coverage that will be possible for this profile using the direct ray incidence angles noted. The horizontal axis extends from receiver well to source well. The vertical axis is depth relative to datum elevation.

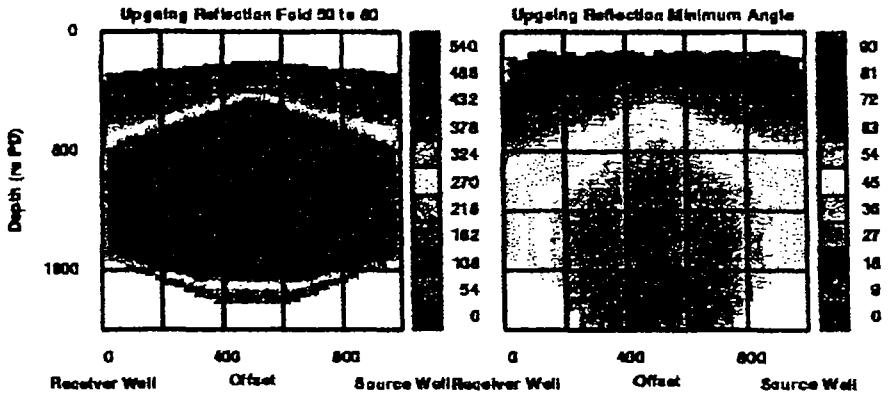
Upgoing Reflection Minimum Angle

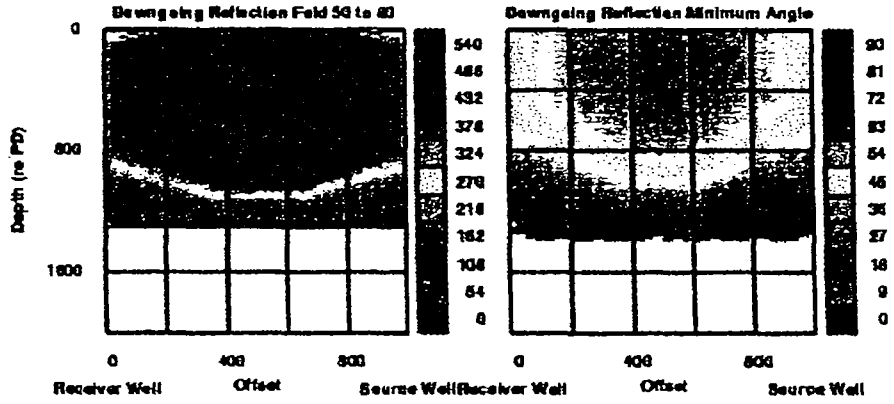
This chart shows the smallest incidence angle illuminating each bin in the inter-well region. Horizontal axis is offset from the receiver well in the direction of the source well. Negative offset numbers are measure from the receiver well in the direction away from the source well. The vertical axis is depth below datum elevation.

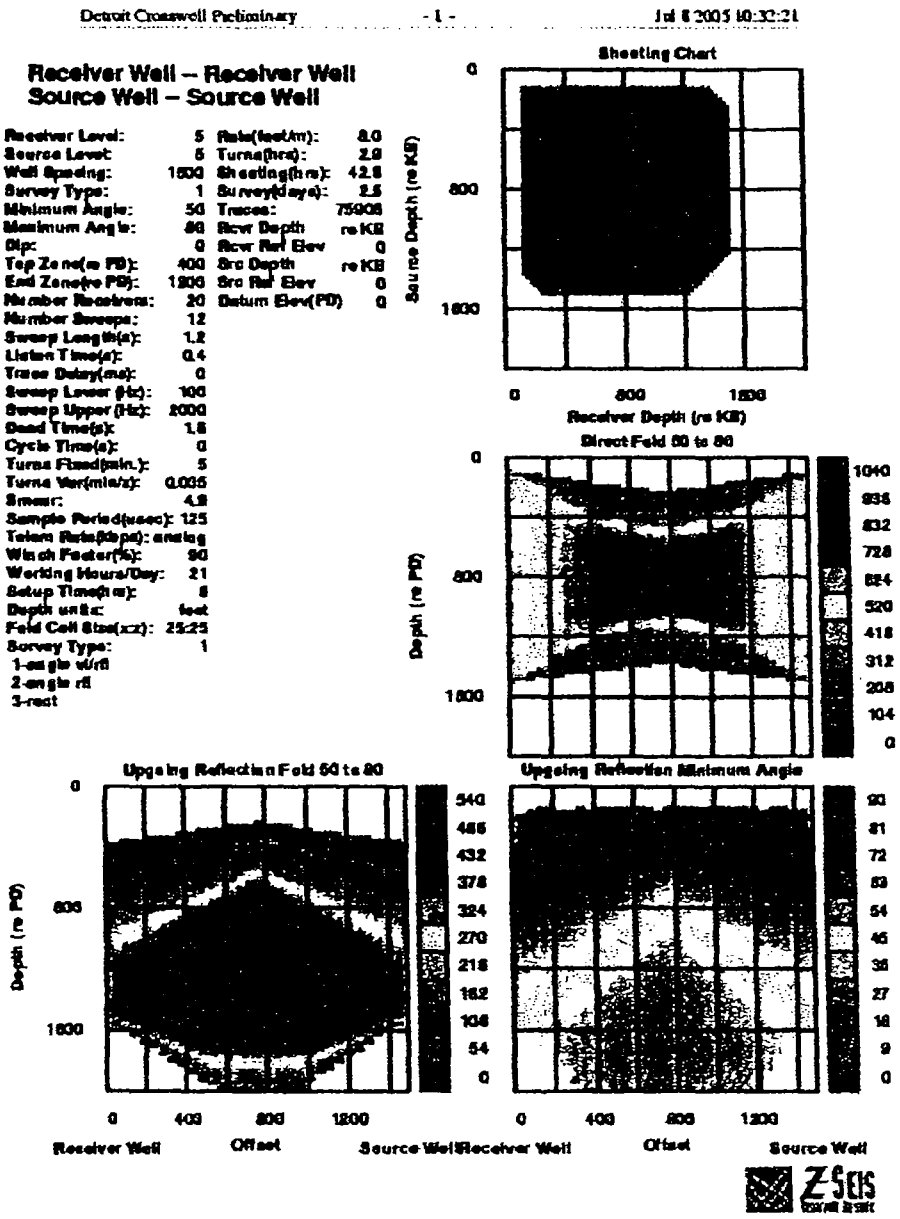
Upgoing (Downgoing) Reflection Fold

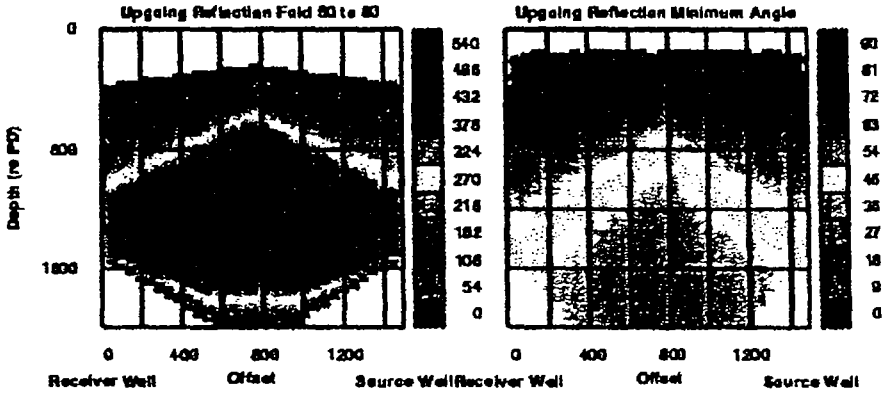
This chart shows the number of rays intersecting a bin for the range of incidence angles noted. The horizontal and vertical axes are as noted in "Upgoing Reflection Minimum Angle". Upgoing coverage is for source and receiver positions above the zone of interest and downgoing coverage is for source and receiver positions below the zone of interest.

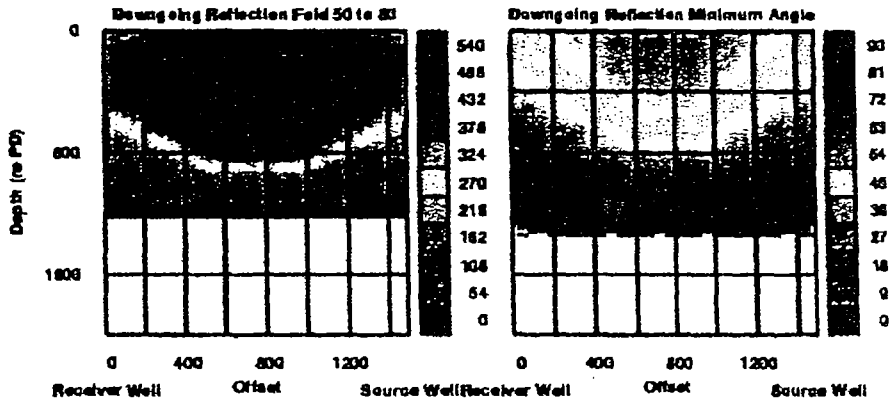

Detroit Crosswell Preliminary - 1 - Jul 8 2005 10:28:04
Receiver Well – Receiver Well
Source Well – Source Well
Receiver Level: 5
Source Level: 5
Well Spacing: 1000
Survey Type: 1
Minimum Angle: 50
Maximum Angle: 80
Dip: 0
Top Zone(re PD): 400
End Zone(re PD): 1200
Number Receivers: 20
Number Sweeps: 8
Sweep Length(s): 1.2
Listen Time(s): 0.4
Trace Delay(ms): 0
Sweep Lower (Hz): 100
Sweep Upper (Hz): 2000
Dead Time(s): 1.6
Cycle Time(s): 0
Turns Fixed(min.): 5
Turns Var(min/z): 0.005
Smear: 4.9
Sample Period(usec): 125
Telem Rate(kbps): analog
Winch Factor(%): 90
Working Hours/Day: 21
Setup Time(hrs): 6
Depth units: feet
Field Cell Size(xz): 25:25
Survey Type: 1
1-angle v/rfl
2-angle rfl
3-rect
Rate(feet/hr): 12.0
Turns(hrs): 2.7
Shooting(hrs): 24.4
Survey(days): 1.8
Traces: 84811
Rcvr Depth re KB
Rcvr Ref Elev 0
Src Depth re KB
Src Ref Elev 0
Datum Elev(PD) 0
Shooting Chart
Source Depth (re KB)
Receiver Depth (re KB)
Direct Field 50 to 80
Depth (re PD)
Upgoing Reflection Field 50 to 80
Upgoing Reflection Minimum Angle
Receiver Well
Offset
Source Well
Receiver Well
Offset
Source Well
Z-SEIS


Upgoing Reflection Fold 50 to 60
Upgoing Reflection Minimum Angle
Depth (re PD)
0
800
1600
540
486
432
378
324
270
216
162
108
54
0
90
81
72
63
54
45
36
27
18
9
0
0
400
800
Receiver Well
Offset
Source Well
Receiver Well
Offset
Source Well


Downgoing Reflection Fold 50 to 60
Downgoing Reflection Minimum Angle
Depth (re PD)
0
800
1600
540
486
432
378
324
270
216
162
108
54
0
90
81
72
63
54
45
36
27
18
9
0
0
400
800
Receiver Well
Offset
Source Well
Receiver Well
Offset
Source Well


Detroit Crosswell Preliminary - 1 - Jul 8 2005 10:32:21
Receiver Well – Receiver Well
Source Well – Source Well
Receiver Level: 5
Source Level: 5
Well Spacing: 1600
Survey Type: 1
Minimum Angle: 50
Maximum Angle: 80
Dip: 0
Top Zone(re PD): 400
End Zone(re PD): 1200
Number Receivers: 20
Number Sweeps: 12
Sweep Length(s): 1.2
Listen Time(s): 0.4
Trace Delay(ms): 0
Sweep Lower (Hz): 100
Sweep Upper (Hz): 2000
Dead Time(s): 1.6
Cycle Time(s): 0
Turns Fixed(min.): 5
Turns Var(min/s): 0.005
Smear: 4.8
Sample Period(usec): 125
Taken Rate(dipst): analog
Winch Factor(%): 90
Working Hours/Day: 21
Setup Time(hrs): 8
Depth units: feet
Field Cell Size(xxx): 25:25
Survey Type: 1
1-angle w/rd
2-angle rd
3-rect
Rate(feet/hr): 8.0
Turns(hrs): 2.9
Shooting(hrs): 42.8
Survey(days): 2.5
Traces: 75908
Rcvr Depth re KB
Rcvr Ref Elev 0
Src Depth re KB
Src Ref Elev 0
Datum Elev(PD) 0
Shooting Chart
Source Depth (re KB)
Receiver Depth (re KB)
Direct Field 50 to 80
Depth (re PD)
Upgoing Reflection Field 50 to 80
Upgoing Reflection Minimum Angle
Receiver Well
Offset
Source Well
Receiver Well
Offset
Source Well


Upgoing Reflection Fold 50 to 80
Upgoing Reflection Minimum Angle
Depth (re PD)
0
600
1200
0
400
800
1200
Receiver Well
Offset
Source Well
540
486
432
378
324
270
216
162
108
54
0
93
81
72
63
54
45
36
27
18
9
0


Downgoing Reflection Fold 50 to 80
Downgoing Reflection Minimum Angle
Depth (re PD)
0
600
1200
0
400
800
1200
Receiver Well
Offset
Source Well
540
486
432
378
324
270
216
162
108
54
0
93
81
72
63
54
45
36
27
18
9
0

Resumes of Key Personnel

Bruce P. Marion, President Z-Seis Corporation, received B.S. and M.S. degrees in electrical engineering from Texas A&M University in 1973 and the Engineers Degree in electrical engineering from Stanford University in 1976. He founded Tomex Corporation in 1984 with Professor Bernard Widrow and developed the Tomex seismic-while-drilling ("SWD") technology. He developed the key signal processing algorithms for SWD and invented the continuous seismic velocity log for SWD. In 1992 he and Professor Jerry Harris of Stanford University founded TomoSeis, a pioneer company in the development of commercial, low-cost crosswell technology. He developed many of the crosswell processing algorithms and was co-inventor of a unique borehole source. In 2000 he sold TomoSeis to Core Labs and was President of the TomoSeis Division of Core Labs, for 3 years. In 2003 he founded Z-Seis Corporation as a successor to TomoSeis, purchasing the crosswell assets of Core Labs, to take crosswell technology to the next level.

Professional Publications

Rector, J. W. and Marion, B. P., 1989, Real-time VSP and checkshot surveys using the drill bit as a downhole seismic source, Oil and Gas Journal, 66-72, February 12.

Rector, J. W. and Marion, B. P., 1989, MWD VSP and checkshot surveys using the drill bit as a downhole energy source, presented at the 21st Annual OTC Conference, Houston.

Society of Exploration Geophysicists, 1989, Best OTC Geophysical Paper Award

Rector, J. W., and Marion, B. P., 1991, The use of drill-bit energy as a downhole seismic source, Geophysics 56, 628-634.

Lazaratos, S. K., Langan, R., Harris, J. M., and Marion, B. P., 1994, Shear-wave crosswell reflection imaging in West Texas, in Expanded Abstracts of the 64th Annual International SEG Meeting, Los Angeles.

Lazaratos, S. K., and Marion, B. P., 1996, Log-scale seismic for reservoir characterization, in Expanded Abstracts of the 66th Annual International SEG Meeting, Denver.

Lazaratos, S. K., and Marion, B. P., 1996 Crosswell seismic imaging of reservoir changes caused by CO_2 injection, in Expanded Abstracts of the 66th Annual International SEG Meeting, Denver.

Patents

Rector, J.W., Marion, B.P., Widrow, B., Salehi, I., 1991, "Signal processing to enable utilization of a rig reference sensor with a drill bit seismic source", U.S. No. 5,050,130.

Rector, J.W., Marion, B.P., Widrow, B., Salehi, I., 1992, "Signal processing to enable utilization of a rig reference sensor with a drill bit seismic source", U.S.No. 4,926,391.

Rector, J.W., Marion, B.P., Widrow, B., Salehi, I., 1993, "Signal processing to enable utilization of a rig reference sensor with a drill bit seismic source", U.S. No. 5,191,557.

Harris, J.M., Marion, B.P., Canny, D., 1998, "Dual well multiple-element resonant cavity piezoceramic borehole energy source", U.S. No. 6,135,234.

GENERAL TERMS AND CONDITIONS (ZS0503)

Z-Seis Corporation (Z-Seis) offers services and equipment under the following General Terms and Conditions.

1. **Independent Contractor**. Z-Seis acts solely as an independent contractor in performing services or furnishing equipment.
2. **Customer Responsibility**. Customer shall at all times be responsible for the complete care, custody and control of the well and direction of services to be performed. Customer is responsible for safety and conditions in and about the well and for advising Z-Seis of the same. Customer has superior knowledge of the hazards and dangers existing in and about the well which could cause damage to property or personal injury or death as a result of services performed hereunder by Z-Seis. Customer shall provide Z-Seis with all information required to enable Z-Seis to perform its services safely and efficiently. Customer shall provide adequate safety apparatus and written safety instructions, as per applicable laws and regulations, and will be responsible for ensuring that adequate means for emergency evacuation are in place. A representative of the Customer must be present to furnish instructions, and to specify depths and methods to be employed for any service which is to be performed hereunder.
3. **Interpretation**. In making interpretations, Z-Seis' employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, Z-Seis cannot, and does not, guarantee the accuracy or the correctness of any interpretation, nor the availability of any specific geophysical data from any subsurface formation. In no event should the Customer base a decision concerning drilling, completion, treatment or production of a well or a decision concerning any procedure involving the safety of any persons or equipment solely on such an interpretation by Z-Seis' employees.
4. **Data Transmission and Storage**. Z-Seis does not warrant the accuracy of logging data transmitted by electronic processes, and will not be responsible for accidental or intentional interception of such data by others. Without prejudice to paragraph 11 hereof, Z-Seis does not guarantee the safe storage or the length of time of storage of any digital tapes, optical prints or transparencies, or other similar products or materials.
5. **No Warranties**. Z-Seis cannot guarantee any results from the performance of services, nor the availability of any specific geophysical data from any subsurface formation. Z-Seis shall not be liable for loss or damage arising from the performance of services and makes no warranties, express or implied regarding Z-Seis' performance of services.
6. **Limitation of Liability**. Z-Seis shall not be liable for any incidental, special, consequential or exemplary damages, including without limitation, loss of anticipated profits or benefits. In no event shall Z-Seis' liability to customer resulting from Z-Seis' performance of the services exceed the total price paid by customer to Z-Seis for the performance of services.
7. **Joint Ownership**. If Customer is not the sole owner of the mineral interests, the well or the field, Customer's request for services shall constitute Customer's warranty that Customer is the duly constituted agent of each and every owner and has full authority to represent the interests of the same with respect to all decisions taken throughout the performance of any services performed hereunder. Customer shall indemnify and hold Z-Seis, its employees, officers, directors and shareholders harmless from and against any and all liabilities, losses or damages, claims, demands, causes of action, suits and associated expenses (including reasonable attorney's fees) and awards resulting from the allegation by any person that Customer has misrepresented or lacked sufficient authority to represent such person as warranted by Customer in this paragraph.
8. **Indemnification**.
   a) Z-Seis agrees to defend, indemnify, and hold harmless Customer against any claims brought against Customer by Z-Seis' officers, employees, agents, subcontractors, business invitees, and guests, including but not limited to claims on account of personal injury, death or property damage resulting from operations conducted pursuant to this Agreement, except those which are caused, in whole or in part, by the gross negligence or intentional misconduct of Customer, its officers, employees, agents, business invitees, or guests.
   b) Customer agrees to defend indemnify, and hold harmless Z-Seis against any claims brought against Z-Seis by Customer's officers, employees, agents, subcontractors, business invitees, and guests, including but not limited to claims on account of personal injury, death or property damage resulting from operations conducted pursuant to this Agreement, except those which are caused, in whole or part, by the gross negligence or intentional misconduct of Z-Seis, its officers, employees, agents, business invitees, or guests.
   c) Notwithstanding subparagraph (a) above, if any Z-Seis equipment is lost, destroyed or damaged while at the well site, in the well or outside the well or while being transported by or on behalf of Customer or by conveyance arranged by Customer, or while in Customer's custody; or if any Z-Seis equipment is expropriated, nationalized or otherwise lost due to force majeure; then (i) Customer shall attempt to recover such equipment for Z-Seis at Customer's sole risk and expense; (ii) Customer shall reimburse Z-Seis for the cost of replacement or repair of such equipment, if reparable, even if such loss, destruction or damage is due in whole or part to the sole, concurrent, active or passive negligence of Z-Seis or its officers, directors, or employees, or to force majeure. Customer shall promptly return to Z-Seis damaged equipment, or lost equipment subsequently recovered without inspecting or opening such equipment.
   d) Customer agrees to protect defend, indemnify and hold Z-Seis and its officers, directors and employees harmless from and against all loss, liability claims, demand and causes of action (including all costs and

expenses thereof and attorney's fees) of every kind and character, without limit and without regard to the cause or causes thereof or the negligence of any party, including but not limited to the sole concurrent, active or passive negligence of Z-Seis or its officers, directors or employees, arising in connection herewith in favor of Customer or any third party on account of pollution, contamination or radiation damage, subsurface loss or damage, or damage or personal injury or death arising on the surface as a result of subsurface loss or damage, including without limitation loss or damage to the well or reservoir.

9. **Equipment**
   a) Notification of Hazardous Conditions. Z-Seis' downhole equipment is designed to operate under conditions normally encountered in the wellbore. The equipment may be seriously damaged by excessive well temperature and pressure, gas-cut drilling mud, deviated borehole, obstacles in the borehole, corrosive gas or chemicals, and other hazardous conditions existing in the borehole. Customer shall notify Z-Seis in advance and make special arrangements for servicing wells in which hazardous or unusual conditions exist.
   b) Fishing. In case it is necessary for Customer to fish for any Z-Seis equipment, Customer shall assume the entire responsibility for such operations, but Z-Seis will, if so desired by Customer, render assistance in advisory capacity for the recovery of such equipment. Z-Seis' employees have no special expertise in fishing operations, nor are they authorized to do anything other than advise and consult with Customer in connection with any such fishing operations. Any fishing tools furnished by Z-Seis are furnished solely as an accommodation.
10. **Manufacturers and Suppliers.** All of these General Terms and Conditions shall also apply in favor of (a) any supplier which designs, manufactures and/or supplies any equipment or services Z-Seis may use in connection with the performance of work or services for Customer and (b) the contractors and subcontractors of such suppliers.
11. **Access to Well.** With respect to onshore and offshore operations, Customer shall provide, at its expense, adequate means of transportation required for Z-Seis' equipment and personnel to gain access to or return from a well site, and shall obtain at Customer's sole cost and expense all permits, licenses or other authorization required for Z-Seis to enter upon work area for the purposes contemplated. When necessary to repair roads or bridges, or to provide transportation to move Z-Seis' equipment or personnel, such shall be arranged and paid for by the Customer.
12. **Confidentiality.** Results obtained by Z-Seis are held in strict confidence and will not be disclosed by Z-Seis to any third party without authorization from Customer as long as such results are not in the public domain, except as required by law or legal process.
13. **Intellectual Property Rights.** Intellectual rights of inventions, patents and results arising out of this agreement shall be the property of Z-Seis.
14. **Payment.** Customer shall pay Z-Seis in accordance with the applicable quotation. Terms for payment of charges not otherwise modified in the quotation are NET CASH within thirty (30) days from the date services are rendered. Any amount unpaid at the end of said thirty (30) days is subject to interest at the maximum rate permitted by law. If unpaid amounts are collected through legal proceedings or by a collection agent, Customer shall pay reasonable costs and attorney's fees.
15. **Taxes.** Customer shall pay Z-Seis in accordance with the terms of Paragraph 12 and shall pay any and all taxes or other levies imposable or imposed by any government or authority with respect to the charges made or payments received in connection with Z-Seis' products or services.
16. **Force Majeure.** Z-Seis shall not be responsible for delay or its failure to perform this Agreement due to causes beyond its control which are not the result of its fault or negligence.
17. **Entire Agreement: Changes.** This Agreement represents the entire agreement and understanding between the parties with respect to its subject matters and supersedes any prior and/or contemporaneous discussions, representations, or agreements, whether written or oral, of the parties regarding this subject matter. Purported amendments or changes shall be of no force or effect unless they are in writing and signed by duly authorized representatives of the parties.

Attachment D

Drilling Cost Proposals

- OIL Ex, Inc.
- LAYNE CHRISTENSEN COMPANY
- Boart Longyear Company

OIL-EX, INC.
415 S. UNION STREET
TRAVERSE CITY, MI 49684

DATE: March 6, 2006
REVISED APRIL 7, 2006

Craig Johnson
NTH Consultants, Ltd.
Detroit, MI

Re: DRIC

RIG MOBILIZATION/DEMOB.	17,000.00
MUD/CHEMICALS	2,000.00
DOZER/LOADER STANDBY RATE $400.00 PER DAY	2,400.00
DAYWORK DRILLING/CREWS/FUEL 5 DAYS @ $9500	47,500.00
DRILL BITS PER WELL	7,500.00
TRUCKING/HAULING	6,000.00
BOP RENTAL/TESTING	2,000.00
CASING TONGS/TOOLS TO RUN 9 5/8" & 5 ½"	2,500.00
CEMENTING 9 5/8" CASING	8,500.00
CEMENTING 5 ½" CASING	10,000.00
RENTAL TANKS/TRUCKING/CLEANOUT	10,000.00
CUTTINGS SOLIDIFICATION AND DISPOSAL	12,500.00
ENVIRONMENTAL LINERS UNDER EQUIPMENT	3,000.00
DRILLING SUPERVISION $1000.00/DAY	6,000.00
EQUIPMENT RENTALS	5,000.00
WELLHEAD ASSEMBLY	2,000.00
FRESH & BRINE WATER	5,000.00
PURCHASE 9 5/8" CASING $28.50/FT.	5,700.00
PURCHASE 5 ½" CASING $8.00/FT.	12,000.00
PLUG AND ABANDON WITH CEMENT TO SURFACE $8.00/FT.	12,000.00
DRIVE ADDTNL CASING TO MEET ENVRNTL CONDITONS	6,500.00
30 TO 120-DAY PAYMENT TERMS (1.5% per 30 days after 30 days)	

TOTAL ESTIMATED COST: $185,100.00

- NOTE: STANDBY RATE PER 24 HRS. WITH RIG WATCH/SECURITY $5200.00/DAY
- ADDITIONAL (HOSPITAL MUFFLERS) TO QUIET RIG AND EQUIPMENT:
- RENTAL ITEM AT $250.00/DAY
- CORING CHARGES AS FOLLOWS: 1-7 7/8" X 4" CORE HEAD (PURCHASE) $16,625.00
- 2 MAN TEAM AS CORING SUPERVISORS AND ALL NECESSARY TOOLS AND EQUIPMENT. ie: CORE BARRELS, X-OVERS AND CONNECTIONS. 4" CORE WOULD BE RECOVERED. PER DAY CHARGE $2500.00
- ADD AN ESTIMATED $15,000 / ROTARY HOLE TO EXTEND FROM 1, 500 TO 1,750 FEET (PER EH, 4/7/2006)
- ADD AN ESTIMATED $25,000 / CORED HOLE TO EXTEND FROM 1,500 TO 1,750 FEET (PER EH, 4/7/2006)

OIL-EX, INC.
415 S. UNION STREET
TRAVERSE CITY, MI 49684

DATE: March 6, 2006
REVISED APRIL 7, 2006

Craig Johnson
NTH Consultants, Ltd.
Detroit, MI

Re: DRIC

ROTARY BORINGS:

$185,100 base
$ 250 day/muffler @10 days

$187, 600
$ 5,628 30 to 90 day payment terms

$193,228 boring

CORE BORINGS:

$185,100 base
$ (6,500) credit for environmental casing
$ 25,000 coring services
$ 16,625 core head per boring
$ 250 day/muffler @8 days

$ 228,725
$ 6,870 30 to 90 day payment terms

$235,587 boring

Date:	February 9, 2006
Prepared For:	Craig Johnson
Affiliation:	NTH Consultants
Project Location:	Detroit Michigan
Scope:	Rotary Drilling on Land (CORE)
Phone:	313-237-3917
Fax	
Email	crjohnson@nthconsultants.com

	UNITS	UNIT COST	ESTIMATED QUANTITY	ESTIMATED EXTENSION
Mobilization & Demobilization				
D 40 K Rotary Drill / Core Drill	Per Rig	$40,000.00	1	$40,000.00
Halliburton Grouting Equipment	Per Hole	$25,000.00	1	$25,000.00
Frac Tank	Each	$3,000.00	0	$0.00
Vertical Hole Drilling Overburden				
18" Overburden Drilling 0 to 100'	Per Foot	$105.00	100	$10,500.00
Set 13 3/8 Casing	Per Hour	$400.00	4	$1,600.00
13 3/8" Surface Casing	Per Foot	$62.00	100	$6,200.00
Setup Of Layne Grouting Equipment	Per Hole	$1,500.00	1	$1,500.00
Grout 13 3/8 Casing (by Layne)	Per Bag	$32.00	85	$2,720.00
12 1/4" Rock Drilling 100' to 200'	Per Foot	$85.00	100	$8,500.00
Set 9 5/8" Casing	Per Hour	$400.00	6	$2,400.00
9 5/8 Casing	Per Foot	$45.00	200	$9,000.00
Grout 9 5/8 Casing (by Layne)	Per Bag	$32.00	70	$2,240.00
B O P Installation and Test	Each	$4,000.00	1	$4,000.00
Drill 8.75" Hole 200' to 1300'	Per Foot	$71.00	1100	$78,100.00
Set 5.5" Casing	Per Hour	$400.00	15	$6,000.00
Grout 5.5" casing (by Halliburton)	Per Bag	$46.00	556	$25,576.00
Float Shoe 5.5" Casing	Each	$750.00	1	$750.00
5.5" Casing Hanger	Each	$225.00	1	$225.00
NQ Core Drilling				
NW Casing	Per Foot	$31.00	200	$6,200.00
Drilling Per Foot 0-500 ft.	Per Foot	$38.00	500	$19,000.00
Drilling Per Foot 501-1000 ft.	Per Foot	$41.00	500	$20,500.00
Drilling Per Foot 1001-1500 ft.	Per Foot	$48.00	500	$24,000.00
Signal Shot Surveys	Per Hour	$250.00	0	$0.00
Mud Engineer	Per Shift	$1,500.00	30	$45,000.00
Drill Additives and Loss Circulation Material (estimated)	Cost Plus 15%	$6,000.00	1	$6,000.00
Health & Safety Officer To Monitor H2S and Discharge	Per Shift	$1,200.00	30	$36,000.00
Per Diem Two Man Crew	Per Man Day	$95.00	120	$11,400.00
Hourly Rig and Crew Charges				
Hole Stabilizing Per Hour or Abandonment	Per Hour	$400.00	0	$0.00
BOP, Accumulator, Gas Buster, Flash Suppressor	Per Day	$1,550.00	45	$69,750.00
Tango 350 Mud Mixing and Cleaning Equipment 300 GPM	Per Day	$350.00	45	$15,750.00
Hole Abandonment Materials Cement Grout	Per Bag	$32.00	150	$4,800.00
Drill Additives and Loss Circulation Material (estimated)	Cost Plus 15%	$15,000.00	1	$15,000.00
Mud Engineer	Per Shift	$1,500.00	30	$45,000.00
Health & Safety Officer To Monitor H2S and Discharge	Per Shift	$1,200.00	30	$36,000.00
Frac Tank 500 BBL Storage Tank Water	Per Day	$125.00	0	$0.00
Frac Tank 500 BBL Storage Tank Drill Fluid Discharge	Per Day	$125.00	0	$0.00
Standby With 2 Man Crew	Per Hour	$300.00	0	$0.00
Signal Shot Survey Camera	Per Month	$3,000.00	0	$0.00
Rig Operating With 2 Man Crew	Per Hour	$400.00	0	$0.00
Water Truck Rental	Per Day	$150.00	0	$0.00
Hauling Water With Water Truck	Per Hour	$95.00	0	$0.00
Core Boxes	Each	$8.75	0	$0.00
Drilling Fluid & Cuttings Disposal by Others	By Others	0	0	$0.00
Moving Between Holes	Per Man Hour	$92.00	100	$9,200.00
Per Diem Three Man Crew	Per Man Day	$95.00	180	$17,100.00
			Approximate Estimate	$605,011.00

Health and Safety officer will be on site every day on the first hole then only when needed do to site condition

Mud Engineer will be on site for first hole or has needed do to hole condition

This quotation is subject to change after 30 days from original proposal date as cited above.

This quotation is subject to the attachment entitled "QUALIFICATIONS AND ASSUMPTIONS."

Prepared By: Keith Meyers - Operation Manager

LAYNE CHRISTENSEN COMPANY

Specialized Drilling Division - Milwaukee

W229 N5005 DePlainville Road

Pewaukee, WI 53072

Phone: (262) 246-4646

Date:	**February 9, 2006**
Prepared For:	**Craig Johnson**
Affiliation:	**NTH Consultants**
Project Location:	**Detroit Michigan**
Scope:	**Rotary Drilling on Land (NO CORE)**
Phone	**313-237-3917**
Fax	
Email	**crjohnson@nthconsultants.com**

	UNITS	UNIT COST	ESTIMATED QUANTITY	ESTIMATED EXTENSION
Mobilization & Demobilization				
D 40 K Rotary Drill / Core Drill	Per Rig	$40,000.00	1	$40,000.00
Halliburton Grouting Equipment	Per Hole	$25,000.00	1	$25,000.00
Frac Tank	Each	$3,000.00	0	$0.00
Vertical Hole Drilling Overburden				
18" Overburden Drilling 0 to 100'	Per Foot	$105.00	100	$10,500.00
Set 13 3/8 Casing	Per Hour	$400.00	4	$1,600.00
13 3/8" Surface Casing	Per Foot	$62.00	100	$6,200.00
Setup Of Layne Grouting Equipment	Per Hole	$1,500.00	1	$1,500.00
Grout 13 3/8 Casing (by Layne)	Per Bag	$32.00	85	$2,720.00
12 1/4" Rock Drilling 100' to 200'	Per Foot	$85.00	100	$8,500.00
Set 9 5/8" Casing	Per Hour	$400.00	6	$2,400.00
9 5/8 Casing	Per Foot	$45.00	200	$9,000.00
Grout 9 5/8 Casing (by Layne)	Per Bag	$32.00	70	$2,240.00
B O P Installation and Test	Each	$4,000.00	1	$4,000.00
Drill 8.75" Hole 200' to 1500'	Per Foot	$71.00	1300	$92,300.00
Set 5.5" Casing	Per Hour	$400.00	15	$6,000.00
Grout 5.5" casing (by Halliburton)	Per Bag	$46.00	556	$25,576.00
Float Shoe 5.5" Casing	Each	$750.00	1	$750.00
5.5" Casing Hanger	Each	$225.00	1	$225.00
NQ Core Drilling				
NW Casing	Per Foot	$31.00	200	$0.00
Drilling Per Foot 0-500 ft.	Per Foot	$38.00	500	$0.00
Drilling Per Foot 501-1000 ft.	Per Foot	$41.00	500	$0.00
Drilling Per Foot 1001-1500 ft.	Per Foot	$48.00	500	$0.00
Signal Shot Surveys	Per Hour	$250.00	0	$0.00
Mud Engineer	Per Shift	$1,500.00	30	$0.00
Drill Additives and Loss Circulation Material (estimated)	Cost Plus 15%	$6,000.00	1	$0.00
Health & Safety Officer To Monitor H2S and Discharge	Per Shift	$1,200.00	30	$0.00
Per Diem Two Man Crew	Per Man Day	$95.00	120	$0.00
Hourly Rig and Crew Charges				
Hole Stabilizing Per Hour or Abandonment	Per Hour	$400.00	0	$0.00
BOP, Accumulator, Gas Buster, Flash Suppressor	Per Day	$1,550.00	45	$69,750.00
Tango 350 Mud Mixing and Cleaning Equipment 300 GPM	Per Day	$350.00	45	$15,750.00
Hole Abandonment Materials Cement Grout	Per Bag	$32.00	150	$4,800.00
Drill Additives and Loss Circulation Material (estimated)	Cost Plus 15%	$15,000.00	1	$15,000.00
Mud Engineer	Per Shift	$1,500.00	30	$45,000.00
Health & Safety Officer To Monitor H2S and Discharge	Per Shift	$1,200.00	30	$36,000.00
Frac Tank 500 BBL Storage Tank Water	Per Day	$125.00	0	$0.00
Frac Tank 500 BBL Storage Tank Drill Fluid Discharge	Per Day	$125.00	0	$0.00
Standby With 2 Man Crew	Per Hour	$300.00	0	$0.00
Signal Shot Survey Camera	Per Month	$3,000.00	0	$0.00
Rig Operating With 2 Man Crew	Per Hour	$400.00	0	$0.00
Water Truck Rental	Per Day	$150.00	0	$0.00
Hauling Water With Water Truck	Per Hour	$95.00	0	$0.00
Core Boxes	Each	$8.75	0	$0.00
Drilling Fluid & Cuttings Disposal by Others	By Others	0	0	$0.00
Moving Between Holes	Per Man Hour	$92.00	100	$9,200.00
Per Diem Three Man Crew	Per Man Day	$95.00	180	$17,100.00
			Approximate Estimate	$451,111.00

Health and Safety officer will be on site every day on the first hole then only when needed do to site condition

Mud Engineer will be on site for first hole or has needed do to hole condition

This quotation is subject to change after 30 days from original proposal date as cited above.

This quotation is subject to the attachment entitled "QUALIFICATIONS AND ASSUMPTIONS."

Prepared By: Keith Meyers - Operation Manager

LAYNE CHRISTENSEN COMPANY

Specialized Drilling Division - Milwaukee

W229 N5005 DePlainville Road

Pewaukee, WI 53072

Phone: (262) 246-4646

Boart Longyear Co

P.O. Box 919
Wytheville, VA. 24382
Phone 276-228-7811

NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 2-6-06
Proposal:
Job Name: Detroit 1-06
Location: Detroit Michigan

Attention: Mr. Craig Johnson

RE: Diamond drilling at your site in Detroit

Dear Sir:

In response to your inquiry concerning core drilling at your site, we are pleased to submit our rates for your consideration.

We understand the following information to be pertinent to the project.

1. You plan to drill four or five PQ/HQ/NQ sized holes approximately 1,500 feet deep.
2. The holes are to be started vertically.
3. The holes are truck mount accessible.
4. Two of the holes will need to finish PQ size.
5. Brine will need to be used in the salt formation, approximately from 1,200 to 1,500 ft.
6. Mud tanks or dug pits will be provided by others.
7. Disposal of drill fluids and cuttings will be provided by others.
8. You will build and maintain roads and drill sites and furnish a dozer with operator to assist in moving the drill and equipment if necessary, at no cost to Boart Longyear Co.
9. Water can be pumped if a source is found within 2,500 feet, or a water truck will be utilized with a driver.
10. The holes will be abandoned with neat cement grout.
11. Our prices are based on working our own people and paying our normal pay rates.
12. Your planned starting date is late March 2006, subject to rig and crew availability at time of contract signing.

We appreciate the opportunity to submit this proposal; should you have any question regarding it, feel free to contact me at your convenience.

Yours Truly,

Boart Longyear

Mike Neal
Business Development Mgr.
Core Drilling Division

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/06/06
Proposal# 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson Client Job #

***** ANTICIPATED REQUIREMENTS AND CONDITIONS ******

Estimated Starting Date:	03/30/06
Estimated Completion Date:	05/30/06
Number of Drills:	1
Drill Type:	44 Truck Mounted Vertical
Number of Shifts:	1
Number in Crew:	2
Hours per Shift:	12.00
Non-Drilling Supervisor:	No
Days per Week:	7
Days on the Job:	15
Days off the Job:	6
Minimum Footage:	6,000
Estimated # of Holes:	1
Maximum Depth of Hole:	1,500
Angle Degrees from Horizontal:	
Average Angle Depth:	0
Average Vertical Depth:	1,500
Average Depth Overburden:	100
Required Hole Size:	PQ,HQor NQ
Required Core Size:	3-11/32,2-1/2" or 1-
Rock Type to Drill:	Sandstone, Limestone, shale and salt
Roads & Drill Sites Maintained by:	Client at $0.00 per Hour

***** CONTRACT CHARGES *****

Mobilization:	$4,500.00
Demobilization:	$4,500.00
Per Diem Charges per Person:	$75.00

Diamond Bits and Shell are Billable According to Stated Terms
Diamond Bits and Shell Terms: NA

Down Hole Tools Charge for Lost through Drilling Operations:	85% of BLY List
Casing & Casing Shoe Charge for Left in Hole at Clients Request:	100% of BLY List
Casing & Casing Shoe Charge for Lost through Drilling Operations:	85% of BLY List

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/06/06
Proposal# 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson **Client Job #**

***** FOOTAGE ******

All Footage Rates are per: Foot

Drill Type	From	To	Bit Type	Attitude	Rate $
Overburden	0	100	7 7/8" Rock Bit	vertical	42.00
Diam. Core	0	500	HQ	vertical	34.50
Diam. Core	500	1,000	HQ	vertical	39.00
Diam. Core	1,000	1,500	HQ	vertical	46.00
Diam. Core	0	500	PQ	vertical	46.00
Diam. Core	500	1,000	PQ	vertical	53.00
Diam. Core	1,000	1,500	PQ	vertical	62.00
Diam. Core	0	500	NQ	vertical	32.00
Diam. Core	500	1,000	NQ	vertical	36.00
Diam. Core	1,000	1,500	NQ	vertical	44.00

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/06/06
Proposal# 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson **Client Job #**

***** HOURLY CHARGES ******

Rate per Hour for a 2 Person Crew

Description	Rate $
Casing Placing/Pulling	125.00
Cementing all phases including setting	125.00
Condition Hole	125.00
Hole Abandonment	125.00
Hole stabilizing or plugging	125.00
Mix Mud	125.00
Moving Between Holes	115.00
Reaming (plus Bits)	125.00
Reducing Hole	125.00
Rig up - Rig down	115.00
Standby Or Delays	115.00
Waterlines-Install/service/Dismantle	115.00
Hole surveying using your instrument	125.00
Mix Brine	125.00

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/08/06
Proposal# 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson **Client Job #**

***** Supplies and Reimbursables ******

Description	Comments	UOM	Rate $	Markup %
Cement		ea	List Plus	15.00
Drill Mud		ea	List Plus	15.00
Mud Additives		ea	List Plus	15.00
Oil Sorb		ea	List Plus	15.00
Plastic 40'x100' roll		ea	List Plus	15.00
Rod Lube		ea	List Plus	15.00
HQ Core Boxes (10' Waxed Cardboard)		ea	5.00	0.00
NQ Core Boxes (10' Waxed Cardboard)		ea	4.50	0.00
10' HQ Wood Core Boxes (hinged lid)		ea	List Plus	15.00
10' NQ Wood Core Boxes (hinged lid)		ea	List Plus	15.00
PQ Core Boxes (4' Waxed Cardboard)		ea	4.50	0.00
PQ Wood Core Boxes (hinged lid)		ea	List Plus	15.00
Salt		ea	List Plus	15.00
Third party services		ea	List Plus	15.00
Third party rentals		ea	List Plus	15.00

3-5K from and to

***** WATER CHARGES *****

Water if Purchased, will be Invoiced at Boart Longyear's List Plus: 15 %

Water Truck Mileage Chargeable at: $ 2.50 Per Mile
Water Truck Driver (if necessary) at: 35.00 Per Hour

Water Truck(s) may include the following:

Water Truck Type	Capacity	Rate $	Per
2 WD	1,000	50.00	da

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/06/06
Proposal# 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson **Client Job #**

***** TERMS AND CONDITIONS *****

INSURANCE
Boart Longyear Company will carry Comprehensive General Liability and Automobile Insurance covering personal injury and property damage and also statutory Workmen's Compensation Insurance. Certificates showing these coverages will be furnished upon request.

LICENSING
Boart Longyear Company certifies that it is licensed to do business in the state of this site location. All other licenses, land and water use permits, environmental reports, state reports relating to hole plugging, etc, shall be the responsibility of Client. Boart Longyear shall cooperate with and give technical assistance for Client's compliance with these regulations.

INVOICES
Invoices covering the work performed will be prepared on a regular basis throughtout the duration of the project. Payment Terms shall be Net Due Upon Receipt of Invoice. Amounts not paid within 45 days of Invoice Date will begin accruing interest at the rate of 1 1/2 percent per month. Remit payment to: Boart Longyear Company, c/o First Bank N. A., SDS 12-0734, P.O. Box 86, Minneapolis MN 55486-0734.

DAILY DRILL REPORTS
In order to facilitate prompt notification to the Client of drilling progress or problems, Boart Longyear Company agrees to provide our Daily Drill Reports to the Client based upon one or more of the following options:
( ) Presented daily to the Client's on-site representive for sign off.
( ) Faxed weekly to the Clients Fax No. _____
( ) Attached to the Invoices.

TAXES
Invoices arising from this project will be subject to all applicable Federal State and Local Taxes (Sales, Use, Gross Receipts, Privilege, etc.).

FORCE MAJEURE
Except for the duty of Client to make payments hereunder when due, neither party shall be liable for delays in performance or for damage occasioned by or caused by Force Majeure, which shall include, but not be limited to, acts of God, actions of the elements, war, strikes, or differences with workmen, acts of the public enemy, rules or regulations of any governmental authority having jurisdiction or control in the premises, compliance with which makes continuance of operations impossible or any other cause beyond the reasonable control of either party. Inability of either party to secure funds, arrange bank loans or other financing, or to obtain credit shall not be regarded as Force Majeure.

EXPIRATION
Prices quoted herein are firm only if this proposal is accepted on or before 02/28/2006 and if work is commenced within a reasonable period of time.

Boart Longyear Company
Core Drilling Division

PO BOX 919
WYTHEVILLE, VA 24382
(276) 228-7811

Proposal

To: NTH Consultants
480 Ford Field
2000 Brush Street
Detroit, MI 48226

Date: 02/06/06
Proposal: 2185
Job Name: Detroit 1-06
Location: Detroit, MI

Attention: Mr. Craig Johnson
Client Job #

***** TERMS AND CONDITIONS *****
continued

CREDIT APPROVAL
This agreement is subject to continuing credit approval by Boart Longyear Company of Client's financial condition, or to other financial arrangements satisfactory to Boart Longyear Company. If at any time Boart Longyear Company, in its sole judgement, deems Client's financial condition unsatisfactory, notice shall be made to client, and if action is not taken satisfactory to Boart Longyear Company, then work under this agreement shall cease. Nothing contained herein shall excuse Client's obligation to pay for work already performed in its behalf pursuant to this agreement.

INDEMNIFICATION
Nothing herein shall be construed or deemed to create any relationship between Client and Boart Longyear Company other than Boart Longyear Company acting as either a Contractor or a Sub-Contractor to Client. Each party shall be solely responsible for the acts of its employees or agents, and each shall hold harmless and fully indemnify the other party, its officers, employees, agents, and affiliated companies from any liability for injury to or death of any person, or for damage to or destruction of any property, and from any claims, actions, proceedings and costs in connection therewith, including reasonable attorney fees, arising out of or resulting from the performance of the work hereunder.

ADDITIONAL SPECIFIC TERMS FOR THIS PROPOSAL
Core boxes, mud, mud additives, plastic, rod grease, and hole plugs will be invoiced in the quantities delivered to the job site. Any of these materials unused and returned in usable condition will be credited on your final invoice.
Overtime requested by client in excess of the stated schedule will be invoiced at $28.00 per crew hr
Mobilization charges apply only to the end of county maintained roads,hourly rates apply from there.
Demobilization charges will start at the beginning of county maintained roads

ENTIRE AGREEMENT
Boart Longyear Company hereby incorporates the requirements of 41 CFR 60-1.4(a)(7)-250.4 and -741.4, if applicable. This proposal together with its covering letter and all attachments will constitute the terms and conditions of this working agreement. Your authorized signature in the space provided below will acknowledge your acceptance and will validate this agreement.

Boart Longyear Company	Client: NTH Consultants
Signed: Mike Neal	Signed: _____
Name: Mike Neal	Name: _____
Title: Contract Manager	Title: _____
Date: 2-7-06	Date: _____

Attachment E

Baker Atlas Cost Proposal

Baker Atlas

Feb 9, 2006

Mr. Craig Johnson
NTH Consultants, LTD

NTH Proposal

Ken Moss
Account Manager
2222 Enterprise Dr.
Mt. Pleasant, Michigan 48858
Tel (989) 773-7992

Baker Atlas Services appreciates the opportunity to offer the following first call service quotes

First trip to well for the Sonar Hoist service:

Run 1 **Depth:** **2000** **Top Log Interval:** **0**

Code	CASED HOLE SERVICES		Qty	Disc. Price
SCOH	Land Service Charge		1	$1,265.00
ENVCOM	Environmental Compliance		1	$200.00
TC-E	Fuel Surcharge		1	$100.00
DOT	DOT Certification	Vehicles	2	$200.00
JCGR-A.100	Junk Catcher-Gauge Ring	Depth	2000	$242.00
		Operation	1	$187.55
CIS-A.150	Customer Instr Service	Depth	2000	$748.00
		Operation	1	$433.40
TC-W	Wireline Charge	Runs	1	$15.00
MC	Mileage	Mileage	175	$577.50
	Rev 2.0		SERVICES TOTAL	$3,968.45

Second trip to well for the Acoustic and Directional logging service:

Code	OPEN HOLE SERVICES		Qty	Disc. Price
SCOH	Land Service Charge		1	$3,575.00
ENVCOM	Environmental Compliance		1	$200.00
TC-E	Fuel Surcharge		1	$100.00
DOT	DOT Certification	Vehicles	2	$200.00
DAL-A.100	DAL (delta t)	Depth	2000	$814.00
		Logging	2000	$814.00
DGR-B.200	Digital GR (Primary Run)	Depth	2000	$275.00
		Logging	2000	$275.00
DIR-A.100	Directional Survey	Depth	2000	$805.00
		Logging	2000	$805.00
DSK.100	LAS Data	Processing	1	$192.50
TC-W	Wireline Charge	Runs	1	$50.00
MC	Mileage	Mileage	175	$577.50
	Rev 2.0		SERVICES TOTAL	$8,283.00

Optional Service:

CR.ZA60	Crane Truck	Mobilization	1	$1,650.00

Operational Remarks:

- Conditions of this quote are good for 60 days from the above quote date.
- Discounts for routine services not specified in this proposal negotiated separately.
- All Rental Items will be billed as per third party invoice with 20% markup.
- Up to 5 prints (b&w) of each log are inclusive. Additional prints are $50.00 ea. (b&w)
- **SERVICE LOCATION: MT PLEASANT, MI PHONE: (989) 773-7992 MGR: Jason Warrens**

Services are subject to the "Worldwide Terms & Conditions" listed under the Terms & Conditions tab or an active Master Service Agreement. If you have additional questions, call me at Tel (989) 773-7992

T H A N K Y O U for considering Baker Atlas for your wellsite services.

Ken Moss
Account Manager

Baker Atlas

Feb 7, 2006

Mr. Craig Johnson
NTH Consultants, LTD.

Detroit River Crossing

Ken Moss
Account Manager
2222 Enterprise Dr.
Mt. Pleasant, Michigan 48858
Tel (989) 773-7992

Baker Atlas Services appreciates the opportunity to offer the following first call service quotes

Run 1 **Depth:** **2000** **Top Log Interval:** **0**

Code	OPEN HOLE SERVICES		Qty	Disc. Price
SCOH	Land Service Charge		1	$3,575.00
ENVCOM	Environmental Compliance		1	$200.00
TC-E	Fuel Surcharge		1	$100.00
DOT	DOT Certification	Vehicles	2	$200.00
DAL-A.100	DAL (delta t)	Depth	2000	$814.00
		Logging	2000	$814.00
DGR-B.200	Digital GR (Primary Run)	Depth	2000	$275.00
		Logging	2000	$275.00
DSK.100	LAS Data	Processing	1	$192.50
TC-W	Wireline Charge	Runs	1	$50.00
	Rev 2.0		SERVICES TOTAL	$6,495.50

Optional Service:

CRZA60	Crane Truck	Mobilization	1	$1,650.00

Well Specifics:
Casing: 5.5" fiberglass, weight N/A

Operational Remarks:

- Conditions of this quote are good for 60 days from the above quote date.
- Discounts for routine services not specified in this proposal negotiated separately.
- All Rental Items will be billed as per third party invoice with 20% markup.
- Up to 5 prints (b&w) of each log are inclusive. Additional prints are $50.00 ea. (b&w)
- **SERVICE LOCATION: MT PLEASANT, MI PHONE: (989) 773-7992 MGR: Jason Warrens**

Services are subject to the "Worldwide Terms & Conditions" listed under the Terms & Conditions tab or an active Master Service Agreement. If you have additional questions, call me at Tel (989) 773-7992
T H A N K Y O U for considering Baker Atlas for your wellsite services.

Ken Moss
Account Manager

Attachment F

Sonar Survey Proposal

SOCON

SOCON Sonar Well Services, Inc.

February 14, 2006

Mr. Craig Johnson
NTH Consultants

RE: Sonar survey proposal

Dear Mr. Johnson,

SOCON Sonar Well Services, Inc. will provide the equipment, materials and personnel to perform a sonar survey at Detroit, Michigan for the following cost:

• Sonar Survey (Open Hole)	$6,500.00 per well
• Wireline Hoisting (Sonar Tool)	$1,800.00 per run
• Mobilization (vehicle to and from site)	$2,500.00 per Campaign
• Service Fee	$750.00 per day
• Standby Time	$150.00 per hour
• Tool Insurance	$550.00 per well
• Sonar Reports (5 included with survey)	$25.00 each additional

SOCON Sonar Well Services, Inc. appreciates the opportunity to submit this quote for this project and any future projects you may have. If you have any questions or concerns please feel free to call me at (936) 441-5801.

Thank You,
SOCON Sonar Well Services, Inc.

Jason McCartney
Vice President

11133 I-45 South, Ste.E
Conroe, TX 77302

Office: (936) 441-5801
Fax: (936) 539-6847

Attachment G

Geotechnical Deep Boring Plan

Parsons

PARSONS

26777 Central Park Boulevard • Suite 275 • Southfield , Michigan 48076 • (248) 262-0013 • Fax: (248) 262-0988 • www.parsons.com

Technical Memo

Date: February 8, 2006

Re: Detroit River International Crossing
Geotechnical Deep Boring Plan

This Technical Memo presents a preliminary boring plan for brine well investigation at the X10 and X11 alignments. The deep boring layout is based on the following assumptions:

- 1,000 ft (300 m) optimal boring spacing
- 1,500 ft (460 m) maximum boring spacing for diagonals
- Preliminary bridge alignments develop to avoid known or suspected brine well locations to the extent practical
- MDOT policy regarding relation of brine well influence areas to "primary" and "secondary" substructure elements is implemented

From the preliminary geotechnical investigation the literature indicates probable rock void propagation angles from a maximum angle of 20 degrees to a minimum of 12 degrees. Based on these angles of influence the clear corridor is from 126 ft (40 m) to 490 ft (150 m) (calculations attached). Each preliminary boring plan figure presents a minimum and maximum clear zone represented by orange and yellow dashed lines respectively. The preliminary boring locations are presented by numbered blue dots.

Each of the attached plans presents the known or potential brine well locations from historic search of related records. Radii of 150 m (for known wells), 300 m, and 450 m representing proximity to the known or possible brine wells are shown on the preliminary boring plans in red, orange and yellow respectively. These zones are presented for illustration only to assist in laying out the bridge alignment as far away as practical from potential brine well voids at depth. It should be noted that these radii have been updated from the preliminary figures presented in the NTH report dated January 20, 2006.

Corridor X10

Attached are the X10A (Figure 1) and X10B (Figure 2) Preliminary Boring Plans. On each of these plans the preliminary bridge centerline is represented by a green line.

Alignment A

This preliminary bridge alignment would not reach grade until well into the widened plaza approach north of Jefferson, therefore, the preliminary bridge approach would likely end just north of Jefferson and the remaining portion would likely be placed on fill until grade is reached. Borings 7 and 8 are shown as open circles, which are meant to be "optional".

Borings 1 through 6 would provide 2-dimensional panels creating a clear zone up to a cross section between boring 5 and 6. Addition of boring 7 would increase

the clear zone to approximately the preliminary location of the bridge abutment. Addition of boring 8 would increase the clear zone into the fill section of the approach.

Alignment B

The attached X10B (Figure 2) plan shows the preliminary bridge alignment for a crossing extending at a high skew angle to a Brighton Beach landing on the Canadian side, while avoiding the Ontario Hydro plant. This alignment would require the addition of boring 9. The attached plan shows the clear zone provided if the brine well influence angle is 12 degrees.

The boring program would begin with borings 1 through 6, boring 9 would only be required if the Canadian boring program revealed that crossing alignment X10A could not be accommodated.

Corridor X11

One preliminary bridge alignment is proposed at the X11 crossing corridor (Figure 3). The main anchorage of a suspension bridge would be located just north of Jefferson and all bridge types would be at grade just past the panel between borings 14 and 16.

The X11 Preliminary Boring Plan is design to provide a clear zone for the primary and secondary foundation elements of the river crossing bridge. However, two of the potential brine well locations may influence ramp structures connecting to I-75 as well as the interstate itself. Livernois/Dragoon Preliminary "Optional" Boring Locations (Plan B) presents "optional" borings that would be required to provide a clear zone for these ramp structures in addition to the river crossing bridge (Figure 4).

These wells date from approximately 1895 to 1920. It should be noted that significant existing industrial and transportation facilities are within the proximity of and/or directly above potential brine well locations. The proposed inspection plaza, connecting roadways and structures are similar to other facilities in the area. These facilities include:

Industrial Facilities	Transportation Facilities
Fisher Body Assembly Plant	Livernois Grade Crossing
Arvin Meritor	Dragoon Grade Crossing
Mistersky Power Plant	I-75 Main Line
DWSD Wastewater Treatment Plant	Fort Street (M-85)
U.S. Steel Corp.	Port of Detroit
Lafarge Concrete Facility	
River Rouge CSO Pumping Station	

After having performed extensive research, we are not aware of any significant subsidence in the over 85 years in this area. Another consideration is that repair or

mitigation of geotechnical issues considered are practical for plaza, approach roadways and ramps, should problems become evident in the future.

The boring locations presented herein are based on available subsurface, historical, and bridge alignment information. Issues such as property entry, location of existing facilities, and utilities may require shifting of these locations. In addition the geotechnical and geophysical investigation results may require adjusting the location and number of borings as the process is under way. In light of these constraints, the following boring program is now recommended:

Location	**Boring No's.**	**Reason**
Required Borings		
Crossing X10A	1 – 6	Coverage for primary and secondary foundation elements.
Crossing X11	10-16	
Optional Borings (To be undertaken if MDOT desires)		
Crossing X10A	7 – 8	Coverage for final low level approach structures
Crossing X10B	9	Coverage for high skew bridge (to Brighton Beach)
Livernois/Dragoon Interchange	17 – 28	Coverage for connecting roadways and ramp structures

Bruce L. Campbell, PE
Project Engineer

Attachments

cc: File
R. Beauboeuf – Parsons
J. Corradino – Corradino
F. Klingler – NTH

SUBJECT

JOB NO.

SHEET NO 1 OF

MADE BY DATE CHECKED BY DATE

1,000 YARDS

IF $\phi = 20°$

$x = 1{,}200' \cdot \tan(20°) = 457'$

$y = 2(.37') + 100 = 974'$

IF $\phi = 12°$

$x = 255'$

$y = 610'$

IF OPTIMUM BOLE HOLE DISTANCE IS 1,000'

20° ϕ GIVES US 126' CLEAR CORRIDOR (40m)

12° ϕ GIVES US 490 WIDE CLEAR OF OBS. (150m)

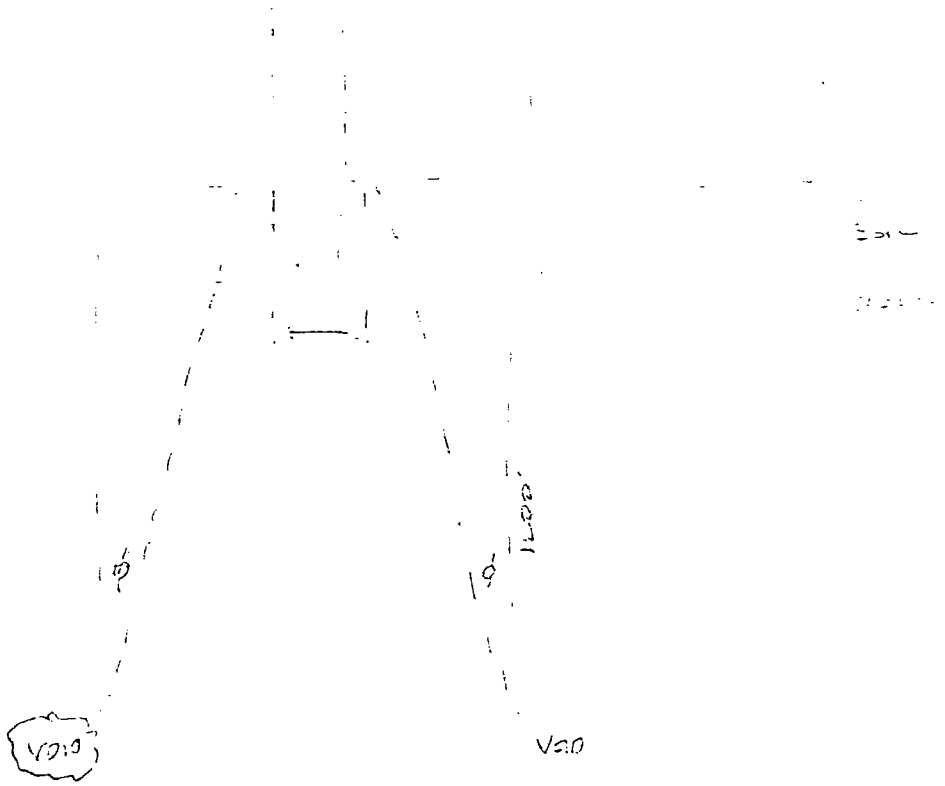
SUBJECT Drive

JOB NO.

SHEET NO. 1 OF

MADE BY DATE CHECKED BY DATE

Problem: Determine ... 1,000' apart.



IF $\phi = 20°$

$x = 1{,}200' \cdot \tan(20°) = 457'$

$y = 2(457') + 100 = 974'$

IF $\phi = 12°$

$x = 255'$

$y = 610'$

IF OPTIMUM BORE HOLE DISTANCE IS 1,000'

20° ϕ GIVES US 126' CLEAR CORRIDOR (40m)

12° ϕ GIVES US 490 WIDE CLEAR CORRIDOR (150m)

Resumes

BIOGRAPHICAL SKETCH
JIMMY F. DIEHL

PHONE: Office: (906) 487-2665; FAX: (906) 487-3371; Home: (906) 482-1654;
E-Mail: jdiehl@mtu.edu

BORN: July 8, 1946
DEGREES: B.A., M.S., Western Washington University; 1968, 1972
Ph.D., The University of Wyoming; 1977
SPECIALITY: Paleomagnetism and Potential Fields
MEMBER: AGU, GSA, SEG, NAGT

PROFESSIONAL EXPERIENCE

9/67-12/68	Teaching/Department Assistant, Western Washington University, Bellingham, WA.
1/71-6/72	Teaching Assistant, Western Washington University, Bellingham, WA.
8/72-5/73	Research Assistant, The University of Wyoming, Laramie, WY.
8/73-5/74	Teaching Assistant, The University of Wyoming, Laramie, WY.
8/74-5/76	Research Assistant (NSF support), The University of Wyoming, Laramie, WY.
9/76-8/79	Assistant Professor, University of Wisconsin-River Falls, River Falls, WI. Research Associate (NSF support), Western Washington University, Bellingham, WA. Summers only.
9/79-8/83	Assistant Professor of Geophysics; Michigan Technological University, Houghton, MI.
9/83-8/90	Associate Professor of Geophysics; Michigan Technological University, Houghton, MI.
9/88-6/89	Visiting Associate Professor; Western Washington University, Bellingham, WA.
9/90-	Professor of Geophysics, Michigan Technological University, Houghton, MI.

TEACHING ASSIGNMENTS

Undergraduate:	Fundamentals of Applied and Environmental Geophysics, Plate Tectonics and Global Geophysics, Gravity and Magnetic Interpretation Methods, Summer Field Geophysics.
Graduate:	Paleomagnetism and Environmental Magnetism, Potential Theory in Gravity and Magnetic Applications, Global Geophysics and Geotectonics

HONORS/AWARDS/POSITION S HELD

1995	Distinguished Teaching Award - Michigan Technological University
1994-1997	Associate Editor - Journal of Geophysical Research-Solid Earth
2003	Distinguished Alumni Award – Western Washington University

ACTIVE RESEARCH INTERESTS

Late Cretaceous/Tertiary apparent polar wander. Keweenawan paleomagnetism and tectonic implications. Secular variation of Plio-Pleistocene volcanic rocks from low and high latitudes. Magnetostratigraphy and caldera evolution. Environmental magnetism and climate records from cave sediments. Application of seismic refraction, resistivity, and gravity methods to ground water exploration and geological engineering problems.

FUNDED RESEARCH

National Science Foundation
10 grants totaling $672,000
Miscellaneous
3 awards totaling $33,000

Research Publications

Kadlec, J., H. Hercman, V. Benes, P. Sroubek, **J. F. Diehl**, and D. Granger, Cenozoic history of the Moravian Karst (northern segment): Cave sediments and karst morphology, *Acta Mus. Moraviae Sci. geol.*, *LXXXVI*, 111-160, 2001.

Sroubek, P., **J. F. Diehl**, J. Kadlec, and K. Valoch, A Late Pleistocene palaeoclimate record based on mineral magnetic properties of the entrance facies sediments of Kulna Cave, Czech Republic, *Geophys. J. Int.*, *147*, 247-262, 2001.

Riley, C. M., **J. F. Diehl**, J. L. Kirschvink, R. L. Ripperdan, Paleomagnetic constraints on fault motion in the Hilina Fault System, south flank of Kilauea Volcano, Hawaii, *J. Volcanol. Geotherm. Res.*, *94*, 233-249, 1999.

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Diehl, J. F. and T. D. Haig, A paleomagnetic study of the lava flows within the Copper Harbor Conglomerate, Michigan: New results and implications, *Can. J. Earth Sci.*, *31*, 369-380, 1994.

Conway, F. M., **J. F. Diehl**, W. I. Rose, and O. Matias, Age and magma flux of Santa Maria Volcano, Guatemala: Correlation of paleomagnetic waveforms with the 28,000 to 25,000 yr BP Mono Lake excursion, *J. Geol.*, *102*, 11-24, 1994.

Conway, F. M., **J. F. Diehl**, and O. Matias, Paleomagnetic constraints on eruption patterns at Pacaya composite volcano, Guatemala, *Bull. Volcanol.*, *55*, 25-32, 1992.

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Diehl, J. F., T. C. Onstott, C. A. Chesner, and M. D. Knight, No short reversals of Brunhes age recorded in the Toba Tuffs, North Sumatra, Indonesia, *Geophys. Res. Lett.*, *14*, 753-756, 1987.

Knight, M. D., G. P. L. Walker, B. B. Ellwood, and **J. F. Diehl**, Stratigraphy, paleomagnetism, and magnetic fabric of the Toba Tuffs: Constraints on the sources and eruptive styles, *J. Geophys. Res.*, *91*, 10,355-10,382, 1986.

Diehl, J. F., M. E. Beck, Jr., S. Beske-Diehl, D. Jacobson, B. C. Hearn, Jr., Paleomagnetism of Late Cretaceous-Early Tertiary north-central Montana alkalic province, *J. Geophys. Res.*, *88*, 10,593-10,609, 1983.

Baker, R. W., **J. F. Diehl**, T. W. Simpson, L. W. Zelazny, and S. Beske-Diehl, Pre-Wisconsin glacial stratigraphy, chronology, and paleomagnetics of west-central Wisconsin, *Bull. Geol. Soc. Amer.*, *94*, 1442-1449, 1983.

Diehl, J. F. and P. N. Shive, Paleomagnetic results from the Late Carboniferous/Early Permian Casper Formation: Implications for Appalachian Tectonics, *Earth Planet. Sci. Lett.*, *54*, 281-292, 1981.

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Jacobson, D., M. E. Beck, Jr., **J. F. Diehl**, and B. C. Hearn, Jr., A Paleocene paleomagnetic pole for North America from alkalic intrusions, central Montana, *Geophys. Res. Lett.*, *7*, 549-552, 1980.

Diehl, J. F. and P. N. Shive, Paleomagnetic studies of the Early Permian Ingelside Formation of northern Colorado, *Geophys. J.*, *56*, 271-282, 1979.

Beck, M. E., Jr., S. D. Sheriff, **J. F. Diehl**, E. A. Hailwood, and P. W. Lipman, Further paleomagnetic results for the San Juan volcanic field of southern Colorado, *Earth Planet. Sci. Lett.*, *37*, 124-130, 1977.

Shive, P. N. and **J. F. Diehl**, Thermomagnetic analysis of natural and synthetic hematite, *Geophys. Res. Lett.*, *4*, 159-162, 1977.

Shive, P. N. and **J. F. Diehl**, Reduction of hematite under natural and laboratory conditions, *J. Geomag. Geoelectr.*, *29*, 345-354, 1977.

Diehl, J. F., M. E. Beck, Jr., and P. W. Lipman, Palaeomagnetism and magnetic-polarity zonation in some Oligocene volcanic rocks of the San Juan Mountains, southwestern Colorado, *Geophys. J.*, *37*, 323-332, 1974.

Curriculum Vitae

Prof. Dr. Timothy M. Niebauer

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Personal:
Born: September 19,1958

Education
B.S. Physics and Mathematics, Magna Cum Laude, Creighton University, 1980
Ph.D. Physics, University of Colorado, Boulder, 1987
Dissertation: ***New Absolute Gravity Instruments for Physics and Geophysics*** With chapters on Instrumentation, geophysical interpretation of precise gravity, and a direct Equivalence Principle test.

Awards
1. Presidential Scholarship at Creighton University (1978-1980)
2. Graduate Student Research and Creative Work Award, Cash award from the University of Colorado, 1987.
3. National Oceanographic and Atmospheric Administration (NOAA) Small Business Innovative Research (SBIR) Phase I award $50,000 for "Small Portable Absolute Gravimeter" 1985-1986
4. NOAA Small Business Innovative Research (SBIR) Phase II award $300,000 for "Small Portable Absolute Gravimeter" 1996-1988
5. Franklin-Jefferson Project SBIR West Regional Award 1996

Patents
(1) Inventor US patent # 5,351,122 "Absolute Gravity Inline Measuring Apparatus".
(2) Inventor US patent # 5,892,151 "Differential Interferometric Ballistic Gravity Apparatus and Method".
(3) Inventor US patent #5,954,502 "Adjustable Orthodontic Bracket Assmebly with Continuous Adjustment in any one of six Planes of Motion".
(4) Inventor US patent #6,298,722 "Rotary CAM driven freefall Dropping Chamber Mechanism".

Professional Job Descriptions

Postdoctoral Positions:

Research Associate, JILA, 1987-1988
Max-Planck stipendium, 1988-1989

Regular appointments

Max-Planck Wissneschaftlicher Angestellter BAT Ib. Staff research scientist 1989-1991
Chief Scientist of AXIS Instruments Co. 1991-Sept. 1993
Visiting Scientist at the Bureau des Poids et Mesures, Sevres, France 3mo. Oct.-Dec. 1993
Adjunct Professor of Physics at the Colorado School of Mines, Jan. 1993- 1995
President, Micro-g Solutions Corp. Dec. 1993- Present
Associate Professor of Physics at the Colorado School of Mines, 1997-1998
Adjunct Professor of Geophysics at the Colorado School of Mines, 1998-Present

Work Experience

Research Physicist at the Joint Institute for Laboratory Astrophysics working on *equivalence principle* experiments. Research Physicist at the Max-Planck Institute for Quantum Optics working on a prototype gravitational wave detector. 1987-1991

Adjunct Geophysics Professor

Colorado School of Mines Geophysics Department (1993-1995)

Physics Professor

Colorado School of Mines Geophysics Department (1997-1997)

Business Experience

Was a founder and owner of Axis Instruments: Chief Scientist, Executive Committee and Board member of AXIS Instruments. Developed new products including the FG5 absolute gravimeter and the ISL stabilized laser. Was involved with two technology transfers from NIST and the BIPM. (1991-1993)

Started Micro-g Solutions with two employees from AXIS Instruments. We repaid our note to AXIS and were debt free within a year and a half after the beginning of Micro-g. Micro-g was profitable within one year. Micro-g Solutions was sold to LRS in 2000. (1993-Present)

Conference Participation and Invited Lectures

1. Chapman Conference on Vertical Crustal Motions, Harper's Ferry, W. Virginia 1984. Presented *Absolute Gravity: A reconnaissance tool for studying vertical crustal motions*
2. Second International Comparison of Absolute Gravimeters, Sevres, France 1985. Participated in inter-comparison with JILAg absolute gravimeter.
3. Denver Area Physics Teacher Meeting 1986. *Precision gravity measurement*
4. Colorado School of Mines Physics Colloquium 1987. *Precision gravity measurement and the proposed fifth force.*
5. Kansas State University Physics Colloquium 1987, *Precise g measurements and the fifth force*
6. Princeton University Journal Club 1988. *Experimental tests of the fifth force.*
7. Los Alamos National Laboratories 1988. *Testing the equivalence principle.*
8. NASA Goddard Space Flight Center, Greenbelt Maryland 1988. *Experiments on the fifth force*
9. University of Washington, Seattle 1988. *Fifth force experiments at JILA.*
10. Max-Planck Institut für Quantenoptik Colloquium 1989. *Geophysical tests of the fifth and sixth force: From the mines to the clouds.*
11. DFVLR Deutsche Forschungs und Versuchsanstalt für Luft-und Raumfahrt e.V. 1989- The German space-flight center. *Overview of experiments on the fifth force*
12. VIII Moriond Workshop in Les Arcs, France 1989. Presented *Results of the Erie tower experiment for the inverse square law.*
13. GRXXII -Twelfth International Conference on General Relativity and Gravitation in Boulder Co, USA 1989. Presented *Pulsar search on Garching prototype gravitational wave detector.*
14. Workshop on Non-Tidal Gravity Changes in Walferdange, Luxembourg (1990). Presented *Absolute gravity: environmental noise limits.*
15. 1993 American Physical Society Meeting in Washington DC. Presented *A new commercial iodine-stabilized laser and its use in precision measurement.*
16. Second Workshop on Non-Tidal Gravity Changes: Intercomparison between absolute and superconducting gravimeters; Walferdange, Lux, Sept. 6-8, 1994
17. Joint Symposium of the International Gravity Commission and International Geoid Commission, Sept. 11-17, 1994; Graz, Austria, *Absolute gravimeters: state of the art*
18. Colorado School of Mines Physics Colloquium 1994. State of the art p*recision gravity measurements.*
19. Heiland Lecture at the Colorado School of Mines Feb. 1995, *Precision Gravity Measurements Using Lasers and Mirrors*
20. Potential Fields Symposium at Colorado School of Mines 1995, *Absolute gravity and gradiometry*
21. Covener of Absolute gravity session of the GRACGEO96 meeting at the University of Tokyo, Tokyo Japan, 1996.
22. Chapman conference on "Microgal Gravimetery" in St. Augustine, Fl. 1996.
23. Presented a paper on "Absolute gravity and gradiometery: satellites in a can" at the Atomic Physics Colloquium at Yale University, 1999
24. Presented a paper on "Recent advances in Absolute gravity" at the Global Geodynamics Program conference held in Luxembourg, 1999.

Publications:

1. *Promise And Plans For The Jila Gravimeter*, J.E. Faller, Y.G. Guo, T.M. Niebauer, and R.L. Rinker, In proceedings of the international school and symposium on precision measurement and gravity experiments, Jan 24- Feb2, 1983, Taipei, Republic of China (W.T. Ni, Ed. National Tsing Hua University, Hsinchu, Taiwan, 1983) pp. 477-488.

2. *The Jila Portable Absolute Gravity Apparatus*, J.E. Faller, Y.Guo, J. Gschwind, T.M. Niebauer, R.L. Rinker, and J.Xue, Bureau Gravimetrique International Bull. d'Inf. **53** (1983).

3. *Fluid Fiber Gradiometers. Their Promise For Tunnel Detection- A Status Report.* J.E. Faller, J.K. Hoskins, P.T. Keyser, and T.M. Niebauer, in Tunnel Detection, Proceedings, 2nd Technical Symposium at the Colorado School of Mines, Golden, Co., 1984

4. *Absolute Gravity: A Reconnaissance Tool For Studying Vertical Crustal Motions*, T.M. Niebauer, J.K. Hoskins, and J.E. Faller, in Proceedings of the Chapman Conference on vertical crustal motions: Measurement and Modeling, J. Geophys. Res. **91**, 9145-9149 (1986).

5. *Comment On 'reanalysis Of The EöTvöS Experiment'*, P.T. Keyser, T.M. Niebauer, and J.E. Faller, Phys. Rev. Lett. **56** 2425 (1986).

6. *Results of the Second International Comparison of Absolute Gravimeters in Sevres 1985*, G. Arnautov, Yu. Boulanger, L. Cannizzo, G. Cerutti, J. Faller, Feng Youg-Yuan, E. Groten, Guo Yguang, W. Hollander, Huang Da-Lun, E. Kalish. I. Marson, T.M. Niebauer, A. Sakuma, G. Sasagawa, S. Schleglov, Yu. Stus, W. Tarasiuk, Zhang Guan-Yuan, Zhou Juing-Hua and M. Zumberge, Bureau Gravimetrique International Bulletin d'Inf. **59** 89-103 (1986).

7. *Galilean Test for the Fifth Force*, T.M. Niebauer, M.P. McHugh, and J.E. Faller, Phys. Rev. Lett. **59**, 609-612 (1987).

8. *Frequency Stability Measurements on Polarization Stabilized HeNe Lasers*, T.M. Niebauer, J.E. Faller, H.M. Godwin, J.L. Hall, and R.L. Barger, Applied Optics **27**, 1285-1289 (1988).

9. *Correcting Gravity Measurements for the Effects of Local Air Pressure*, T.M. Niebauer, J. Geophys. Res. 93, 7989-7991 (1988).

10. The Fifth Force, Window Magazine (summer, 1988), pp.16-19

11. *Comment on 'Possible resolution of the Brookhaven and Washington Eötvös Experiments*, T.M. Niebauer, J.E. Faller, and P.L. Bender, Phys Rev. Lett. **61** 2272 (1988).

12. *Current Research Efforts At Jila To Test The Equivalence Principle At Short Ranges*, J.E. Faller, T.M. Niebauer, M.P. McHugh, and D.A. Van Baak, in 5th Force and Neutrino Physics, Proceedings, Moriond Conference, Les Arcs, France pp. 457-470. (1988)

13. *The Effective Measurement Height of Free-fall Absolute Gravimeters*, T.M. Niebauer, Metrologia **26**, 115-118 (1989).

14. *High-Precision Absolute Gravity Observations in the United States*, G. Peter, R.E. Moose, C.W. Wessells, J.E. Faller, and T.M. Niebauer, J. Geophys. Res. **94** 5659-5674 (1989).

15. *Test Of The Inverse Square Law Of Gravitation Using The 300m Tower At Erie, Colorado*, C.C. Speake, T.M. Niebauer, M.P.Mchugh, P.T. Keyser, J.E. Faller, J.Y. Cruz, J.C. Harrison Jaako Makinen, and R.B. Beruff, Phys. Rev. Lett. 65, 1967-1971 (1990)

16. *Test of Newton's inverse square law of gravity using the 300m Tower at Erie, Colorado: Newton vindicated on the plains of Colorado*, C.C. Speake, T.M. Niebauer, M.P. McHugh, P.T. Keyser, J.E. Faller, J.Y. Cruz, J.C. Harrison, J. Makinen and R.B. Beruff, in New and Exotic Phenomena '90, Proceedings of the XXVth Rencontre de Moriond, Les Arcs, Savoie, France, January 20-27, 1990 (O. Fackler and J. Tran Thanh Van, Eds., Editions Frontieres, Gif-sur-Yvette, 1990), pp. 255-262

17. *A Test of Newton's inverse square law of gravitation using the 300m tower at Erie, Colorado*, J.Y. Cruz, J.C. Harrison, C.C. Speake, T.M. Niebauer, M.P. McHugh, P.T. Keyser, J.E. Faller, J. Makinen, and R.B. Beruff, J. Geophys. Res., **96**, 20073-20092 (1991)

18. *Non-Stationary Shot Noise And Its Effect On The Sensitivity Of Interferometers*, T.M. Niebauer, R. Shilling, K. Danzmann, A. Rüdiger, and W. Winkler, Phys. Rev. A, **43**, 5022-5029 (1991)

19. *Absolute Gravimetry: Environmental Noise Limits*, T.M. Niebauer and J.E. Faller, in workshop proceedings, Non-tidal gravity changes, Walferdange (Luxembourg). Tiré à part des Cahiers du Centre Européen de Géodynamique et de Séismologie **3**, (1991).

20. *Continuous Gravity Observations Using Jilag Absolute Gravimeters*, T.M. Niebauer and J.E. Faller, J. Geophys. Res., **97**,12427-12435, (1992).

21. *Pulsar Search Using Data Compression With The Garching Gravitational Wave Detector*, T.M. Niebauer, A. Rudiger, R. Schilling, L. Schnupp, W. Winkler, and K. Danzmann, Phys. Rev. D, 47, 3106-3123 (1993).

22. *High-Precision Absolute Gravity Observations In The United States*, G. Peter, R.E. Moose, C.W. Wessells, J.E. Faller, and T.M. Niebauer, J. Geophys. Res., **94**, 5659-5674 (1989).

23. *Short And Long-Term Stability Of The Jilag-4 Absolute Gravimeter*, G. Peter, F.J. Klopping, G. Sasagawa, J.E. Faller, T.M. Niebauer, J. Geophys. Res., **98**, 4619-4626, (1993).

24. Three part contribution
A. *The GEO-Project: A long-Baseline Laser Interferometer for the Detection of Gravitational Waves,* K. Danzmann et al.
B. *The Optics of an Interferometric Gravitational Wave Antenna,* W. Winkler et al.
C. *Mechanical Aspects in Interferometric Gravitational Wave Antenna,* A. Rüdiger et al.
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Cost Proposal

Change to Amendment #1

Exhibit A Amendment 1 Original
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with EIS - Amend 1 Additional Public Involvement
		Use of Commentworks and Larger Meetings
Name of Prime Consultant:		The Corradino Group

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Corradino, JC	Proj. Manager	300	x	76.45		$22,935
Corradino, D	Planner	400	x	25.24		$10,096
Butler	Planner	100	x	23.82		$2,382
Hartman	Lead Traffic Eng.	100	x	47.89		$4,789
Santana	Planner	400	x	22.51		$9,004
Stone, T.	Lead Environ.	300	x	45.74		$13,722
	Total Hours	1600			**Total Labor**	**$62,928**

LABOR ESCALATION

$62,928	x	0.00%	**Escalation**	**$0**

OVERHEAD

$62,928	x	164.07%	**Total Overhead**	**$103,246**

FACILITIES COST OF CAPITAL

$62,928		0.3720%	**Total F.C.C.**	**$234**

DIRECT EXPENSES	Unit Cost		Units		
Supplies/Shipments	$600.00	x	1	Lump Sum	$600
Additional Equipment Rental (see attached sheet)					$119,102
Additional Meeting Printed Materials (see attached sheet)					$20,080
Subtotal					$139,782
Subconsultants					
Parsons Transportation Group					$25,595
ACG: The al Chalabi Group, Ltd.					$0
DLA Piper Rudnick Gray Cary US LLP					$241,830
Alfred Benesch & Company					$0
CCRG					$59,761
Hamilton Anderson Associates					$158,127
Northwest Consultants, Inc.					$0
NTH					$2,008,009
SOMAT Engineering, Inc.					$0
TBE Group, Inc.					$0
Wetland & Coastal Res., Inc.					$0
Woolpert Design, LLP					$14,863
				Total Direct Costs	**$2,647,968**

FIXED FEE

$166,174	x	11%	**Total Fixed Fee**	**$18,279**

TOTAL Original Amend 1 COSTS $2,832,655

Exhibit A - Negative Derivation Sheet Amend. 1 Corradino Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS Shift of Bore Hole Drilling from Amend 1 to Amend 3 - Additional Geotech Invest

Name of Prime Consultant: The Corradino Group

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Corradino, JC	Proj. Manager	0	x	76.45		$0
Corradino, D	Planner	0	x	25.24		$0
Butler	Planner	0	x	23.82		$0
Hartman	Lead Traffic Eng.	0	x	47.89		$0
Santana	Planner	0	x	22.51		$0
Stone, T.	Lead Environ.	0	x	45.74		$0
	Total Hours	0			**Total Labor**	**$0**

LABOR ESCALATION

$0	x	0.00%	**Escalation**	**$0**

OVERHEAD

$0	x	164.07%	**Total Overhead**	**$0**

FACILITIES COST OF CAPITAL

$0		0.3720%	**Total F.C.C.**	**$0**

DIRECT EXPENSES	Unit Cost		Units		
Supplies/Shipments	$600.00	x	1	Lump Sum	$0
Additional Equipment Rental (see attached sheet)					$0
Additional Meeting Printed Materials (see attached sheet)					$0
Subtotal					$0
Subconsultants					
Parsons Transportation Group					$0
ACG: The al Chalabi Group, Ltd.					$0
DLA Piper Rudnick Gray Cary US LLP					$0
Alfred Benesch & Company					$0
CCRG					$0
Hamilton Anderson Associates					$0
Northwest Consultants, Inc.					$0
NTH decrease results from the transfer of boring costs and labor to Amend 3					($1,314,222)
SOMAT Engineering, Inc.					$0
TBE Group, Inc.					$0
Wetland & Coastal Res., Inc.					$0
Woolpert Design, LLP					$0
				Total Direct Costs	**($1,314,222)**

FIXED FEE

$0	x	11%	**Total Fixed Fee**	**$0**

TOTAL Amend 1 COSTS Reduction ($1,314,222)

Exhibit A Amendment 1 Corradino Summary - Final Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with EIS - Amend 1 Additional Public Involvement
		Use of Commentworks and Larger Meetings
Name of Prime Consultant:		The Corradino Group

DIRECT LABOR

Name	Classification	Person Hour	x	Hourly Rate	=	Labor Costs
Corradino, JC	Proj. Manager	300	x	76.45		$22,935
Corradino, D	Planner	400	x	25.24		$10,096
Butler	Planner	100	x	23.82		$2,382
Hartman	Lead Traffic Eng.	100	x	47.89		$4,789
Santana	Planner	400	x	22.51		$9,004
Stone, T.	Lead Environ.	300	x	45.74		$13,722
	Total Hours	1600			**Total Labor**	**$62,928**

LABOR ESCALATION

$62,928	x	0.00%	**Escalation**	**$0**

OVERHEAD

$62,928	x	164.07%	**Total Overhead**	**$103,246**

FACILITIES COST OF CAPITAL

$62,928		0.3720%	**Total F.C.C.**	**$234**

DIRECT EXPENSES	Unit Cost		Units		
Supplies/Shipments	$600.00	x	1	Lump Sum	$600
Additional Equipment Rental (see attached sheet)					$119,102
Additional Meeting Printed Materials (see attached sheet)					$20,080
Subtotal					$139,782
Subconsultants					
Parsons Transportation Group					$25,595
ACG: The al Chalabi Group, Ltd.					$0
DLA Piper Rudnick Gray Cary US LLP					$241,830
Alfred Benesch & Company					$0
CCRG					$59,761
Hamilton Anderson Associates					$158,127
Northwest Consultants, Inc.					$0
NTH					$693,787
SOMAT Engineering, Inc.					$0
TBE Group, Inc.					$0
Wetland & Coastal Res., Inc.					$0
Woolpert Design, LLP					$14,863
				Total Direct Costs	**$1,333,746**

FIXED FEE

$166,174	x	11%	**Total Fixed Fee**	**$18,279**

TOTAL Amend 1 COSTS Final $1,518,433

Exhibit B Amendment 1 NTH Original
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS Amendment 1 - Add. Geotech Invest
Name of Sub Consultant:	**NTH CONSULTANTS, LTD.**	

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Keith Swaffar	Proj. Director	112	x	$50.00		$5,600
Fritz Klingler	Proj. Manager	280	x	$50.00		$14,000
Joe Alberts	Task Manager	420	x	$42.00		$17,640
Harry Price	Task Manager	420	x	$42.00		$17,640
Craig Johnson	Project Eng.	778	x	$22.00		$17,116
Jason Edberg	Project Eng.	654	x	$22.00		$14,388
Heather Audet	Project Eng.	654	x	$22.00		$14,388
Sanket Gole	Project Eng.	654	x	$22.00		$14,388
Mike Firestone	Project Eng.	654	x	$22.00		$14,388
Zachary Carr	Project Eng.	400	x	$22.00		$8,800
Nateira Farrington	Clerical	690	x	$15.00		$10,350
Dawn Pressley	Clerical	690	x	$15.00		$10,350
Latricia Giddens	Clerical	690	x	$15.00		$10,350
	Total Hours	7096			**Total Labor**	**$169,398**

OVERHEAD	$169,398	x	188.00%	**Total OH**		**$318,468**
FACILITIES COST OF CAPITAL	$169,398	x	0.04%	**F.C.C.**		**$68**
DIRECT EXPENSES	**Unit Cost**	x	**Units**			
Mileage	$0.405		4000	miles		$1,620
Copies	$0.220		4000	pages		$880
FedEx	$15.00		13	overnights		$195
Digital Camera	$10.00		120	days		$1,200
Layne Christensen Drilling (attached)						
1 core-hole (land) to approximately 1,500 feet @ $292,238						$292,238
1 core-hole (land) to approximately 1,500 feet @ $292,238 - $40,000 (mob/demob)						$252,238
2 rotary borings to approximately 1,500 feet @ $189,873 / each						$379,746
Rig mud system (mob/demob)						$25,000
Moving btw holes / Standby allow. @ $10,000/boring ($3,588 + NTH-add $6,412/boring)						$40,000
Z-Seis Reservoir Seismic (tomography((attached))						
Project Setup, Mob / Demob @ $30,000						$30,000
Perform gyroscopic borehole surveys @ $10,000 per boring x 4 borings						$40,000
Crane Rental @ $5,000 per boring						$20,000
Perform cross-hole seismic tomography panel @ $50,000 per panel x 3 panels						$150,000
Tooling Insurance @ $25,000 per set of borings x 1 set per panel x 3 panels						$75,000
Standby time @ $10,000 per day x 1 day						$10,000
Equipment	$75		120			$9,000
Supplies	$1,500		1			$1,500
Permits (Corps, US)	$10,000		4			$40,000
External Consulting - Cording					Not to Exceed	$44,900
External Consulting - Turpening					Not to Exceed	$52,893
					Total Direct Costs	**$ 1,466,410**
FIXED FEE	$487,866	x	11.00%	**Fixed Fee**		**$53,665**

TOTAL Original Amend 1 NTH COSTS $ 2,008,009

Exhibit B - Negative Derivation Sheet Amend. 1 NTH
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS Shift of Bore Hole Drilling from Amend 1 to Amend 3 - Additional Geotech Invest
Name of Sub Consultant:		NTH CONSULTANTS, LTD.

Bore Hole Cost Reduction

DIRECT EXPENSES

Boring of 4 holes under Amendment 1 by Layne Christensen deleted

Layne Christensen Drilling		
1 core-hole (land) to approximately 1,500 feet @ $292,238	$	(292,238)
1 core-hole (land) to approximately 1,500 feet @ $292,238 - $40,000 (mob/demob)	$	(252,238)
2 rotary borings to approximately 1,500 feet @ $189,873 / each	$	(379,746)
Rig mud system (mob/demob)	$	(25,000)
Moving btw holes / Standby allow. @ $10,000/boring ($3,588 + NTH-add $6,412/boring)	$	(40,000)
Net Change in Directs w/deletion of Layne Christensen	**$**	**(989,222)**

These drilling costs are provided for in Amend 3.

Tomography under Amendment 1 by Z-Seis deleted

Perform cross-hole seismic tomography		
Z-Seis Reservoir Seismic		
Project Setup, Mob / Demob @ $30,000	$	(30,000)
Perform gyroscopic borehole surveys @ $10,000 per boring x 4 borings	$	(40,000)
Crane Rental @ $5,000 per boring	$	(20,000)
Perform cross-hole seismic tomography panel @ $50,000 per panel x 3 panels	$	(150,000)
Tooling Insurance @ $25,000 per set of borings x 1 set per panel x 3 panels	$	(75,000)
Standby time @ $10,000 per day x 1 day	$	(10,000)
Net Change in Directs w/deletion of Z-Seiss	**$**	**(325,000)**

These analysis costs are provided for in Amend 3.

Net Change in Amendment 1 $ (1,314,222)

Exhibit B Amendment 1 NTH Summary - Final
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS Amendment 1 - Add. Geotech Invest

Name of Sub Consultant: NTH CONSULTANTS, LTD.

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Keith Swaffar	Proj. Director	112	x	$50.00		$5,600
Fritz Klingler	Proj. Manager	280	x	$50.00		$14,000
Joe Alberts	Task Manager	420	x	$42.00		$17,640
Harry Price	Task Manager	420	x	$42.00		$17,640
Craig Johnson	Project Eng.	778	x	$22.00		$17,116
Jason Edberg	Project Eng.	654	x	$22.00		$14,388
Heather Audet	Project Eng.	654	x	$22.00		$14,388
Sanket Gole	Project Eng.	654	x	$22.00		$14,388
Mike Firestone	Project Eng.	654	x	$22.00		$14,388
Zachary Carr	Project Eng.	400	x	$22.00		$8,800
Nateira Farrington	Clerical	690	x	$15.00		$10,350
Dawn Pressley	Clerical	690	x	$15.00		$10,350
Latricia Giddens	Clerical	690	x	$15.00		$10,350
	Total Hours	7096			**Total Labor**	**$169,398**

OVERHEAD	$169,398	x	188.00%	**Total OH**		**$318,468**
FACILITIES COST OF CAPITAL	$169,398	x	0.04%	**Total F.C.C.**		**$68**

DIRECT EXPENSES	Unit Cost	x	Units		
Mileage	$0.405		4000	miles	$1,620
Copies	$0.220		4000	pages	$880
FedEx	$15.00		13	overnights	$195
Digital Camera	$10.00		120	days	$1,200
Layne Christensen Drilling (No longer doing boring)					
1 core-hole (land) to approximately 1,500 feet @ $292,238					$0
1 core-hole (land) to approximately 1,500 feet @ $292,238 - $40,000 (mob/demob)					$0
2 rotary borings to approximately 1,500 feet @ $189,873 / each					$0
Rig mud system (mob/demob)					$0
Moving btw holes / Standby allow. @ $10,000/boring ($3,588 + NTH-add $6,412/boring)					$0
Z-Seis Reservoir Seismic (tomography((attached))					
Project Setup, Mob / Demob @ $30,000					$0
Perform gyroscopic borehole surveys @ $10,000 per boring x 4 borings					$0
Crane Rental @ $5,000 per boring					$0
Perform cross-hole seismic tomography panel @ $50,000 per panel x 3 panels					$0
Tooling Insurance @ $25,000 per set of borings x 1 set per panel x 3 panels					$0
Standby time @ $10,000 per day x 1 day					$0
Equipment	$75		120		$9,000
Supplies	$1,500		1		$1,500
Permits (Corps, US)	$10,000		4		$40,000
External Consulting - Cording				Not to exceed	$44,900
External Consulting - Turpening				Not to exceed	$52,893
				Total Direct Costs	**$ 152,188**

FIXED FEE	$487,866	x	11.00%	**Fixed Fee**	**$53,665**
				TOTAL Amend 1 NTH COSTS Final	**$ 693,787**

Exhibit C - Amendment 1 Final
Derivation of Cost
SUMMARY BY JOB NUMBER AND BY CATEGORY

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS Amendment 1

DIRECT LABOR (with escalation)	Direct Labor Hours	Direct Labor Costs
Prime Consultant	1600	$62,928
Subconsultants		
Parsons Transportation Group	162	$9,720
DLA Piper Rudnick Gray Cary US	382	$240,660
CCRG	1040	$25,445
Hamilton Anderson Associates	84	$3,108
NTH	7096	$169,398
Woolpert Design, LLP	112	$2,534
Total Direct Labo	**10,476**	**$513,792**

OVERHEAD	Overhead Costs
Prime Consultant	$103,246
Subconsultants	
Parsons Transportation Group	$13,316
DLA Piper Rudnick Gray Cary US LLP	$0
CCRG	$27,488
Hamilton Anderson Associates	$5,242
NTH	$318,468
Woolpert Design, LLP	$4,390
Total Overhead	**$472,150**

FACILITIES COST OF CAPITAL	F.C.C. Costs
Prime Consultant	$234
Subconsultants	
Parsons Transportation Group	$26
DLA Piper Rudnick Gray Cary US LLP	$0
CCRG	$0
Hamilton Anderson Associates	$23
NTH	$68
Woolpert Design, LLP	$49
Total F.C.C. Costs	**$400**

DIRECT EXPENSES		Direct Costs
Prime Consultant		139782
Subconsultants		
	Parsons Transportation Group	$0
	DLA Piper Rudnick Gray Cary US LLP	$1,170
	CCRG	$1,005
	Hamilton Anderson Associates	$148,836
	NTH	$152,188
	Woolpert Design, LLP	$7,129
	Total Direct Expenses	**$450,110**

FIXED FEE		Fixed Fee Costs
Prime Consultant		$18,279
Subconsultants		
	Parsons Transportation Group	$2,534
	DLA Piper Rudnick Gray Cary US LLP	$0
	CCRG	$5,823
	Hamilton Anderson Associates	$918
	NTH	$53,665
	Woolpert Design, LLP	$762
	Total Fixed Fee	**$81,981**

TOTALS		Total Costs
Prime Consultant		$324,469
Subconsultants		
	Parsons Transportation Group	$25,595
	DLA Piper Rudnick Gray Cary US LLP	$241,830
	CCRG	$59,761
	Hamilton Anderson Associates	$158,127
	NTH	$693,787
	Woolpert Design, LLP	$14,863
	TOTAL COSTS Amendment 1 Final	**$1,518,433**

Cost Proposal

Amendment #3

Exhibit A Amend 3 Summary w/adj. From Amend 1
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - Amendment 3 - Deep Drilling Program, Public Involvement (Ombusman during drilling)
Name of Prime Consultant:		The Corradino Group

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Corradino, JC	Proj. Manager	36	x	$91.74		$3,303
Corradino, G	Planner	1040	x	$29.22		$30,389
Bocks	Planner	36	x	$19.38		$698
Butler	Planner	0	x	$28.85		$0
Deutsch	Counsel	0	x	$70.80		$0
Hartman	Engineer	36	x	$49.81		$1,793
P'Pool	Economic Planner	0	x	$78.46		$0
Santana	Planner	1040	x	$23.64		$24,586
Stone	Env. Planner	36	x	$49.40		$1,778
Townsend	Planner	0	x	$30.35		$0
	Total Hours	2224			**Total Labor**	**$62,546**
OVERHEAD		$62,546	x	164.07%	**Total Overhead**	**$102,620**
FACILITIES COST OF CAPITAL		$62,546		0.3720%	**Total F.C.C.**	**$233**
DIRECT EXPENSES		Unit Cost		Units		
Overnight Del		$18.00	x	2 overnights		$36
Lodging		$65.00	x	2 days		$130
Meals (per diem)		$38.50	x	2 days		$77
Rental car		$80.00	x	4 days		$320
24-hr Relocation Security - see attach		$17.85	x	720 hours		$12,852
H2S Evacuation Plan - see attached						$325,305
Subtotal Corradino Direct Costs						**$338,720**
Subconsultant Expenses						
Parsons Transportation Group						$328,615
Rick Miller						$0
Richard Woods						$0
DLA Piper Rudnick Gray Cary US LLP						$0
Alfred Benesch & Company						$0
CCRG						$0
Fletcher & Stippel, LLC						$0
Hamilton Anderson Associates						$0
Northwest Consultants, Inc.						$0
NTH						$8,514,512
SOMAT Engineering, Inc.						$1,931,269
TBE Group, Inc.						$0
Wetland & Coastal Res., Inc.						$0
Woolpert Design, LLP						$0
Subtotal Subconsultant Total Costs						$10,774,397
					Corradino Direct Costs, Plus Subconsultant Total Costs	**$11,113,117**
FIXED FEE		$165,166	x	11.00%	**Corradino Fixed Fee**	**$18,168**

TOTAL Amend 3 COSTS $11,296,683

Credit from Amend 1 (see following sheet) ($1,314,222)

TOTAL Amend 3 New Authorization $9,982,461

Quotes And References For Security Guards

The following quotes are for security guards. These quotes are based on a four-month schedule (December to March). 12 and 24 hour rates

Guardian Security Services	Standard Hrly Billing Rate	Holiday Hrly Billing Rate
Unarmed Security Officer	$14.00	$21.00

Reference: Nemar Property Group **Contact:** Lind Zyla, (248) 352-2080
Comments: They have been using the same company for over 20 years to guard their properties after hours and to patrol the parking lots in security vehicles. The guards and company are very reliable. In the event there is an incident they type up incident reports and it is a very seamless system.

Nationwide Security	Standard Hourly Billing Rate
Unarmed Security Officer	$22.50

Reference: United States Steel Corporation **Contact:** Mr. Robert Peters, (313) 749-5113
Comments: They have 43 guards who man the gates. They have a natural turn-around; nothing unique or bad. Feels that they do a good job overall.

Securitas	Standard Hrly Billing Rate	Holiday Hrly Billing Rate
Officer - dust to dawn, 7 days per week	$20.15	$30.23
Officer – 24 / 7 days per week	$17.85	$26.78

Left voicemail for sales rep and he has not called back regarding possible changes in hourly rate.
Reference: Visteon Corp. **Contact:** Mr. Brian King, (734) 710-5567
Comments: Securitas mans all of the gates to their facility. They have employees at every level from Entry to Management. The guards patrol on foot, bike and car. Mr.

Rationale
Mr. King has worked with Securitas for two years at Visteon and in his prior job for several years. Securitas does not use armed guards. They have great infrastructure to assist in the event of emergencies. The turnover is low.

Based on our review and conversations with the above references, it is our opinion that Securitas provide the security guards. Securitas has an extended network of resources as well as experience in various environments.

H_2S Evacuation Plan

People Affected:	600, based on 1,300-foot evacuation area around bore hole						
Duration of Evacuation: 12 hours							
Location for Evacuees:					$ 2,000	$	2,000
Patton Park & Roberto Clemente Center (300 + 300 = 600 people)							
Bedding						$	33,000
Transportation							
3 buses on call. Two vans already covered in another budget item. The vans will be placed at the drilling sites ready to go						$	2,265
Food							
Breakfast	$ 4.95	x	600	=	$ 2,970		
(Egg, sausage or ham or diced potatoes)							
Lunch	$ 6.00	x	600	=	$ 3,600		
(3 tacos/1 Enchilada)							
Dinner	$ 7.95	x	600	=	$ 4,770		
(Chimichanga Combo/ Burrito) - Delux Combo							
Water per case	$ 4.50	x	600	=	$ 2,700		
Ice per bag	$ 1.50	x	600	=	$ 900		
Chips per pack	$ 1.50	x	600	=	$ 900		
Pop per 12-pack	$ 3.50	x	600	=	$ 2,100		
Cookies per 8-pack	$ 3.50	x	600	=	$ 2,100		
Pizza	$ 5.00	x	600	=	$ 3,000		
Subtotal					$ 23,040	$	23,040
Cost for City of Detroit Emergency Response							
6 Engines, 3 Trucks, 2 Squads, 3 Chiefs, 2 Fire Marshal 600 Car, Safety Officer, EMS, Haz-Mat 1 & 2. @ 100 per item per hour for 12 hours							
Subtotal						$	265,000
Total Cost:						**$**	**325,305**

Exhibit A Adj. To Derive Amend 3 Authorization Amount
Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	
		DRIC - Amendment 3 - Deep Drilling Program, Public Involvement (Ombusman during drilling)
Name of Prime Consultant:		The Corradino Group

Amendment 1 was authorized in the amount of $2,832,655. Sheets in this submittal for Amendment 3 include elimination of costs for Layne Christensen, as that work will now be done under Amendment 3 by Oil-Ex, Inc.

These changes are shown below. The end result is that the work now shown under Amendment 1 will cost less than the authorized amount, so there is money "left over" from Amendment 1, reducing the amount of "new" money that needs to be authroized in Amendment 3. These costs are shown below and the total is carried forward to the previous sheet.

Bore Hole Cost Reduction

DIRECT EXPENSES

Boring of 4 holes under Amendment 1 by Layne Christensen deleted

Layne Christensen Drilling

1 core-hole (land) to approximately 1,500 feet @ $292,238	$	(292,238)
1 core-hole (land) to approximately 1,500 feet @ $292,238 - $40,000 (mob/demob)	$	(252,238)
2 rotary borings to approximately 1,500 feet @ $189,873 / each	$	(379,746)
Rig mud system (mob/demob)	$	(25,000)
Moving btw holes / Standby allow. @ $10,000/boring ($3,588 + NTH-add $6,412/boring)	$	(40,000)

Net Change in Directs w/deletion of Layne Christensen $ (989,222)

These drilling costs are provided for in Amend 3.

Tomography under Amendment 1 by Z-Seis deleted

Perform cross-hole seismic tomography

Z-Seis Reservoir Seismic

Project Setup, Mob / Demob @ $30,000	$	(30,000)
Perform gyroscopic borehole surveys @ $10,000 per boring x 4 borings	$	(40,000)
Crane Rental @ $5,000 per boring	$	(20,000)
Perform cross-hole seismic tomography panel @ $50,000 per panel x 3 panels	$	(150,000)
Tooling Insurance @ $25,000 per set of borings x 1 set per panel x 3 panels	$	(75,000)
Standby time @ $10,000 per day x 1 day	$	(10,000)

Net Change in Directs w/deletion of Z-Seiss $ (325,000)

These analysis costs are provided for in Amend 3.

Net Change in Amendment 1 $ (1,314,222)

Exhibit B Summary

Derivation of Cost Proposal

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	
		DRIC - Amendment 3 - Geotechnical Analysis
Name of Consultant:		Parsons Transportation Group

DIRECT LABOR Classification	Classification	Person Hrs	x	Hourly Rate	=	Labor Costs
Regine Beauboeuf	Deputy Proj. Man.	160	x	$66.05		$10,568
Bruce L. Campbell	Lead Bridge	160	x	$52.00		$8,320
Patrick Cassity	Bridge Design	120	x	$68.75		$8,250
Ken Serzan	Bridge Design	120	x	$89.42		$10,730
Gerald Bonner	Tunnel/Geotechnical	275	x	$89.42		$24,591
Mike Ashmore	Rdway/Bridge Design	400	x	$48.08		$19,232
Richard Saporsky	Lead Roadway	0	x	$45.67		$0
Robert Hosler	Landscape Architect	0	x	$48.31		$0
Joseph Marson	Lead Traffic	0	x	$50.18		$0
Stephen Mayer	Policy	0	x	$79.33		$0
Craig Richardson	Landscape Architect	0	x	$31.00		$0
Jeffrey Squires	Policy	0	x	$86.54		$0
Jr. Engineer	Rd/Plaza/Bridge	0	x	$24.89		$0
Sr. Engineer	Bridge Design	200	x	$47.87		$9,574
Engineer	Rd/Plaza/Bridge	730	x	$37.77		$27,572
Administrative		120	x	$25.48		$3,058
	Total Hours	2285			**Labor**	**$121,895**
OVERHEAD						
		$121,895	x	131.00%	**Overhead**	**$159,682**
FACILITIES COST OF CAPITAL						
		$121,895	x	0.2965%	**F.C.C.**	**$361**
DIRECT EXPENSES		Unit Cost		Units		
Airline Travel		$500.00	x	$20.00		$10,000
Mileage		$0.45	x	$7,700.00		$3,427
Lodging		$65.00	x	$22.00		$1,430
Meals (per diem)		$38.50	x	$22.00		$847
					Direct Costs	**$15,704**
FIXED FEE						
		$281,577	x	11.00%	**Fixed Fee**	**$30,973**
					TOTAL Parson Amend 3	**$328,615**

Exhibit B

Derivation of Cost Proposal - Geotechnical Analysis

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	
		DRIC - Amendment 3 - Geotechnical Analysis, Task 2330
Name of Sub Consultant:		NTH CONSULTANTS, LTD.

DIRECT LABOR

Name	Classification	Hours	x	Rate	=	Labor Costs
Keith Swaffar	Project Director	342	x	$ 62.00		$21,204
Fritz Klingler	Project Manager	899	x	$ 58.00		$52,142
Joe Alberts	Task Manager	1044	x	$ 46.50		$48,546
Harry Price	Task Manager	1044	x	$ 46.50		$48,546
John Kosnak	Task Manager	1044	x	$ 46.50		$48,546
Craig Johnson	Project Engineer	1103	x	$ 25.50		$28,127
Jason Edberg	Project Engineer	1103	x	$ 25.50		$28,127
Heather Audet	Project Engineer	1103	x	$ 25.50		$28,127
Sanket Gole	Project Engineer	1103	x	$ 25.50		$28,127
Mike Firestone	Project Engineer	1103	x	$ 25.50		$28,127
Danny Yip	Project Engineer	1103	x	$ 25.50		$28,127
Kurt Warning	Project Engineer	1103	x	$ 25.50		$28,127
Michael Schorsch	Project Engineer	1103	x	$ 25.50		$28,127
Steve Innes	Project Engineer	1103	x	$ 25.50		$28,127
Jason Edberg	Project Engineer	1103	x	$ 25.50		$28,127
Zachary Carr	Project Engineer	1103	x	$ 25.50		$28,127
Steve Bryan	CADD	513	x	$ 25.50		$13,082
Ennis Smith	Technician III	914	x	$ 18.00		$16,452
Tom Mendenhall	Technician III	914	x	$ 18.00		$16,452
Nateira Farrington	Clerical	1250	x	$ 15.00		$18,750
Dawn Pressley	Clerical	1250	x	$ 15.00		$18,750
Latrida Giddens	Clerical	1250	x	$ 15.00		$18,750
Contract Employee	Clerical	1250	x	$ 15.00		$18,750
Contract Employee	Clerical	1250	x	$ 15.00		$18,750
	Subtotal Hours	25,097			**Total Labor**	**$668,111**

OVERHEAD					
Overhead	$668,111	x	188.00%	**Total OH**	**$1,256,049**
FACILITIES COST OF CAPITAL					
Facilities Cost of Capital	$668,111	x	0.04%	**Total F.C.C.**	**$267**
DIRECT EXPENSES	Unit Cost	x	Units		
Mileage	$0.445		6500	miles	$2,893
Copies	$0.25		9000	pages	$2,250
FedEx	$20.00		66	units	$1,320
Digital Camera	$10.00		100	days	$1,000
Oil-Ex/Advanced Enery Drilling (see support sheet)	$2,172,250		1	lump sum	$2,172,250
Z-Seis Reservoir Seismic (see sub support sheet)	$2,559,000		1	lump sum	$2,559,000
Baker Atlas (see sub support sheet)	$123,244		1	lump sum	$123,244
Socon Well Services (see sub support sheet)	$24,926		1	lump sum	$24,926
Microg-Lacoste (Borehole Gravity)	$251,063		1	lump sum	$251,063
American Drilling (Install VSP source geophone)	$10,185		1	lump sum	$10,185
Gravity Modeling Software (Purchase @ 10,000 Euros)	$12,511		1	lump sum	$12,511
External Consulting (Cording)	$250		377	hours	$94,250
External Consulting (Cording Asst.)	$100		455	hours	$45,500
External Consulting (Turpening)	$186		1900	hours	$353,476
External Consulting (Diehl)	$181		1318	hours	$238,242
Site Improvements (see direct cost support sheet)	$104,287		1	NA	$104,287
Drill Cutting Removal (see direct cost support sheet)	$24,750		1	NA	$24,750
Site Restoration (see direct cost support sheet)	$85,904		1	NA	$85,904
PL Insurance pass through (see direct cost support sheet)	$115,186		1	NA	$115,186
MDEQ Permit (see direct cost support sheet)	$19,292		1	NA	$19,292
Estimated Field Expenses (see direct cost support sheet)	$129,700		1	NA	$129,700
Sound/Vibration Monitoring (see direct cost support sheet)	$7,200		1	NA	$7,200
Subtotal Direct Costs					**$6,378,428**
FIXED FEE	$1,924,160	x	11.00%	**Fixed Fee**	**$211,658**

TOTAL NTH Geotechnical COSTS Amend 3 $8,514,512

NTH Consultants, Ltd. SUBCONTRACTOR SHEET

SUBCONTRACTOR PROJECT FEE ESTIMATING SHEET - Amendment 3

Client Name: Parsons
Project Description: DRIC Solution Mining Research
Prepared By: C. Johnson / F. Klingler

Work Package Designation: MDOT Proposal
Project/Proposal Name: 15-050014-01
Date: 10/17/2006

All subcontractor unit rates for both crossings are based on proposals by Oil-Ex, SOCON, Baker Atlas, Z-Seis, and Microg-Lacoste (see attached)

Detailed List of Steps or Tasks Required To Complete This Project					Fee Estimate
Investigate both alignments with eight land borings (6 core and 2 rotary), 6 additional rotary to be performed by SOMAT					
Drilling / Coring					
Drill 6 Borings to approximately 1,500 feet					
Drill 2 Borings to approximately 1,750 feet					
Oil-Ex, Inc./Advanced Energy (see Oil-Ex Proposal)					
2 core-holes (land) to approximately 1,500 feet @ $266,487 / each					$532,974
2 core-holes (land) to approximately 1,750 feet @ $291,487 / each					$582,974
4 rotary borings (land) to approximately 1,500 feet @ $223,613 / each					$894,452
Additional Mob / Demob to abandon borings (4/7 @ $15,000 / each)					$8,600
Standby Time during Acoustic Televiwer Service (1 day at $5,200/day * 9 holes)					$46,800
Allowance for Lost Equipment for insurance purposes (5% of total estimate)					$100,950
Pollution Liability Insurance					$5,500
30 to 90 day payment terms @1.5% per 30 days (included)					$0
OIL-EX/Advanced Energy SUBTOTAL					**$2,172,250**
Crosswell Seismic Imaging / Vertical Seismic Profiling (VSP)					
Z-Seis Reservoir Seismic (see Z-Seis Proposal)					
Perform crosswell seismic imaging (34 panels)					
Project Setup, 6 Mob / Demob @ $30,000 / each					$180,000
Crane Rental @ $5,000 per boring					$70,000
Perform crosswell seismic imaging panel @ $50,000 per panel x 34 panels					$1,700,000
Extend crosswell seismic imaging panel to 1,750 feet @ $8,000 per panel x 6 panels					$48,000
Tooling Insurance @ $12,500 per set of borings x 1 set per panel x 34 panels					$425,000
Perform VSP Surveys (Z-Seis) (2 surveys)					
Mob/Demob (0$ if performed with crosswell) (15K if required)					
Data Acquisition (50 levels, single offset at $30,000 per survey * 2)					$60,000
Data Processing (Checkshot and offset VSP at $8,000 per survey * 2)					$16,000
Mini-Vib Source Rental @$23,000 per month * 2)					$46,000
Tool insurance (for downhole receivers at $7,000/hole * 2)					$14,000
30 to 90 day payment terms @1.5% per 30 days					$0
Z-SEIS SUBTOTAL					**$2,559,000**
Baker Atlas (see Baker Atlas Proposal)					
Perform Borehole Deviation, Natural Gamma, and Acoustic Logging Surveys					
Perform Surveys (14 @ $8,546.75 / Run)					$119,655
30 to 90 day payment terms @1.5% per 30 days					$3,590
BAKER ATLAS SUBTOTAL					**$123,244**
SOCON Sonar Well Services, Inc. (see SOCON Proposal)					
Perform 3-D Sonar Cavity Inspection					
Sonar Survey 2 @ $6,500 / each					$13,000
Wireline Hoisting 2 @ $1,800 / run					$3,600
Mob / Demob 2 @ $2,500 / each					$5,000
Service Fee 2 @$750 / each					$1,500
Tool Insurance 2 @ $550 / each					$1,100
30 to 90 day payment terms @1.5% per 30 days					$726
SOCON SUBTOTAL					**$ 24,926**

MicroG-Lacoste - Borehole Gravity Survey (see Microg-LaCoste Proposal)					
Perform Borehole Gravity Surveys					
Mob / Demob (2 @ $12,000 per mob)					$24,000
Borehole Gravity Data Personnel @ $7,875 at three days per borehole * 10 boreholes					$78,750
Borehole Gravimeter, Sonde, Rigging Rental ($10,600 per borehole * 10 boreholes)					$106,000
Report ($3,500 per borehole report * 10 boreholes)					$35,000
30 to 90 day payment terms @ 1.5% per 30 days					$7,313
MICROG-LACOSTE SUBTOTAL					**$251,063**

Baker Atlas
Mr. Craig Johnson
NTH Consultants, LTD

10/16/2006

Revised NTH Proposal

Ken Moss Account Manager
Mt. Pleasant, Michigan 48858

BAKER HUGHES
2222 Enterprise Dr.
Tel (989) 773-7992

Baker Atlas Services appreciates the opportunity to offer the following first call service quotes

First trip to well for the Sonar Service:

Run 1 **Depth:** **2000** **Top Log Interval:**

Code	CASED HOLE SERVICES		Qty	Unit Price	Book Price	Disc. Price
SCCH	Land Service Charge		1	$2,530.00	$2,530.00	$1,391.50
ENVCOM	Environmental Compliance		1	$200.00	$200.00	$200.00
TC-E	Fuel Surcharge		1	$300.00	$300.00	$300.00
DOT	DOT Certification	Vehicles	2	$100.00	$200.00	$200.00
JCGR-A.100	Junk Catcher-Gauge Ring	Depth	2000	$0.24	$480.00	$264.00
		Operation	1	$375.00	$375.00	$206.25
CIS-A.150	Customer Instr Service	Depth	2000	$0.68	$1,360.00	$748.00
		Operation	1	$788.00	$788.00	$433.40
TC-W	Wireline Charge	Runs	2	$15.00	$30.00	$30.00
MC	Mileage	Mileage	175	$6.00	$1,050.00	$577.50
	Rev 1.0		SERVICES TOTAL			$4,350.65

Second trip to well for the Acoustic and Directional logging service:

Code	OPEN HOLE SERVICES		Qty	Unit Price	Book Price	Disc. Price
SCOH	Land Service Charge		1	$7,150.00	$7,150.00	$3,932.50
ENVCOM	Environmental Compliance		1	$200.00	$200.00	$200.00
TC-E	Fuel Surcharge		1	$300.00	$300.00	$300.00
DOT	DOT Certification	Vehicles	2	$100.00	$200.00	$200.00
DAL-A.100	DAL (delta t)	Depth	2000	$0.81	$1,620.00	$891.00
		Logging	2000	$0.81	$1,620.00	$891.00
DGR-B.200	Digital GR (Primary Run)	Depth	2000	$0.28	$560.00	$308.00
		Logging	2000	$0.28	$560.00	$308.00
DIR-A.100	Directional Survey	Depth	2000	$0.55	$1,100.00	$605.00
		Logging	2000	$0.55	$1,100.00	$605.00
DSK.100	LAS Data	Processing	1	$375.00	$375.00	$206.25
TC-W	Wireline Charge	Runs	2	$50.00	$100.00	$100.00
MC	Mileage	Mileage	0	$6.00	$0.00	$0.00
	Rev 1.0		SERVICES TOTAL			$8,546.75

Optional Service:

CR.ZA60	Crane Truck	Mobilization	1	$3,000.00	$3,000.00	$1,650.00

Operational Remarks:

- Optional Instrument Protection is $200.00 for each service performed.
- Conditions of this quote are good for 90 days from the above quote date.
- Discounts for routine services not specified in this proposal negotiated separately.
- Standby time will be charged $600 per hr.(truck) and $600 per hr.(crew).
- All Rental Items will be billed as per third party invoice with 20% markup.
- Up to 5 prints of each log delivered to 1 destination are inclusive. Additional prints are $40.00 each. Shipping to additional destinations is $25.00 each.

- SERVICE LOCATION: MT PLEASANT, MI PHONE: (989) 773-7992 MGR: Jason Warrens

Services are subject to the "Worldwide Terms & Conditions" listed under the Terms & Conditions tab or an active Master Service Agreement. If you have additional questions, call me at Tel (989) 773-7992

T H A N K Y O U for considering Baker Atlas for your wellsite services.

Ken Moss **Account Manager**

Baker Atlas

Jul 6, 2006

Mr. Craig Johnson
NTH Consultants, LTD

NTH CBIL

Ken Moss
Account Manager
2222 Enterprise Dr.
Mt. Pleasant, Michigan 48858
Tel (989) 773-7992

Baker Atlas Services appreciates the opportunity to offer the following first call service quotes

Run 1 **Depth:** **2000** **Top Log Interval:** **0** **0**

Code	OPEN HOLE SERVICES		Qty	Unit Price	Book Price	Disc. Price
TC-W	Wireline Charge	Runs	1	$50.00	$50.00	$50.00
CBIL-C.100	CBIL	Depth	2000	$1.16	$2,320.00	$1,160.00
		Logging	2000	$4.31	$8,620.00	$4,310.00
		Operation	1	$4,125.00	$4,125.00	$2,062.50
DGR-B.200	Dig.GR (Subsequent)	Depth	2000	$0.28	$560.00	$280.00
	Rev 1.0			SERVICES TOTAL		$7,862.50

Optional CBIL processing for fracture and borehole feature analysis: **$5,000.00**
One wide bed print is included in price. Additional prints are $200.00 each.

Operational Remarks:

- Conditions of this quote are good for 90 days from the above quote date.
- Discounts for routine services not specified in this proposal negotiated separately.
- Optional Instrument Protection is $200.00 for each service performed.
- Up to 5 prints of each log delivered to 1 destination are inclusive. Additional prints are $40.00 each. Shipping to additional destinations is $25.00 each.
- **SERVICE LOCATION: MT PLEASANT, MI PHONE: (989) 773-7992 MGR: Jason Warrens**

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T H A N K Y O U for considering Baker Atlas for your wellsite services.

Ken Moss
Account Manager

AMERICAN DRILLING & TESTING CO., INC.

4041 Martel ♦ P.O. Box 3059 ♦ Melvindale, Michigan 48122 ♦ (313) 389-5300
Fax (313) 389-5346 ♦ E-mail americandrill80@aol.com ♦ Web americandrilling.org

2005/2006 Price list

ITEM		Price
Mobilization		$300.00 first 50 miles form our office, over 50 miles $3.50 per mile
ATV Rental		$300.00 per day
Rig set up fee		
Daily travel to / from site		$75.00 per hour
Soil Drilling 2.25" Has	0-50'	$10.50 per foot
	51'-100'	$11.50 per foot
Soil Drilling 4.25" Has	0-50'	$11.50 per foot
	51'-100'	$14.50 per foot
Soil Drilling 6.25" Has	0-50'	$14.50 per foot
	51'-100'	$17.50 per foot
Wash Rotary 2.78"	2.78	$10.50 per foot
	3.78	$11.50 per foot
	5.78	$14.50 per foot
Soil Drilling	Profile	$8.25 per foot
Rock Coring		As Negotiated
Drilling Hourly		$160.00 per hour
Hardpan Over 59 Blows		$17.00 per foot
Install NW Casing for rock coring		$5.80 per foot
Grouting		$4.25 per foot
Steam Cleaning		$160.00 per hour
Steam Cleaner/Generator		$175.00 per day
Installing Monitoring wells		$160.00 per hour
Installing Piezometers		$160.00 per hour
Installing Inclinometers		$160.00 per hour
Delays Any Type		$160.00 per hour
Concrete cutting		$85.00 per hole up to 8" thick
Vain Sheer Testing		$150.00 per test/$100.00 Euipment rental
Premium Time		$55.60 per hour
Bailing Boring		$160.00 per hour
Packer Testing		As Negotiated
Piston Shelby tubes		$80.00 per tube
Shelby Tubes		$45.00 per tube
Sample Jars		$0.75 per jar
Crew Per diem		$80.00 per man/per day
Chemgrouter		$125.00 per day
Double Chemgrouter		$225.00 per day

AMERICAN DRILLING & TESTING CO., INC.

4041 Martel ♦ P.O. Box 3059 ♦ Melvindale, Michigan 48122 ♦ (313) 389-5300
Fax (313) 389-5346 ♦ E-mail americandrill80@aol.com ♦ Web americandrilling.org

2005/2006 Supply Price list

ITEM		Price				
2" X 5' pvc screen		$13.00 each				
2" X 5' pvc riser		$8.10 each				
2" X 10' pvc screen		$26.00 each				
2" X 10' pvc riser		$16.20 each				
2" locking caps		$14.50 each				
2" pvc bottom plugs		$4.50 each				
2" pvc slip cap		$2.25 each				
1.5" X 5' pvc screen		$19.30 each				
1.5" X 5' pvc riser		$10.18 each				
1.5" X 10' pvc screen		$22.48 each				
1.5" X 10' pvc riser		$14.95 each				
1.5" bottom plug		$4.89 each				
1.5" top cap		$4.89 each				
1.0" X 5' screen		$11.65 each				
1.0" X 5' screen		$6.10 each				
1.0" X 10' screen		$16.45 each				
1.0" X 10' riser		$9.50 each				
1.0" bottom blug		$1.75 each				
1.0" top cap		$1.75 each				
Sand 80# bag		$5.75 bag				
Bentonite Powder		$11.50 bag				
Bentonite hole plug		$9.75 bag				
Portland cement		$7.95 bag				
Quikrete		$5.00 bag				
Asphalt coldpatch		$8.25 bag				
Roadbox 7"		$55.00 each				
4" X 5" pro casing		$85.00 each				
6" X 5" pro casing		$100.00 each				
Wooden Core Box		$17.50 each				

NTH Consultants, Ltd. Cording

PROJECT FEE ESTIMATING SHEET

Client Name: Parsons Work Package Designation:

Project Description: DRIC Solution Mining (Dr. Edward Cording Scope - Additional Services) Project/Proposal Name: 15-050014-01

Prepared By: C. Johnson Date: 10/17/2006

Detailed List of Steps or Tasks Required To Complete This Project	ESTIMATED LABOR HOURS Initials of Team Members				Est. Exp.	Estimated Fees
	EC $250	PC $100		Total Hours		
Review Overall Project & Provide Recommendations;**Meeting in Detroit**	40	50		90		$15,000
Review Boring Logs During Drilling and Provide Opinions	60	80		140		$23,000
Review Acoustic Televiewer Logs During Drilling and Provide Opinions	72			72		$18,000
Review and consult on field data analysis (One trip to Detroit)	40	35		75		$13,500
Review Draft Report, **Meeting In Detroit**	40	35		75		$13,500
Perform void propagation analysis (Additional effort beyond original scope)	28	175		203		$24,500
Prepare brine well risk section of report	24	40		64		$10,000
Review stabilization methods	15	40		55		$7,750
Review Draft Interpretative Report	22			22		$5,500
MDOT Meeting In Detroit (One meeting beyond original scope)	16			16		$4,000
Phone Discussions	20			20		$5,000
				0		
TOTAL HOURS PER TEAM MEMBER	377	455	0	832	$0	$139,750
						TOTAL ESTIMATED FEE

NTH Consultants, Ltd. Turpening

PROJECT FEE ESTIMATING SHEET

Client Name: The Corradino Group
Project Description: DRIC Solution Mining (Dr. Roger Turpening Scope)
Prepared By: C. Johnson

Work Package Designation:
Project/Proposal Name: 15-050014-01
Date: 4/27/2006

Detailed List of Steps or Tasks Required To Complete This Project	ESTIMATED LABOR HOURS Initials of Team Members				Est. Exp.	Estimated Fees
	RT			Total Hours		
	$186.04					
Review Overall Project Plan and Provide Recommendations.	10			10		$1,860
Review and consult on field data analysis	16			16		$2,977
Onsite for field data acquisition (Crosswell)	1020			1020		$189,761
Onsite for field data acquisition (VSP)	80			80		$14,883
Perform void analysis modeling of data	100			100		$18,604
Interpretation of Crosswell Data	200			200		$37,208
Interpretation of VSP Data	150			150		$27,906
Coordinate Crosswell and Seismic Data	260			260		$48,370
Review Draft Report	8			8		$1,488
Review Draft Interpretative Report	8			8		$1,488
MDOT Meeting In Detroit	8			8		$1,488
Phone Discussions	40			40		$7,442
				0		$0
TOTAL HOURS PER TEAM MEMBER	1900	0	0			
			TOTALS	1900	$0	$353,476
						TOTAL ESTIMATED FEE

NTH Consultants, Ltd. Diehl

PROJECT FEE ESTIMATING SHEET

Client Name: The Corradino Group
Project Description: DRIC Solution Mining (Dr. Jimmy Diehl Scope)
Prepared By: C. Johnson

Work Package Designation:
Project/Proposal Name: 15-050014-01
Date: 10/17/2006

Detailed List of Steps or Tasks Required To Complete This Project	ESTIMATED LABOR HOURS Initials of Team Members JD		Total Hours	Est. Exp.	Estimated Fees
	$180.76				
Review Overall Project Plan and Provide Recommendations.	40		40		$7,230
Review and consult on field data analysis	40		40		$7,230
Onsite for field data acquisition	396		396		$71,581
Perform void analysis modeling of data	390		390		$70,496
Prepare Borehole Gravity Report Section	120		120		$21,691
Review Draft Report	16		16		$2,892
Coordinate Borehole Gravity to VSP and Crosswell Data	260		260		$46,998
MDOT Meeting In Detroit	16		16		$2,892
Phone Discussions	40		40		$7,230
			0		$0
TOTAL HOURS PER TEAM MEMBER	1318	0			
		TOTALS	1318	$0	$238,242
					TOTAL ESTIMATED FEE

E:\Projects\3600\Contracts\Amendment 3\[Cost Amend 3 Nov 25 06 no geop.xls]Diehl

NTH Consultants, Ltd. **DIRECT COST SUPPORT**

PROJECT FEE ESTIMATING SHEET FOR LUMP SUM ITEMS

Client Name: Corradino/ Parsons | Work Package Designation: | MDOT Proposal
Project Description: DRIC Solution Mining Investigation | Project/Proposal Name: | 15-050014-01
Prepared By: C. Johnson/F. Klingler | Date: | 10/17/2006

Detailed List of Steps or Tasks Required To Complete This Project

	CADD	T2	WP	Total Hours	Estimated Expenses	Fee Estimate
NOTE: These cost are for NTH 6 core and 2 rotary holes. SOMAT direct costs for their 6 rotary holes are prorated from the below values.						
Task 1 - Site Improvements (8 Test Boring Locations)						
This cost became apparent after the actual test boring locations were established. This cost is for the 8 NTH borings. SOMAT's 6 boring are prorated from this.						
Borehole Sites						
Dozer: 2.5 days per site x 8 sites x $1200/Day					$24,000	
Loader: 2.5 days per site x 8 sites x $1250/Day					$25,000	
Stone: 250'x25'x6"/27cf/yd x 8 sites x $13/yd					$12,037	
VSP Source Pad Preparation						
Excavator: 2 days per site x 4 sites x $1500/Day					$12,000	
Loader: 1 day per site x 4 sites x $1250/Day					$5,000	
Stone: 35'x35'x10'/27cf/yd x 4 sites x $13/yd					$23,600	
Additional Berm Construction						
Dozer: 0.5 days per site x 2 sites x $1200/Day					$1,200	
Stone: 5'x100'X3'/27cf/yd x 2 sites x $13/yd					$1,450	$104,287
Task 2 - Drill Cutting Removal and Disposal						
20 yd Roll-off Box Rental: $500/wk x 21 wks					$10,500	
475 yds material disposal at landfill x $30/yd (inc transport)					$14,250	$24,750
Task 3 - Site Restoration						
This cost became apparent after the actual test boring locations were established. This cost is for the 8 NTH borings. SOMAT's 6 boring are prorated from this.						
Borehole Sites						
Dozer: 1.0 days per site x 8 sites x $1200/Day					$9,600	
Loader: 1.0 days per site x 8 sites x $1200/Day					$9,600	
Haul off Stone: 250'x25'x6"/27cf/yd x 8 sites x $5/yd					$4,629	
Landsacaping allowance; actual cost per site varies; assume $3000/site					$24,000	
VSP Source Pad Sites						
Excavator: 2 days per site x 4 sites x $1500/Day					$12,000	
Loader: 1 day per site x 4 sites x $1250/Day					$5,000	
Haul off Stone: 35'x35'x10'/27cf/yd x 4 sites x $5/yd					$9,075	
Landscaping allowance; actual cost per site varies; assume $3000/site					$12,000	$85,904
Task 4 - Professional Liability Insurance Costs for Pass-Through						
Note that considering the large amount of subcontractor pass through (about 75% of the total cost), the direct cost to NTH for professional liability insurance for the pass through of construction contractors is 1.5%. On this basis, the pass through for all subcontracted work (including that from the work already authorized is computed)						
Pass Through PL Insurance costs for October 14 Proposal: $1,463,617 x 1.5%					$21,954	
Pass Through PL insurance costs for current Proposal: $6,215,479 x 1.5%					$93,232	$115,186
Task 5 - MDEQ Permit and Bond						
This cost became apparent after the actual test boring locations were established. This cost is for the 8 NTH borings. SOMAT's 6 boring are prorated from this.						
Permit Fees: 16 permits x $500 ea					$8,000	
Permit Bond: 16 permits x $198 ea					$3,168	
Survey required for Permit Application (Metco)					$5,000	
Color Copies: 2200 copies @ $1.42 ea					$3,124	$19,292
Task 6 - Estimated Field Expenses						
Field Trailer: 6 mos. @ $1000/per					$6,000	
Land Rental for Trailer: 6 mos. @ $800/per					$4,800	
Plywood Fencing: 8 sites @ $3000 per (in place)					$24,000	
Warehouse for core storage and logging 10 mos. @ $2500 per					$25,000	
Misc office equipment Allowance					$3,500	
Truck for hauling core: 5 mos @ $800 per					$4,000	
Portable toilet: 24 weeks @ $200 per					$4,800	
Portable Chain Link Fencing: 1000ft x $10/ft + moving 8 times @ $1000 per					$18,000	
Gas Detectors: 24 weeks @ $200 per					$4,800	
SCBA Equipment on standby: 24 weeks @ $200 per					$4,800	
Misc allowance for site access, etc.					$30,000	$129,700
Task 7 - Sound and Vibration Monitoring Equipment						
Blast Mate vibration monitoring device: 24 wks @ $100 per x 2					$4,800	
Sound Monitoring Device: 24 weeks @ $50 per x 2					$2,400	$7,200

DERIVATION OF COST PROPOSAL - Exhibit B

(DESIGN PHASE SERVICES)

MDOT PROJECT NUMBER:	PROJECT DESCRIPTION:
JN: 802330 - CS: 82900	DRIC - Amend 3 Geotechnical Analysis Task 2330

SUBCONSULTANT NAME:

SOMAT Engineering

DIRECT LABOR:

Classification	Person Hours	x	Hourly Rate	=	Labor Cost
QA/QC Engineer	32		$ 56.00	$	1,792
Project Manager	422		$ 58.00	$	24,476
Project Engineer	682		$ 38.00	$	25,916
Project Coordinator	1314		$ 27.00	$	35,478
Staff Engineer	160		$ 26.50	$	4,240
Field Engineer	1860		$ 23.50	$	43,710
Field Technician	400		$ 18.00	$	7,200
Clerical	40		$ 17.00	$	680
Total Hours	4910			Total Labor $	**143,492**

OVERHEAD:

$143,492	x	168%	= Total Overhead	$	241,067
			Subtotal Labor and Overhead	$	**384,559**

DIRECT EXPENSES:

Field Engineer OT	720 hours	$ 11.75	$	8,460
Oil Ex/Advanced Energy - 6 rotary borings + 1/2 mob (quote attached)			$	1,348,107
Site Improvements (estimate by NTH)			$	45,778
Drill Cutting Removal (estimate by NTH)			$	10,607
Site Restoration (estimate by NTH)			$	35,872
Estimated Expenses (logging/access/vehicle rental/copies/camera etc.) (estimate by NTH)			$	55,586
			$	
		Subtotal Direct Expenses	$	**1,504,409**

FIXED FEE:

$384,559	x	11.0%	= Total Fixed Fee	$	42,301
			Subtotal Fixed Fee	$	**42,301**
			TOTAL COSTS	$	**1,931,269**

Exhibit C

Derivation of Cost
SUMMARY BY JOB NUMBER AND BY CATEGORY

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	
		DRIC - Amendment 3 - Expanded Boring Program

DIRECT LABOR (with escalation)	Direct Labor Hours	Direct Labor Costs
Prime Consultant - Corradino	2,224	$62,546
Subconsultants		
Parsons Transportation Group	2,285	$121,895
NTH	25,097	$668,111
SOMAT	4,910	$143,492
Total Labor	**34,516**	**$996,044**

OVERHEAD	Overhead Costs
Prime Consultant - Corradino	$102,620
Subconsultants	
Parsons Transportation Group	$159,682
NTH	$1,256,049
SOMAT	$241,067
Total Overhead	**$1,759,417**

FACILITIES COST OF CAPITAL	F.C.C. Costs
Prime Consultant - Corradino	$233
Subconsultants	
Parsons Transportation Group	$361
NTH	$267
SOMAT	$0
Total F.C.C.	**$861**

DIRECT EXPENSES	Direct Costs
Prime Consultant - Corradino	$338,720
Subconsultants	
Parsons Transportation Group	$15,704
NTH	$6,378,428
SOMAT	$1,504,409
Total Direct Expenses	**$8,237,261**

Exhibit C

FIXED FEE	Fixed Fee Costs
Prime Consultant - Corradino	$18,168
Subconsultants	
Parsons Transportation Group	$30,973
NTH	$211,658
SOMAT	$42,301
Total Fixed Fee	**$303,101**

Total Labor	**$996,044**
Total Overhead	**$1,759,417**
Total Facilities Cost of Capital	**$861**
Total Direct Costs	**$8,237,261**
Total Fixed Fee	**$303,101**
TOTAL COSTS FOR Amendment 3	**$11,296,683**
Credit from Amend 1	**($1,314,222)**
TOTAL Amend 3 New Authorization	**$9,982,461**

FIRM TOTALS	
Prime Consultant - Corradino	$522,287
Subconsultants	
Parsons Transportation Group	$328,615
NTH - Geotech	$8,514,512
SOMAT	$1,931,269
	$11,296,683
Credit from Amend 1 (see following sheet)	**($1,314,222)**
TOTAL Amend 3 New Authorization	**$9,982,461**

Derivation of Cost

SUMMARY BY CATEGORY BY ORIGINAL CONTRACT AND AMENDMENTS

Control Section	MDOT Job #	Project Description
CS 82900	JN 802330	DRIC - EPE with an EIS

DIRECT LABOR

	Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total
Corradino	$ 2,017,175	$ 62,928	$ -	$ 62,928	$ 247,129	$ 62,546	$ 2,389,779
Parsons Transportation Group	$ 1,742,723	$ 9,720	$ -	$ 9,720	$ 113,915	$ 121,895	$ 1,988,252
Rick Miller - Geotech Advisory Group	$ -	$ -	$ -	$ -	$ 24,000	$ -	$ 24,000
Richard Woods - Geotech Ad. Group	$ -	$ -	$ -	$ -	$ 30,000	$ -	$ 30,000
ACG: The al Chalabi Group, Ltd.	$ 310,015	$ -	$ -	$ -	$ -	$ -	$ 310,015
DLA Piper Rudnick Gray Cary US LLP	$ -	$ 240,660	$ -	$ 240,660	$ 141,120	$ -	$ 381,780
Alfred Benesch & Company	$ 251,624	$ -	$ -	$ -	$ -	$ -	$ 251,624
CCRG	$ 224,488	$ 25,445	$ -	$ 25,445	$ -	$ -	$ 249,933
Fletcher & Sippel, LLC	$ -	$ -	$ -	$ -	$ 99,635	$ -	$ 99,635
Hamilton Anderson Associates	$ 299,019	$ 3,108	$ -	$ 3,108	$ -	$ -	$ 302,127
Northwest Consultants, Inc.	$ 108,617	$ -	$ -	$ -	$ -	$ -	$ 108,617
NTH	$ 46,053	$ 169,398	$ -	$ 169,398	$ 27,987	$ 668,111	$ 911,549
SOMAT Engineering, Inc.	$ 76,069	$ -	$ -	$ -	$ 11,590	$ 143,492	$ 231,151
TBE Group, Inc.	$ 6,703	$ -	$ -	$ -	$ -	$ -	$ 6,703
Wetland & Coastal Res., Inc.	$ 108,705	$ -	$ -	$ -	$ -	$ -	$ 108,705
Woolpert Design, LLP	$ 274,665	$ 2,534	$ -	$ 2,534	$ -	$ -	$ 277,199
Total	**$5,463,856**	**$513,792**	**$0**	**$513,792**	**$695,376**	**$996,044**	**$7,669,068**

OVERHEAD

Corradino	$3,398,537	$ 103,246	$ -	$ 103,246	$ 416,783	$ 102,620	$ 4,021,186
Parsons Transportation Group	$2,335,597	$ 13,316	$ -	$ 13,316	$ 156,064	$ 159,682	$ 2,664,659
Rick Miller - Geotech Advisory Group	$0	$ -	$ -	$ -	$ -	$ -	$ -
Richard Woods - Geotech Ad. Group	$0	$ -	$ -	$ -	$ -	$ -	$ -
ACG: The al Chalabi Group, Ltd.	$0	$ -	$ -	$ -	$ -	$ -	$ -
DLA Piper Rudnick Gray Cary US LLP	$0	$ -	$ -	$ -	$ -	$ -	$ -
Alfred Benesch & Company	$405,089	$ -	$ -	$ -	$ -	$ -	$ 405,089
CCRG	$242,514	$ 27,488	$ -	$ 27,488	$ -	$ -	$ 270,003
Fletcher & Sippel, LLC	$0	$ -	$ -	$ -	$ -	$ -	$ -
Hamilton Anderson Associates	$504,296	$ 5,242	$ -	$ 5,242	$ -	$ -	$ 509,537
Northwest Consultants, Inc.	$176,166	$ -	$ -	$ -	$ -	$ -	$ 176,166
NTH	$86,580	$ 318,468	$ -	$ 318,468	$ 52,616	$ 1,256,049	$ 1,713,712
SOMAT Engineering, Inc.	$129,318	$ -	$ -	$ -	$ 19,471	$ 241,067	$ 389,855
TBE Group, Inc.	$11,078	$ -	$ -	$ -	$ -	$ -	$ 11,078
Wetland & Coastal Res., Inc.	$165,392	$ -	$ -	$ -	$ -	$ -	$ 165,392
Woolpert Design, LLP	$456,054	$ 4,390	$ -	$ 4,390	$ -	$ -	$ 460,443
Total	**$7,910,620**	**$472,150**	**$0**	**$472,150**	**$644,934**	**$1,759,417**	**$10,787,121**

FACILITIES COST OF CAPITAL

Corradino	$6,336	$ 234	$ -	$ 234	$ 1,128	$ 233	$ 7,931
Parsons Transportation Group	$4,627	$ 26	$ -	$ 26	$ 302	$ 361	$ 5,317
Rick Miller - Geotech Advisory Group	$0	$ -	$ -	$ -	$ -	$ -	$ -
Richard Woods - Geotech Ad. Group	$0	$ -	$ -	$ -	$ -	$ -	$ -
ACG: The al Chalabi Group, Ltd.	$0	$ -	$ -	$ -	$ -	$ -	$ -
DLA Piper Rudnick Gray Cary US LLP	$0	$ -	$ -	$ -	$ -	$ -	$ -
Alfred Benesch & Company	$2,667	$ -	$ -	$ -	$ -	$ -	$ 2,667
CCRG	$0	$ -	$ -	$ -	$ -	$ -	$ -
Fletcher & Sippel, LLC	$0	$ -	$ -	$ -	$ -	$ -	$ -
Hamilton Anderson Associates	$2,180	$ 23	$ -	$ 23	$ -	$ -	$ 2,203
Northwest Consultants, Inc.	$0	$ -	$ -	$ -	$ -	$ -	$ -
NTH	$18	$ 68	$ -	$ 68	$ 11	$ 267	$ 365
SOMAT Engineering, Inc.	$0	$ -	$ -	$ -	$ -	$ -	$ -
TBE Group, Inc.	$20	$0	$ -	$ -	$0	$ -	$ 20
Wetland & Coastal Res., Inc.	$0	$ -	$ -	$ -	$ -	$ -	$ -
Woolpert Design, LLP	$3,378	$ 49	$ -	$ 49	$ -	$ -	$ 3,428
Total	**$19,226**	**$400**	**$0**	**$400**	**$1,442**	**$861**	**$21,929**

DIRECT EXPENSES

	Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total
Corradino	$400,251	$ 139,782	$ -	$ 139,782	$ 128,402	$ 338,720	$ 1,007,155
Parsons Transportation Group	$ 372,903	$ -	$ -	$ -	$ 42,793	$ 15,704	$ 431,400
Rick Miller - Geotech Advisory Group	$ -	$ -	$ -	$ -	$ 2,518	$ -	$ 2,518
Richard Woods - Geotech Ad. Group	$ -	$ -	$ -	$ -	$ 518	$ -	$ 518
ACG: The al Chalabi Group, Ltd.	$ 7,596	$ -	$ -	$ -	$ -	$ -	$ 7,596
DLA Piper Rudnick Gray Cary US LLP	$0	$ 1,170	$ -	$ 1,170	$ 2,108	$ -	$ 3,278
Alfred Benesch & Company	$ 52,356	$ -	$ -	$ -	$ -	$ -	$ 52,356
CCRG	$ 329,327	$ 1,005	$ -	$ 1,005	$ 4,568	$ -	$ 334,900
Fletcher & Sippel, LLC	$ -	$ -	$ -	$ -	$ 43,310	$ -	$ 43,310
Hamilton Anderson Associates	$ 48,735	$ 148,836	$ -	$ 148,836	$ -	$ -	$ 197,571
Northwest Consultants, Inc.	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NTH	$ 217,619	$ 1,466,410	$ (1,314,222)	$ 152,188	$ 260,412	$ 6,378,428	$ 7,008,646
SOMAT Engineering, Inc.	$ 112,000	$ -	$ -	$ -	$ -	$ 1,504,409	$ 1,616,409
TBE Group, Inc.	$ 96,955	$ -	$ -	$ -	$ -	$ -	$ 96,955
Wetland & Coastal Res., Inc.	$ 70,544	$ -	$ -	$ -	$ -	$ -	$ 70,544
Woolpert Design, LLP	$ 162,686	$ 7,129	$ -	$ 7,129	$ -	$ -	$ 169,815
Total	**$1,870,971**	**$1,764,332**	**($1,314,222)**	**$450,110**	**$484,628**	**$8,237,261**	**$11,042,969**

FIXED FEE

	Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total
Corradino	$ 595,728	$ 18,279	$ -	$ 18,279	$ 73,030	$ 18,168	$ 705,206
Parsons Transportation Group	$ 448,615	$ 2,534	$ -	$ 2,534	$ 29,698	$ 30,973	$ 511,820
Rick Miller - Geotech Advisory Group	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Richard Woods - Geotech Ad. Group	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ACG: The al Chalabi Group, Ltd.	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DLA Piper Rudnick Gray Cary US LLP	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Alfred Benesch & Company	$ 72,193	$ -	$ -	$ -	$ -	$ -	$ 72,193
CCRG	$ 51,370	$ 5,823	$ -	$ 5,823	$ -	$ -	$ 57,193
Fletcher & Sippel, LLC	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Hamilton Anderson Associates	$ 88,365	$ 918	$ -	$ 918	$ -	$ -	$ 89,283
Northwest Consultants, Inc.	$ 31,326	$ -	$ -	$ -	$ -	$ -	$ 31,326
NTH	$ 14,590	$ 53,665	$ -	$ 53,665	$ 8,866	$ 211,658	$ 288,779
SOMAT Engineering, Inc.	$ 22,593	$ -	$ -	$ -	$ 3,417	$ 42,301	$ 68,311
TBE Group, Inc.	$ 1,956	$ -	$ -	$ -	$ -	$ -	$ 1,956
Wetland & Coastal Res., Inc.	$ 29,931	$ -	$ -	$ -	$ -	$ -	$ 29,931
Woolpert Design, LLP	$ 80,379	$ 762	$ -	$ 762	$ -	$ -	$ 81,141
Total	**$1,437,045**	**$81,981**	**$0**	**$81,981**	**$115,011**	**$303,101**	**$1,937,138**

FIRM TOTALS

	Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total
Corradino	$ 6,418,028	$ 324,469	$ -	$ 324,469	$ 866,473	$ 522,287	$ 8,131,257
Parsons Transportation Group	$ 4,904,464	$ 25,595	$ -	$ 25,595	$ 342,773	$ 328,615	$ 5,601,447
Rick Miller - Geotech Advisory Group	$ -	$ -	$ -	$ -	$ 26,518	$ -	$ 26,518
Richard Woods - Geotech Ad. Group	$ -	$ -	$ -	$ -	$ 30,518	$ -	$ 30,518
ACG: The al Chalabi Group, Ltd.	$ 317,611	$ -	$ -	$ -	$ -	$ -	$ 317,611
DLA Piper Rudnick Gray Cary US LLP	$ -	$ 241,830	$ -	$ 241,830	$ 143,228	$ -	$ 385,058
Alfred Benesch & Company	$ 783,929	$ -	$ -	$ -	$ -	$ -	$ 783,929
CCRG	$ 847,700	$ 59,761	$ -	$ 59,761	$ 4,568	$ -	$ 912,028
Fletcher & Sippel, LLC	$ -	$ -	$ -	$ -	$ 142,945	$ -	$ 142,945
Hamilton Anderson Associates	$ 942,594	$ 158,127	$ -	$ 158,127	$ -	$ -	$ 1,100,721
Northwest Consultants, Inc.	$ 316,110	$ -	$ -	$ -	$ -	$ -	$ 316,110
NTH	$ 364,859	$ 2,008,009	$ (1,314,222)	$ 693,787	$ 349,892	$ 8,514,512	$ 9,923,050
SOMAT Engineering, Inc.	$ 339,979	$ -	$ -	$ -	$ 34,478	$ 1,931,269	$ 2,305,727
TBE Group, Inc.	$ 116,712	$ -	$ -	$ -	$ -	$ -	$ 116,712
Wetland & Coastal Res., Inc.	$ 372,571	$ -	$ -	$ -	$ -	$ -	$ 372,571
Woolpert Design, LLP	$ 977,162	$ 14,863	$ -	$ 14,863	$ -	$ -	$ 992,025
TOTAL COSTS	**$ 16,701,719**	**$ 2,832,655**	**$ (1,314,222)**	**$ 1,518,433**	**$ 1,941,391**	**$ 11,296,683**	**$ 31,458,226**

Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total

	Original Contract	Amend 1 Authorized	Shift Amend 1 to 3	Amend 1 Fin. After shift to 3	Amend 2 Authorized	Amend 3	Cumulative Total
Below are costs related to the physical aspects of the boring program, not including Advisory Group or Forward Modeling							
NTH Subconsultants (no NTH labor, OH, FCC or fee)							
Layne Christenson	$ -	$ 989,222	$ (989,222)	$ -	$ -	$ -	$ -
Oil-Ex, Inc./Advanced Energy (see Oil-Ex P	$ -	$ -	$ -	$ -	$ -	$ 2,172,250	$ 2,172,250
Z-Seis Reservoir Seismic (see Z-Seis Prop	$ -	$ 325,000	$ (325,000)	$ -	$ 117,500	$ 2,559,000	$ 2,676,500
Baker Atlas (see Baker Atlas Proposal)	$ -	$ -	$ -	$ -	$ -	$ 123,244	$ 123,244
SOCON Sonar Well Services, Inc. (see SC	$ -	$ -	$ -	$ -	$ -	$ 24,926	$ 24,926
MicroG-Lacoste - Borehole Gravity Survey	$ -	$ -	$ -	$ -	$ -	$ 251,063	$ 251,063
American Drilling (Install VSP source geop	$ -	$ -	$ -	$ -	$ -	$ 10,185	$ 10,185
Permits/Equipment/Supplies	$ -	$ 50,500	$ -	$ 50,500	$ -	$ 486,319	$ 536,819
Cording	$ -	$ 44,900	$ -	$ 44,900	$ 56,400	$ 139,750	$ 241,050
Turpening	$ -	$ 52,893	$ -	$ 52,893	$ 31,638	$ 353,476	$ 438,007
Diehl	$ -	$ -	$ -	$ -	$ -	$ 238,242	$ 238,242
NTH SUBS TOTAL	$ -	$ 1,462,515	$ (1,314,222)	$ 148,293	$ 205,538	$ 6,358,454	$ 6,712,285
SOMAT Subconsultants (no NTH labor, OH, FCC or fee)							
Oil-Ex, Inc./Advanced Energy (see Oil-Ex P	$ -	$ -	$ -	$ -	$ -	$ 1,348,107	$ 1,348,107
Permits/Equipment/Supplies	$ -	$ -	$ -	$ -	$ -	$ 156,303	$ 156,303
SOMAT TOTAL	$ -	$ -	$ -	$ -	$ -	$ 1,504,409	$ 1,504,409
Boring Program TOTAL	$ -	$ 1,462,515	$ (1,314,222)	$ 148,293	$ 205,538	$ 7,862,864	$ 8,216,695

DRIC - EPE/EIS - COST - AMENDMENT 3

HOURS BY TASK

The Corradino Group

			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Corradino, JC	Proj. Manager		36	0	0	0	36
Corradino, G	Planner		1040	0	0	0	1040
Bocks	Planner		36	0	0	0	36
Butler	Planner		0	0	0	0	0
Deutsch	Counsel		0	0	0	0	0
Hartman	Engineer		36	0	0	0	36
PPool	Economic Planner		0	0	0	0	0
Santana	Planner		1040	0	0	0	1040
Stone	Env. Planner		36	0	0	0	36
Townsend	Planner			0	0	0	0
	Subtotal Hours		2224	0	0	0	2224

HOURS BY TASK

Parsons Transportation Group

			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Regine Beauboeuf	Deputy Proj. Man.		0	0	0	160	160
Bruce L. Campbell	Lead Bridge		0	0	0	160	160
Patrick Cassity	Bridge Design		0	0	0	120	120
Ken Serzan	Bridge Design		0	0	0	120	120
Gerald Bonner	Tunnel/Geotechnical		0	0	0	275	275
Mike Ashmore	Rdway/Bridge Design		0	0	0	400	400
Richard Saporsky	Lead Roadway		0	0	0	0	0
Robert Hosler	Landscape Architect		0	0	0	0	0
Joseph Marson	Lead Traffic		0	0	0	0	0
Stephen Mayer	Policy		0	0	0	0	0
Craig Richardson	Landscape Architect		0	0	0	0	0
Jeffrey Squires	Policy		0	0	0	0	0
Jr. Engineer	Rd/Plaza/Bridge		0	0	0	0	0
Sr. Engineer	Bridge Design		0	0	0	200	200
Engineer	Rd/Plaza/Bridge		0	0	0	730	730
Administrative			0	0	0	120	120
	Subtotal Hours		0	0	0	2285	2285

HOURS BY TASK

NTH Consultants - Geotech

			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Keith Swaffar	Project Director		0	0	0	342	342
Fritz Klingler	Project Manager		0	0	0	899	899
Joe Alberts	Task Manager		0	0	0	1044	1044
Harry Price	Task Manager		0	0	0	1044	1044
John Kosnak	Task Manager		0	0	0	1044	1044
Craig Johnson	Project Engineer		0	0	0	1103	1103
David Adler	Project Engineer		0	0	0	1103	1103
Heather Audet	Project Engineer		0	0	0	1103	1103
Sanket Gole	Project Engineer		0	0	0	1103	1103
Mike Firestone	Project Engineer		0	0	0	1103	1103
Danny Yip	Project Engineer		0	0	0	1103	1103
Kurt Warning	Project Engineer		0	0	0	1103	1103
Michael Schorsch	Project Engineer		0	0	0	1103	1103
Steve Innes	Project Engineer		0	0	0	1103	1103
Jason Edberg	Project Engineer		0	0	0	1103	1103
Zachary Carr	Project Engineer		0	0	0	1103	1103
Steve Bryan	CADD		0	0	0	513	513
Ennis Smith	Technician III		0	0	0	914	914
Tom Mendenhall	Technician III		0	0	0	914	914
Nateira Farrington	Clerical		0	0	0	1250	1250
Dawn Pressley	Clerical		0	0	0	1250	1250
Latricia Giddens	Clerical		0	0	0	1250	1250
Contract Employee	Clerical		0	0	0	1250	1250
Contract Employee	Clerical		0	0	0	1250	1250
	Subtotal Hours		0	0	0	25097	25097

HOURS BY TASK

SOMAT			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
	QA/QC Engineer		0	0	0	32	32
	Project Manager		0	0	0	422	422
	Project Engineer		0	0	0	682	682
	Project Coordinator		0	0	0	1314	1314
	Staff Engineer		0	0	0	160	160
	Field Engineer		0	0	0	1860	1860
	Field Technician		0	0	0	400	400
	Clerical		0	0	0	40	40
	Subtotal Hours		0	0	0	4910	**4910**

TOTAL HOURS			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
The Corradino Group			2224	0	0	0	2,224
Parsons Transportation Group			0	0	0	2285	2,285
NTH			0	0	0	25097	25097
SOMAT			0	0	0	4910	4910
TOTAL			2224	0	0	32292	**34,516**

COST BY TASK

The Corradino Group		Wage Rate	Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Corradino, JC	Proj. Manager	$91.74	3303	0	0	0	$ 3,303
Corradino, G	Planner	$29.22	30389	0	0	0	$ 30,389
Bocks	Planner	$19.38	698	0	0	0	$ 698
Butler	Planner	$28.85	0	0	0	0	$ -
Deutsch	Counsel	$70.80	0	0	0	0	$ -
Hartman	Engineer	$49.81	1793	0	0	0	$ 1,793
P'Pool	Economic Planner	$78.46	0	0	0	0	$ -
Santana	Planner	$23.64	24586	0	0	0	$ 24,586
Stone	Env. Planner	$49.40	1778	0	0	0	$ 1,778
Townsend	Planner	$30.35	0	0	0	0	$ -
	Subtotal Wages		62546	0	0	0	$ 62,546
Overhead		164.07%	102620	0	0	0	$ 102,620
Facilities Cost of Capital		0.3720%	233	0	0	0	$ 233
Profit		11.00%	18168	0	0	0	$ 18,168
Subtotal - Wages + Overhead + Profit			183,567	-	-	-	$ 183,567

Direct Costs	Unit Cost	Type	# Units	Cost
Overnight Del	$18.00	overnights	2	$36
Lodging	$65.00	days	2	$130
Meals (per diem)	$38.50	days	2	$77
Rental car	$80.00	days	4	$320
24-hr Relocation Security - see att	$17.85	hours	720	$12,852
H_2S Evacuation Plan - see attached				$325,305
Subtotal Other Direct Costs				$338,720
TOTAL - COSTS				$522,287

COST BY TASK

Parsons Transportation Group

			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Regine Beaubosuf	Deputy Proj. Man.	$66.05	0	0	0	10,568	$ 10,568
Bruce L. Campbell	Lead Bridge	$52.00	0	0	0	8,320	$ 8,320
Patrick Cassity	Bridge Design	$68.75	0	0	0	8,250	$ 8,250
Ken Serzan	Bridge Design	$89.42	0	0	0	10,730	$ 10,730
Gerald Bonner	Tunnel/Geotechnical	$89.42	0	0	0	24,591	$ 24,591
Mike Ashmore	Rdway/Bridge Design	$48.08	0	0	0	19,232	$ 19,232
Richard Saporsky	Lead Roadway	$45.67	0	0	0	0	$ -
Robert Hosler	Landscape Architect	$48.31	0	0	0	0	$ -
Joseph Marson	Lead Traffic	$50.18	0	0	0	0	$ -
Stephen Mayer	Policy	$79.33	0	0	0	0	$ -
Craig Richardson	Landscape Architect	$31.00	0	0	0	0	$ -
Jeffrey Squires	Policy	$86.54	0	0	0	0	$ -
Jr. Engineer	Rd/Plaza/Bridge	$24.89	0	0	0	0	$ -
Sr. Engineer	Bridge Design	$47.87	0	0	0	9,574	$ 9,574
Engineer	Rd/Plaza/Bridge	$37.77	0	0	0	27,572	$ 27,572
Administrative		$25.48	0	0	0	3,058	$ 3,058
	Subtotal Wages		0	0	0	121,895	$ 121,895
Overhead		131.00%	-	-	-	159,682	$ 159,682
Facilities Cost of Capital		0.2965%	-	-	-	361	$ 361
Profit		11.00%	-	-	-	30,973	$ 30,973
Subtotal - Wages + Overhead + Profit			-	-	-	312,911	$ 312,911

Direct Costs		Unit Cost	Type	# Units	Cost
	Airline Travel	$ 500.00	Lump Sum	20	$10,000
	Mileage	$ 0.445	miles	7700	$3,427
	Lodging	$ 65.00	days	22	$1,430
	Meals (per diem)	$ 38.50	days	22	$847
	Subtotal Other Direct Costs				$15,704
TOTAL - COSTS					**$328,615**

COST BY TASK

NTH Consultants - Geotech		Wage Rate	Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
Keith Swaffar	Project Director	$ 62.00	$ -	$ -	$ -	$ 21,204	$ 21,204
Fritz Klingler	Project Manager	$ 58.00	$ -	$ -	$ -	$ 52,142	$ 52,142
Joe Alberts	Task Manager	$ 46.50	$ -	$ -	$ -	$ 48,546	$ 48,546
Harry Price	Task Manager	$ 46.50	$ -	$ -	$ -	$ 48,546	$ 48,546
John Kosnek	Task Manager	$ 46.50	$ -	$ -	$ -	$ 48,546	$ 48,546
Craig Johnson	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
David Adler	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Heather Audet	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Sanket Gole	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Mike Firestone	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Danny Yip	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Kurt Warning	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Michael Schorsch	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Steve Innes	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Jason Edberg	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Zachary Carr	Project Engineer	$ 25.50	$ -	$ -	$ -	$ 28,127	$ 28,127
Steve Bryan	CADD	$ 25.50	$ -	$ -	$ -	$ 13,082	$ 13,082
Ennis Smith	Technician III	$ 18.00	$ -	$ -	$ -	$ 16,452	$ 16,452
Tom Mendenhall	Technician III	$ 18.00	$ -	$ -	$ -	$ 16,452	$ 16,452
Nateira Farrington	Clerical	$ 15.00	$ -	$ -	$ -	$ 18,750	$ 18,750
Dawn Pressley	Clerical	$ 15.00	$ -	$ -	$ -	$ 18,750	$ 18,750
Latricia Giddens	Clerical	$ 15.00	$ -	$ -	$ -	$ 18,750	$ 18,750
Contract Employee	Clerical	$ 15.00	$ -	$ -	$ -	$ 18,750	$ 18,750
Contract Employee	Clerical	$ 15.00	$ -	$ -	$ -	$ 18,750	$ 18,750
	Subtotal Wages		$ -	$ -	$ -	$ 668,111	$ 668,111
Overhead		188.00%	$ -	$ -	$ -	$ 1,256,049	$ 1,256,049
Facilities Cost of Capital		0.04%	$ -	$ -	$ -	$ 267	$ 267
Profit		11.00%	$ -	$ -	$ -	$ 211,658	$ 211,658
Subtotal Wages, OH, FCC, and Profit				$ -	$ -	$ 2,136,084	$ 2,136,084

Direct Costs	Unit Cost	Type	# Units	Cost
Mileage	$ 0.445	miles	6500	$ 2,893
Copies	$ 0.25	pages	9000	$ 2,250
FedEx	$ 20.00	units	66	$ 1,320
Digital Camera	$ 10.00	days	100	$ 1,000
Oil-Ex/Advanced Enery Drilling (see support sheet)	$ 2,172,250	lump sum	1	$ 2,172,250
Z-Seis Reservoir Seismic (see sub support sheet)	$ 2,559,000	lump sum	1	$ 2,559,000
Baker Atlas (see sub support sheet)	$ 123,244	lump sum	1	$ 123,244
Socon Well Services (see sub support sheet)	$ 24,926	lump sum	1	$ 24,926
Microg-Lacoste (Borehole Gravity)	$ 251,063	lump sum	1	$ 251,063
American Drilling (install VSP source geophone)	$ 10,185	lump sum	1	$ 10,185
Gravity Modeling Software (Purchase @ 10,000 Euros)	$ 12,511	lump sum	1	$ 12,511
External Consulting (Cording)	$ 250	hours	377	$ 94,250
External Consulting (Cording Asst.)	$ 100	hours	455	$ 45,500
External Consulting (Turpening)	$186.04	hours	1900	$ 353,476
External Consulting (Diehl)	$181	hours	1318	$ 238,242
Site Improvements (see direct cost support sheet)	$104,287	NA	1	$ 104,287
Drill Cutting Removal (see direct cost support sheet)	$24,750	NA	1	$ 24,750
Site Restoration (see direct cost support sheet)	$85,904	NA	1	$ 85,904
PL Insurance pass through (see direct cost support sheet)	$115,186	NA	1	$ 115,186
MDEQ Permit (see direct cost support sheet)	$19,292	NA	1	$ 19,292
Estimated Field Expenses (see direct cost support sheet)	$129,700	NA	1	$ 129,700
Sound/Vibration Monitoring (see direct cost support sheet)	$7,200	NA	1	$ 7,200
Subtotal Direct Costs				$ 6,378,428
TOTAL COSTS				$ 8,514,512

COST BY TASK

SOMAT			Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total
	QA/QC Engineer	$56.00	0	0	0	1792	$ 1,792
	Project Manager	$58.00	0	0	0	24476	$ 24,476
	Project Engineer	$38.00	0	0	0	25916	$ 25,916
	Project Coordinator	$27.00	0	0	0	35478	$ 35,478
	Staff Engineer	$26.50	0	0	0	4240	$ 4,240
	Field Engineer	$23.50	0	0	0	43710	$ 43,710
	Field Technician	$18.00	0	0	0	7200	$ 7,200
	Clerical	$17.00	0	0	0	680	$ 680
	Subtotal Wages		0	0	0	143492	$ 143,492
Overhead		168.00%	0	0	0	241067	$ 241,067
Profit		11.00%	0	0	0	42301	$ 42,301
Subtotal - Wages + Overhead + Profit			0	0	0	$ 426,860	$ 426,860

Direct Costs	Unit Cost	Type	# Units	Cost
Field Engineer OT	$11.75	hours	720	$8,460
Oil Ex/Advanced Energy - 6 rotary borings + 1/2 mob (quote attached)				$1,348,107
Site Improvements (estimate by NTH)				$45,778
Drill Cutting Removal (estimate by NTH)				$10,607
Site Restoration (estimate by NTH)				$35,872
Estimated Expenses (logging/access/vehicle rental/copies/camera etc.) (estimate by NTH)				$55,586
Subtotal Direct Costs				$1,504,409
TOTAL - COSTS				$1,931,269

COST TOTALS BY TASK AND FIRM

FIRM	Public Involv. 1230/211M	Practical Alternatives 2340	Recom. Alternative 2510	Geotech Investigation 2330	Total Service $	Directs	Totals
The Corradino Group	183,567	0	-	-	$ 183,567	$ 338,720	$ 522,287
Parsons Transportation Group	-	-	-	312,911	$ 312,911	$ 15,704	$ 328,615
NTH	-	-	-	2,136,084	$ 2,136,084	$ 6,378,428	$ 8,514,512
SOMAT	-	-	-	426,860	$ 426,860	$ 1,504,409	$ 1,931,269
TOTALS	183,567	-	-	2,875,856	$ 3,059,423	$ 8,237,261	$ 11,296,683
CREDIT FROM AMENDMENT 1							$ (1,314,222)
BALANCE NEEDED FOR AUTHORIZATION OF AMENDMENT 3							$ 9,982,461

Michigan Department of Transportation

ADDITIONAL SCOPE OF SERVICES

CONTROL SECTION: 82900 JOB NUMBER: 80233

PROJECT LOCATION:

The study limits extend from Belle Isle on the North, to the I-94 corridor on the West, to Grosse Isle on the South, to the Canadian border in the Detroit River.

PROJECT DESCRIPTION:

The original contract provides for the study for all work related to the Route Planning and Environmental Impact Statement through the Record of Decision (ROD), including all work related to the preparation of documentation to receive approvals under the United States National Environmental Policy Act (NEPA) and coordination of NEPA activities with the Canadian Environmental Assessment Act (CEAA) and the Ontario Environmental Assessment Act (OEAA).

PLAN COMPLETION DATE: December 31, 2008.

DBE REQUIREMENT: 12 %

DESCRIPTION:

The Detroit River International Crossing Study has reached a point where the preliminary list of Practical Alternatives has been established. Additional work needs to be conducted to prepare the Draft Environmental Impact Statement and conduct the Early Preliminary Engineering. That work includes the following.

1. Additional Geotechnical Analysis
2. Additional Public Involvement
   - ✓ Drilling Program Ombudsman

The scope of work in each area follows.

1. Additional Geotechnical Analysis

The proposed alternatives are near historically identified salt solution mining wells, which are associated with issues regarding the suitability of bedrock formations in these areas to support bridge foundations because the Michigan Basin is one of the largest areas of halite (salt-NaCl) deposition in the world. Salt has historically been mined either in solid form as rock salt or as natural or artificial brine pumped through solution mining wells. The area beneath Detroit and Windsor within the Michigan Basin is currently mined using conventional room-and-pillar excavation methods. This area has also been historically mined for salt using solution mining methods. Known areas of solution mining have been identified and discussed in the DRIC Report "Draft Preliminary Geotechnical Evaluation for the Proposed Detroit River International Crossing dated May 23, 2005 for the DRIC Study. While the known solution mining areas are located south of Zug Island to the southern end of the DRIC study area, the occurrence of unknown brine wells throughout the corridor cannot be precluded as many unknown wells are thought to exist. The solution wells extended to depths of 1,100 to 1,300 feet.

In general, solution mining consists of introducing water from the surface down a well casing between an outer casing and a central tube. The brine produced from the salt dissolving in the water is recovered through the central tube. Cavities using this method are usually greater at the top of the stratum than at the bottom because the fresh water, which tends to stratify above the denser salt brine in the cavity, dissolves salt more rapidly near cavity roofs than at the base of the cavities, which are in contact with saturated brine. This would result in an inverted cone shaped cavity.

With continued production using this method, solution cavities often coalesce with adjacent cavities to form composite cavities called galleries. When this occurred historically, one or more of the wells were then converted to water inlet wells and the brine was pumped out through other wells in the interconnected system. As production continued in the gallery, large spans of unsupported roofs were sometimes created which, in turn, could cause sagging, downward flexure, and local separation of rock units resulting in local roof collapse and eventual surface subsidence in some instances.

Uncontrolled solution mining near the top of a salt layer commonly leaves overlying weak or weakened rocks exposed at the top of the cavity, which increase potential for roof collapses.

The subsidence and/or collapse can progress upwards as a chimney effect on an approximately 10- to 20-degree angle (or possibly steeper) from vertical from the outside edges of the cavity. Several theories have been published on the subsidence progression to the surface, the more notable of which attributes surface daylighting to failure of a sandstone formation at a depth of approximately 400 feet. According to the theory, the sandstone actually disintegrates under the induced compression from rock mass sagging, and the fragments filter downwards as granular material into voids below. This results in a void at a depth of approximately 400 feet instead of at the original cavity depth. This mechanism would explain why theoretical "bulking" of broken rock pieces would not be sufficient to fill the cavities before daylighting occurs.

The solution mining areas of interest for this project present the potential for future ground collapse and related adverse effects on elements of the proposed crossing structure. Simply avoiding the known solution wells may not be a viable alternative because the mining is relatively widespread and it appears that not all of the mining activities have been well documented. Additionally, at least one previous collapse has occurred in Windsor, Canada, in the area of the proposed Practical Alternatives. Therefore, MDOT requests that the Detroit River International Study consultant develop a scope of work to further investigate and define the solution mining well areas, and to evaluate their long-term potential impacts on the future crossing structures.

To address these issues, the original program of four boreholes in one corridor and related cross-hole tomography will be expanded to two corridors each with seven boreholes and related cross-hole tomography. Compliance with all MDEQ permitting procedures as well as City of Detroit Right-of-Entry procedures are to be part of the consultant's work. Likewise, accommodations to address noise and vibration effects of the drilling will be part of the consultant's work. That work will be completely monitored in the field to ensure complete compliance with all regulatory requirements and engineering best practices. The cross-hole tomography will be accompanied by the application of forward modeling. This application of computer software will use field data to verify the

recommendations. It may also be useful in limiting the field work, described above, so fewer boreholes than the 14 now contemplated (seven in each of two corridors) may be required.

The work performed by the consultant geotechnical engineer shall consist of performing additional geophysical investigation to determine if a suitable clear zone exists at practical alterative crossing locations X-10 and X-11 that will satisfy the requirements of MDOT's geotechnical design policy established by the January 27, 2006 memo from Brenda O'Brien, and John Friend to Larry Tibbets.

The geophysical investigation shall include all borings, geophysical measurements, field sampling, laboratory testing, engineering analysis, field records, rock mechanics analysis, coordination of meetings and all activities related to the investigation, and report writing.

The geophysical investigation shall search for existing cavities and rubblized zones indicating ongoing collapse of salt mine cavities. The investigation shall determine the future potential for instability and the potential for propagation of existing voids to the ground surface and determine if existing voids are expanding in size laterally.

The consultant geotechnical engineer shall propose for MDOT's approval the geophysical investigation method or combination of methods that will be used.

The consultant shall propose for MDOT's approval the staging or sequencing of the geophysical investigation and borings. The geophysical investigation shall be done in a manner that is cost effective and meets established dates and milestones. Data collection and analysis shall be integrated with the drilling so that the status of the alignment can be evaluated periodically as the work proceeds.

The consultant shall supply equipment suitable to take deep borings up to depths of 1,500 feet from the ground surface and allow for appropriate geophysical investigation methods and field sampling. The consultant shall provide equipment to perform all other tasks of the geophysical investigation.

The consultant shall propose for MDOT's approval the number, location and depth of borings.

If a void is encountered during the drilling operations, the consultant geotechnical engineer shall perform a cavity survey using 3-D cavity detection sonar.

Evacuation Plan: The money allocated for the evacuation plan can only be used for that purpose after pursuing all available means to have evacuation costs covered by contractors insurance. In the event that the evacuation plan is not required to be put into effect during deep drilling operations, MDOT will re-evaluate the need for the allocated funds at that time.

Entry Permission: It is the responsibility of the consultant geotechnical engineer to obtain permission for entry from each property owner whose property must be entered for any reason.

Damages: It is the responsibility of the consultant geotechnical engineer acting as a representative of the Michigan Department of Transportation to compensate the property owners for any damage incurred to their property because of the geophysical investigation.

Railroad Expenses: This item consists of the actual cost involved by the railroad for railroad permits, flagman, right of entry, etc. The consultant geotechnical engineer shall obtain the written approval of the State before incurring any railroad expense.

Upon completion of the geophysical investigation the consultant shall fill abandon and seal all bore holes full depth with an approved grout to permanently seal the holes from moisture intrusion in accordance with MDEQ permit requirements.

This amendment takes account of the already approved amendment # 1 which has the budget for 2 core holes and two rotary holes.

2. Additional Public Involvement

MDOT has decided to expand the public involvement effort from that in the original scope of

work of the consultant. The consultant shall provide complete coverage through an ombudsman of the drilling program as well as relocation payments to nearby residential property owners for the inconvenience/nuisance associated with the drilling program.