

McMicken Dam Rehabilitation Project

GEOTECHNICAL INVESTIGATION AND DATA REPORT

FOR OUTLET CHANNEL ALTERNATIVE 4

Contract FCD 2011C030

Prepared for:

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**



JULY 2014

Prepared by:



In Association with:
URS CORPORATION

GF Project No. 056312

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OUTLET CHANNEL ALTERNATIVE 4
TABLE OF CONTENTS

| | | |
|------------|---|----|
| 1.0 | INTRODUCTION | 1 |
| 1.1 | Project Background..... | 1 |
| 1.2 | Description of Proposed Outlet Channel Alternative 4..... | 2 |
| 1.3 | Outlet Channel Preliminary Geotechnical Investigation Objectives and Scope..... | 2 |
| 2.0 | REGIONAL GEOLOGIC SETTING | 14 |
| 2.1 | Regional Setting..... | 14 |
| 2.2 | Surficial Geology..... | 15 |
| 2.3 | Deep Basin Characteristics..... | 17 |
| 2.4 | Groundwater..... | 17 |
| 3.0 | SUBSURFACE INVESTIGATION METHODS | 18 |
| 3.1 | Hollow-Stem Auger Drilling..... | 18 |
| 3.2 | Test Pit Excavation..... | 19 |
| 3.3 | Seismic Refraction and Refraction Microtremor (ReMi) Survey..... | 20 |
| 3.4 | Laboratory Testing..... | 21 |
| 4.0 | INVESTIGATION RESULTS | 23 |
| 4.1 | General Description of Subsurface Conditions..... | 23 |
| 4.2 | Soil Classifications and Blow Counts..... | 23 |
| 4.3 | Seismic Refraction and Refraction Microtremor Surveys..... | 24 |
| 4.4 | Cementation/Excavatability..... | 25 |
| 4.5 | Engineering Properties of Excavated Soils..... | 27 |
| 5.0 | LIMITATIONS | 30 |
| 6.0 | REFERENCES | 31 |

TABLES

- Table 1 Summary Preliminary Geotechnical Exploration
- Table 2 Summary of Geotechnical Laboratory Testing Program
- Table 3 Summary of Geotechnical Laboratory Testing Results
- Table 4 Summary of Laboratory Soil Classifications
- Table 5 Summary of SPT Blow Counts
- Table 6 Summary of Calcium Carbonate Measurements

FIGURES

- Figure 1 Project Site
- Figure 2 Outlet Channel Alternative 4 Alignment Station 10+47 to Station 180+75
- Figure 3 Outlet Channel Alternative 4 Alignment Station 180+75 to Station 342+23
- Figure 4 Alternative 4: Realign Outlet Channel North Typical Section
- Figure 5 Outlet Channel Alternative 4 Plan and Profile Station 65+00 to Station 125+00
- Figure 6 Outlet Channel Alternative 4 Plan and Profile Station 125+00 to Station 185+00
- Figure 7 Outlet Channel Alternative 4 Plan and Profile Station 185+00 to Station 245+00
- Figure 8 Outlet Channel Alternative 4 Plan and Profile Station 245+00 to Station 305+00
- Figure 9 Outlet Channel Alternative 4 Plan and Profile Station 305+00 to Station 345+00
- Figure 10 Relative Calcium Carbonate Concentrations as a Function of Location and Depth

APPENDICES

- Appendix A Soil Boring and Test Pit Logs
- Appendix B Seismic Refraction and Refraction Microtremor Results
- Appendix C Soils Laboratory Reports
- Appendix D Historic Geotechnical Data
- Appendix E Test Pit Photographs
- Appendix F Backfill Compaction Test Results

1.0 INTRODUCTION

1.1 Project Background

The Trilby Wash Detention Basin Dam & Appurtenances (McMicken Dam Project) was constructed by the USACE in 1954 and 1955 to protect Luke Air Force Base, the Litchfield Park Naval Air Facility, and agricultural activities in the area from flooding. The Project currently provides flood protection for significant portions of the cities of Surprise, El Mirage, Sun City West, Grand, and Litchfield Park, as well as unincorporated areas of Maricopa County. Critical public facilities and infrastructure such as: hospitals, schools, police and fire stations, freeways and other public roadways, railroads, and canals such as Beardsley Canal also benefit from the flood protection provided by the McMicken Dam Project. The ability of the McMicken Dam Project to maintain the current level of protection in the long-term for the benefit of the public in an increasingly urbanized environment is in question due to significant concerns regarding aging infrastructure, land subsidence, earth fissuring, urbanization encroachment and current dam safety standards.

These dam safety issues have lead the Flood Control District of Maricopa County (the District) to determine that an overall rehabilitation of the dam is required. The McMicken Dam Project, shown on Figure 1, was originally designed as a dry, homogeneous earthen embankment, and includes McMicken Dam itself, (approximately 9.5 miles in length) the McMicken Dam Outlet Channel (approximately 6 miles in length) and the McMicken Dam Outlet Wash (approximately 4 miles in length) which discharges to the Agua Fria River. McMicken Dam has a maximum height of about 39 feet and a storm water storage capacity of approximately 21,000 acre-feet from a 245-square mile drainage area.

The primary project goals of the Project as defined by the District are to prepare a design to eliminate or mitigate current dam safety deficiencies and failure modes with regards to the Project in accordance with ADWR and District requirements and to maintain or improve upon the level of flood protection currently being provided for the new Project life of 100 years. The Project also includes rehabilitation and improvement of the McMicken Dam Outlet Channel and Outlet Wash. Resolution FCD2010R009 authorized the District to advertise, select, negotiate and award contracts for engineering and construction services; negotiate Intergovernmental Agreements; acquire rights-of-way; and include funding in the District's Five-Year Capital Improvement Program.

As part of the Design Elements Alternatives Evaluation and Selection process for the Project, four design alternatives for the Outlet Channel were evaluated. Plans, profiles, typical sections and order-of-magnitude cost estimates were prepared and evaluated during an Alternatives Review Meeting at the District offices on January 14, 2014. It was determined in the meeting that re-aligning the Outlet Channel was the preferred alternative from a technical and risk management perspective. However, no site-specific geotechnical data were available to support the excavation cost estimate for the re-aligned channel (Alternative 4) and allow direct cost comparison between the alternatives. Therefore, a preliminary geotechnical investigation was conducted along the proposed Alternative 4 channel alignment and the results are reported

herein. The proposed Outlet Channel Alternative 4 alignment and typical section are presented graphically as Figures 2 and 3, respectively.

1.2 Description of Proposed Outlet Channel Alternative 4

Outlet Channel Alternative 4 would be re-aligned to the north relative to the existing Outlet Channel. The realignment would begin at approximately Station 112+20 to avoid the existing electrical transmission line towers (see Figures 4 through 9). It will also eliminate the need for as much of the existing levee as feasible east of the US 60 and BNSF Railroad bridges.

The proposed earthen channel would have a trapezoidal shape with 4H:1V side slopes and varying depths and widths along its length. A 16-foot wide maintenance road with an aggregate base course would be provided along the south side of the proposed channel. Another 16 feet wide earthen access road will be provided along the north side of the channel. The trapezoidal excavated channel will have a curved alignment at the downstream end prior to confluence with the Outlet Wash.

Side inflows would be directed into the proposed channel through grouted riprap spillways, similar to the existing grouted spillways at the existing channel.

1.3 Outlet Channel Preliminary Geotechnical Investigation Objectives and Scope

The overall objectives of the Outlet Channel preliminary geotechnical investigation are:

- To provide information on channel excavatability as determined by presence of cemented material.
- To develop construction quantities to update the Outlet Channel Alternative 4 cost estimate.
- To provide information on engineering properties of excavated material to assess potential for material reuse in other construction projects.

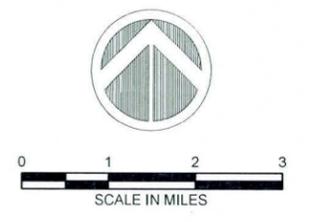
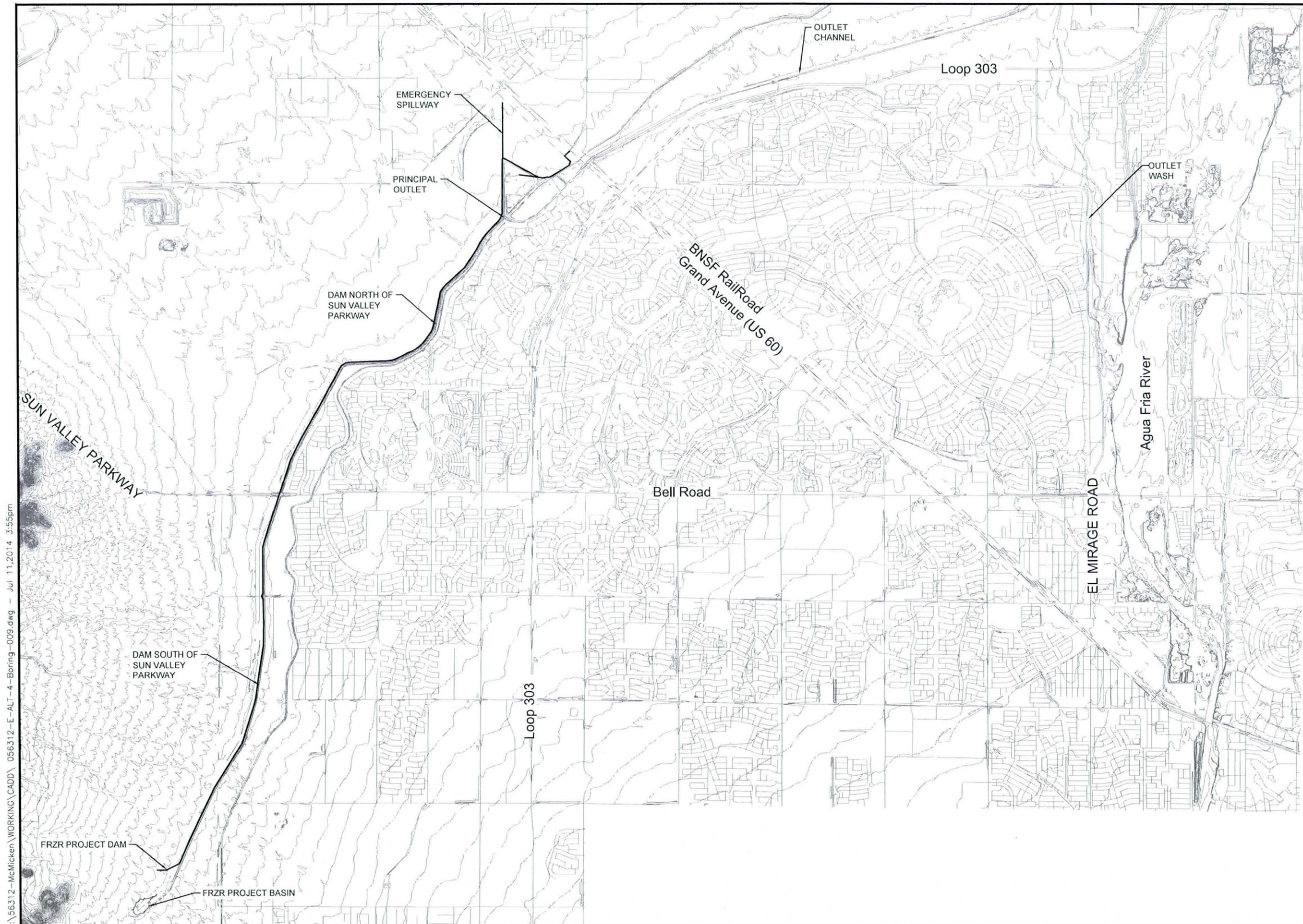
The geotechnical field investigation consisted of the following specific activities:

- Pre-investigation activities included obtaining utility clearances, obtaining a dust control permit for the investigative work, subcontracting with drilling and excavation contractors and obtaining archaeological clearance.
- Drilling and sampling a total of 23 shallow soil borings using a hollow-stem auger (HSA) to evaluate the subsurface conditions, including observations of cementation, and to collect soil samples for laboratory testing. Borings ranged in depth from 6 feet below ground surface (bgs) to 25 feet bgs. Boring locations are shown on Figures 2 and 3 and on the plan and profile sheets presented as Figures 5 through 9. Table 1 includes a summary of the boring data; boring logs are included in Appendix A.
- Excavating a total of 4 test pits to confirm subsurface conditions encountered at select boring locations. Test pits ranged in depth from 13.4 feet bgs to 15.5 feet bgs. Test pit locations are shown on Figures 8 and 9; Table 1 includes a summary of the test pit data and test pit logs are included in Appendix A.

- Performing a seismic refraction survey and a seismic refraction microtremor (ReMi) survey to evaluate seismic wave velocities for correlation to excavatability. Seismic line locations are shown on Figures 6 through 9; the results of the seismic surveys are included in Appendix B.
- Performing laboratory testing on soil samples obtained from the borings to assess the engineering characteristics of the subsurface materials for potential reuse as construction materials. Soils laboratory reports are included in Appendix C.

Table 1. Summary Preliminary Geotechnical Exploration - Outlet Channel Alternative 4

| Boring/ Test Pit ID | Outlet Channel Alternative 4 Station | Northing | Easting | Approximate Ground Surface Elevation at Channel Centerline (ft msl) | Approximate Channel Bottom Elevation (ft msl) | Approximate Depth to Channel Bottom (ft) | Total Boring/Test Pit Depth (ft) |
|--------------------------------|---|-----------------|----------------|--|--|---|---|
| TH-501 | 339+99 | 984418.127 | 574053.809 | 1292 | 1292 | 0 | 6.5 |
| TH-502 | 330+00 | 985346.914 | 574124.306 | 1298 | 1293 | 5 | 11.5 |
| TH-503 | 320+03 | 986085.792 | 573692.843 | 1314 | 1294 | 20 | 26.5 |
| TH-504 | 309+90 | 985870.101 | 572739.241 | 1315 | 1296 | 19 | 25.5 |
| TH-505 | 299+95 | 985227.391 | 571958.799 | 1312 | 1297 | 15 | 21.5 |
| TH-506 | 290+04 | 984892.188 | 571008.927 | 1313 | 1298 | 15 | 21.5 |
| TH-507 | 279+95 | 984644.032 | 570058.654 | 1315 | 1299 | 16 | 21.5 |
| TH-508 | 270+05 | 984397.207 | 569120.144 | 1316 | 1300 | 16 | 21.5 |
| TH-509 | 259+95 | 984144.564 | 568148.637 | 1319 | 1301 | 18 | 21.5 |
| TH-510 | 250+00 | 983845.455 | 567180.736 | 1320 | 1303 | 17 | 21.5 |
| TH-511 | 244+03 | 983687.043 | 566586.507 | 1320 | 1304 | 16 | 21.5 |
| TH-512 | 230+00 | 983285.909 | 565250.548 | 1320 | 1305 | 15 | 21.5 |
| TH-513 | 224+00 | 983140.423 | 564673.736 | 1320 | 1306 | 14 | 21.5 |
| TH-514 | 210+06 | 982788.698 | 563338.267 | 1321 | 1308 | 13 | 19.5 |
| TH-515 | 199+99 | 982468.411 | 562365.368 | 1322 | 1309 | 13 | 21.5 |
| TH-516 | 189+99 | 982251.093 | 561403.955 | 1321 | 1310 | 11 | 21.5 |
| TH-517 | 180+00 | 981979.562 | 560455.217 | 1322 | 1311 | 11 | 16.5 |
| TH-518 | 169+99 | 981914.852 | 559466.803 | 1320 | 1312 | 8 | 16.5 |
| TH-519 | 160+00 | 981576.039 | 558404.086 | 1326 | 1314 | 12 | 16.5 |
| TH-520 | 152+00 | 981217.054 | 557687.551 | 1330 | 1315 | 15 | 21.5 |
| TH-521 | 140+04 | 980880.081 | 556602.670 | 1331 | 1316 | 15 | 21.5 |
| TH-522 | 129+98 | 980506.659 | 555655.650 | 1328 | 1317 | 11 | 16.5 |
| TH-523 | 120+00 | 980052.300 | 554759.138 | 1330 | 1318 | 12 | 16.5 |
| TP-601 | 320+03 | 986068.372 | 573692.526 | 1314 | 1294 | 20 | 15.5 |
| TP-602 | 309+90 | 985893.285 | 572731.724 | 1315 | 1296 | 19 | 15.0 |
| TP-603 | 299+95 | 985209.027 | 571958.592 | 1312 | 1297 | 15 | 13.5 |
| TP-604 | 270+05 | 984374.244 | 569128.150 | 1316 | 1300 | 16 | 15.3 |



Topography Source:
 Topography provided by Flood Control District of Maricopa County, Nov 2012
 Flight dates: 12/18/2000 and 12/17/200
 Vertical Datum NAVD88
 Horizontal Datum: Stateplane NAD88, Arizona Central, International Feet



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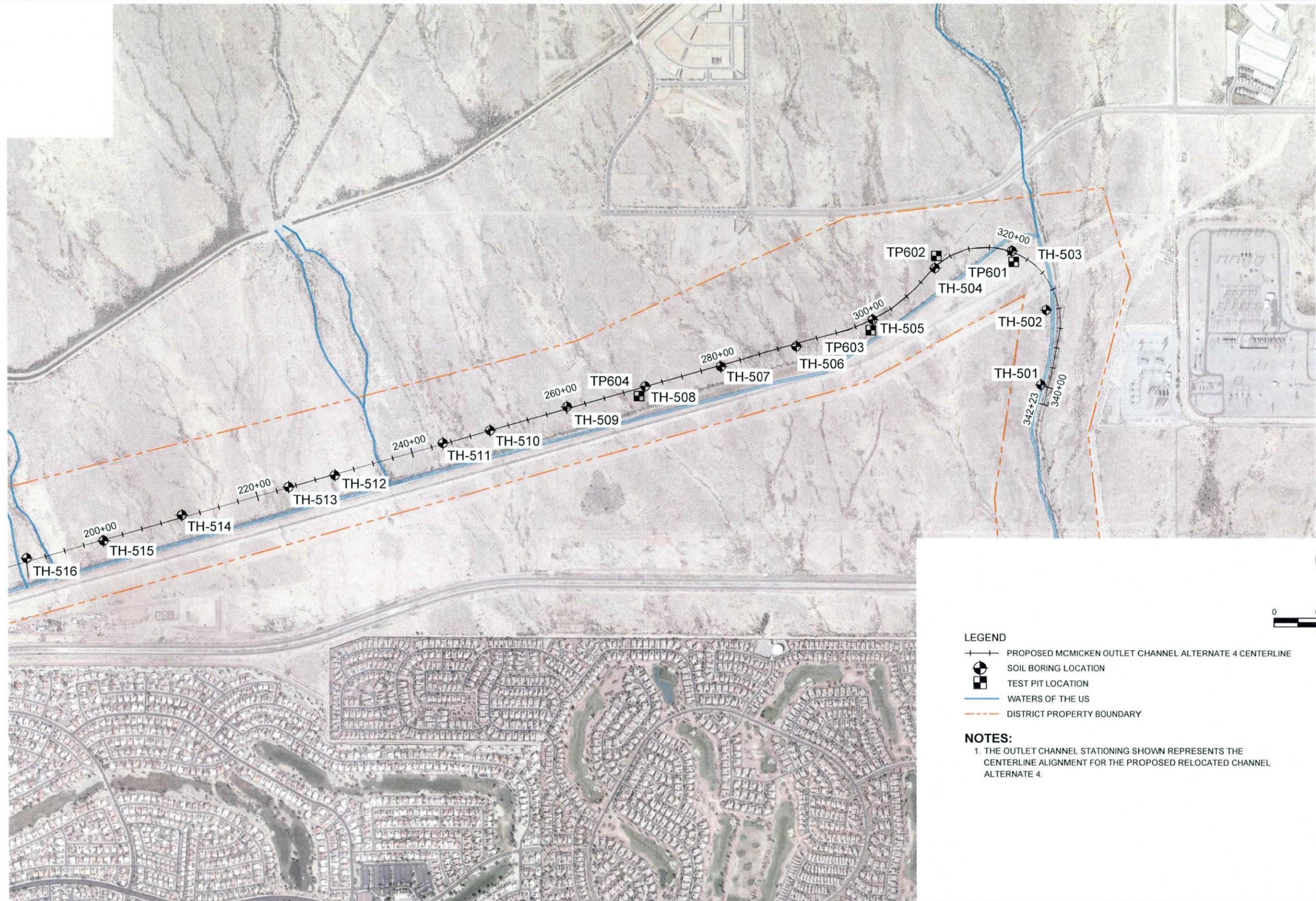
- +— PROPOSED MCMICKEN OUTLET CHANNEL ALTERNATE 4 CENTERLINE
- ⊗ SOIL BORING LOCATION
- ⊠ TEST PIT LOCATION
- WATERS OF THE US
- - - DISTRICT PROPERTY BOUNDARY

NOTES:

1. THE OUTLET CHANNEL STATIONING SHOWN REPRESENTS THE CENTERLINE ALIGNMENT FOR THE PROPOSED RELOCATED CHANNEL ALTERNATE 4.



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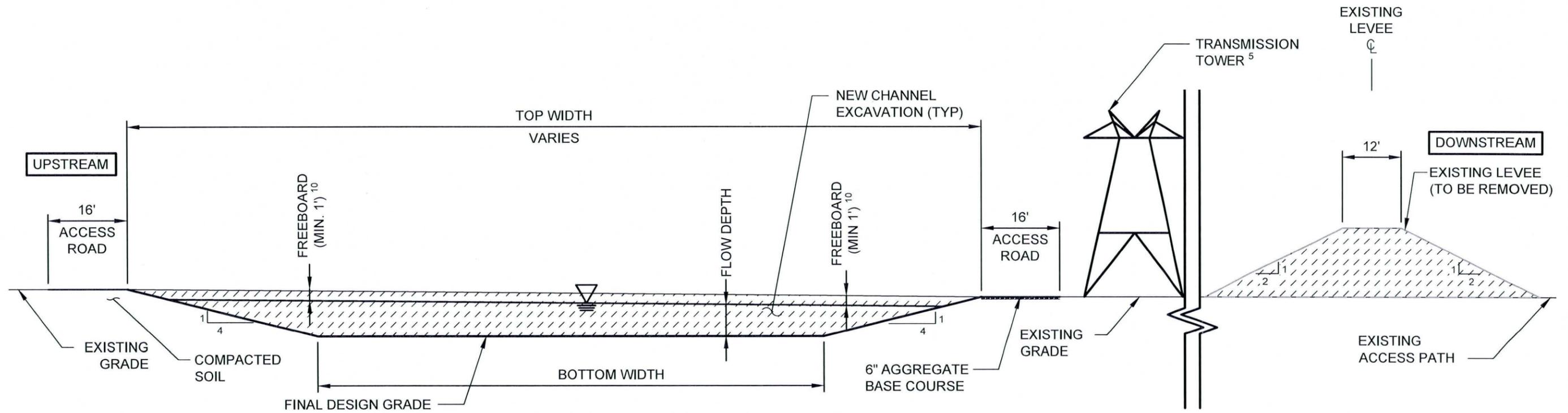
- +— PROPOSED MCMICKEN OUTLET CHANNEL ALTERNATE 4 CENTERLINE
- ⊗ SOIL BORING LOCATION
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- Waters of the US
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1. THE OUTLET CHANNEL STATIONING SHOWN REPRESENTS THE CENTERLINE ALIGNMENT FOR THE PROPOSED RELOCATED CHANNEL ALTERNATE 4.



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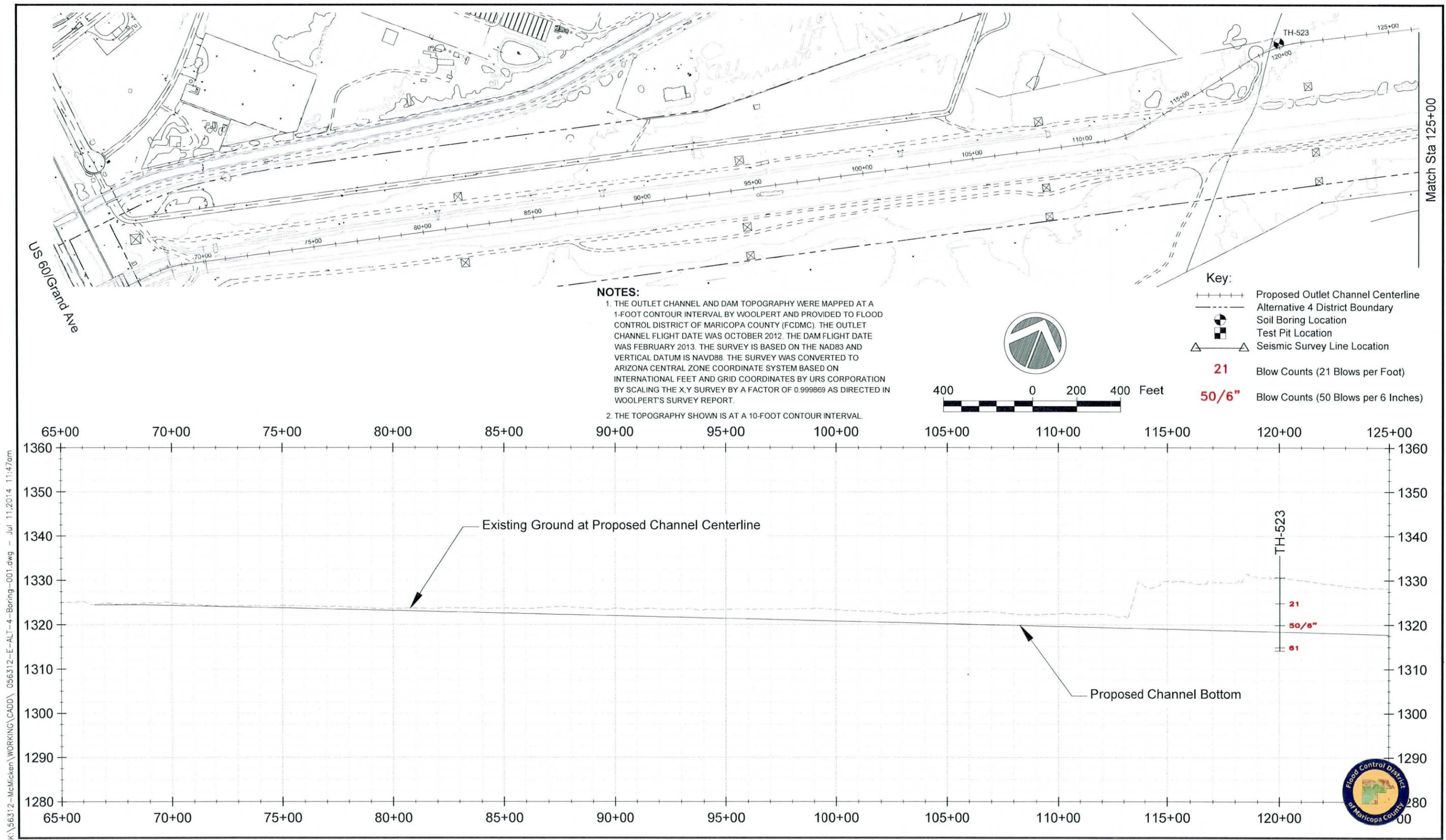
| HYDRAULICS TABLE | | | | | | | | |
|-------------------------------------|--------------------------|--------------------------|-------------------------|-------------------------|-------------------|--------------------------|--------------------------|----------------------------|
| STATION | 100-YEAR DISCHARGE (CFS) | 200-YEAR DISCHARGE (CFS) | 100-YEAR VELOCITY (FPS) | 200-YEAR VELOCITY (FPS) | BOTTOM WIDTH (FT) | 100-YEAR FLOW DEPTH (FT) | 200-YEAR FLOW DEPTH (FT) | LONGITUDINAL SLOPE (FT/FT) |
| 111+50 TO 129+20 A4 ^{6,8} | 4,450 ¹ | 4,450 | 5.2 | 5.2 | 50 | 9.7 | 9.7 | 0.0012 |
| 131+00 A4 TO 158+85 A4 ⁸ | 4,450 ¹ | 4,450 | 4.7 | 4.7 | 100 | 7.3 | 7.3 | 0.0012 |
| 162+00 A4 TO 230+30 A4 ⁸ | 7045 ² | 8,243 | 4.9 | 5.2 | 170 | 7.2 | 7.9 | 0.0012 |
| 233+00 A4 TO 328+00 A4 ⁸ | 9090 ³ | 10,716 | 5.0 | 5.3 | 230 | 7.1 | 7.7 | 0.0012 |

- NOTES:
- 4,450 cfs is the Principal Outlet discharge used in the McMicken Dam Outlet Channel Inundation Report EAP Update (2004) by Kimley Horn and Associates (KHA).
 - 7,045 cfs is the 100-year discharge used in the Low Resolution Hydrology Model within the McMicken Dam Draft Hydrology Report (late 2012) by RBF Engineering.
 - 9,090 cfs is the 100-year discharge used in the Low Resolution Hydrology Model within the McMicken Dam Draft Hydrology Report (late 2012) by RBF Engineering.
 - Manning's Roughness Coefficients are based on the FCDMC Hydraulic Manual in conjunction with discussions with the District project team staff.
 - Refer to the plans for location of transmission towers.
 - Channel sections between stations 111+50 and 129+20 retains the existing channel side slopes.
 - Channel bottom widths vary linearly where there are gaps between stations in the table above.
 - A4 refers to Alternative 4 Alignment Stationing.
 - Figure 2-5 "Modify Existing Levee with Recessed Upstream Filter for Alternatives 1 - 4" will be common to all four alternatives.
 - Freeboard shown in this typical section is for the 100-year storm. Freeboard for the 200-year storm is 0.3 feet min.

TYPICAL SECTION

NTS





NOTES:

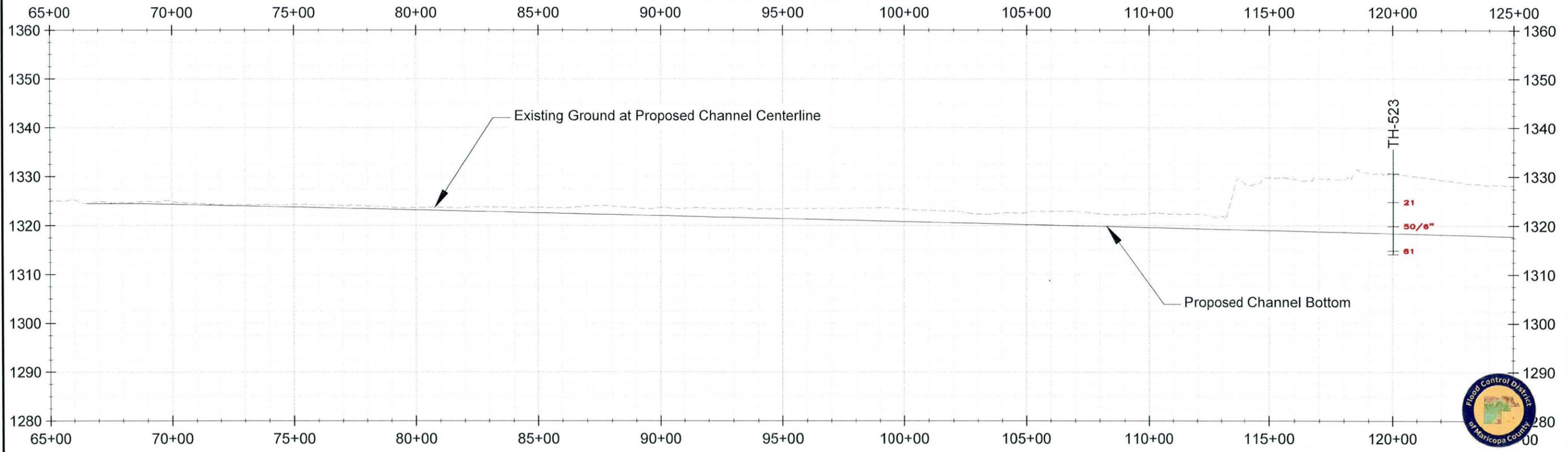
1. THE OUTLET CHANNEL AND DAM TOPOGRAPHY WERE MAPPED AT A 1-FOOT CONTOUR INTERVAL BY WOOLPERT AND PROVIDED TO FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC). THE OUTLET CHANNEL FLIGHT DATE WAS OCTOBER 2012. THE DAM FLIGHT DATE WAS FEBRUARY 2013. THE SURVEY IS BASED ON THE NAD83 AND VERTICAL DATUM IS NAVD88. THE SURVEY WAS CONVERTED TO ARIZONA CENTRAL ZONE COORDINATE SYSTEM BASED ON INTERNATIONAL FEET AND GRID COORDINATES BY URS CORPORATION BY SCALING THE X,Y SURVEY BY A FACTOR OF 0.9999869 AS DIRECTED IN WOOLPERT'S SURVEY REPORT.

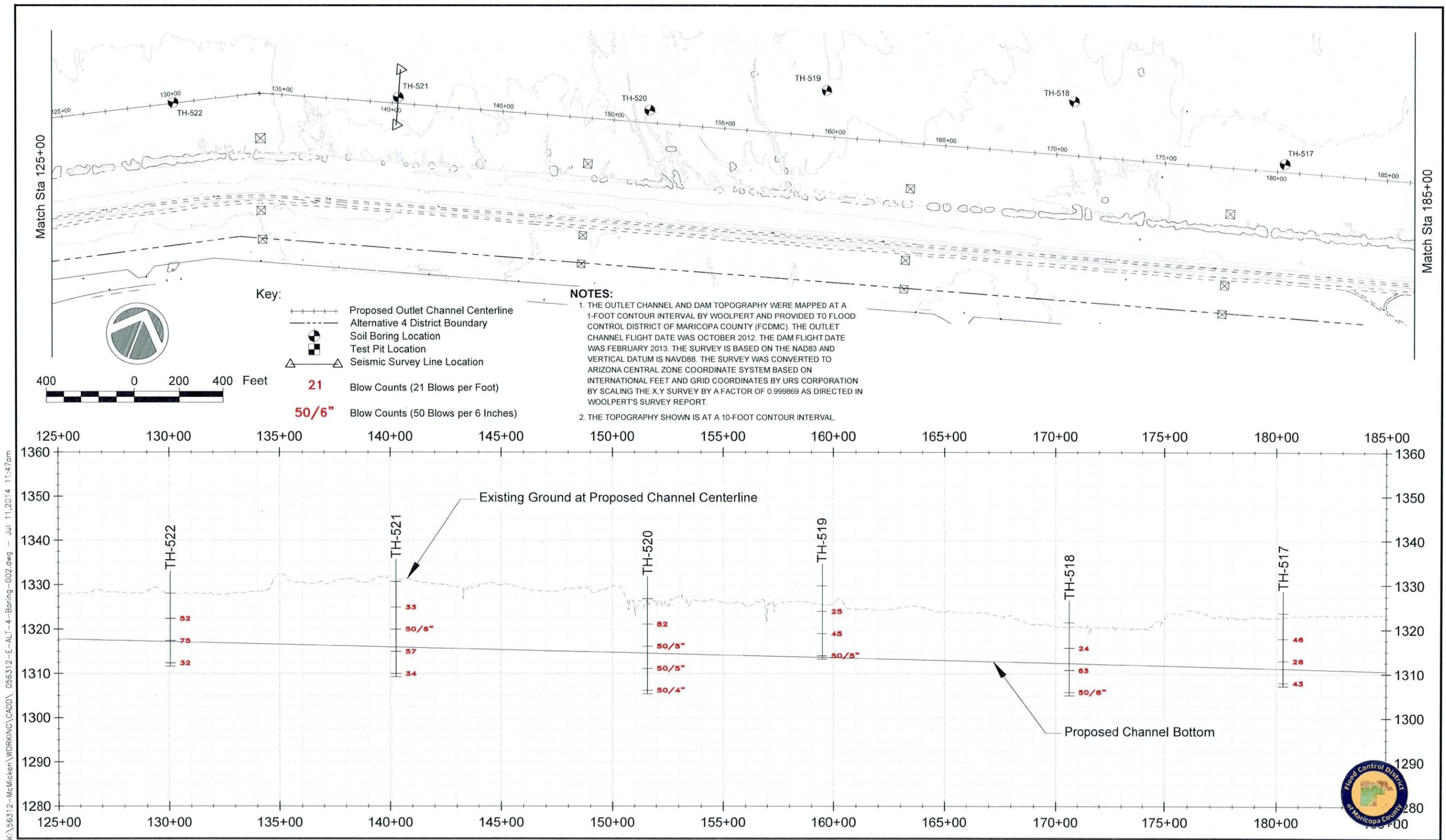
2. THE TOPOGRAPHY SHOWN IS AT A 10-FOOT CONTOUR INTERVAL.

Key:

- Proposed Outlet Channel Centerline
- Alternative 4 District Boundary
- Soil Boring Location
- Test Pit Location
- Seismic Survey Line Location
- 21** Blow Counts (21 Blows per Foot)
- 50/6"** Blow Counts (50 Blows per 6 Inches)

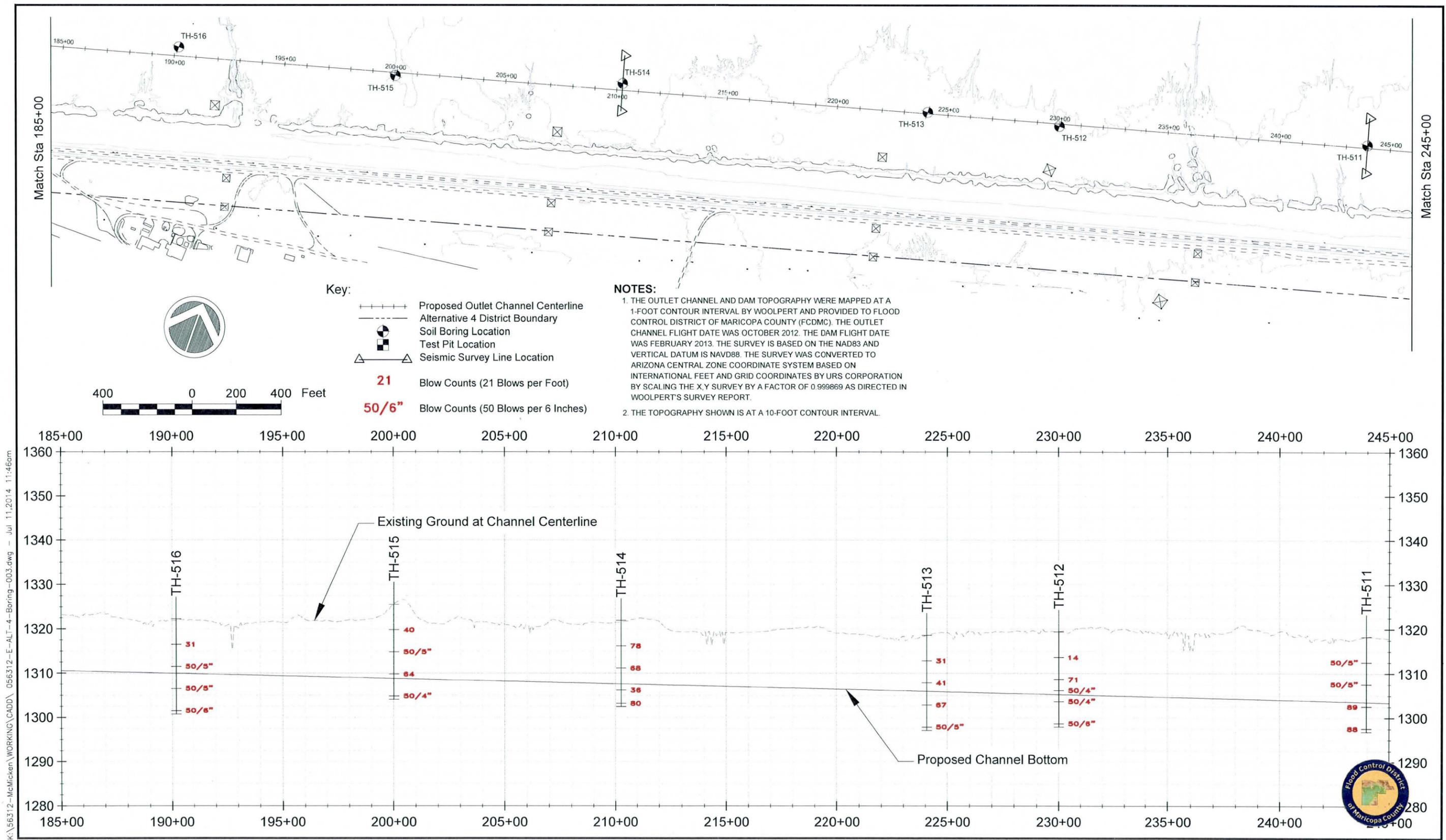
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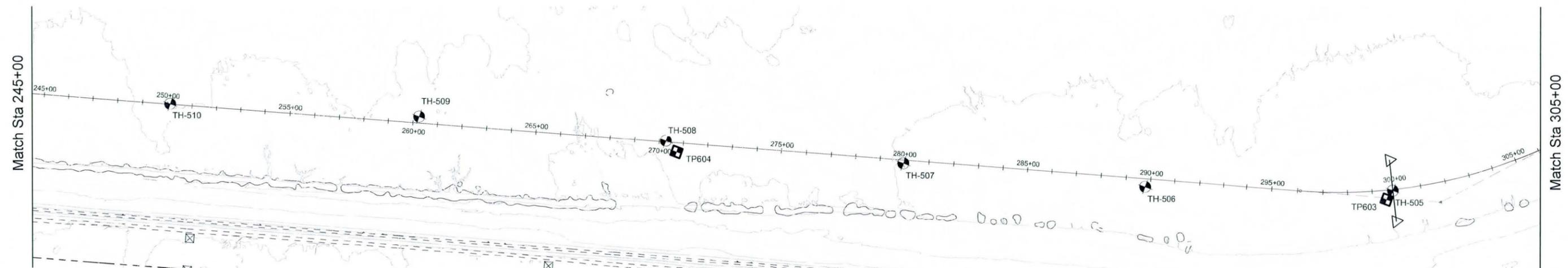




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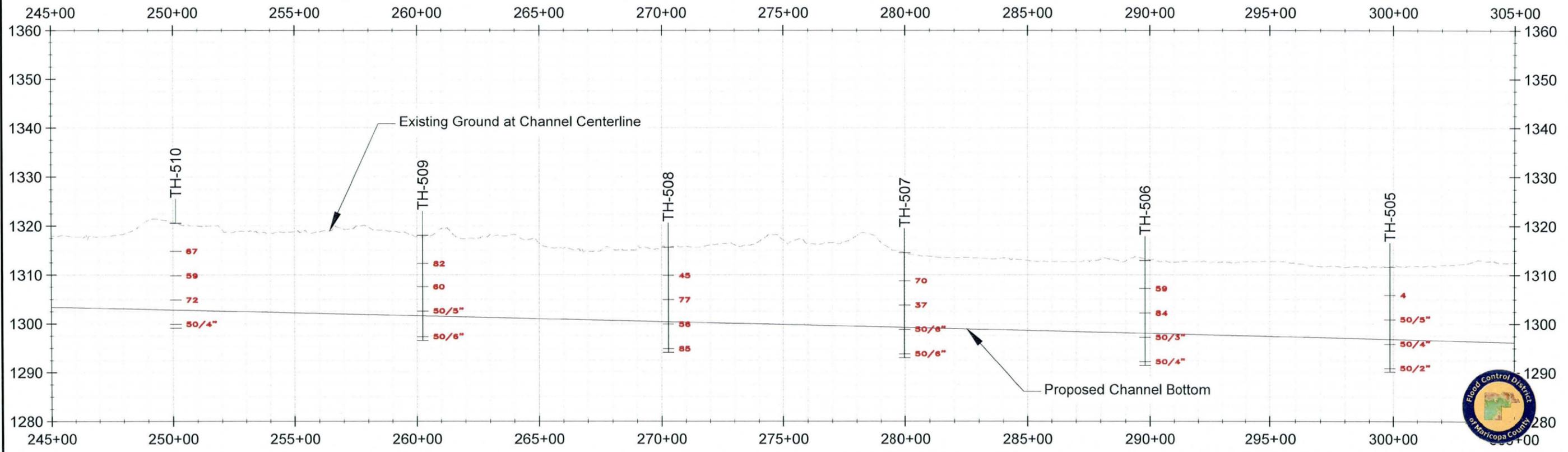
- Key:**
- Proposed Outlet Channel Centerline
 - Alternative 4 District Boundary
 - Soil Boring Location
 - Test Pit Location
 - Seismic Survey Line Location



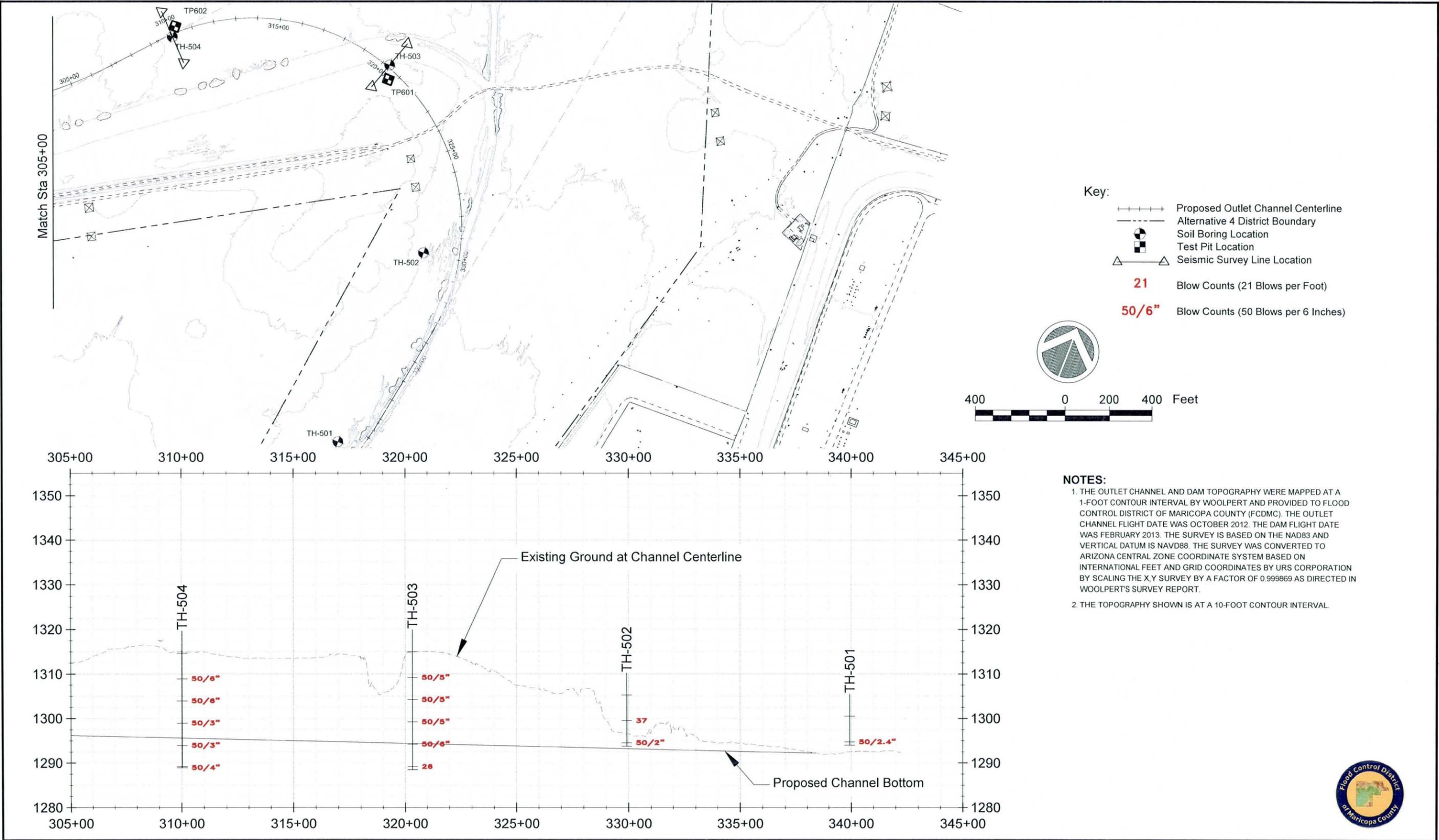
- 21** Blow Counts (21 Blows per Foot)
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NOTES:

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2. THE TOPOGRAPHY SHOWN IS AT A 10-FOOT CONTOUR INTERVAL.



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- Key:**
- Proposed Outlet Channel Centerline
 - Alternative 4 District Boundary
 - Soil Boring Location
 - Test Pit Location
 - Seismic Survey Line Location
 - 21** Blow Counts (21 Blows per Foot)
 - 50/6"** Blow Counts (50 Blows per 6 Inches)



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 2. THE TOPOGRAPHY SHOWN IS AT A 10-FOOT CONTOUR INTERVAL.



2.0 REGIONAL GEOLOGIC SETTING

The geological setting text provided in the following subsections was borrowed from the *Geotechnical Appraisal Report* (AMEC, 2013) with only minor changes not affecting content. This section describes the regional geologic setting and is applicable to both McMicken Dam and the Outlet Channel. There are numerous geological reference citations in the following text. The references themselves are not included in Section 8 “References” for purposes of brevity, but the reader can find these references in the *Geotechnical Appraisal Report* (AMEC 2013), if desired. In addition, historic geotechnical data relevant to the Outlet Channel are included in Appendix D.

2.1 Regional Setting

McMicken Dam lies within the western portion of the Salt River Valley, off the eastern flank of the White Tank Mountains. The dam extends beyond the northern end of the White Tank Mountains, intercepting Trilby Wash and flood flows from the extensive contributing watershed. The southern half of the dam is situated on an alluvial fan surface about two miles east of bedrock exposed at the foot of the White Tank Mountains. The northern portion of the dam, from about Bell Road north to the emergency spillway, is predominantly located on alluvial deposits associated with the Trilby Wash system. The McMicken Dam Outlet Channel and Outlet Wash are predominately located on the distal portions of coalesced alluvial fans from the Hieroglyphic Mountains to the north.

The western Salt River Valley is a typical component of the Sonoran region of the Basin and Range physiographic province. The Sonoran region contains many broad, deeply founded, alluvium-filled basins, separated by structural highlands composed of competent bedrock. The White Tank Mountains are one of these uplifted highlands, composed of both metamorphic and granitoid bedrock (Reynolds et al. 2002).

Although collaborating data are lacking, the gravity data of both Sweeney and Hill (2001) and Peterson (1968) suggest the presence of a buried bedrock shelf beneath the alluvial fan surface located directly east of the White Tank Mountains. If the buried bedrock shelf is present, there would be a rapid deepening of the basin (and thickening of basin fill) northward and up-station along the dam alignment. The presence of relatively shallow bedrock beneath the alluvial fan and upstream of the southern one-third of the dam is also indicated by the presence of inselbergs of competent rock, such as Fenne Knoll, protruding through the alluvial cover and removed from the contiguous mountain front. Geophysical investigations by AMEC in 2002 (AMEC 2003b) and subsidence patterns shown by interferometric synthetic aperture radar (InSAR) support the presence of this buried bedrock shelf.

As implied by Bouguer gravity data presented in Sweeney and Hill (2001), the basin deepens considerably to the east of McMicken Dam, reaching a maximum depth approximately 10 miles east-southeast of the south end of the dam. The prominent negative gravity feature to the east of Luke Air Force Base is, in part, an expression of a large salt body, containing some 15 cubic miles of halite (Eaton et al. 1972). The salt body was likely formed in a non-marine environment in the center of a closed clastic-dominated sedimentary basin. Geophysical data developed by Peterson (1968) indicates that the salt may extend from a depth of 6,900 to a depth of 9,000 ft.

Recent drilling encountered the top of the salt body about 7 miles southeast of McMicken Dam at Cotton Lane and Indian School Road. The depth to the top of the salt body at this location was 5,050 ft (Rauzi 2002).

2.2 Surficial Geology

The local surficial geologic units within the McMicken Dam Project study area, as broadly described by Huckleberry (1994), Reynolds and Grubensky (1993), Field and Pearthree (1991) and Demsey (1988), are comprised of an assemblage of unconsolidated Quaternary alluvial fan deposits derived from the surrounding mountains and stream deposits associated with the Trilby Wash and Agua Fria River systems. Blissenback (1954) and Harvey (1992) describe alluvial fans as being composed of a complex assemblage of stream channel deposits, sheet flow deposits from larger floods (which cause avulsion of the small watercourses across the fan surface), and thick debris flow and/or mudflow deposits from large infrequent floods. The fans likely include a minor component of aeolian deposits. Deposits associated with Trilby Wash primarily consist of channel deposits from relatively frequent flow events. Alluvial terrace deposits associated with the Agua Fria River occur to the east of the confluence with the McMicken Dam Outlet Wash. Surficial geologic units in relatively close proximity to the McMicken Dam Project are described below as based on Reynolds and Grubensky (1993) and Field and Pearthree (1991).

- **Late Holocene Alluvial fans, Low Terraces and Active Stream Channels (Qy2r, Qyc and Qy2)** – Within the McMicken Dam Project study area, this unit is generally limited to active channels and floodplains associated with the Trilby Wash drainage system from about Dam Stations 220+00 to 360+00. These deposits are dominated by clastic sediments dominated by sand and gravel with some cobbles and rare boulders. The age of this unit is less than 3,000 years before present (ybp) and is typically uncemented.
- **Late to Early Holocene Alluvial Fans and Terraces (Qy1)** – Outside the active braided channels, this unit is locally comprised of an angular to sub-angular mixture of silt, sand and gravel. Little soil development is present and Stage I to II carbonate cementation development is common in the lower portion of the unit, whereas the upper portion of the unit is largely uncemented. This unit typically becomes coarser grained near the mountain front. The age of unit Qy1 ranges from about 10,000 to 1,000 ybp. This unit is only differentiated in a few locations of the project area and is generally equivalent to the mapped unit Qy described below.
- **Undifferentiated Holocene Alluvial Surfaces and Young Alluvium (Qy)** – Outside the active braided channels, this unit is locally comprised of a limited thickness of silty to clayey sand and sandy silt, overlain by a thin mantle of aeolian silty sand. This unit is identified as undifferentiated due to the difficulty in identifying subunits, such as Qy1 and Qy2r, in areas that have been disturbed by human activity. Little soil development is present and Stage I carbonate cementation development is common in the lower sandy portion of the unit, whereas the upper loess-dominated portion of the unit is largely uncemented. Moderate to strong rubification (reddening) is common in this unit. Within ephemeral channels, the upper aeolian deposits are absent, with larger amounts of gravel

and cobbles present. Nearer the mountain front, the unit contains coarser sediments, including silt, sand and gravel mixtures. The age of unit Qy is less than about 10,000 ybp. This unit is widespread throughout the project area with notable deposits in the vicinity the spillway area and along the Outlet Channel.

- **Latest to late Pleistocene Alluvial Fans and Younger Middle Alluvium (Qm2)** – This unit is locally comprised of moderately cemented (Stage I to II) clayey to silty sands occasionally interbedded with silty to sandy gravels. The surfaces are moderately dissected on the upper piedmont with 3 to 10 ft of relief above active channels. Interfluvial areas are generally flat and expansive with moderately to well preserved bar and swale topography. Desert pavement is poorly to moderately developed and occurs over 50 to 80 percent of the surface. These deposits usually display poor soil development and some rubification. The age of unit Qm2 ranges from 10,000 to 150,000 ybp. This unit is only differentiated in a few locations of the project area.
- **Middle to Late Pleistocene Alluvial Fans (Qm1b)** – This unit consists of a poorly sorted, angular to sub-angular mixtures of silt, sand and gravel deposits. The surfaces are moderately dissected on the upper piedmont with 3 to 20 ft of relief above active channels. Interfluvial areas are generally flat and expansive with poorly preserved bar and swale topography. Desert pavement is moderately to well developed and occurs over 50 to 75 percent of the surface. Underlying soils are characterized by weakly developed argillic horizons with Stage II calcification. The age of unit Qm1b ranges from 150,000 to 300,000 ybp. Qm1b deposits are widespread throughout the study area, with the greatest concentrations occurring to the south of Trilby Wash.
- **Middle or Late Pleistocene Distal Alluvial Fans (Qm12)** – This unit is comprised of undifferentiated Qm1b and Qm2 surfaces. This designation is mostly used in agricultural areas where surface characteristics are destroyed and available soil descriptions do not enable differentiation of the two surfaces. The age of unit Qm12 ranges from 100,000 to 300,000 ybp.
- **Middle Pleistocene Alluvial Fans and Older Middle Alluvium (Qm1)** – This unit consists of a poorly sorted, angular to sub-angular mixture of silt, sand and gravel. The surfaces are moderately dissected on the upper piedmont with 3 to 20 ft of relief above active channels. Interfluvial areas are generally flat and expansive with poorly preserved bar and swale topography. Desert pavement is moderately to well developed and occurs over 50 to 75 percent of the surface. Underlying soils are characterized by weakly developed argillic horizons with Stage II to III calcification. The age of unit Qm1 ranges from 300,000 to 1,000,000 ybp. Qm1 deposits are widespread throughout the study area, with the greatest concentrations occurring to the south of Trilby Wash.
- **Older Alluvium (Qo)** – Unit Qo is composed of early Pleistocene to late Pliocene alluvial fan deposits greater than 1,000,000 years in age. The unit generally consists of poorly sorted subangular gravels containing minor amounts of finer material, ranging in thickness from a thin veneer over bedrock pediments to tens of feet thick. The surfaces of

unit Qo are deeply dissected, up to 50 ft within interfluvial areas, and have well rounded ridges with intervening swales or ravines. Soils are generally eroded away, exposing remnants of Stage IV to VI petrocalcic horizons. Unit Qo occurs as terrace deposits associated with the Agua Fria River east of the terminus of the Outlet Channel.

2.3 Deep Basin Characteristics

As discussed by Prokopovich (1983) and the USBR (1976), the basin fill deposits of the Salt River Valley are comprised of unconsolidated to weakly indurated sediments deposited on an irregular bedrock surface. From a geotechnical perspective, the upper basin sediments likely classify as stiff soils to soft rock, with the deep Tertiary deposits classifying as soft to moderately indurated rock. The basin deposits are quite variable, ranging from fine-grained clay and silt deposits of lacustrine or playa origins, to coarse clastics derived from the adjacent upland. Most studies divide the basin fill materials into three lithologic units and two subunits as follows:

- **Upper Alluvial Unit.** The UAU is comprised of clastic material derived locally from the surrounding bedrock terrain and is estimated to be about 450 ft thick in the vicinity of McMicken Dam.
- **Middle Alluvial Unit.** The MAU is comprised of intercalated alluvial fan and fluvial deposits of silt, silty sand and gravel and soft siltstone and only appears to be located directly below McMicken Dam in a small area near the southern end of the dam. For this project, MAU was primarily characterized from deep resistivity soundings as a very low resistivity and from InSAR signatures indicating slow subsidence.
- **Lower Alluvial Unit.** The defining characteristic of the LAU is that it was deposited when the basin was a closed-basin with internal drainage. The LAU, although dominated by fine-grained sediments, is typically coarse-grained at depth and along basin margins. The LAU is divided into two subunits: the Upper LAU and the Lower LAU.

2.4 Groundwater

Records of wells drilled in the area east of McMicken Dam indicate that the depth to water was approximately 300 to 450 feet in the emergency spillway and the northern half of the dam in the 1980's and 1990's.

3.0 SUBSURFACE INVESTIGATION METHODS

3.1 Hollow-Stem Auger Drilling

Geotechnical borings were laid out along the proposed Alternative 4 channel alignment at the locations shown on Figures 2 and 3 using a hand-held Global Positioning System (GPS) unit. Borings were located on approximately 1,000 foot intervals along the centerline of the proposed Alternative 4 channel alignment beginning at channel Station 120+00 where the proposed alignment deviates from the existing channel alignment. Some minor adjustments to the spacing were required due to drill rig access limitations. Where site conditions did not allow locating borings coincident with the planned locations, the borings were offset as short a distance as possible from the planned location. After completion of the field investigation all boring locations were surveyed. Surveyed boring locations are shown on Figures 2 and 4. Surveyed coordinates, station, ground surface elevation and boring depth are summarized in Table 1 and on the boring logs included in Appendix A.

Twenty-three hollow stem auger (HSA) test holes (TH-501 to TH-523) were drilled by Geomechanics Southwest of Phoenix, Arizona, between April 16th and April 22nd, 2014. HSA drilling was performed using a Central Mine Equipment (CME)-75 truck-mounted auger drill rig equipped with an automatic hammer, and using 6 5/8-inch outer diameter (O.D.) hollow stem augers. Soil samples 1.5 feet in length were collected at approximate 5-foot intervals (i.e., 3.5-foot interval between collected samples) beginning at 5 feet bgs and throughout the entire test hole depth using a 2-in O.D. SPT split spoon sampler in accordance with ASTM D 1586 or a 3-in O.D. ring lined barrel sampler (modified Dames and Moore sampler) in accordance with ASTM D 3550.

During drilling, careful observations and constant communication with the driller were used to identify changes in material type indicated by drilling advancement rate and/or required torque. When changes in material type were apparent to the driller, the drilling was halted immediately and additional soil samples were collected. However, the alluvial fan soils encountered consist of a complex and heterogeneous mixture of stream channel and sheet flow deposits with lesser amounts of debris flow deposits. As such, they are highly variable, both laterally and vertically, and include silt, sand and gravel fractions, often with gradational boundaries. Such gradational changes in material types were not always apparent during auger advancement. In the absence of any indication from the driller that a change of material was observed, when a sample was logged with a different USCS soil classification from the preceding sample, the material change was typically indicated on the log at the top of the subsequent sample, although the actual location of the material change most likely occurred elsewhere within the 3.5-foot interval between the two successive samples.

Blow counts were recorded for both standard SPT split spoon samples and for ring lined barrel samples. The respective sampling barrels were driven through the soil with a hydraulically-driven automatic hammer weighing 140 pounds falling a distance of 30 in. The number of hammer blows (blow counts) for each of three 6-in sample intervals was recorded and is included on the boring logs in Appendix A. SPT N-values, defined as the number of blows required to advance the sampler for the second and third 6-in sample advancement intervals,

were calculated for each sample and are also shown on the boring logs in Appendix A. N-values measured for ring barrel samples have not been corrected.

All test holes were logged in the field by a Gannett Fleming geologist in general accordance with the Unified Soil Classification System (USCS; ASTM D 2487). Logging was performed in the field and the following subsurface information was recorded on the field logs: blow counts, percent recovery, USCS field classifications, soil descriptions, reaction to hydrochloric acid (HCl), and qualitative descriptions of cementation (weak, moderate, strong). Soil classifications shown on the final boring logs included in Appendix A were modified as necessary based on laboratory data to conform to laboratory classifications in accordance with USCS.

Ring samples were capped and sealed using duct tape. Split spoon samples were placed in sealed plastic bags. All samples were labeled with the project name, test hole identification, sample depth, date, project section, and station (if applicable). Samples selected for testing were delivered to the AMEC geotechnical laboratory in Phoenix, Arizona.

Upon completion of drilling and logging, the test holes were tremie-backfilled with non-shrink grout. Prior to demobilization, all test holes were revisited to assess whether additional grouting was required to address any post-abandonment settlement and/or shrinking. At that time, no additional grouting was needed.

3.2 Test Pit Excavation

Test pit locations were coincident with previously drilled HSA borings to verify subsurface conditions at selected locations. Surveyed test pit locations are shown on Figures 2 and 4. Surveyed coordinates, station, ground surface elevation and test pit depths are summarized in Table 1 and on the test pit logs included in Appendix A.

Four test pits (TP-601 to TP-604) were excavated by Southern Plains Construction II, LLC between April 28 and April 30, 2014. Test pits were excavated using a Caterpillar 320L excavator equipped with a heavy duty ripper bucket to depths of between 13.5 feet and 15.5 feet, where equipment refusal occurred. The Caterpillar 320L excavator, at a flywheel power of 153 horsepower (hp), is roughly equivalent in power to a D6N bulldozer having flywheel power of 150 hp. All test pits were logged in the field by a Gannett Fleming geologist in general accordance with the Unified Soil Classification System (USCS; ASTM D 2487). The test pit side walls, bottom, and spoil were observed without physical entry into the test pit; test pit logs are included in Appendix A and document soil type(s), moisture, cementation, apparent stratigraphic contact depths, ease/difficulty of excavation, sidewall stability, qualitative descriptions of cementation (weak, moderate, strong), and any other noteworthy geologic features. In particular, the depth to any cemented layers were carefully observed and documented.

Photographs of each test pit were taken and select photographs are included in Appendix E. Bulk samples were collected from each test pit along with companion bag samples tightly sealed to preserve the in-situ moisture content. The bulk and bag samples were labeled with the project

name, geologist/field engineer, date, test pit I.D., sample depth, and station. Samples selected for testing were delivered to the AMEC geotechnical laboratory in Phoenix, Arizona.

Test pits were backfilled with spoil in moisture-conditioned 12-inch loose lifts, and compacted with a sheepsfoot wheel roller attached to the excavator bucket. During excavation of the first test pit (TP-601), a one-point Proctor test was performed in the field to determine the approximate maximum density as a guide to assessing the backfill compaction of the test pits. A test fill program was then carried out to develop a backfilling protocol that would result in compaction meeting or exceeding 95% maximum dry density and/near optimum moisture content as determined by the one-point Proctor test. As part of the test fill, compaction testing was performed in the field on the upper 4 feet of backfill at TP-601. The lifts below 4 feet were not tested due to access and safety constraints. Lift density was measured using a nuclear density gauge in general accordance with ASTM D 6938. The results of the test fill compaction testing are included in Appendix F.

Test pits TP-602 through TP-604 were backfilled and compacted in a manner consistent with the TP-601 test fill protocol. On the final day of test pit excavations, density testing using a nuclear density gauge was performed on the upper 12-inch lift of each test pit to verify compaction. Density test results ranged from 100% to 102% of maximum dry density in three of the four test pits. Results from the fourth test pit indicated a lower dry density than the other locations and the soil appeared to have less gravel-sized material. Therefore, an additional sample was taken to the laboratory and a one-point Proctor test was performed to confirm the compaction. The one-point Proctor could not be completed in the field because windy conditions made in-field testing impractical. The results on the additional testing in the laboratory indicated that compaction achieved 92% of maximum dry density.

3.3 Seismic Refraction and Refraction Microtremor (ReMi) Survey

A total of six combined seismic refraction compression wave (p-wave) and refraction microtremor (ReMi) surface wave (for shear or s-wave) surveys were performed by AMEC Environment & Infrastructure, Inc. of Phoenix, Arizona to assess the seismic wave velocity and thus the rippability of the cemented material, allowing a reasonable evaluation of areas where excavation may be difficult. Locations of the seismic line surveys are included on Figures 6 through 9. Seismic lines were completed using geophone arrays 240 feet in length with 24 geophones spaced on a 10-foot interval and a Geometrics SE-24 signal enhancement engineering seismograph. A sledgehammer energy source was used to collect compression wave (p-wave) data for seismic refraction analysis. Jumping at the geophone array center was performed to generate surface wave energy for refraction microtremor (ReMi) analysis for a one-dimensional vertical surface wave (s-wave) profile at each seismic line to supplement the p-wave data.

Lines were centered on boring locations and oriented perpendicular to the proposed channel alignment. Lines 2 through 6 were also oriented perpendicular to the electrical transmission lines to minimize potential 60-cycle electrical noise on the highest gain geophones. Results of the seismic study are presented in section 4.3. The Seismic Refraction & ReMi Evaluation Report is included in Appendix B.

3.4 Laboratory Testing

Laboratory testing was performed on selected soil samples for the following objectives:

- **Soil classification** to establish the general engineering characteristics of soil types encountered. Tests included: grain size analysis, Atterberg limits, USCS classification, moisture content, calcium carbonate and corrosivity (pH and resistivity).
- **Compaction characteristics** of soils in the upper 5 feet below ground surface to evaluate the reuse potential of the soil. Tests included: moisture-density characteristics (Proctor test).

The laboratory testing program, including the ASTM standard test methods and number of tests performed, is summarized in Table 2. Samples were tested at the AMEC geotechnical testing laboratory in Phoenix, Arizona. Laboratory results are summarized in Table 3 and laboratory reports are included in Appendix C.

Table 2. Summary of Geotechnical Laboratory Testing Program – Outlet Channel Alternative 4

| Laboratory Test | ASTM Standard | Outlet Channel Alternative 4 Alignment | | Total |
|-----------------------------------|-----------------|--|----------|-------|
| | | Boring | Test Pit | |
| Grain Size Analysis | D 6913 C 136 | 23 | 5 | 28 |
| Grain Size Analysis w/ Hydrometer | D 422 | 6 | 0 | 6 |
| Atterberg Limits | D 4318 | 23 | 5 | 28 |
| Moisture Content | D 2216 | 23 | 5 | 28 |
| USCS Classification | D 2487 | 23 | 5 | 28 |
| Calcium Carbonate | D 4373 | 23 | 5 | 28 |
| Standard Proctor Test | D 698 | 0 | 4 | 4 |
| Corrosivity (pH and resistivity) | AZ 236 | 2 | 3 | 5 |

Table 3. Summary of Geotechnical Laboratory Testing Results – Outlet Channel Alternative 4

| Sample ID | | Sample Depth (ft bgs) | | USCS Class. | Gradation | | | | | Atterberg Limits | | Moisture Content (%) | Calcium Carbonate (%) | Standard Proctor Compaction | | Corrosivity | |
|----------------------|------------|-----------------------|------|-------------|------------|----------|-----------|----------|----------|------------------|----------------------|----------------------|-----------------------|-----------------------------|------------------------------|-------------|----------------------|
| Test Hole / Test Pit | Sample No. | From | To | | Gravel (%) | Sand (%) | Fines (%) | Silt (%) | Clay (%) | Liquid Limit (%) | Plasticity Index (%) | | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | pH | Resistivity (Ohm-cm) |
| TH-501 | S-1 | 5.0 | 6.5 | SP-SM | 32 | 58.3 | 9.7 | | | NV | NP | 0.9 | 5.8 | | | | |
| TH-502 | S-1 | 5.0 | 6.5 | GP-GM | 62 | 28.3 | 9.7 | | | NV | NP | 0.3 | 4.2 | | | | |
| TH-504 | S-2 | 10.0 | 11.5 | SC | 4 | 57 | 39 | 28 | 11 | 40 | 16 | 4.2 | 4.5 | | | | |
| TH-505 | S-3 | 15.0 | 16.5 | CH | 0 | 43 | 57 | | | 58 | 31 | 6.0 | 21.9 | | | | |
| TH-506 | S-1 | 5.0 | 6.5 | SC | 4 | 64 | 32 | 17 | 15 | 40 | 15 | 4.5 | 12.0 | | | 8.9 | 1163 |
| TH-506 | S-3 | 15.0 | 16.5 | SM | 5 | 58 | 37 | | | 44 | 16 | 4.7 | 31.9 | | | | |
| TH-507 | S-2 | 10.0 | 11.5 | SM | 6 | 72 | 22 | | | 32 | 8 | 3.1 | 6.1 | | | | |
| TH-508 | S-1 | 5.0 | 6.5 | CL | 5 | 33 | 62 | | | 30 | 15 | 3.7 | 5.7 | | | | |
| TH-509 | S-2 | 10.0 | 11.5 | SC | 3 | 61 | 36 | 23 | 13 | 48 | 22 | 3.9 | 17.6 | | | | |
| TH-510 | S-3 | 15.0 | 16.5 | SM | 17 | 64 | 19 | 13 | 6 | 27 | 3 | 2.0 | 2.6 | | | | |
| TH-511 | S-2 | 10.0 | 11.5 | SC | 5 | 70 | 25 | | | 44 | 20 | 6.8 | 20.4 | | | | |
| TH-512 | S-2 | 10.0 | 11.5 | CL | 0 | 41 | 59 | 43 | 16 | 36 | 12 | 3.2 | 5.6 | | | | |
| TH-513 | S-1 | 5.0 | 6.5 | CL | 0 | 40 | 60 | | | 27 | 8 | 4.7 | 4.8 | | | | |
| TH-514 | S-1 | 5.0 | 6.5 | SM | 14 | 68 | 18 | | | NV | NP | 1.4 | 3.8 | | | 9.2 | 2632 |
| TH-515 | S-1 | 5.0 | 6.5 | SC | 7 | 59 | 34 | 12 | 22 | 44 | 26 | 8.5 | 0.9 | | | | |
| TH-516 | S-2 | 10.0 | 11.5 | CL | 18 | 31 | 51 | | | 35 | 12 | 3.9 | 7.5 | | | | |
| TH-517 | S-2 | 10.0 | 11.5 | SP-SM | 29 | 63.1 | 7.9 | | | NV | NP | 1.6 | 2.6 | | | | |
| TH-518 | S-2 | 10.0 | 11.5 | SC | 18 | 59 | 23 | | | 31 | 12 | 2.6 | 2.8 | | | | |
| TH-519 | S-1 | 5.0 | 6.5 | CL | 1 | 44 | 55 | | | 29 | 13 | 6.4 | 1.6 | | | | |
| TH-520 | S-3 | 15.0 | 16.5 | SC | 7 | 71 | 22 | | | 32 | 12 | 3.1 | 2.9 | | | | |
| TH-521 | S-2 | 10.0 | 11.5 | CL | 2 | 34 | 64 | | | 40 | 20 | 4.4 | 34.0 | | | | |
| TH-521 | S-3 | 15.0 | 16.5 | SM | 26 | 62 | 12 | | | NV | NP | 1.5 | 1.9 | | | | |
| TH-523 | S-3 | 15.0 | 16.5 | SC | 21 | 65 | 14 | | | 39 | 19 | 2.6 | 0.9 | | | | |
| TP-601 | -- | 3.5 | 5.0 | SP-SC | 38 | 54 | 8.0 | | | 39 | 17 | 3.4 | 3.2 | 120 | 12.5 | | |
| TP-602 | -- | 0.0 | 5.0 | SM | 11 | 50 | 39 | | | NV | NP | 4.7 | 12.4 | 107 | 16.0 | 8.9 | 1693 |
| TP-603 | -- | 3.0 | 5.0 | CL | 1 | 29 | 70 | | | 38 | 17 | 7.1 | 12.9 | 104 | 18.0 | 8.4 | 1761 |
| TP-603 | -- | 7.0 | 9.0 | SC | 10 | 52 | 38 | | | 33 | 12 | 3.8 | 16.1 | | | | |
| TP-604 | -- | 0.0 | 2.0 | SM | 10 | 59 | 31 | | | NV | NP | 2.1 | 3.3 | 123 | 9.6 | 8.5 | 3995 |

4.0 INVESTIGATION RESULTS

4.1 General Description of Subsurface Conditions

The McMicken Dam Outlet Channel is located primarily on unconsolidated Quaternary alluvial fan deposits. The surficial geologic units present beneath the proposed channel alignment include Late to Early Holocene Alluvial Fans and Terraces, Undifferentiated Holocene Alluvial Surfaces and Young Alluvium, Latest to Late Pleistocene Alluvial Fans and Younger Middle Alluvium, and Middle or Late Pleistocene Distal Alluvial Fans and Middle Pleistocene Alluvial Fans and Older Middle Alluvium (map units Qy1, Qy, Qm2, Qm12 and Qm1, respectively; AMEC, 2013). Map unit Qm2, which is regionally described as moderately cemented (Stage I to II) clayey to silty sands occasionally interbedded with silty to sandy gravels, is only present beneath the eastern end of the proposed channel alignment, beginning at approximately Station 200+00.

Soils encountered during the 2014 field investigation represent typical alluvial fan deposits, with highly variable soil types ranging from silts and clays to sand and gravel. Surficial soils along the proposed McMicken Outlet Channel Alternative 4 alignment are predominantly coarse grained sandy soils (less than 50 percent fines) with variable fines contents and minor amounts of gravel. Fine grained soils, predominantly sandy clays with variable gravel contents were also encountered in several locations, both as surficial deposits and at depth. Silty gravel lenses were also encountered primarily in the vicinity of two major surface drainage features (TH-510, TH-511, TH-512 and TH-515; see Figures 2 and 3).

4.2 Soil Classifications and Blow Counts

Table 4 summarizes the USCS classifications for soils encountered in the soil borings and test pits.

Table 4. Summary of Laboratory Soil Classifications – Outlet Channel Alternative 4

| USCS Classification | Soil Descriptions | Percentage Occurrence (by linear foot) |
|---------------------|--|--|
| SC | Clayey Sand, Clayey Sand with Gravel | 33 |
| SM | Silty Sand with Gravel, Silty Sand | 30 |
| CL | Sandy Lean Clay, Sandy Lean Clay with Gravel | 25 |
| SP-SM | Poorly Graded Sand with Silt and Gravel | 8 |
| GP-GM | Poorly Graded Gravel with Silt and Sand | 4 |

Clayey sand (SC) and silty sand (SM) with variable amounts of gravel and sandy lean clay (CL) with variable amounts of gravel were the most frequently encountered soil classifications. The sandy units made up nearly two-thirds of the soil classifications (63%) and the sandy clay comprised another one-quarter of the classifications (25%). Minor amounts of poorly graded sand with silt and gravel (SP-SM; 8%) and poorly graded gravel with silt and sand (GP-GM; 4%) were also encountered.

The SC and SM units contained between 12% and 39% fines and 3% to 26% gravel and the CL units contained between 29% and 44% sand and generally less than 5% gravel, though one CL sample contained 18% gravel. Plasticity indices vary but were generally low, ranging from 3% to 31%.

Table 5 summarizes the minimum, maximum and average SPT blow counts, by depth interval, recorded during drilling. Because sampler refusal (inability to advance the sampler 6 inches in less than 50 hammer blows) was a common occurrence during the investigation, the percentage of sampler refusal in each depth interval is also included in Table 5.

Table 5. Summary of SPT Blow Counts – Outlet Channel Alternative 4

| Depth Interval (ft bgs) | N-Value (minimum/maximum/average) | Percentage of samples with refusal |
|-------------------------|--------------------------------------|------------------------------------|
| 0 - 5 | 9 / 82 / 36 | 35 |
| 5 - 15 | 26 / 89 / 55 | 82 |
| 15 - 25 | 34 / 88 / 73 | 89 |

The shallow soils were generally medium dense to dense or very stiff to hard, with relatively few instances of sampler refusal in the upper 5 feet of the soil profile. With increasing depth the samples became predominantly dense to very dense or hard. The percentage of samples for which refusal occurred also increased with increasing depth. It is notable that the relatively few shallow instances of sampler refusal (at the 5-ft sample interval) were clustered at the downstream end of the channel alignment in borings TH-501, TH-503 and TH-504.

4.3 Seismic Refraction and Refraction Microtremor Surveys

Six combined seismic refraction compression wave (p-wave) and refraction microtremor (ReMi) surface wave (for shear or s-wave) surveys were performed at soil boring locations (Figures 5 through 9). Measuring the velocity of seismic waves allowed detailed two-dimensional assessment of the distribution and thickness of subsurface materials having different density characteristics to complement the single-point data developed through the boring and test pit investigation. The seismic surveys also provided information not available from the boring data, namely an assessment of the relative hardness of the subsurface materials that can be correlated with excavation power requirements (see discussion in Section 4.4).

The results of the seismic surveys indicate a low-velocity surficial soil layer underlain by increasing p-wave velocities with increasing depth. S-wave velocity reversals were also observed at some locations and depths which represent zones of softer, lower-velocity materials below harder, higher-velocity materials. Such increasing p-wave velocities with depth and s-wave velocity reversals are consistent with borehole observations of caliche layers extending to variable depths at some boring locations. A thin zone of relatively low p-wave velocity materials is present at all seismic line locations. P-wave velocities less than about 1,500 feet per second (fps) were observed to depths of between about 2 feet bgs and 10 feet bgs. This low velocity zone is underlain by higher p-wave velocity zones at all survey locations. In survey lines near the downstream end of the alignment (Lines 1 through 3), the p-wave velocities range from about 3,000 fps to 6,300 fps. In Lines 4, through 6, further upstream (to the west), the p-wave

velocities in this zone are more on the order of 1,800 fps to 3,600 fps. Higher p-wave velocity zones were observed in all survey line locations at depths greater than the proposed channel depths. These material velocities are consistent with cemented alluvium equivalent to “caliche” or conglomerate for excavation assessment.

S-wave velocities indicated a similar layered trend with a thin lower velocity upper zone having s-wave velocities on the order of 350 fps to 750 fps underlain by a zone of somewhat higher velocities of about 1,000 fps to 3,000 fps. The s-wave interpretations also indicate a zone of s-wave velocity reversal beneath the higher velocity zone, where s-wave velocities of 600 fps to 1,400 fps were interpreted. The s-wave velocity reversals are indicative of softer materials beneath the higher velocity zones at these depths. The s-wave reversals occur at elevations near or below the channel bottom elevation at the survey line locations. S-wave velocities are a much less precise measure than p-wave velocities and correlation of s-wave velocities with excavatability is, therefore, subject to a greater degree of uncertainty than is correlation using p-wave velocities.

A complete interpretation of the seismic survey methods and results is included in the Seismic Refraction and ReMi Evaluation in Appendix B.

4.4 Cementation/Excavatability

An evaluation was made of soil cementation to assess the excavatability of the materials within the proposed channel excavation. Soil cementation was evaluated based on field observations of drilling advancement rate and ease or difficulty of test pit excavation, soil reaction to HCl applied to samples in the field, observations of cementation on soil samples, laboratory measurements of calcium carbonate in soil samples and seismic wave velocity interpretations. N-values obtained from the soil borings were used qualitatively to compare to other indications of the presence of cemented soil. HCl reactions, observations of cementation and other relevant field observations noted during drilling and/or test pit excavations are recorded on boring logs and test pit logs included in Appendix A; laboratory measurements of calcium carbonate are included in Table 3 and summarized by depth interval in Table 6; the Seismic Refraction and Refraction Microtremor (ReMi) survey report is included as Appendix B.

Consistent with standard practice and ASTM D-2488-06 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), cementation observed during drilling and excavation was described qualitatively as weak, moderate or strong. A relatively large volume of intact soil fabric is needed to accurately classify cementation stage and the drilling and sampling process destroys the soil fabric which makes accurate observations of cementation stage uncertain.

Strong HCl reactions were noted in all soil borings and test pits with only a few observations of no reaction or weak to moderate reaction. Observations of weak to strong cementation were noted in all borings and test pits. The most frequently recorded description of cementation was weakly cemented. A few observations of weakly to moderately cemented, moderately to strongly cemented, and strongly cemented soils were also recorded. As was the case with sampler refusal in shallow soil samples (upper 5 to 10 feet bgs), observations of moderately to

strongly cemented soil was limited to the downstream end of the alignment, past Station 300+00 (TH-501 to TH-505). Other observations of moderate to strong cementation were noted at greater depths in the borings and test pits.

Laboratory measurements of calcium carbonate are summarized, by depth interval, in Table 6.

Table 6. Summary of Calcium Carbonate Measurements – Outlet Channel Alternative 4

| Depth Interval | Calcium Carbonate (%) |
|----------------|-----------------------|
| 0 - 5 | 0.9 - 12.9 |
| 5 - 10 | 2.6 - 34.0 |
| 10 - 15 | 0.9 - 31.9 |

Cementation stage was categorized based on calcium carbonate (CaCO_3) content ranges (Stage I, II, III; Machette, 1985) for comparison with observations made during drilling and test pit excavation, seismic wave velocities and published information on excavatability. Calcium carbonate was present in all samples tested and concentrations ranged from 0.9% to 34.0%. About 40% of the results indicate concentrations less than 4% CaCO_3 (Stage I cementation), 45% of the results indicate CaCO_3 concentrations between 4% and 20% (Stage II cementation), and 15% of the results indicate concentrations greater than 20% (Stage III cementation). CaCO_3 concentrations are generally higher at the downstream end of the proposed channel alignment (Station 240+00 and greater), and notably, are higher shallower in the soil profile at the downstream end of the proposed alignment. This is illustrated graphically in Figure 10, where CaCO_3 concentrations are presented in relative size as a function of depth and location along the alignment (larger circles represent higher concentrations and smaller circles represent lower concentrations).

At the downstream end of the alignment, CaCO_3 concentrations indicated the presence of Stage II cementation in shallow near-surface soils while the p-wave velocity interpretations in survey lines near the downstream end of the alignment (Lines 1 through 3), the p-wave velocities range from about 4,000 fps to 6,000 fps. A p-wave velocity of 3,000 fps roughly correlates with Stage III cementation (Rucker and Ferguson, 2006). Because the p-wave velocities are considered more indicative of material behavior, they were relied on more heavily than the CaCO_3 concentrations to interpret the excavatability of the materials.

For the purposes of defining the excavatability of the proposed channel, observations of moderately to strongly cemented materials, CaCO_3 concentrations greater than 20% (Stage III cementation), and/or interpreted p-wave velocities greater than 3,000 fps were used to interpret areas of difficult excavation. Areas of weakly cemented materials, CaCO_3 concentrations less than 20% and interpreted p-wave velocities less than 3,000 fps were considered amenable to excavation using conventional equipment (standard backhoe). This threshold was selected because published correlations between seismic velocity, stage cementation and excavation equipment generally indicate that a boundary with respect to excavation equipment power requirements exists for these conditions (Rucker and Ferguson, 2006). It should be noted that these criteria for defining difficult excavation were used as a general guide in interpreting areas where difficult excavation is expected, not hard and fast rules. The data were obtained from widely spaced points and assumptions were made regarding the relative weighting of each data

type and the potential variability between data points. The resulting interpretation is considered reasonable to provide a preliminary estimate of the excavation quantities.

Cemented soils are present throughout the length of the proposed channel alignment. The information discussed in the previous section was used to interpret the extent of cemented soils and locations and depths where excavation of the cemented soils may require specialized construction equipment. This interpretation was used to calculate channel excavation quantities for input to the cost estimate for Outlet Channel Alternative 4.

The weakly to moderately cemented soils that are generally present throughout the vertical extent of the proposed channel excavation, beginning at the point where the proposed channel alignment deviates from the existing channel (about Station 120+00) and extending to about Station 240+00, are assumed to be excavatable using conventional equipment. Some limited areas of difficult excavation are present near the bottom of the proposed channel alignment near Station 130+00 to Station 140+00 and near Station 160+00. From Station 240+00 to Station 300+00, difficult excavation is expected in the deeper portions of the proposed channel. Beginning at about Station 300+00 difficult excavation is expected beginning at or near the ground surface and extending to the bottom of the excavation. In these areas of difficult excavation, particularly at the downstream end of the channel alignment, beginning at about Station 300+00, it is estimated that ripping with newer D8R or D8T bulldozers will be required and may become marginal at p-wave velocities of about 5,500 f/s (caliche) to 6,200 f/s (conglomerate). If the material has higher p-wave velocities than observed in the limited seismic survey lines completed along the proposed channel alignment, it may become unrippable at p-wave velocities of about 7,700 f/s (caliche) to 8,200 f/s (conglomerate) and use of a D9 or blasting may be required. If these conditions occur in the vicinity of the 36-inch gas pipeline, blasting may not be feasible. For the purposes of calculating difficult excavation quantities, it was assumed that ripping could be accomplished.

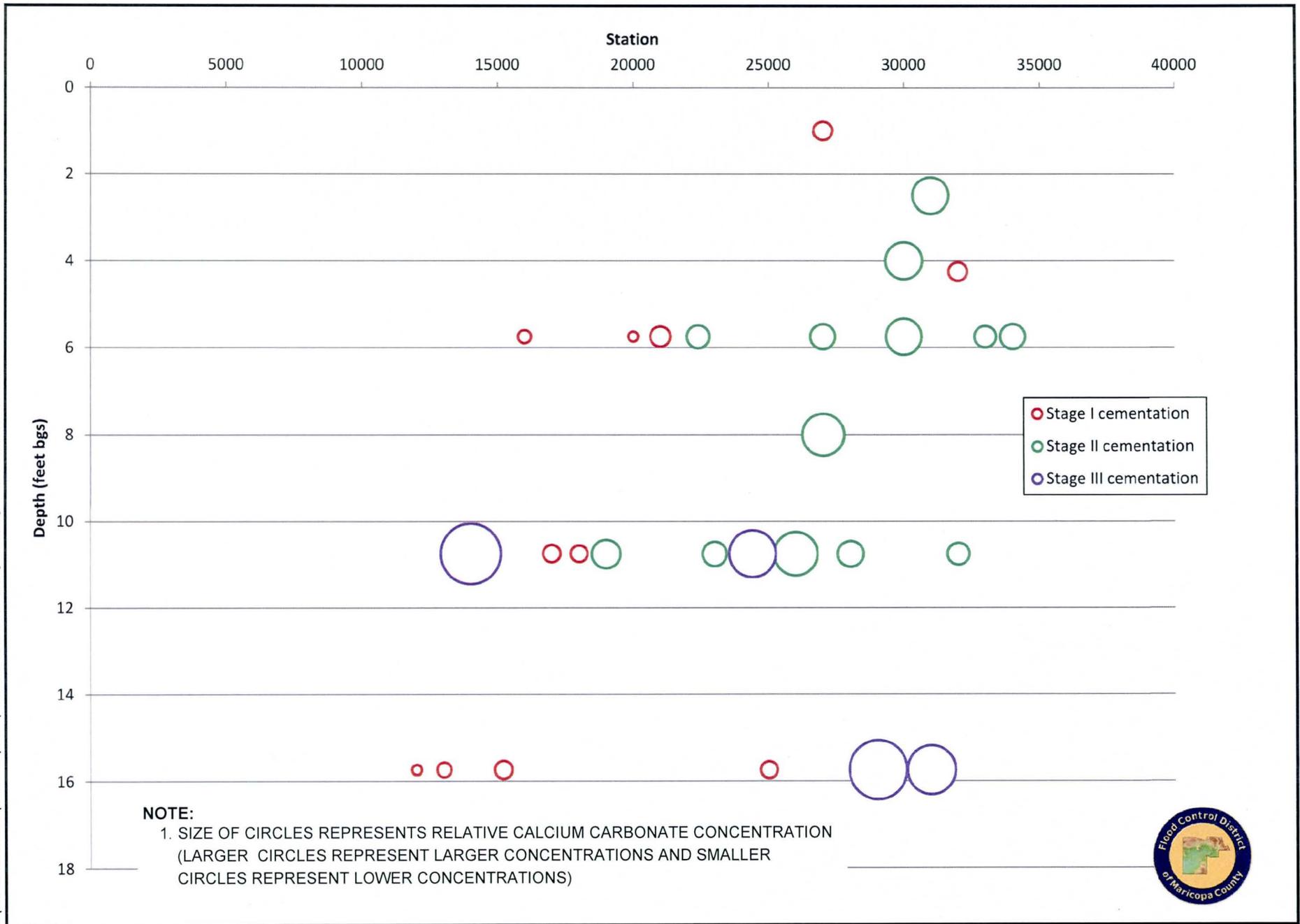
4.5 Engineering Properties of Excavated Soils

Test pits were excavated at four locations along the proposed channel alignment (see Figures 2 and 3) to confirm information obtained from the soil borings and collect bulk samples for laboratory testing. Samples were collected from the upper 5 feet in each test pit for Proctor compaction testing and the results are included in Table 3. Engineering characteristics of the upper 5 feet were evaluated based on lab testing performed on these soil samples and samples collected from the soil borings (see Table 3).

The presence of moderately to strongly cemented soil in the shallow subsurface at the downstream end of the channel alignment, from about Station 300+00 eastward, indicates that excavated soil in this area may have limited reuse potential. West of Station 300+00, the soils that make up the upper 5 feet of the soil profile along the channel alignment are described below. Much of this material may be acceptable for reuse as general fill. If borrow areas are specifically identified, they should be fully characterized prior to final selection.

The soils in the upper 5 feet are highly variable and generally coarse grained and sandy. They contain a significant amount of fines, both silts and clays, and gravel. Fines contents measured in the upper 5 feet of soil ranged from 18 to 62 percent and averaged 42 percent; gravel contents in the upper 5 feet ranged from 0 to 14 percent and averaged 6 percent. The shallow soils classified as SM, SC, and CL. The fines are generally low to medium plasticity; two of the 7 samples were non-plastic and the plasticity index of the remaining five samples ranged from 8 to 26 percent and averaged 15 percent. Weakly to moderately cemented zones were generally observed throughout the upper 5 feet. Maximum dry density and optimum moisture contents of soil from the TP-604 (the only test pit west of Station 300+00) was 123 pcf at 9.6 percent.

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5.0 LIMITATIONS

This study has been conducted in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design purposes. The conclusions are based upon the proposed outlet channel layout and data obtained from the soil borings and test pits performed at the approximate locations indicated on the appended boring location plan. No warranty, expressed or implied, is made as to the professional advice set forth.

This report does not reflect variations which may occur between the borings. The nature and extent of subsurface variations across the site may not become evident until construction. If during construction, soil or water conditions appear to be different from those described herein, this office should be advised at once so that we may re-evaluate the recommendations provided herein.

This report has been prepared for the exclusive use by our client for design purposes. We are not responsible for technical interpretations by others of our exploratory information that has not been described or documented in this report. Significant design changes may require additional analysis or modifications of the recommendations presented herein.

This report and any future addenda or reports should be made available to bidders prior to submitting their proposals and to the successful contractor or subcontractors for their information only and to supply them with facts relative to the subsurface evaluations, laboratory tests, etc. Please note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluations of environmental concerns or the presence of hazardous materials on this site.

6.0 REFERENCES

AMEC 2013. *Geotechnical Appraisal Report, McMicken Dam*. AMEC Earth & Environmental, Inc. February 22, 2013.

Machette 1985. *Calcic Soils of Southwestern United States, Geological Society of America, Special Paper 203*. U.S. Geological Survey, Denver Federal Center, Denver Colorado 80225, 1985.

Rucker, M.L., and K.C. Fergason. 2006. *Characterizing Unsaturated Cemented Soil Profiles for Strength, Excavatability and Erodibility Using Surface Seismic Methods*. In *Unsaturated Soils*, edited by G.A. Miller, C.E. Zapata, S.L. Houston, and D.G. Fredlund, pp. 589-600. Geotechnical Special Publication No. 147. Reston, Virginia: ASCE.



APPENDIX A
SOIL BORING AND TEST PIT LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

| MATERIAL TYPES | CRITERIA FOR ASSIGNING SOIL GROUP NAMES | | | GROUP SYMBOL | SOIL GROUP NAMES & LEGEND | |
|--|---|---|-------------------------------------|--------------|---------------------------|---|
| COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE | GRAVELS >50% OF COARSE FRACTION RETAINED ON NO. 4. SIEVE | CLEAN GRAVELS <5% FINES | Cu>4 AND 1<Cc<3 | GW | WELL-GRADED GRAVEL |  |
| | | | Cu>4 AND 1>Cc>3 | GP | POORLY-GRADED GRAVEL |  |
| | | GRAVELS WITH FINES >12% FINES | FINES CLASSIFY AS ML OR MH | GM | SILTY GRAVEL |  |
| | | | FINES CLASSIFY AS CL OR CH | GC | CLAYEY GRAVEL |  |
| | SANDS >50% OF COARSE FRACTION PASSES ON NO. 4. SIEVE | CLEAN SANDS <5% FINES | Cu>6 AND 1<Cc<3 | SW | WELL-GRADED SAND |  |
| | | | Cu>6 AND 1>Cc>3 | SP | POORLY-GRADED SAND |  |
| | | SANDS AND FINES >12% FINES | FINES CLASSIFY AS ML OR MH | SM | SILTY SAND |  |
| | | | FINES CLASSIFY AS CL OR CH | SC | CLAYEY SAND |  |
| FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT<50 | INORGANIC | P<7 AND PLOTS>"A" LINE | CL | LEAN CLAY |  |
| | | | P<4 AND PLOTS<"A" LINE | ML | SILT |  |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OL | ORGANIC CLAY OR SILT |  |
| | SILTS AND CLAYS LIQUID LIMIT>50 | INORGANIC | PI PLOTS >"A" LINE | CH | FAT CLAY |  |
| | | | PI PLOTS <"A" LINE | MH | ELASTIC SILT |  |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OH | ORGANIC CLAY OR SILT |  |
| HIGHLY ORGANIC SOILS | | PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR | | PT | PEAT |  |

SAMPLE TYPES

ASTM D 2488 NOTE 15 - CRITERIA FOR DESCRIBING PERCENTAGES OF GRAVEL, SAND AND FINES

DESCRIPTION CRITERIA

| | |
|--------|--|
| TRACE | PARTICLES ARE PRESENT BUT ESTIMATED TO BE LESS THAN 5% |
| FEW | 5 TO 10% |
| LITTLE | 15 TO 25% |
| SOME | 30 TO 45% |
| MOSTLY | 50 TO 100% |

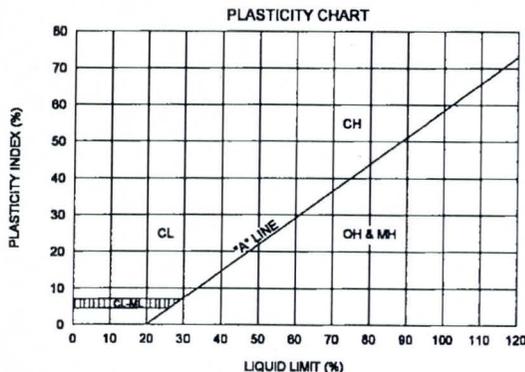
ASTM D 2488 TABLE 3 - CRITERIA FOR DESCRIBING MOISTURE CONDITION

DESCRIPTION CRITERIA

| | |
|-------|---|
| DRY | ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH |
| MOIST | DAMP, BUT NO VISIBLE WATER |
| WET | VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE |

ADDITIONAL TESTS

| | |
|--|--|
| CA - CHEMICAL ANALYSIS (CORROSIVITY) | (200) - (WITH % PASSING NO. 200 SIEVE) |
| CD - CONSOLIDATED DRAINED TRIAXIAL | |
| CN - CONSOLIDATION | SW - SWELL TEST |
| CU - CONSOLIDATED UNDRAINED TRIAXIAL | TC - CYCLIC TRIAXIAL |
| DS - DIRECT SHEAR | TV - TORVANE SHEAR |
| PP - POCKET PENETROMETER (TSP) | UC - UNCONFINED COMPRESSION |
| (3.0) - (WITH SHEAR STRENGTH IN KSF) | (1.5) - (WITH SHEAR STRENGTH IN KSF) |
| RV - R-VALUE | |
| SA - SIEVE ANALYSIS: % PASSING #200 SIEVE | UU - UNCONSOLIDATED UNDRAINED TRIAXIAL |
| ▽ - WATER LEVEL (WITH DATE OF MEASUREMENT) | WA - WASH ANALYSIS (200%) - (WITH % PASSING NO. 200 SIEVE) |



| PENETRATION RESISTANCE (RECORDED AS BLOWS / 0.5 FT) | | | | |
|--|-------------|--------------|-------------|----------------------------|
| SAND & GRAVEL | | SILT & CLAY | | |
| RELATIVE DENSITY | BLOWS/FOOT* | CONSISTENCY | BLOWS/FOOT* | COMPRESSIVE STRENGTH (TSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 2 | 0 - 0.25 |
| LOOSE | 4 - 10 | SOFT | 2 - 4 | 0.25 - 0.50 |
| MEDIUM DENSE | 11 - 30 | MEDIUM STIFF | 4 - 8 | 0.50 - 1.0 |
| DENSE | 31 - 50 | STIFF | 8 - 15 | 1.0 - 2.0 |
| VERY DENSE | OVER 50 | VERY STIFF | 15 - 30 | 2.0 - 4.0 |
| | | HARD | OVER 30 | OVER 4.0 |

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1588 STANDARD PENETRATION TEST).

BORING LEGEND - GENERAL. McMICKEN TEST PIT LOGS (WA7).GPJ. 7/11/14



TERMS & SYMBOLS USED ON BORING LOGS FOR SOIL
McMicken Dam Rehabilitation Project
McMicken Dam, Surprise, AZ



4722 N. 24th Street, Suite 250
 Phoenix, AZ 85016
 602-553-8817
 602-553-8816 (Fax)

BORING LOG: TH-501

SHEET 1 of 1
 GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 984,418.127 **REF. ALIGNMENT:**
E: 574,053.809 **STATION:** 339+99
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 10 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1300.3
TOTAL DEPTH: 6.5 FT
START DATE: 04/16/2014 **TIME:**
FINISH DATE: 04/16/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|-------|---------|--------|--------|--------|------------|-----|-------------|-------------------|--------------------|---------|-------|--|--|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | | N |
| 5 | SP-SM | | SPT | S-1 | | 5.0 | 6.5 | 0.9 | 8 | 16 | 50/2.4" | | 1.0 (67) | Poorly Graded SAND with Silt and Gravel (SP-SM), subangular to subrounded gravel, light gray (10 YR 7/2), dry, strong reaction with HCl, weak cementation. | |
| | | | | | | | | | | | | | | End of boring at 6.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-502

SHEET 1 of 1

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 985,346.914 **REF. ALIGNMENT:**
E: 574,124.306 **STATION:** 330+00
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 7 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1305.2
TOTAL DEPTH: 11.5 FT
START DATE: 04/16/2014 **TIME:**
FINISH DATE: 04/16/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | |
|--------------------------|-------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | |
| 5 | GP-GM | | SPT | S-1 | | 5.0 | 6.5 | 0.3 | | 34 | 22 | 15 | 37 | 1.5 (100) | Poorly Graded GRAVEL with Silt and Sand (GP-GM), subangular to subrounded gravel, pinkish white (2.5 YR 8/2), dry, strong reaction with HCL, weak cementation, thin non-continuous patches of calcite coating some clasts. |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | | 50/2" | | | | | 0.2 (13) | |
| | | | | | | | | | | | | | | | End of boring at 11.5 feet below ground surface. No groundwater encountered. |



Gannett Fleming

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BORING LOG: TH-503

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------|--|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | |
| 15 | | | SPT | S-3 | | 15.0 | 16.5 | | | 50/5" | | | | | 0.3 (20) | Silty GRAVEL with Sand (gm), subangular gray clasts, pinkish white (7.5 YR 8/2) and gray (2.5 YR 6/1), dry, strong reaction with HCl, weak cementation. |
| 20 | gm | | SPT | S-4 | | 20.0 | 21.5 | | | 50/6" | | | | | 0.3 (20) | gm as above, white (7.5 YR 8/1), subangular dark gray to black clasts, strong reaction with HCl, weak cementation. |
| 25 | | | SPT | S-5 | | 25.0 | 26.5 | | | 26 | 32 | 44 | 76 | 1.5 (100) | gm as above, strong reaction to HCl from 25.0' to 25.7', no reaction with HCl from 25.7' to 26.5', weak cementation. | |
| | | | | | | | | | | | | | | | | End of boring at 26.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-504

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 985,870.101 **REF. ALIGNMENT:**
E: 572,739.241 **STATION:** 309+90
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 13 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1314.7
TOTAL DEPTH: 25.5 FT
START DATE: 04/16/2014 **TIME:**
FINISH DATE: 04/16/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | REC (FT) (%REC) | |
| 5 | SC | | SPT | S-1 | | 5.0 | 6.5 | | | 16 | 50/6" | | | | 1.0 (67) | Clayey SAND (sc), white to pinkish white (2.5 YR 8/1 to 2.5 YR 8/2), dry. sc as above, strong reaction with HCl, weak to moderate cementation. |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | 4.2 | | 28 | 50/6" | | | | 1.0 (67) | Clayey SAND (SC), strong reaction with HCl, weak cementation. |



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BORING LOG: TH-504

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|--|---|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | |
| 15 | | | SPT | S-3 | | 15.0 | 16.5 | | | 50/3" | | | | | 0.3 (17) | Silty GRAVEL with Sand (gm), pinkish white (2.5 YR 8/2), dry, strong reaction with HCl, weak cementation, patches of white calcite on some clasts. |
| 20 | gm | | SPT | S-4 | | 20.0 | 21.5 | | | 23 | 50/3" | | | | 0.8 (50) | gm as above, strong reaction with HCl, weak cementation, patchy white calcite coating some clasts. |
| 25 | | | SPT | S-5 | | 24.0 | 25.5 | | | 20 | 50/4" | | | | 0.8 (53) | gm as above, strong reaction to HCl, weak cementation. |
| | | | | | | | | | | | | | | | | End of boring at 25.5 feet below ground surface. No groundwater encountered. |



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 602-553-8817
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BORING LOG: TH-505

SHEET 1 of 2
 GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 985,227.391 **REF. ALIGNMENT:**
E: 571,958.799 **STATION:** 299+95
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 5 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1311.7
TOTAL DEPTH: 21.5 FT
START DATE: 04/16/2014 **TIME:**
FINISH DATE: 04/16/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|---|-----------------|----------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | | |
| 5 | cl | | R | S-1 | | 5.0 | 6.5 | | | 20 | 20 | | | | | 1.0 (67) | Sandy Lean CLAY (cl), pinkish white (2.5 YR 8/2), dry, strong reaction with HCl, weak cementation. |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | | | 22 | 29 | 50/5" | | | | 1.4 (93) | Harder drilling and gravel cuttings at 8'. cl as above, strong reaction with HCl, moderate cementation, laminated 1/8" to 1/2" wafers (thin layers of competent material), no gravel from 10' to 15', per driller. |



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BORING LOG: TH-505

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|---|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | |
| 15 | CH | | SPT | S-3 | | 15.0 | 16.5 | 6.0 | | 50/4" | | | | | 0.3 (20) | Sandy Fat CLAY (CH), strong reaction with HCl, weak to moderate cementation. Very hard drilling 15' to 20', per driller. |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 50/2" | | | | | 0.3 (20) | CH as above, strong reaction with HCl, weak to strong cementation. |
| | | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-506

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 984,892.188
E: 571,008.927
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 290+04
OFFSET: 13 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1312.9
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|---|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | |
| 5 | SC | | R | S-1 | | 5.0 | 6.5 | 4.5 | 26 | 33 | | | | 1.0 (67) | Clayey SAND (SC), pinkish white (7.5 YR 8/2), dry. SC as above, strong reaction with HCl, weak to moderate cementation. |
| 10 | ml | | SPT | S-2 | | 10.0 | 11.5 | | 21 | 34 | 50 | 84 | | 1.2 (80) | Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. |



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BORING LOG: TH-506

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | | |
| 15 | SM | | SPT | S-3 | | 15.0 | 16.5 | 4.7 | | 32 | 50/3" | | | | | 0.9 (60) | Silty SAND (SM), pinkish white (7.5 YR 8/2), dry strong reaction with HCl. |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 50/4" | | | | | | 0.3 (20) | Gravel layer from 16' to 17', per driller. |
| | | | | | | | | | | | | | | | | | Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. |
| | | | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-507

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 984,644.032 **REF. ALIGNMENT:**
E: 570,058.654 **STATION:** 279+95
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 2 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1314.6
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| | cl | | | | | | | | | | | | | | | Gravelly CLAY with Sand (cl). |
| 5 | ml | | R | S-1 | | 5.0 | 6.5 | | | 39 | 31 | | | 1.0 (67) | | Gravelly SILT with Sand (ml). Sandy SILT (ml), mottled pinkish white (7.5 YR 8/2) and light reddish brown (5 YR 6/4), dry, strong reaction with HCl. Some gravel in auger flights. |
| 10 | SM | | SPT | S-2 | | 10.0 | 11.5 | 3.1 | | 11 | 16 | 21 | 37 | 1.5 (100) | | Silty SAND (SM), pink (7.5 YR 7/3), dry, strong reaction with HCl, weak cementation. |



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BORING LOG: TH-507

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| | | | | | | | | | | | | | | | | |
| 15 | | | SPT | S-3 | | 15.0 | 16.5 | | | 34 | 50/6" | | | | 1.0 (67) | Sandy SILT with Gravel (ml), mottled pink (5 YR 7/4) and white (7.5 YR 8/1), dry, strong reaction with HCl, no reaction with HCl in some decomposed clasts. |
| 20 | ml | | SPT | S-4 | | 20.0 | 21.5 | | | 50/6" | | | | | 0.5 (33) | Silty SAND with Gravel (sm), pink (7.5 YR 8/3), dry, moderate to strong reaction with HCl, moderate to strong cementation. |
| | sm | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-508

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | | | SPT | S-3 | | 15.0 | 16.5 | | | 25 | 31 | 25 | 56 | 1.5 (100) | Sandy SILT (ml), pink (7.5 YR 7/4), dry, none to strong reaction with HCl. | |
| 20 | sm | | SPT | S-4 | | 20.0 | 21.5 | | | 25 | 35 | 50 | 85 | 1.2 (80) | Silty SAND with Gravel (sm), pink (7.5 YR 7/3), dry, none to strong reaction with HCl, moderate cementation. sm as above. | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-509

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 984,144.564
E: 568,148.637
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 259+95
OFFSET: 2 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1318.5
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|----------------|-------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | Auger Size | | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------------|-----------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | | N | |
| 5 | ml | | R | S-1 | | 5.0 | 6.5 | | | 37 | 45 | | | | 1.0 (67) | Sandy SILT (ml), reddish yellow (7.5 YR 6/6) and pinkish white (7.5 YR 8/2) to white (7.5 YR 8/1), dry. ml as above, none to strong reaction with HCl. |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | 3.9 | | 16 | 30 | 30 | 60 | | 1.5 (100) | Clayey SAND (SC), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. Some gravel on auger flights. |



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BORING LOG: TH-509

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | SC | | SPT | S-3 | | 15.0 | 16.5 | | | 50/5" | | | | | 0.4 (27) | SC as above, strong reaction with HCl. Some gravel on auger flights. |
| 20 | ml | | SPT | S-4 | | 20.0 | 21.5 | | | 30 | 50/6" | | | | 1.0 (67) | Sandy SILT (ml), trace to little fine gravel, pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. |
| | | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-510

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 983,845.455 **REF. ALIGNMENT:**
E: 567,180.736 **STATION:** 250+00
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1320.6
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|---|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 5 | gm | | SPT | S-1 | | 5.0 | 6.5 | | | 40 | 25 | 42 | 67 | 1.5 (100) | Silty GRAVEL with Sand (gm). Silty GRAVEL with Sand (gm), pinkish white (5 YR 8/2), dry, strong reaction with HCl, weak cementation. | |
| 10 | ml | | R | S-2 | | 10.0 | 11.5 | | | 25 | 34 | | | 1.0 (67) | Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. Sandy SILT with Gravel (ml), pink (7.5 YR 7/4), dry, strong reaction with HCl, more sand at 11.5'. Gravel on auger flights. | |



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BORING LOG: TH-510

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|--|-----------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) |
| 15 | SM | | SPT | S-3 | | 15.0 | 16.5 | 2.0 | | 26 | 39 | 33 | 72 | 1.5 (100) | Silty SAND with Gravel (SM), pink (5 YR 7/3) and white (7.5 YR 8/1), dry, strong reaction with HCl, weak cementation. |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 24 | 50/4" | | | 0.8 (53) | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-511

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 983,687.043 **REF. ALIGNMENT:**
E: 566,586.507 **STATION:** 244+03
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 5 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1318.4
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|--|---|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | | |
| 5 | gm | | SPT | S-1 | | 5.0 | 6.5 | | | 38 | 50/5" | | | | | 0.9 (60) | Silty GRAVEL with Sand (gm). |
| 10 | | | R | S-2 | | 10.0 | 11.5 | 6.8 | | 42 | 50/5" | | | | | 0.9 (60) | Clayey SAND (SC), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. |



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BORING LOG: TH-511

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | SC | | SPT | S-3 | | 15.0 | 16.5 | | | 26 | 41 | 48 | 89 | 1.5 (100) | Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl, some cementation as evidenced by wafers (thin layers of competent material) in sample. | |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 21 | 40 | 48 | 88 | 1.5 (100) | ml as above, pinkish gray (7.5 YR 7/2), dry, strong reaction with HCl, moderate to strong cementation. | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-512

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 983,285.909 **REF. ALIGNMENT:**
E: 565,250.548 **STATION:** 230+00
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1319.8
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 5 | ml | | SPT | S-1 | | 5.0 | 6.5 | | | 5 | 9 | | | | 0.0 (0) | SILT (ml), little gravel. Lense of fine gravel from 2' to 3', per driller. Silty GRAVEL with Sand (gm), pinkish gray (7.5 YR 7/2), dry, strong reaction to HCl, weak cementation. |
| 10 | gm | | SPT | S-2 | | 10.0 | 11.5 | 3.2 | | 16 | 30 | 41 | 71 | | 1.5 (100) | Sandy Lean CLAY (CL), pink (7.5 YR 7/3), dry, strong reaction with HCl, moderate cementation evidenced by wafers (thin layers of competent material) and chunks that can be crumbled by hand with some effort. |



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BORING LOG: TH-512

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | CL | | R | S-3 | | 12.5 | 14.0 | | | 50/4" | | | | | 0.3 (20) | Sandy SILT with Gravel (ml), pink (7.5 YR 7/4), dry, strong reaction with HCl. |
| | | | SPT | S-4 | | 15.0 | 16.5 | | | 39 | 50/4" | | | | 0.8 (53) | ml as above, strong reaction with HCl. |
| 20 | sm | | SPT | S-5 | | 20.0 | 21.5 | | | 42 | 29 | 50/6" | | | 1.5 (100) | Silty SAND with Gravel (sm), white (7.5 YR 8/1), dry, strong reaction with HCl, weak cementation. |
| | | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-513

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 983,140.423
E: 564,673.736
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 224+00
OFFSET: 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1319.1
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------|--|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | |
| 5 | CL | | R | S-1 | | 5.0 | 6.5 | 4.7 | 15 | 16 | | | | | 1.0 (67) | Gravelly SILT with Sand (ml). Sandy Lean CLAY (CL), light brown (7.5 YR 6/4), dry, strong reaction with HCl. Gravel layer from 6.5' to 7.0', per driller. |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | | 23 | 20 | 21 | 41 | | 1.5 (100) | Sandy SILT (ml), little gravel, pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. | |



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BORING LOG: TH-513

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|---|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | ml | | SPT | S-3 | | 15.0 | 16.5 | | | 23 | 23 | 44 | 67 | 1.5 (100) | SILT with Sand (ml), pink (7.5 YR 7/3), dry, weak to strong reaction with HCl. Some gravel on auger flights. | |
| 20 | | | R | S-4 | | 20.0 | 21.5 | | | 50/5" | | | | 0.4 (27) | ml as above, strong reaction with HCl. | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-514

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 982,788.698 **REF. ALIGNMENT:**
E: 563,338.267 **STATION:** 210+06
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1322.4
TOTAL DEPTH: 19.5 FT
START DATE: 04/21/2014 **TIME:**
FINISH DATE: 04/21/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|-----------|---|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 5 | SM | | SPT | S-1 | | 5.0 | 6.5 | 1.4 | 36 | 38 | 40 | 78 | 1.5 (100) | Silty GRAVEL with Sand (gm). Difficult drilling, cobble or boulder from 4.0' to 4.5', per driller. Silty SAND with Gravel (SM), pinkish gray (7.5 YR 7/2), dry, strong reaction with HCl, weak cementation. | | |
| 10 | | | R | S-2 | | 10.0 | 11.5 | | 18 | 50 | | | 1.0 (67) | Silty SAND with Gravel (sm), pink (7.5 YR 7/3), dry, strong reaction to HCl, weak cementation. | | |



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BORING LOG: TH-514

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | | | SPT | S-3 | | 15.0 | 16.5 | | | 11 | 16 | 20 | 36 | 1.5 (100) | Silty SAND (sm), pink (7.5 YR 7/3), dry, none to strong reaction with HCl, weak cementation. | |
| | ml | | SPT | S-4 | | 18.0 | 19.5 | | | 19 | 30 | 50 | 80 | 1.3 (87) | Sandy SILT (ml), pink (7.5 YR 7/3), dry, none to strong reaction to HCl. ml as above, laminated (1/16" to 1/8"), weak to strong cementation, white calcite (discontinuous filaments). | |
| | | | | | | | | | | | | | | | End of boring at 19.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-515

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 982,468.411 **REF. ALIGNMENT:**
E: 562,365.368 **STATION:** 199+99
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 7 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1326.1
TOTAL DEPTH: 21.5 FT
START DATE: 04/18/2014 **TIME:**
FINISH DATE: 04/18/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|---|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 5 | ml | | R | S-1 | | 5.0 | 6.5 | 8.5 | 19 | 21 | | | | | 1.0 (67) | Gravelly SILT with Sand (ml). Clayey SAND (SC), reddish brown (5 YR 5/4), dry, moderate to strong reaction with HCl. |
| 10 | ml | | SPT | S-2 | | 10.0 | 11.5 | | 50/5" | | | | | | 0.4 (27) | Sandy SILT with Gravel (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl. |



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BORING LOG: TH-515

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | sm | | SPT | S-3 | | 15.0 | 16.5 | | | 19 | 21 | 43 | 64 | 1.5 (100) | Silty SAND with Gravel (sm), pinkish gray (5 YR 7/2) and white (5 YR 8/1), dry, strong reaction with HCl, weak cementation. | |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 38 | 50/4" | | | 0.8 (53) | sm as above, pinkish gray (5 YR 7/2) and light reddish brown (5 YR 6/4), weak to strong reaction with HCl, weak to moderate cementation. | |
| | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | | |



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BORING LOG: TH-516

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 982,251.093
E: 561,403.955
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 189+99
OFFSET: 6 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1322.8
TOTAL DEPTH: 21.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|---|--|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | | |
| 5 | gm | | R | S-1 | | 5.0 | 6.5 | | | 10 | 21 | | | | | 1.0 (67) | SILT with Gravel (ml). Silty GRAVEL with Sand (gm), pink (7.5 YR 7/3), dry, strong reaction with HCl, weak cementation. |
| 10 | CL | | SPT | S-2 | | 10.0 | 11.5 | 3.9 | | 27 | 40 | 50/5" | | | | 1.4 (93) | Sandy Lean CLAY with Gravel (CL), pink (7.5 YR 7/3), dry, strong reaction with HCl. |



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BORING LOG: TH-516

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|--|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | | N | |
| 15 | gm | | SPT | S-3 | | 15.0 | 16.5 | | | 50/5' | | | | | 0.4 (27) | Silty GRAVEL with Sand (gm), light gray (10 R 7/1), dry, strong reaction with HCl in fines, some cementation as evidenced by wafers (thin layers of competent material) in sample. |
| 20 | ml | | SPT | S-4 | | 20.0 | 21.5 | | | 22 | 50/6" | | | | 1.0 (67) | Sandy SILT (ml), mottled white (7.5 YR 8/1) and reddish brown (5 YR 4/4), dry, strong reaction with HCl. |
| | | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-517

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 981,979.562
E: 560,455.217
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 180+00
OFFSET: 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1324.1
TOTAL DEPTH: 16.5 FT
START DATE: 04/21/2014 **TIME:**
FINISH DATE: 04/21/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|-------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------|-----------------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | |
| | ml | | | | | | | | | | | | | | | SILT with Sand (ml). |
| 5 | | | SPT | S-1 | | 5.0 | 6.5 | | | 16 | 26 | 20 | 46 | 1.5 (100) | | Silty SAND with Gravel (sm), pinkish gray (7.5 YR 7/2), dry, strong reaction with HCl, weak cementation. |
| 10 | SP-SM | | SPT | S-2 | | 10.0 | 11.5 | 1.6 | | 13 | 15 | 11 | 26 | 1.5 (100) | | Poorly Graded SAND with Silt and Gravel (SP-SM), weak to strong reaction with HCl, weak cementation. |



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BORING LOG: TH-517

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | | | SPT | S-3 | X | 15.0 | 16.5 | | | 16 | 17 | 26 | 43 | 1.3 (87) | sm as above, none to strong reaction with HCl, weak cementation. | |
| | | | | | | | | | | | | | | | End of boring at 16.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-518

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 981,914.852 **REF. ALIGNMENT:**
E: 559,466.803 **STATION:** 169+99
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 2 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1321.7
TOTAL DEPTH: 16.5 FT
START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | | N |
| 5 | ml | | SPT | S-1 | | 5.0 | 6.5 | | | 7 | 12 | 12 | 24 | 1.5 (100) | Sandy SILT (ml), trace to little gravel. |
| 10 | SC | | SPT | S-2 | | 10.0 | 11.5 | 2.6 | | 24 | 32 | 31 | 63 | 1.5 (100) | Clayey SAND with Gravel (SC), pinkish gray (7.5 YR 7/2) and white (7.5 YR 8/1), dry, strong reaction with HCl, weak to moderate cementation. Silt rich from 10.0' to 10.7' |



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BORING LOG: TH-518

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | ml | | SPT | S-3 | | 15.0 | 16.5 | | | 26 | 50/6" | | | | 1.0 (67) | <p>Sandy SILT (ml), pink (7.5 YR 7/3), strong reaction with HCl, weak to strong cementation, blocky with continuous white calcite matrix.</p> <p>End of boring at 16.5 feet below ground surface. No groundwater encountered.</p> |



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BORING LOG: TH-519

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 981,576.039 **REF. ALIGNMENT:**
E: 558,404.086 **STATION:** 160+00
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1329.7
TOTAL DEPTH: 16.5 FT
START DATE: 04/21/2014 **TIME:**
FINISH DATE: 04/21/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|-----------|---|-----------------|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | |
| 5 | CL | | SPT | S-1 | | 5.0 | 6.5 | 6.4 | 8 | 11 | 14 | 25 | 1.5 (100) | SILT with fine Gravel (ml). Sandy Lean CLAY (CL), reddish yellow (5 YR 6/6), dry strong reaction with HCl, discontinuous filaments of white calcite 1 to 5 mm long. | |
| 10 | | | SPT | S-2 | | 10.0 | 11.5 | | 24 | 23 | 22 | 45 | 1.5 (100) | Coarsens downward from Sandy SILT (ml) to Silty SAND with Gravel (sm) to Silty GRAVEL with Sand (gm), pinkish white (7.5 YR 8/2), strong reaction with HCl, weak cementation. | |



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BORING LOG: TH-519

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|---|-----------------|--|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | | |
| 15 | ml | | SPT | S-3 | | 15.0 | 16.5 | | | | | | | | | | Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl, strong cementation. |
| | | | | | | | | | | | | | | | | | End of boring at 16.5 feet below ground surface. No groundwater encountered. |



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BORING LOG: TH-520

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 981,217.054 **REF. ALIGNMENT:**
E: 557,687.551 **STATION:** 152+00
LOCATION: McMicken Dam, Surprise, AZ **OFFSET:** 9 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1327.0
TOTAL DEPTH: 21.5 FT
START DATE: 04/21/2014 **TIME:**
FINISH DATE: 04/21/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▽ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|-----------------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | | N |
| | ml | | | | | | | | | | | | | | Silt (ml). |
| 5 | | | SPT | S-1 | | 5.0 | 6.5 | | | 28 | 40 | 42 | 82 | 1.5 (100) | Silty SAND with Gravel (sm), pinkish white (7.5 YR 8/2), dry. sm as above, strong reaction with HCl, weak cementation. |
| 10 | sm | | SPT | S-2 | | 10.0 | 11.5 | | | 50/5" | | | | 0.4 (27) | sm as above, strong reaction with HCl, weak cementation. |



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BORING LOG: TH-520

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|---|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | SC | | SPT | S-3 | | 15.0 | 16.5 | 3.1 | | 21 | 46 | 50/5" | | 1.4 (93) | Clayey SAND (SC), none to strong reaction with HCl, weak to moderate cementation. | |
| 20 | | | SPT | S-4 | | 20.0 | 21.5 | | | 18 | 45 | 50/4" | | 1.3 (87) | SC as above, none to strong reaction with HCl, weak cementation. Silt rich from 20.9' to 21.5'. | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-521

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 980,880.081
E: 556,602.670
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 140+04
OFFSET: 3 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1330.9
TOTAL DEPTH: 21.5 FT
START DATE: 04/22/2014 **TIME:**
FINISH DATE: 04/22/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | | |
| 5 | ml | | SPT | S-1 | | 5.0 | 6.5 | | | 12 | 21 | | | | | 1.0 (67) | SILT trace to little fine Gravel (ml). SILT (ml), light brown (7.5 YR 6/4), dry, strong reaction with HCl, crumbles with slight to moderate finger pressure, discontinuous white calcite filaments. |
| 10 | CL | | R | S-2 | | 10.0 | 11.5 | 4.4 | | 25 | 50/6" | | | | | 1.0 (67) | Sandy Lean CLAY (CL), light brown (7.5 YR 6/4) and white (7.5 YR 8/1), dry, strong reaction with HCl, moderate to strong cementation. Gravelly at 11', per driller. |







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BORING LOG: TH-521

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 980,880.081
E: 556,602.670
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 140+04
OFFSET: 3 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1330.9
TOTAL DEPTH: 21.5 FT
START DATE: 04/22/2014 **TIME:**
FINISH DATE: 04/22/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|----------------|----------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | 3.25" (6.625") | | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|-----------------|----------|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | | |
| 5 | ml | | SPT | S-1 | | 5.0 | 6.5 | | | 12 | 21 | | | | | 1.0 (67) | SILT trace to little fine Gravel (ml). |
| 10 | CL | | R | S-2 | | 10.0 | 11.5 | 4.4 | | 25 | 50/6" | | | | | 1.0 (67) | Sandy Lean CLAY (CL), light brown (7.5 YR 6/4) and white (7.5 YR 8/1), dry, strong reaction with HCl, moderate to strong cementation. Gravelly at 11', per driller. |



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BORING LOG: TH-521

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|---|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | SM | | SPT | S-3 | X | 15.0 | 16.5 | 1.5 | | 17 | 30 | 27 | 57 | 1.5 (100) | Silty SAND with Gravel (SM), pinkish gray (7.5 YR 7/2) and white (7.5 YR 8/1), dry, strong reaction with HCl, weak cementation. | |
| 20 | | | SPT | S-4 | X | 20.0 | 21.5 | | | 11 | 17 | 17 | 34 | 1.0 (67) | sm as above, light brown (7.5 YR 6/4), strong reaction with HCl, weak cementation. | |
| | | | | | | | | | | | | | | | End of boring at 21.5 feet below ground surface. No groundwater encountered. | |



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BORING LOG: TH-522

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 980,506.659
E: 555,655.650
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 129+98
OFFSET: 4 ft R

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1328.7
TOTAL DEPTH: 16.5 FT
START DATE: 04/22/2014 **TIME:**
FINISH DATE: 04/22/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▼ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▼ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▼ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|--|---|-----------------|----------|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | | | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | | N | REC (FT) (%REC) | | |
| 5 | | | SPT | S-1 | | 5.0 | 6.5 | | | 23 | 29 | | | | | 1.0 (67) | SILT with fine gravel (ml). SILT (ml), light brown (7.5 YR 6/4), dry, none to strong reaction with HCl, trace to little fine gravel. |
| 10 | ml | | SPT | S-2 | | 10.0 | 11.5 | | | 29 | 34 | 41 | 75 | | | 1.1 (73) | ml as above, pink (7.5 YR 7/3) and white (7.5 YR 8/1), dry, strong reaction with HCl, requires considerable filger pressure to crumble, some pieces will not crumble, moderate to strong cementation. |



Gannett Fleming

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Phoenix, AZ 85016
602-553-8817
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BORING LOG: TH-522

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|---|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | | | SPT | S-3 | X | 15.0 | 16.5 | | | 12 | 14 | 18 | 32 | 1.5 (100) | SILT with fine Sand (ml), pink (7.5 YR 7/3), dry, strong reaction with HCl, weak cementation. | |
| | | | | | | | | | | | | | | | End of boring at 16.5 feet below ground surface. No groundwater encountered. | |



Gannett Fleming

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BORING LOG: TH-523

SHEET 1 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

COORDINATES N: 980,052.300
E: 554,759.138
LOCATION: McMicken Dam, Surprise, AZ
REF. ALIGNMENT:
STATION: 120+00
OFFSET: 0

RIG TYPE: CME-75 Truck Mounted
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

COMMENTS:

SURFACE ELEV.: 1330.7
TOTAL DEPTH: 16.5 FT
START DATE: 04/22/2014 **TIME:**
FINISH DATE: 04/22/2014 **TIME:**

| Type/Symbol | Augers | Ring Sampler | Split Spoon | D&M Lined | Shelby Tube | Cuttings | GROUNDWATER DATA | | | | | |
|-------------|----------|--------------|-------------|-----------|-------------|----------------|------------------|------|------------------|-------------------|-----------------|--------|
| | | R | S | DM | U | CU | Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol |
| I.D. | | 2.5" | 1.375" | 2.5" | 2.8" | -- | | | | | | ▽ |
| O.D. | | 3" | 2" | 3" | 3" | -- | | | | | | ▼ |
| Length | | 18" | 18" | 18" | 30" | -- | | | | | | ▽ |
| Hammer WT. | 140 lbs. | | Auger Size | | | | | | | | | ▽ |
| Hammer Fall | 30 in. | | I.D. (O.D.) | | | 3.25" (6.625") | | | | | | ▽ |

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|-------|-------|---|--|---|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | |
| 5 | gm | | R | S-1 | | 5.0 | 6.5 | | | 5 | 16 | | | 1.0 (67) | SILT with fine Gravel (ml). Silty GRAVEL with Sand (gm), light gray (7.5 YR 7/1) and pink (7.5 YR 7/3), dry, strong reaction with HCl, weak cementation. |
| 10 | | | R | S-2 | | 10.0 | 11.5 | | | 27 | 50/6" | | | 1.0 (67) | gm as above, pink (5 YR 7/3) and light reddish brown (5 YR 6/4), dry, strong reaction with HCl, weak cementation. |



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BORING LOG: TH-523

SHEET 2 of 2

GF PROJECT #: 56312

PROJECT: McMicken Dam Rehabilitation Project
CLIENT: URS / Flood Control District of Maricopa County

CONTRACTOR: Geomechanics Southwest, Inc.
DRILLER: T. Crain
FIELD ENGINEER: W. Roman

| DEPTH BELOW SURFACE (FT) | USCS | GRAPHIC | SAMPLE | | | | | | | | | | | VISUAL MATERIAL CLASSIFICATION AND REMARKS | | |
|--------------------------|------|---------|--------|--------|--------|------------|------|-------------|-------------------|--------------------|------|-------|----|--|--|--|
| | | | TYPE | NUMBER | SYMBOL | DEPTH (FT) | | MOISTURE, % | DRY DENSITY (PCF) | SOIL (Blows/6 in.) | | | | | REC (FT) (%REC) | |
| | | | | | | FROM | TO | | | 0/6 | 6/12 | 12/18 | N | | | |
| 15 | SC | | SPT | S-3 | | 15.0 | 16.5 | 2.6 | | 19 | 27 | 34 | 61 | 1.5 (100) | Clayey SAND with Gravel (SC), light gray (5 YR 7/1) and light reddish brown (5 YR 6/4), dry, none to strong reaction with HCl, weak to moderate cementation. | |
| | | | | | | | | | | | | | | | End of boring at 16.5 feet below ground surface. No groundwater encountered. | |

Test Pit Log



Gannett Fleming

Project: McMicken Dam Rehabilitation Project

Location: McMicken Dam, Surprise, AZ

Page 1 of 1

Test Pit No.: TP-601

Date Started: 4/28/14

Operator/Contractor: J. Osborn/Southern Plains Construction

Date Finished: 4/28/14

Excavation Method: Hydraulic Excavator

Depth: 15.5 ft

Coordinates: N 986,068.372
E 573,692.526

Equipment Used: Caterpillar 320L

Station: 320+03

Field Observation / Logging: W. Roman

Offset from CL:

Surface Elevation: 1314.8 ft

Checked By: _____ Date: _____

Depth to Groundwater: N/A

| Depth (ft) | USCS | Legend | Material Description | Elevation (ft) | Field | | Lab | | | Remarks | | |
|------------|-------|--------|---|----------------|-----------|-------------|--------|--------|--------------|---------|--|---------------------------------|
| | | | | | Sample ID | Sample Type | LL (%) | PI (%) | Moisture (%) | | % Passing #4 | % Passing #200 |
| 1 | | | Sandy SILT (ml), dry, strong reaction with HCl, weak cementation. | | | | | | | | | |
| 2 | ml | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | 1311.3 | | | | | | | | |
| 4 | | | Poorly Graded SAND with Clay and Gravel (sp-sc), dry, strong reaction with HCl. | | | | 39 | 17 | 3.4 | 59 | 8 | Bucket sample from 3.5 to 5.0'. |
| 5 | | | | | | | | | | | | |
| 6 | | | White band (top of caliche) at 5', moderate cementation. | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | At 8', digging became hard, ripping teeth used (strong cementation). | |
| 9 | | | | | | | | | | | | |
| 9 | sp-sc | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | At 11', operator indicated digging became harder, scraping noises. | |
| 12 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | Less material in each bucket, slower excavation from 12' to 15'. | |
| 13 | | | Very strong cementation at 12', per operator. | | | | | | | | | |
| 13 | | | Coarser texture, more cobbles, but no boulders from 12' to 15'. | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 14 | | | Increased number of cobbles (coarsens downward) at 14'. | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 15 | | | | 1299.3 | | | | | | | | |
| 15 | | | | | | | | | | | Wetted spoil is yellowish red (5 YR 5/4). | |
| | | | Bottom of excavation at 15.5 feet. | | | | | | | | | |

PHOENIX - GF MCKEN TEST PIT LOGS (WA7), GPJ PHX LOG (LAB), GDT 7/14/14

Test Pit Log

| | | | |
|--|---|-------------|-----------------------------|
|  Gannett Fleming | Project: McMicken Dam Rehabilitation Project | Page 1 of 1 | Test Pit No.: TP-602 |
| | Location: McMicken Dam, Surprise, AZ | | |
| Date Started: 4/28/14 | Operator/Contractor: J. Osborn/Southern Plains Construction | | |
| Date Finished: 4/28/14 | Excavation Method: Hydraulic Excavator | | Depth: 15.0 ft |
| Coordinates: N 985,893.285 E 572,731.724 | Equipment Used: Caterpillar 320L | | Station: 309+90 |
| | Field Observation / Logging: W. Roman | | Offset from CL: |
| Surface Elevation: 1315.3 ft | Checked By: | Date: | Depth to Groundwater: N/A |

| Depth (ft) | USCS | Legend | Material Description | Elevation (ft) | Field | | Lab | | | Remarks |
|------------|------|--------|---|----------------|-----------|-------------|--------|--------|--------------|--|
| | | | | | Sample ID | Sample Type | LL (%) | PI (%) | Moisture (%) | |
| 1 | | | Silty SAND (SM), trace gravel, dry, strong reaction with HCl. | | | | | | | Walls collapse in upper 2'. |
| 2 | | | SM as above, dry, strong reaction with HCl, weak to moderate cementation, amount of white (calcite) increases with depth. | | | | | | | Cross-bedded (faintly) in side wall from 2' to 5'. |
| 3 | | | | | | NV | NP | 4.7 | 86 | 39 |
| 4 | | | sm as above, stronger cementation, more white material (calcite). | | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | SM | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | sm as above, strong cementation, strong reaction with HCl, clods cannot be completely broken by hand. | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | gm | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | Silty GRAVEL with Sand and Cobbles (gm), dry, strong reaction with HCl, strong cementation. | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | 1301.3 | | | | | | |
| 15 | | | | 1300.3 | | | | | | Excavator lifting off ground when digging. |
| | | | Bottom of excavation at 15.0 feet. | | | | | | | |

PHOENIX - GFL - MCKEN TEST PIT LOGS (WA7), GPJ PHX LOG (LAB), GDT 7/14/14

Test Pit Log



Gannett Fleming

Project: McMicken Dam Rehabilitation Project

Location: McMicken Dam, Surprise, AZ

Page 1 of 1

Test Pit No.: TP-604

Date Started: 4/29/14

Operator/Contractor: J. Osborn/Southern Plains Construction

Date Finished: 4/29/14

Excavation Method: Hydraulic Excavator

Depth: 15.3 ft

Coordinates: N 984,374.244
E 569,128.150

Equipment Used: Caterpillar 320L

Station: 270+05

Field Observation / Logging: W. Roman

Offset from CL:

Surface Elevation: 1316.0 ft

Checked By: _____ Date: _____

Depth to Groundwater: N/A

| Depth (ft) | USCS | Legend | Material Description | Elevation (ft) | Field | | Lab | | | Remarks | | |
|------------|------|--------|--|----------------|-----------|-------------|--------|--------|--------------|---------|--------------|--|
| | | | | | Sample ID | Sample Type | LL (%) | PI (%) | Moisture (%) | | % Passing #4 | % Passing #200 |
| 1 | | | Silty SAND (SM), dry, strong reaction with HCl, rapid dilatancy. | | | | NV | NP | 2.1 | 88 | 31 | Bucket sample from 0' to 2'. |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | sm as above, dry, strong reaction with HCl, whitish. Larger clods can be broken by hand to smaller pieces, but smaller pieces cannot be crushed completely with fingers. | | | | | | | | | Harder excavation at 3', per operator. Smoother, whiter sidewalls from 3' to 5'. Bucket sample from 4' to 8.5'. |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | sm | | | | | | | | | | | Bucket sample from 8' to 9.5'. |
| 9 | | | | | | | | | | | | |
| 10 | | | Sandy SILT with Gravel (ml), dry, strong reaction to HCl. Clods can be broken by hand, but smaller pieces cannot be crushed completely. | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | 1300.7 | | | | | | | | Excavation becomes progressively harder, less material in buckets from 14' to 15.3'. |
| | | | Bottom of excavation at 15.3 feet. | | | | | | | | | |

PHOENIX - GF MCKEN TEST PIT LOGS (WAT), GPJ PHX LOG (LAB), GDT 7/14/14



APPENDIX B

SEISMIC REFRACTION AND REFRACTION MICROTREMOR RESULTS

June 30, 2014
AMEC Job No. 17-2013-4059

URS Corporation
7720 North 16th Street
Suite 100
Phoenix, Arizona 85020

Attn: Todd Ringsmuth, PE

**RE: Seismic Refraction and ReMi Evaluation
McMicken Dam Outlet Channel
McMicken Dam Rehabilitation Project
Maricopa County, Arizona**

In response to your request, AMEC Environment & Infrastructure, Inc. (AMEC) presents herein a report of the performance of a seismic refraction and refraction microtremor (ReMi) evaluation of the site of the referenced project. The purpose of the investigation was to assist with the characterization of the geotechnical profile beneath the site, primarily for excavation conditions. It is understood that this seismic survey supplements field investigations to be completed by others.

1.0 PROJECT DESCRIPTION

Details of the project were provided to us by Ms. Anne Frances Ackerman, PE with Gannett Fleming, Inc. (GF) under the direction of Todd Ringsmuth, PE with URS Corporation (URS). The seismic refraction surveys are part of a comprehensive site investigation being performed by GF for URS. Six seismic line locations along the proposed revision to the McMicken Dam Outlet Channel alignment, part of the McMicken Dam Rehabilitation Project, were determined by GF and are shown in the site plan at the end of this report. It is understood that excavation depths may reach up to about 20 feet. The intent of the seismic refraction surveys is to provide additional information about the subsurface conditions to depths of at least 30 feet, including soil profile and conditions, to assist with estimation of excavatability at the site.

2.0 REFRACTION SEISMIC INVESTIGATION

Six 240-foot long refraction seismic surveys were completed on May 15th, 2014 at locations determined by GF along the proposed outlet channel realignment by Michael L. Rucker, PE and Joseph Zaleski, EIT, both of AMEC. A Geometrics Geode 24-channel signal enhancement seismograph with a 24-geophone array was used for the data collection. A sledgehammer energy source was used to collect compression wave (p-wave) data for seismic refraction analysis. Jumping at the geophone array center was performed to generate surface wave energy for refraction microtremor (ReMi) analysis for a one-dimensional vertical surface wave (s-wave) profile at each seismic line to supplement the p-wave data. The results of the

refraction seismic surveys are presented in Appendix A at the end of this report, along with a brief description of the seismic refraction equipment and procedures used.

Due to the nature of the geophysical techniques utilized, all depths, locations and velocities presented on the interpretations attached are approximate. The maximum practical depth of investigation for these seismic lines is about 60 to 80 feet below ground surface. However, actual depths of investigation vary according to the subsurface profile under each line. Compression wave (p-wave) depth of investigation interpretations are included in the interpretations, are typically about 40 to 55 feet, and range from about 38 to 70 feet. Surface wave (s-wave) depths of investigation are typically deeper than p-wave depths of investigation. ReMi s-wave depths of investigation are also included in the interpretations, and range from about 45 feet to greater than 100 feet.

Velocity reversals, where softer, lower-velocity materials could underlie moderate- to higher-velocity materials, would not be detected using the p-wave seismic refraction technique. Significant, relatively large-scale velocity reversals might be detected in the vertical s-wave profile obtained from the refraction microtremor technique. Interpreted subsurface material p-wave velocities from the seismic lines are average values obtained over distances of 10 to 20 feet. Discrete zones of material could have slower or faster velocities, and therefore, be weaker or stronger than indicated by the average velocities interpreted from the seismic data. ReMi results are derived using data from at least 12 geophones, and interpreted ReMi profiles are a vertical (one-dimensional) weighted average of the s-wave profile underlying those geophones.

Where p-wave results are not available to relevant depths, due to shallow depth of investigation, the presence of velocity reversals, or very low subsurface velocities similar to velocities of sound in air, s-wave results with deeper depth of investigation can be used to estimate corresponding deeper p-wave velocities. Given a typical soil Poisson's ratio of 0.33, a p-wave velocity can be estimated by doubling the corresponding s-wave velocity. Also, in subsurface profiles where the s-wave velocity is considerably less than one-half of the corresponding p-wave velocity, relatively thin horizontal-oriented cementation or the presence of a velocity reversal may be indicated.

3.0 RESULTS OF SEISMIC INVESTIGATION

The six seismic lines were located to complement borehole data to characterize anticipated excavation conditions in cemented soils within the proposed channel excavation prism. In general, a layer of low velocity material is indicated to be present along the seismic lines to typical depths of about 2 to 10 feet. This material horizon has a range of compression wave (p-wave) velocities less than about 1,500 feet per second (f/s). Such material velocities are consistent with surficial soils.

Beneath the low velocity surface layer, interpreted subsurface cemented alluvium geometries are variable laterally as well as vertically. At Lines 1, 2 and 3 in the eastern portion of the Outlet Channel, material p-wave velocities increase to between about 3,000 to 6,300 f/s underlying the surficial soil horizon. Interpreted s-wave velocities, where relevant in an environment of laterally

variable cemented alluvium profiles, increase to about 1,600 to 3,200 f/s. At Lines 4, 5 and 6 in the western portion of the Outlet Channel, material p-wave velocities increase to between about 1,800 to 3,600 f/s underlying the surficial soil horizon. Interpreted p-wave velocities are variable laterally across each seismic line, as well as between the different seismic lines. Interpreted s-wave velocities, where relevant in an environment of laterally variable cemented alluvium profiles, increase to about 900 to 1,300 f/s. These material velocities are consistent with cemented alluvium equivalent to 'caliche' or conglomerate for excavation assessment.

Velocity reversal zones, where lower velocity (less cemented to uncemented) materials underlie higher velocity (more cemented) materials, are commonly interpreted in the ReMi results beginning at interpreted depths of about 10 to 20 feet in the seismic lines. Velocity reversal zones are also occasionally interpreted in other portions of the subsurface profile. Interpreted s-wave velocities in these zones typically range from about 800 to 1,100 f/s in the upper 20 to 30 feet of the subsurface, and are higher at greater depths. P-wave velocities are not interpreted in these zones; anticipated p-wave velocities in these zones may be about twice the s-wave velocity, with a typical range of about 1,600 to 2,200 f/s. Higher velocity p-wave horizons underlying velocity reversal zones may have interpreted depths that are greater than the actual depths; the seismic refraction method does not account for the presence of velocity reversal zones.

Interpreted p-wave and s-wave velocities increase at depths below the anticipated excavation limits. At Seismic Lines 1 through 4 in the eastern portion of the Outlet Channel, p-wave velocities greater than 7,000 f/s, and in some isolated locations over 8,000 f/s. Some interpreted s-wave velocities increase to 3,000 to 4,100 f/s at interpreted depths of about 16 to 20 feet at Line 3. Seismic velocities at depth are not as high in Seismic Lines 5 and 6 in the western portion of the Outlet Channel. Deeper p-wave velocities are in a range of 3,600 to 5,100 f/s at these lines, and s-wave velocities are in a range of 1,400 to 2,000 f/s.

4.0 DISCUSSION

This report presents results that are specific to the locations evaluated. Seismic p-wave and s-wave interpretations and profiles are presented in Appendix A. SPT blow counts from corresponding boring logs provided by GF are also included on the interpretation profiles. The types of materials encountered and the variability of those materials provide insight to what can be expected in adjacent areas, but correlation to other subsurface exploration (such as drilling) or additional seismic lines should be utilized if more specific information at other locations is needed.

As indicated by the refraction seismic information and approximate excavation capabilities of various heavy equipment presented in Table 1, mass excavation of the site can be effectively accomplished using appropriate equipment as listed for the geologic materials. Using the criteria of Stacy and Noble (1975) and local experience summarized in Figure 1 (Rucker and Ferguson, 2006, 2009), it is anticipated that mass excavation and trench excavation using backhoes could proceed without significant difficulty in materials with p-wave velocities less than about 3,000 f/s. As indicated in Table 1 and Figure 1, conglomerate and bedrock zones may need sufficiently heavy equipment. It is estimated that ripping with newer D8R or D8T bulldozers may become marginal at p-wave velocities of about 5,500 f/s (caliche) to 6,200 f/s (conglomerate) and become unrippable at p-wave velocities of about 7,700 f/s (caliche) to 8,200 f/s (conglomerate). The larger

D9R or D9T may encounter marginal ripping conditions at p-wave velocities of about 6,300 f/s (caliche) to 7,700 f/s (conglomerate), and refusal at p-wave velocities of about 8,600 f/s to 9,300 f/s.

Erodability is related to excavatability. Table 2 presents means to estimate the Erodability Index (NRCS, 2001) from seismic velocity. Given the interpreted presence of less competent zones or horizons within the anticipated excavation profile, zones of more erodible material may be present within the rehabilitated Outlet Channel prism.

Another parameter that may be estimated from seismic velocity is material unit weight. Figure 2 presents estimated unit weight as a function of seismic velocity; bulk volumes of excavated materials (assuming the physical gel trend) may be estimated in this manner.

Although very approximate, correlations between seismic velocity and Standard Penetration Test (SPT) blow counts provides another means to better understand excavation conditions across the Outlet Channel alignment. Stage III or higher cementation, as described in Rucker and Ferguson (2006), is consistent with refusal SPT blow counts and typical p-wave velocities greater than about 3,000 f/s. However, inherent SPT variability in the presence of gravels, and the very small volume of material sampled by SPT compared to the very large material volume sampled by seismic lines, severely limits the reliability of correlations between these methods. In spite of these constraints, SPT blow counts at depth in several of the borings (TH-503, TH-511, TH-21 and TH-514) do indicate underlying less competent soils consistent with the presence of seismic velocity reversals.

Should you have any questions concerning this report, we would appreciate the opportunity to review and clarify.

Respectfully submitted,

AMEC Environment & Infrastructure, Inc.

Reviewed by:



Michael L. Rucker, PE
Senior Geotechnical Engineer



Mark Hartig, PE
Geotechnical Operations Manager

c: Addressee (2)

G:\Geotechnical\2013 Projects\17-2013-4059 Seismic Refraction and ReMi Evaluation\17-2013-4059 McMicken Dam Outlet Channel seismic.doc

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TABLE 1
Approximate Excavatability of Materials
Using Various Ripping & Trenching Equipment

| Material & Range of Marginal Rippability by Seismic Velocity (Cat, 1984; 1993; 2012) | Typical Bulldozer Used as Ripper (Cat, 1984; 1993; 2012) | Equivalent Backhoe (Kirsten, 1982; 1988) |
|---|--|--|
| "Caliche" 4,000 – 6,000 fps 5,500 – 7,700 fps 6,300 – 8,600 fps 6,300 – 8,600 fps 6,300 – 8,700 fps 7,200 – 10,300 fps 7,200 – 10,300 fps 7,200 – 10,300 fps 7,400 – 10,600 fps 7,500 – 11,000 fps 7,600 – 11,000 fps | D7G, 200 HP | 235 |
| | D8R/T, 305-310 HP | - |
| | D8L, 335 HP | 245 |
| | D9R/T, 405-410 HP | - |
| | D9N, 370 HP | - |
| | D9L, 460 HP | RH 40 |
| | D10T, 580 HP | - |
| | D10N, 520 HP | - |
| | D10, 700 HP | - |
| | D11T, 850 HP | - |
| | D11N, 770 HP | - |
| Conglomerate 4,600 – 5,700 fps 6,200 – 8,200 fps 7,600 – 9,300 fps 7,700 – 9,300 fps 7,600 – 9,300 fps 8,400 – 10,600 fps 8,500 – 10,600 fps 8,400 – 10,600 fps 9,000 – 11,000 fps 9,300 – 11,500 fps 9,300 – 11,500 fps | D7G, 200 HP | 235 |
| | D8R/T, 305-310 HP | - |
| | D8L, 335 HP | 245 |
| | D9R/T, 405-410 HP | - |
| | D9N, 370 HP | - |
| | D9L, 460 HP | RH 40 |
| | D10T, 580 HP | - |
| | D10N, 520 HP | - |
| | D10, 700 HP | - |
| | D11T, 850 HP | - |
| | D11N, 770 HP | - |
| Granite 4,300 – 4,800 fps 5,800 – 8,000 fps 6,800 – 8,000 fps 6,800 – 8,000 fps 6,800 – 8,000 fps 7,300 – 8,400 fps 7,300 – 8,400 fps 7,300 – 8,500 fps 7,800 – 9,000 fps 8,100 – 9,600 fps 8,100 – 9,500 fps | D7G, 200 HP | 235 |
| | D8R/T, 305-310 HP | - |
| | D8L, 335 HP | 245 |
| | D9R/T, 405-410 HP | - |
| | D9N, 370 HP | - |
| | D9L, 460 HP | RH 40 |
| | D10N, 520 HP | - |
| | D10T, 580 HP | - |
| | D10, 700 HP | - |
| | D11T, 850 HP | - |
| | D11N, 770 HP | - |

Note: Bulldozer and backhoe power are presented by Kirsten (1982, 1988) as a measure of equivalent performance for excavation. The Caterpillar D6D bulldozer and 225 backhoe and D4E/D5B bulldozer and 215 backhoe are considered equivalent. Seismic velocities below marginal indicate that the material is rippable. Seismic velocities above marginal indicate that the material is non-rippable. All velocities are approximate and represent a typical range. See the Caterpillar Performance Handbook (Caterpillar, 1984, 1993, 2012 or current edition) for details on use of this information. Different model configurations include variations in weight and horsepower.

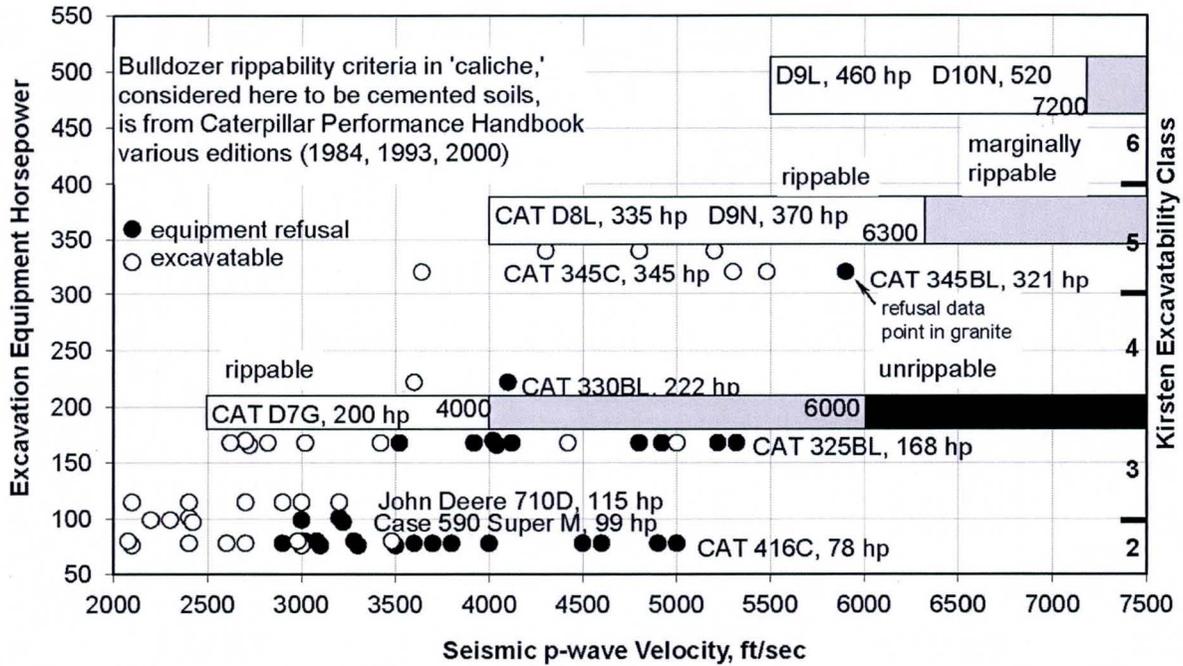
TABLE 2
Approximate Erodability & Excavatability of Materials
Limestone & Cemented Soils (caliche)

| Seismic Velocity f/s (m/s) (Rucker and Ferguson, 2006) | Trackhoe / Dozer Type & Power (Cat, 1984, 1993) | Erodability / Excavatability Index (Kirsten 1982, 1986; NRCS, 2001) | Erosion Threshold Stream Power, KW/m ² (Annandale, 1995) |
|--|--|--|---|
| s-wave < 750 f/s (230 m/s) p-wave < 1,500 f/s (460 m/s) | Hand spade | < 0.01 | Very erodable |
| s-wave 750 – 1,500 (230 – 460) p-wave 1,500 – 3,000 (460 – 910) | Hand pick & spade | 0.01 – 0.099 | Very erodable – 0.2 |
| s-wave 1,500 – ~1,800 (460 – 550) p-wave 3,000 – ~3,500 (910 – 1,070) | Cat 325BL 168 hp 125 KW Cat D6D 136 hp 101 KW | 0.1 – 0.99 | 0.2 – 1.0 |
| s-wave ~1,800 – 2,000 (550 – 610) p-wave ~3,500 – 4,000 (1,070 – 1,220) | Cat 330BL 222 hp 165 KW Cat D7G 200 hp 149 KW | 1.0 – 9.99 | 1.0 – 5.0 |
| s-wave ~2,100 – 3,000 (640 – 910) p-wave ~4,200 – 5,900 (1,280 – 1,800) | Cat 345BL 321 hp 239 KW Cat D8L 335 hp 249 KW | 10 – 99 | 5.0 – 30 |
| s-wave 3,000 – 3,600 (910 – 1,100) p-wave 5,900 – 7,200 (1,800 – 2,200) | Cat 375 428 hp 319 KW Cat D9L 460 hp 342 KW | 100 – 999 | 30 – 200 |

Table Notes: Bulldozer and backhoe power ranges are presented by Kirsten (1982, 1988) as a measure of equivalent performance for excavation. All velocities are approximate and represent a typical range. S-wave velocities are assumed to be about half of p-wave velocities consistent with a Poisson's ratio of 0.33. Seismic velocity ranges for backhoes and trackhoes in cemented soils with typical p-wave velocity less than 6,000 f/s (1,830 m/s) are from Rucker and Ferguson (2006). See the Caterpillar Performance Handbook (Caterpillar, 1984, 1993 or current edition) for details on use of seismic information for rippability. Different model configurations include variations in weight and horsepower.

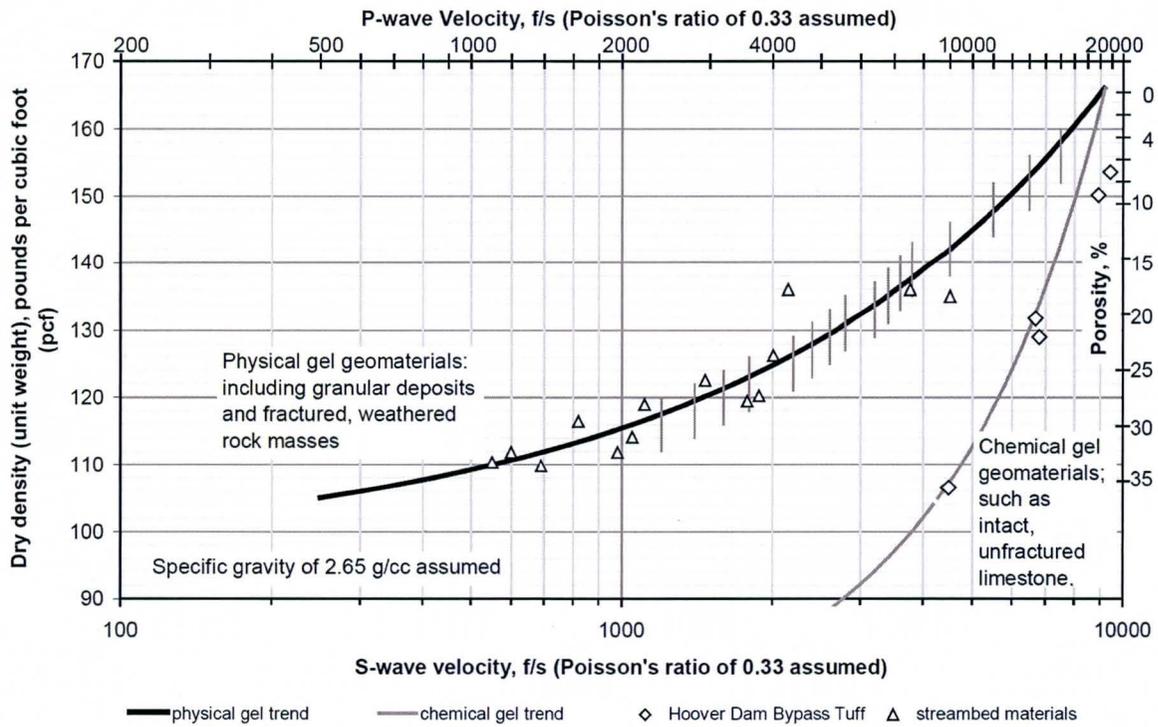
FIGURE 1

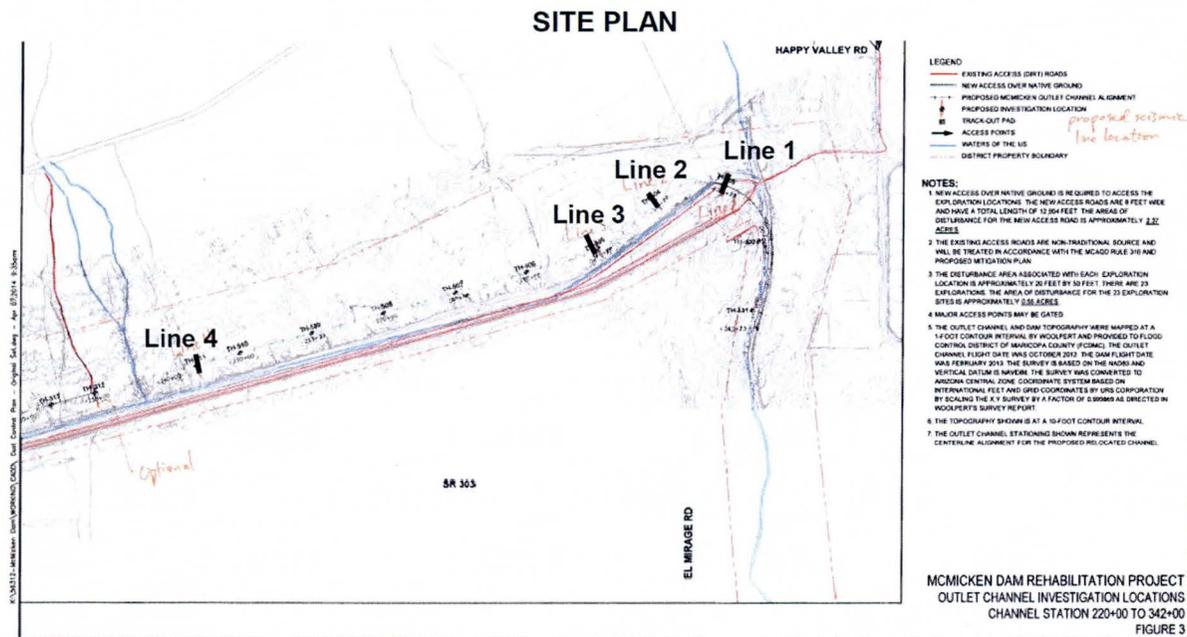
Typical Excavability Performance in Cemented Soils for Various Equipment Completing Test Pits in Salt River Valley Area



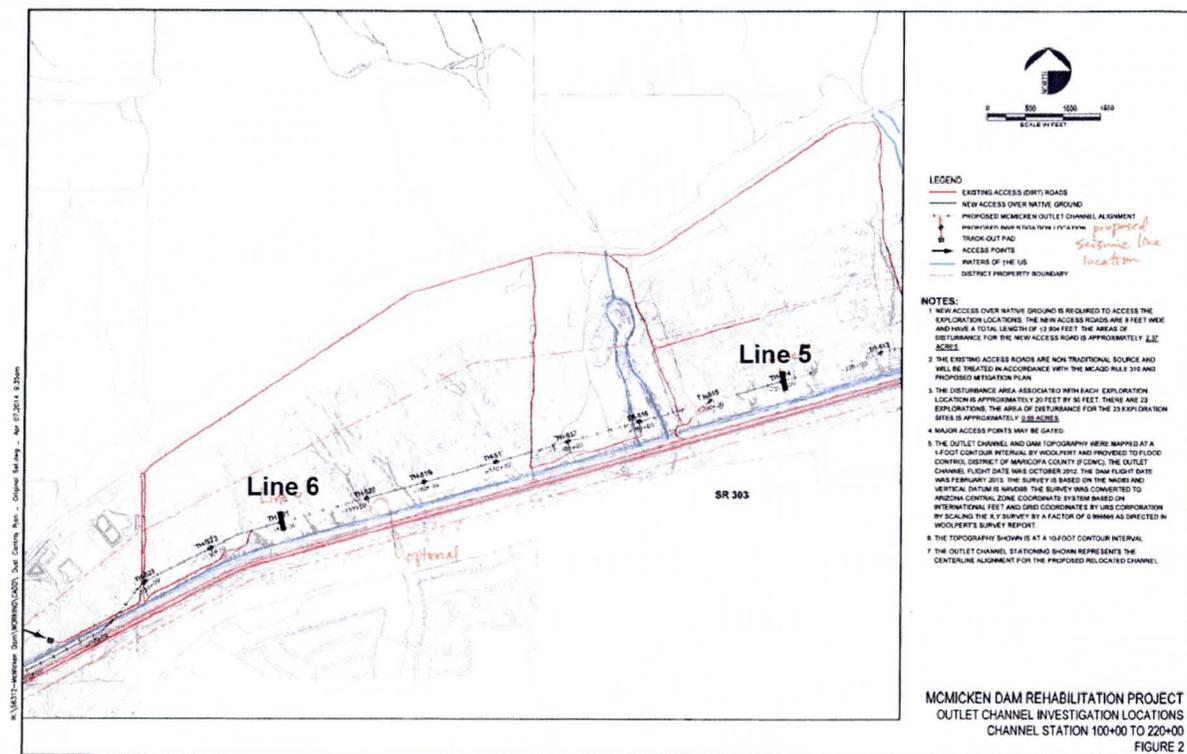
Note: From Rucker and Ferguson, (2006; 2009). This chart documents typical backhoe and trackhoe excavation performance at lower seismic p-wave velocities than are presented in the Caterpillar Ripability Charts (CAT 1981, 1993, 2000). These correlations were developed in cemented materials as a function of subsurface material p-wave seismic velocity and equipment horsepower using data from test pits with overlapping seismic lines in the Salt River Valley, Arizona area. Although there are anticipated to be differences between cemented soils and highly weathered to decomposed granites, this chart shows a general trend of increasing p-wave velocities indicating more power required for excavation.

FIGURE 2
Estimation of Unit Weight from Interpreted Seismic Velocity
(Rucker, 2008)





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APPENDIX A

REFRACTION SEISMIC EQUIPMENT AND PROCEDURES

Refraction seismic surveys are performed in general conformance with the guidelines presented in ASTM D5777-95 Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation for refraction surveys using compression waves (p-waves). ASTM D5777 does not address shear wave (s-wave) surveys; standard practice is followed for refraction surveys using s-waves. In some investigations, such as seeking and tracing earth fissures or other significant discontinuities (Rucker and Keaton, 1998), non-standard procedures and analyses, such as signal amplitude analysis, are used as part of the investigation process.

Seismic Equipment - Refraction seismic surveys are performed using a Geometrics Smartseis SE-12 or SE-24 or equivalent signal enhancement seismograph. These instruments have the capability to simultaneously record 12 or 24 channels of geophone data and produce hard copies of that data. The Smartseis also has the capability of digitally storing geophone data. Signal enhancement capability permits the use of a sledgehammer as the seismic energy source. A timing sensor is attached to the hammer, and for p-waves, a metal plate is set securely on the ground surface and struck. Generating horizontally polarized s-waves typically involves setting the plate against the end of a wooden plank or railroad tie oriented perpendicular to the axis of the geophone array and striking with a horizontal motion of the sledgehammer. A truck is usually driven onto the plank or tie to effectively couple the plank or tie to the ground.

Because of the signal enhancement capability, signals from several or many strikes can be added together to increase the total signal available relative to noise to obtain the seismic record. Although explosives can also be used as a p-wave seismic energy source, a sledgehammer does not require licenses or permits, or involve special limitations, regulations and liabilities. Explosive energy sources may be needed for long geophone arrays. Geophone cables with 12 geophone takeouts at 10-foot, 25-foot or 20-meter spacings are presently used. Vertical geophones are used to obtain p-wave data and horizontal geophones are used to obtain s-wave data. The seismograph system is extremely portable. In areas where vehicular access is not possible, the equipment can be mobilized by various means, including backpacking, packhorse, helicopter and canoe.

Field Procedures - The field operations are directed by our experienced engineer or geologist, who operates the equipment, prepares the records and examines the data in the field. Refraction seismic lines are generally laid out using the standard spacings on the geophone cables. A maximum depth of investigation of about 75 to 100 feet may be possible using a 300-foot array. For shorter lines with improved near-surface resolution, 10-foot spacings between geophones with a 120-foot array have a maximum depth of investigation of about 30 to 40 feet, and with a 240-foot array have a maximum depth of investigation of about 60 to 80 feet. Other geophone spacings can also be used. To improve the resolution of near-surface interfaces, energy source positions generally are set at 12.5 feet from the ends of a 25-foot spacing geophone array or at 5 feet from the ends of a 10-foot geophone spacing array. Several shots locations are utilized along the length of an array. When three shots are obtained, there is a foreshot and a backshot at the array ends and a midshot at the array center. The midshot is usually placed midway between the two centermost geophones. When five shots are obtained, the additional shotpoints are located midway between the foreshot-midshot and the midshot-backshot. For 240-foot 24-channel arrays, shotpoints are arrayed at 30-foot intervals along the array. These multiple shot points permit interpretation of near-surface interfaces at various locations along the array as well as near the endpoints for variable subsurface profiles, and permits more refined overall interpretations of shallow and mid-depth subsurface velocities and interfaces. In cases when both enhanced depth of investigation and improved shallow resolution are needed, multiple geophone arrays are completed end to end and combined into longer composite geophone arrays with greater depths of investigation. Additional energy shotpoints are then, at a minimum, performed at the midpoint and far endpoint of each adjacent geophone array to provide seismic energy travel path coverage over the extended array.

Surface wave data is also typically collected for each seismic line setup and interpreted for vertical shear wave profiles using the Refraction Microtremor method. This procedure is described separately. To facilitate the collection of low frequency surface wave data, 4.5 Hz geophones are typically used for surface seismic work.

REFRACTION SEISMIC EQUIPMENT AND PROCEDURES (Cont.)

P-wave data are recorded for general exploration work. S-wave data are also recorded when dynamic subsurface material properties are desired. An s-wave arrival is verified by obtained two sets of horizontal data that are 180 degrees out of phase. The phase reversal is obtained by either reversing the horizontal geophone orientation or reversing the hammer impact direction. Hard copy printouts of all field data are made and inspected as the information is collected. Field notes, including line number and orientation, topographic variations and other notes as appropriate are made on the hard copy printout. Locations and other notes are made on site maps and in notebooks as appropriate. Initial first arrival picks are made in the field and array endpoint arrival times are checked for immediate data adequacy verification as part of the quality control process.

Interpretation - Although preliminary or quality control initial refraction seismic data interpretations may sometimes be performed in the field, full interpretations are completed in the office. At the present time, two interpretation methods are being used; the intercept time method (ITM) and an optimization software routine based on finite difference optimization software. ITM breaks an interpretation into several distinct layers. It is simple, can be performed with a calculator, and can provide excellent interpretations of near surface layer depths and velocities. Optimization provides a continuously variable velocity interpretation through a discrete grid. Interpretations using optimization also indicate zones where interpretation has occurred, thus providing quality control on the depths to which the interpretation can be relied upon. However, the discrete grid used by optimization results in a low resolution near surface interpretation. The combination of both ITM and, when appropriate, optimization methods provides two separate interpretations with complimentary strengths and cross-checking capability. These interpretation methods are applied as appropriate to a particular project.

Refraction seismic data interpretation using the intercept time method is detailed by Mooney (1973). A personal computer spreadsheet is used to perform the necessary calculations to obtain depths and layer velocities, and print out time-distance plots and depth interpretations. This method is used for interpretations of up to three layers. It is considered that more than three layers cannot be effectively interpreted using twelve geophone data points. Interpretations are then completed manually to produce a final interpreted geologic profile and layer depths.

Refraction seismic data interpretation using optimization is performed using the SeisOpt2D (presently Version 4.0) software package by Optim, L.L.C., 1999-2007, of Reno, Nevada. Energy source and geophone receiver locations and elevations, and first arrival times are entered into the software package, and first arrival travel times are optimized through a process of repeated (typically 10,000 to 100,000) iterations. Multiple seismic lines combined end to end into a longer composite line can be effectively interpreted using this software. Model grid dimensions and element sizes are selected, with larger grids containing smaller elements providing greater potential resolution. However, very large grids containing small elements may become unstable, and several runs may need to be made to obtain stable, robust interpretations. Once a robust interpretation has been obtained, the resulting seismic velocity profile is printed out with varying colors indicating the interpreted velocities.

References:

Mooney, H.M., 1973, Engineering Seismology Using Refraction Methods, Bison Instruments, Inc., Minneapolis, Minnesota.

Rucker, M.L. and Keaton, J.R., 1998, Tracing an Earth Fissure Using Seismic-Refraction Methods with Physical Verification, in Land Subsidence Case Studies and Current Research: Proceedings of the Dr. Joseph F. Poland Symposium on Land Subsidence, Edited by Borchers, J.W., Special Publication No. 8, Association of Engineering Geologists, Star Publishing Company, Belmont, California, p. 207-216.

REFRACTION MICROTREMOR (ReMi) SHEAR WAVE EQUIPMENT AND PROCEDURES

Refraction microtremor or ReMi surveys are performed in general accordance with the method described by Louie (2001) to develop vertical one-dimensional shear wave (s-wave) velocity profiles. The same equipment used for ReMi is also used for refraction seismic. When appropriate, both p-wave and s-wave data can be collected with the same physical seismic line setup.

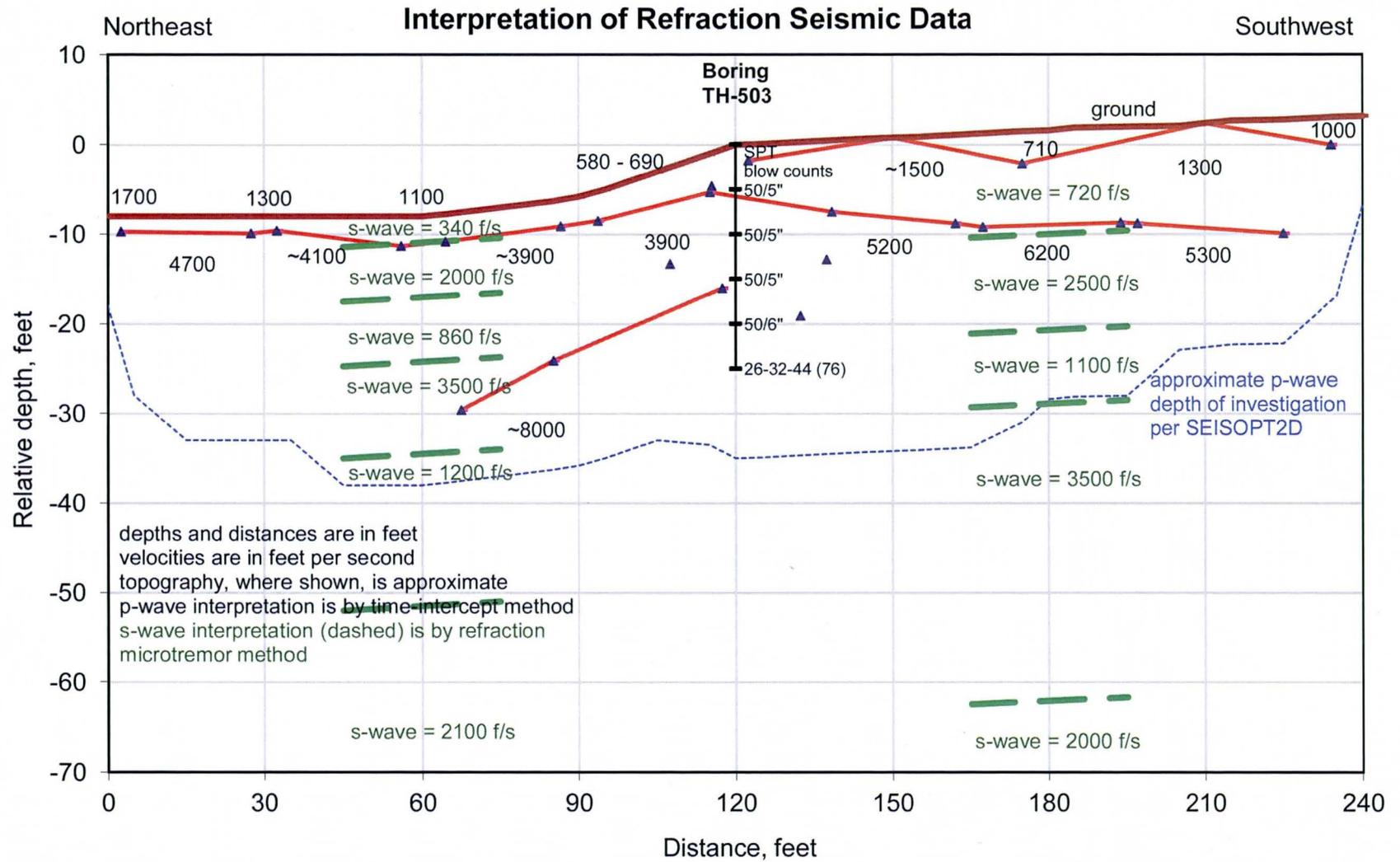
ReMi Seismic Equipment - ReMi surveys are performed using a Geometrics SE-12 or SE-24 Smartseis signal enhancement seismograph or equivalent. These instruments have the capability to digitally record and store up to 12 or 24 channels of geophone data in SEG2 format. Up to 16,384 samples can be acquired for each geophone channel at sample intervals as long as 0.25, 0.5, 1 and 2 milliseconds. Sampling events to collect ReMi field data may typically last 6, 12 or 24 seconds. Geophone cables with 12 geophone takeouts at 10-foot, 25-foot or 20-meter spacings are presently used. Vertical geophones with resonant frequencies of 28 Hz and 4.5 Hz are used to obtain surface wave data for s-wave vertical profile analysis. High frequency geophones are used for shorter arrays with shallower depths of investigation, and low frequency geophones are used for longer arrays with greater depths of investigation. Broad band ambient site noise may be used as a surface wave energy source. Controlled surface wave energy sources include jogging alongside shorter geophone arrays and driving a field vehicle alongside longer geophone arrays. The seismograph system is extremely portable. In areas where vehicular access is not possible, the equipment can be mobilized by various means, including backpacking, packhorse, helicopter and canoe.

ReMi Field Procedures - The field operations are directed by our experienced engineer or geologist, who operates the equipment, prepares the records and examines the data in the field. ReMi seismic lines are generally laid out using the standard spacings on the geophone cables. A depth of investigation of about 100 meters or more may be possible using a 240 meter array. For shorter lines with improved near-surface resolution, 10-foot array spacings between geophones have a shallower depth of investigation. Other geophone spacings can also be used.

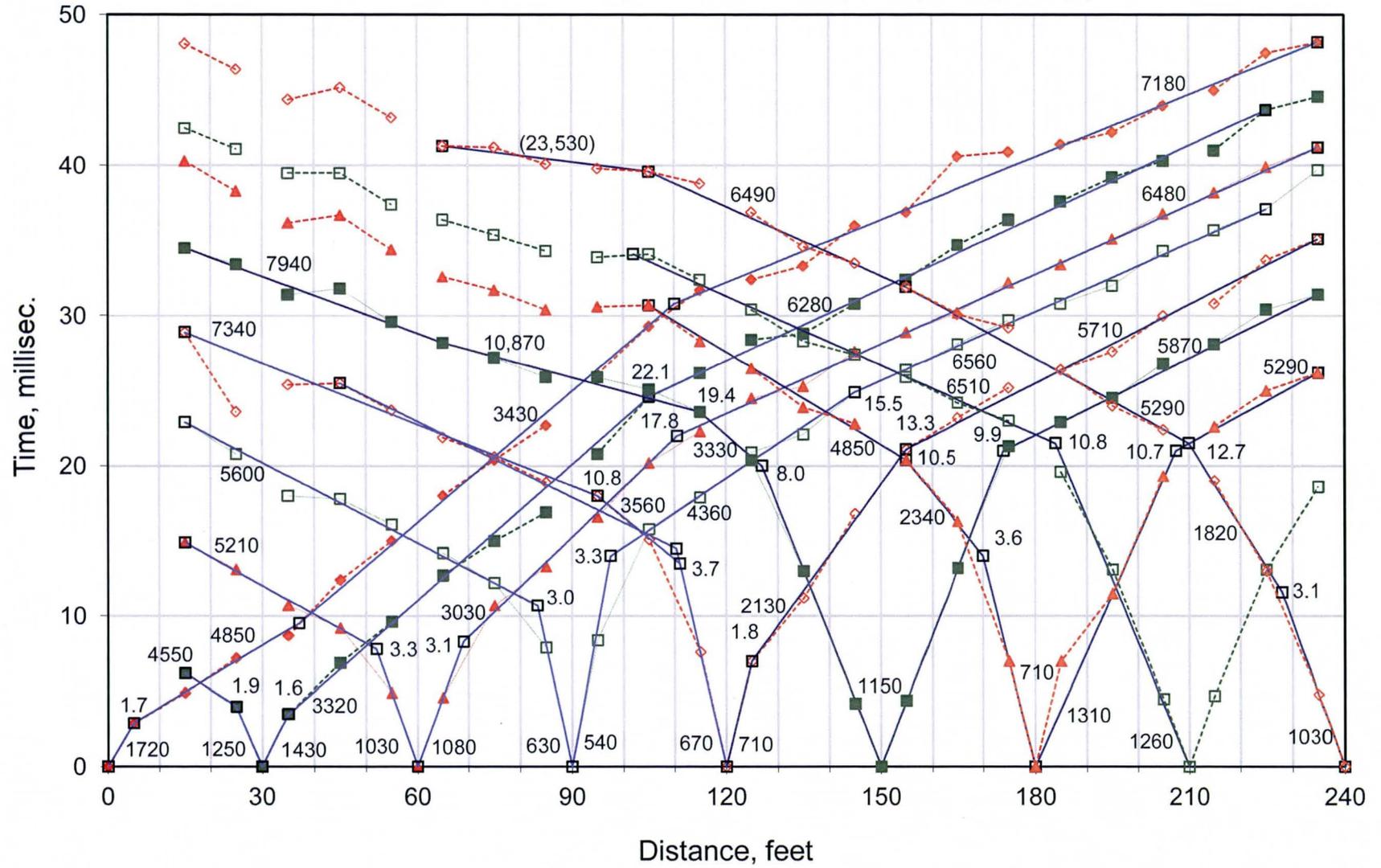
Data collection consists of the system sampling the ambient or generated surface waves (a sampling event) at the geophone array for several to many seconds. Typical sampling times and intervals for a sampling event may be 6 seconds at 0.5 milliseconds, 12 seconds at 1 millisecond and 24 seconds at 2 milliseconds for array lengths of 60 feet, 120 to 240 feet, and 600 feet to 240 meters, respectively. Several sampling events are collected at each ReMi setup. For shorter arrays where ReMi with surface wave energy generated by jumping is conducted in concert with seismic refraction data collection, four sampling events may typically be recorded. For longer arrays where urban ambient noise or a field vehicle generates the surface wave energy, six to ten sampling events may be recorded. Field notes, including line number and orientation, topographic variations and other notes as appropriate are made on hard copy of traces. Locations and other notes are made on site maps and in notebooks as appropriate. Sample data files may be transferred by 3.5-inch floppy to the laptop computer and preliminary interpretations made for immediate data adequacy verification as part of the quality control process.

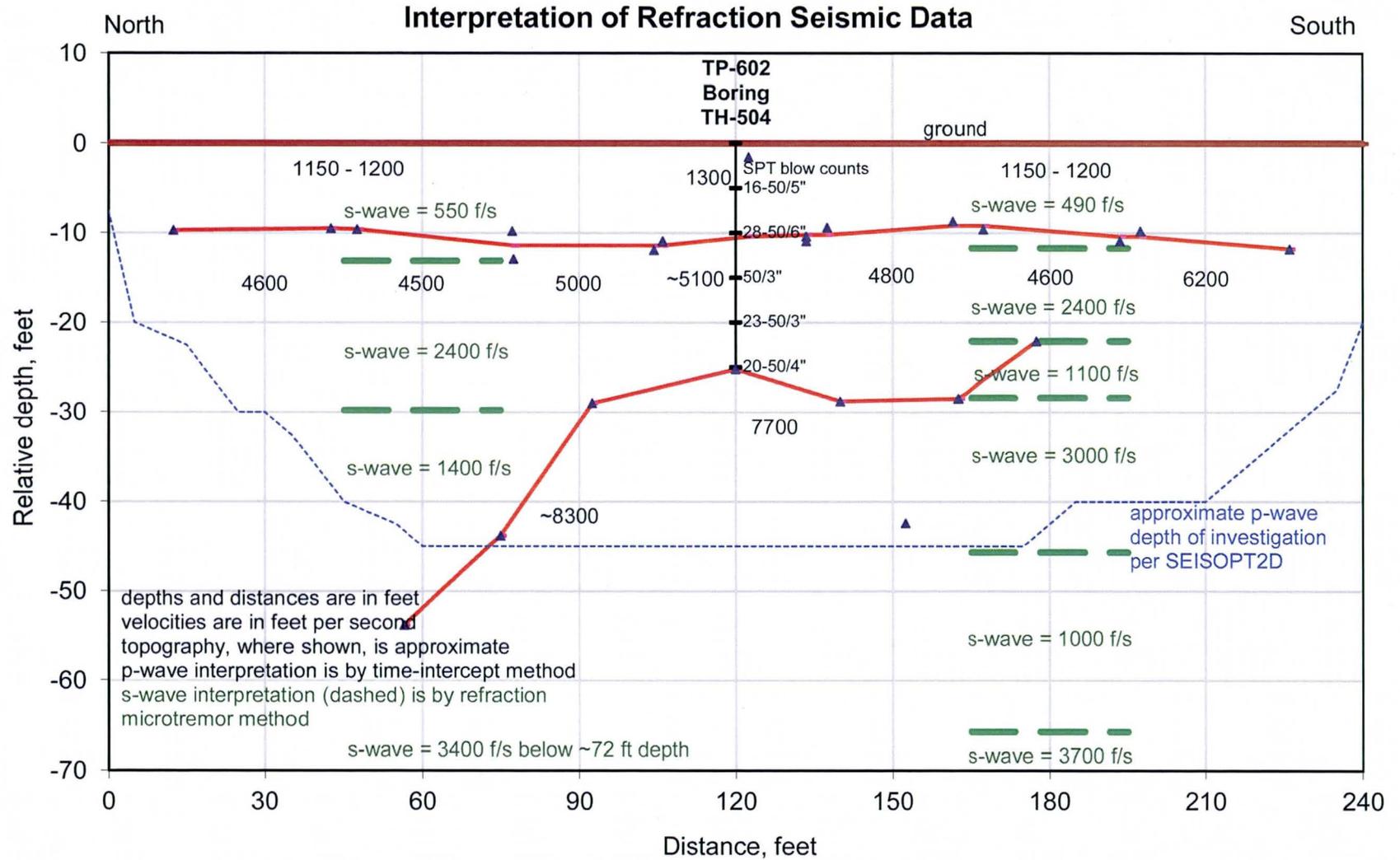
Interpretation - Although preliminary or quality control initial ReMi seismic data interpretations may sometimes be performed in the field, full interpretations are completed in the office. Data files, typically about 1,160kb each in size, are transferred from the seismograph to the laptop computer using 3.5-inch floppy disks. Interpretation is performed using the SeisOpt ReMi Version 3.0 (2004) software package by Optim, L.L.C., of Reno, Nevada. The software consists of two modules. The ReMiVsSpect module is used to convert the SEG2 files into a spectral energy shear wave frequency versus shear wave velocity presentation for a ReMi seismic setup. The interpreter then selects a dispersion curve consisting of the lower bound of the spectral energy shear wave velocity versus frequency trend, and that dispersion curve is saved to disk. Tracing the lower bound (slowest) of the shear wave velocity at each frequency selects the ambient energy propagating parallel to the geophone array, since energy propagating incident to the array will appear to have a faster propagating velocity. The second module, ReMiDisper, is then invoked. The interpreter models a dispersion curve with multiple layers and s-wave velocities to match the selected dispersion curve from the field data. An interpreted vertical s-wave profile is obtained through this process. It must be understood that this type of interpretation may not result in a unique solution.

Louie, J.L., 2001, Faster, Better: Shear-wave velocity to 100 meters depth from refraction microtremor arrays, *Bulletin of the Seismological Society of America*, Vol. 91, 347-364.

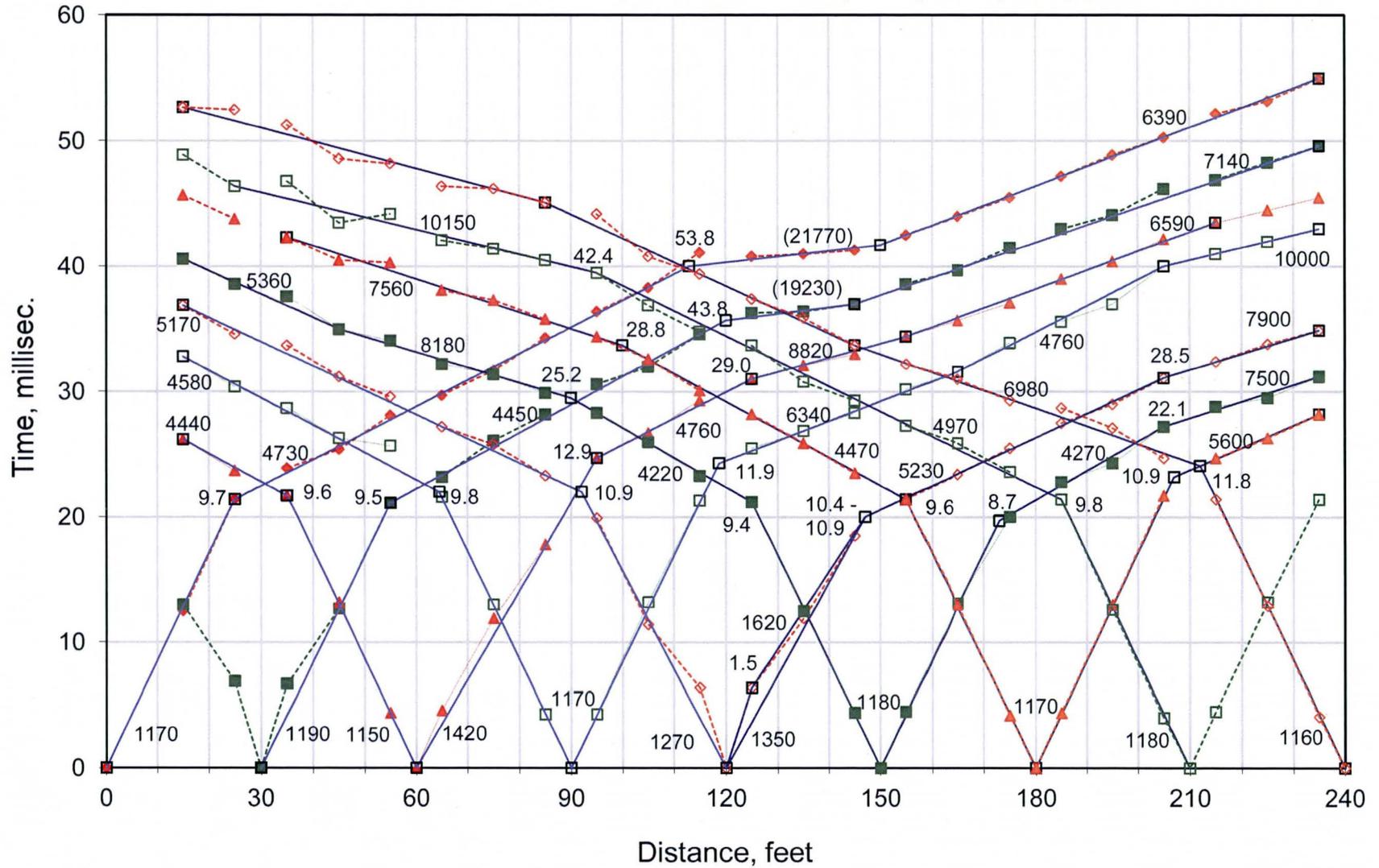


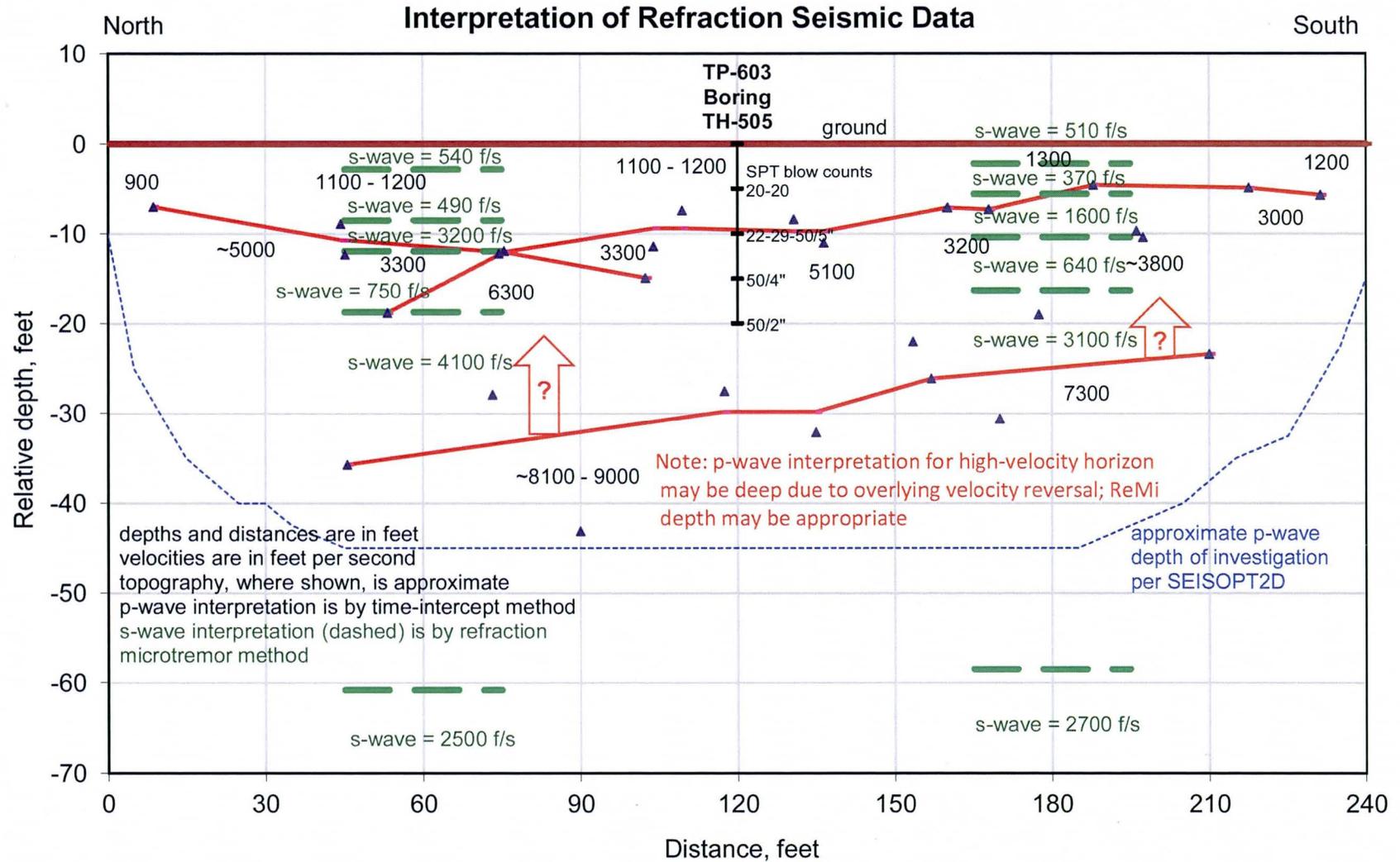
Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)

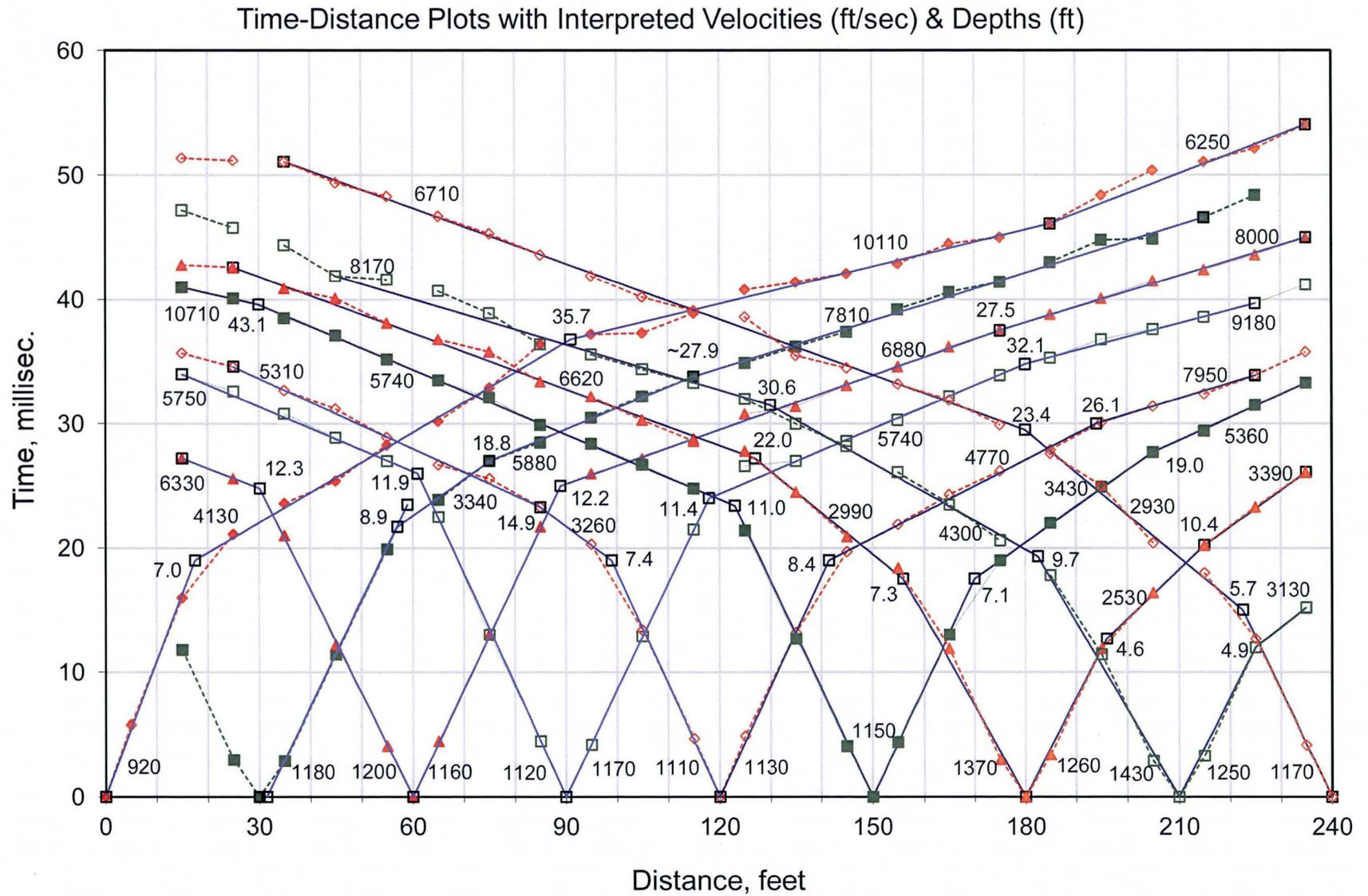




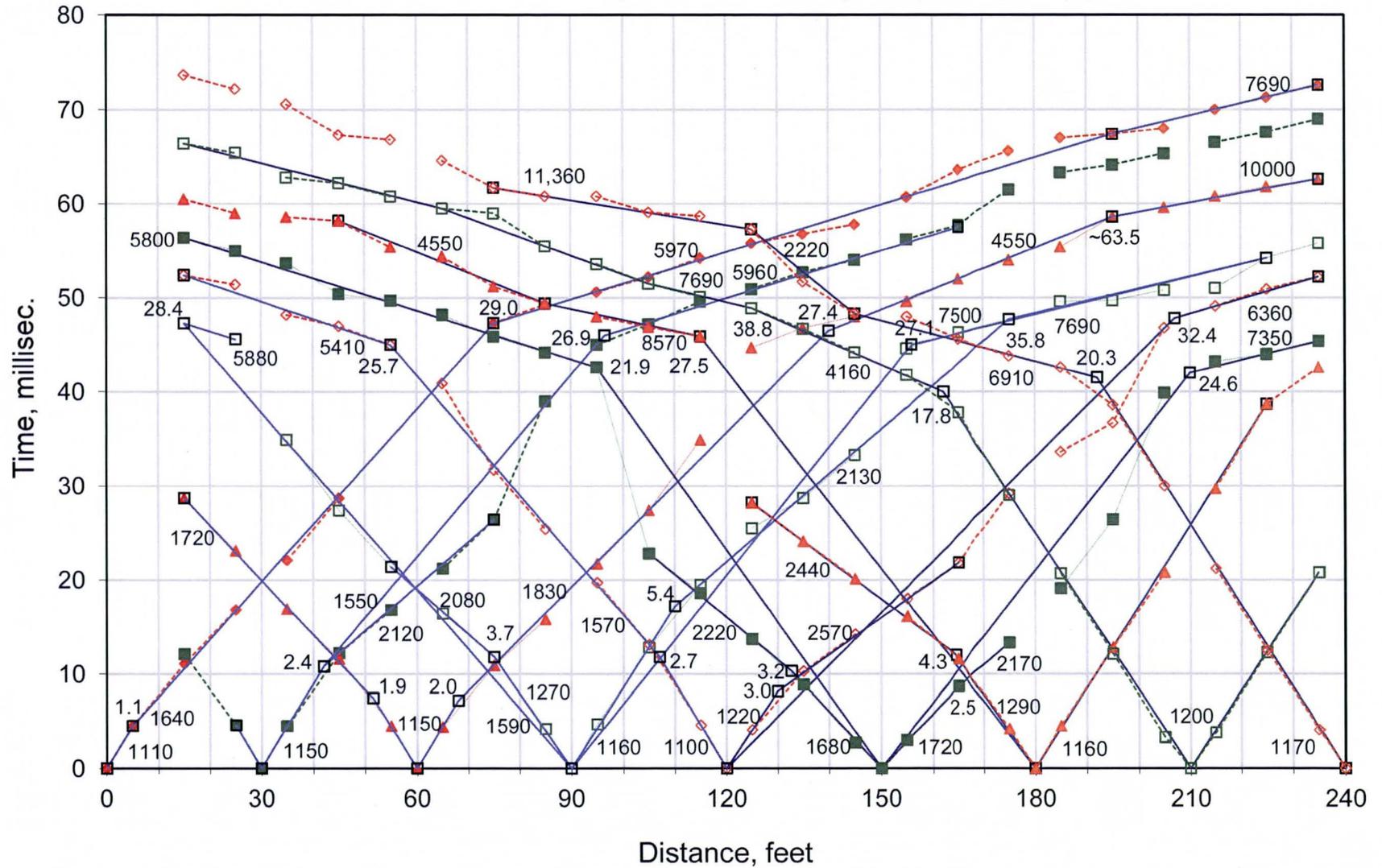
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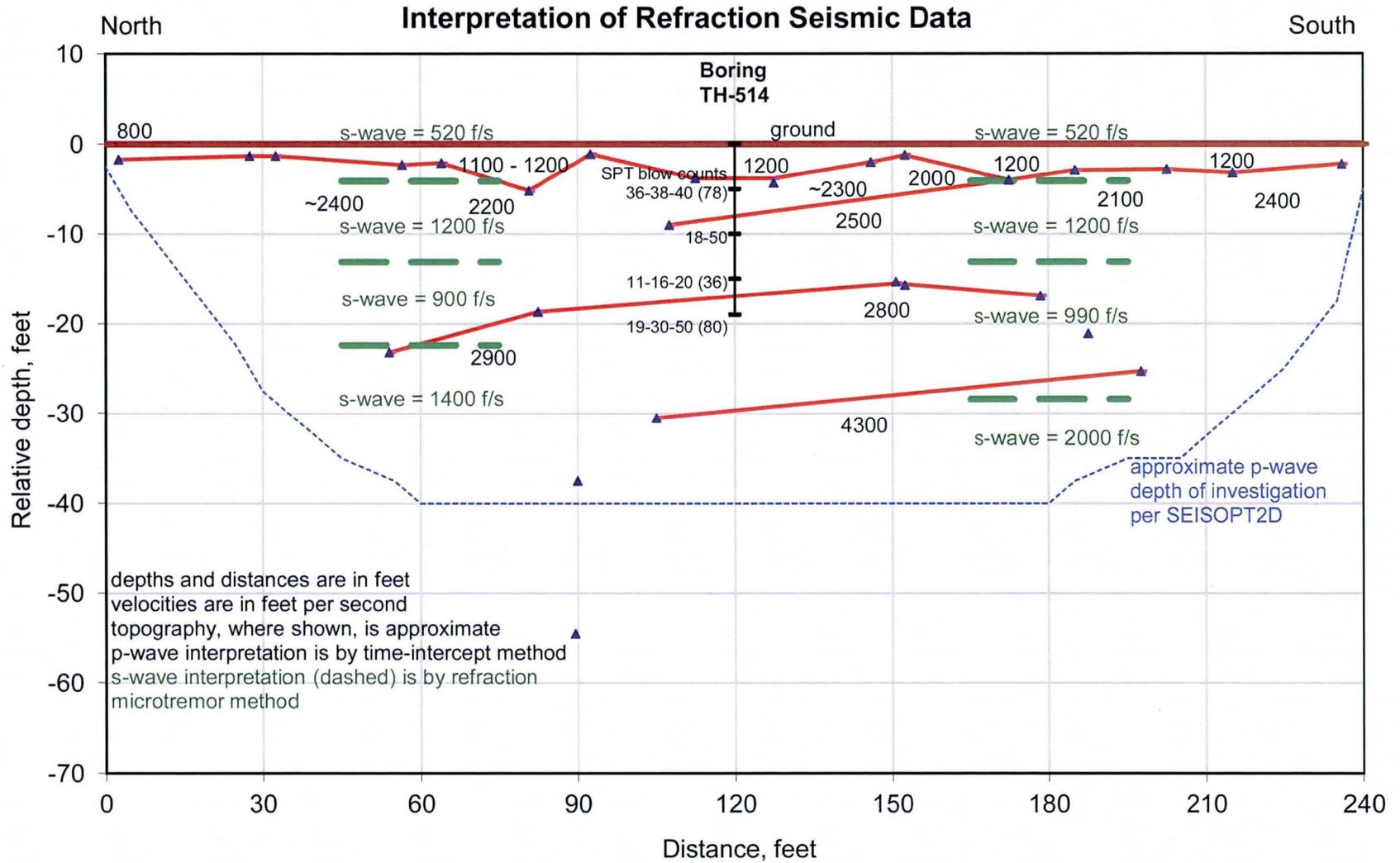


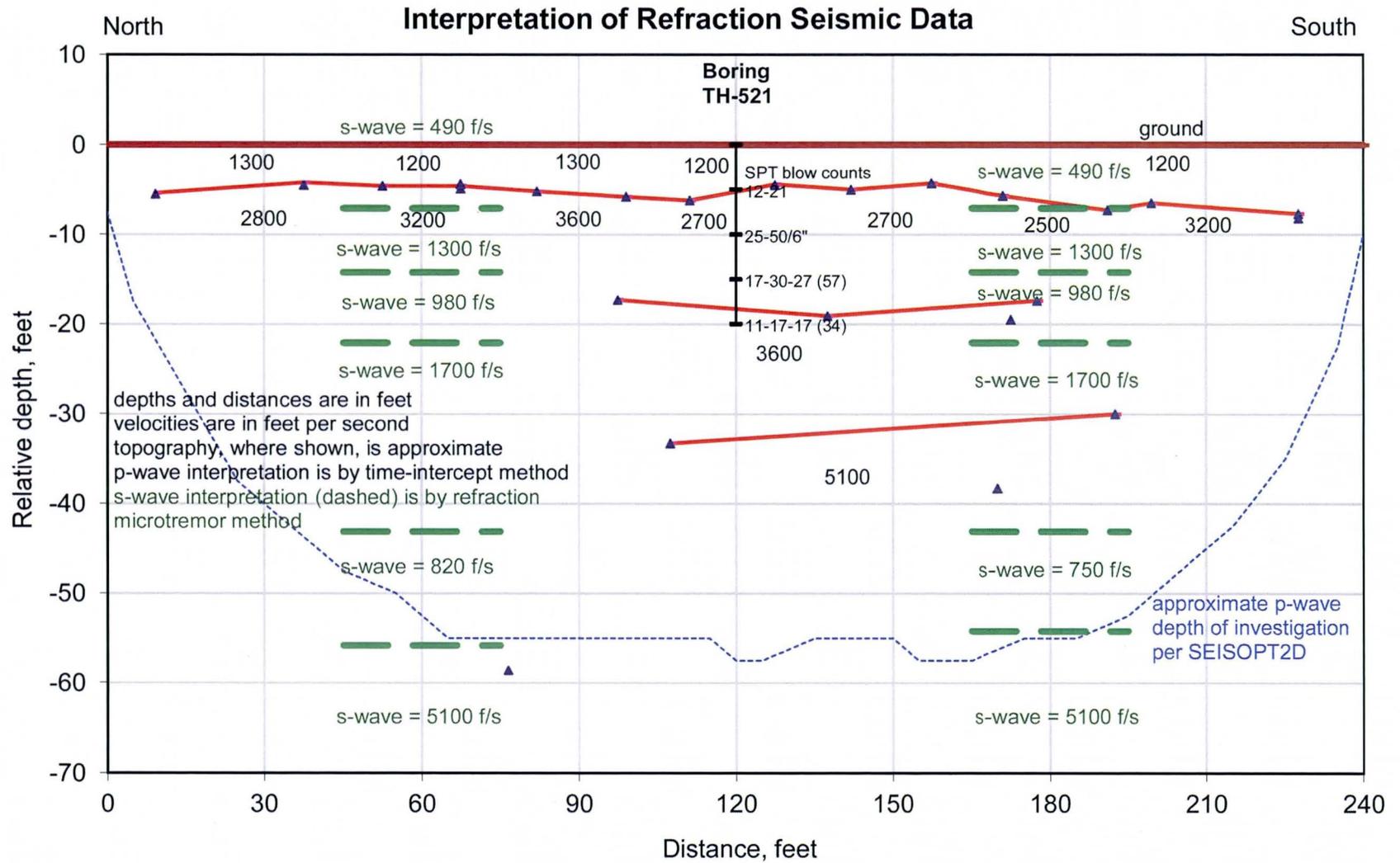




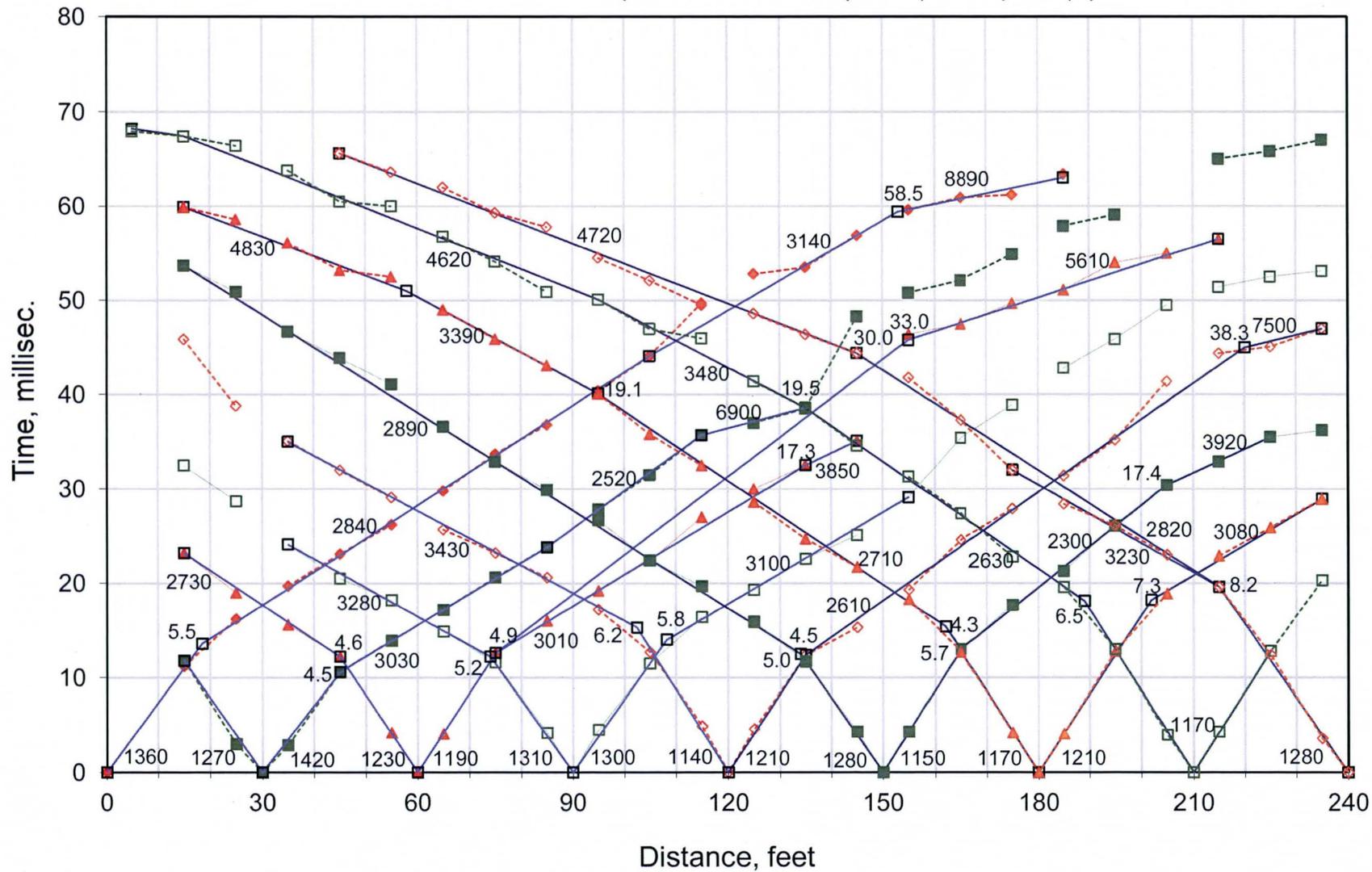
Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)

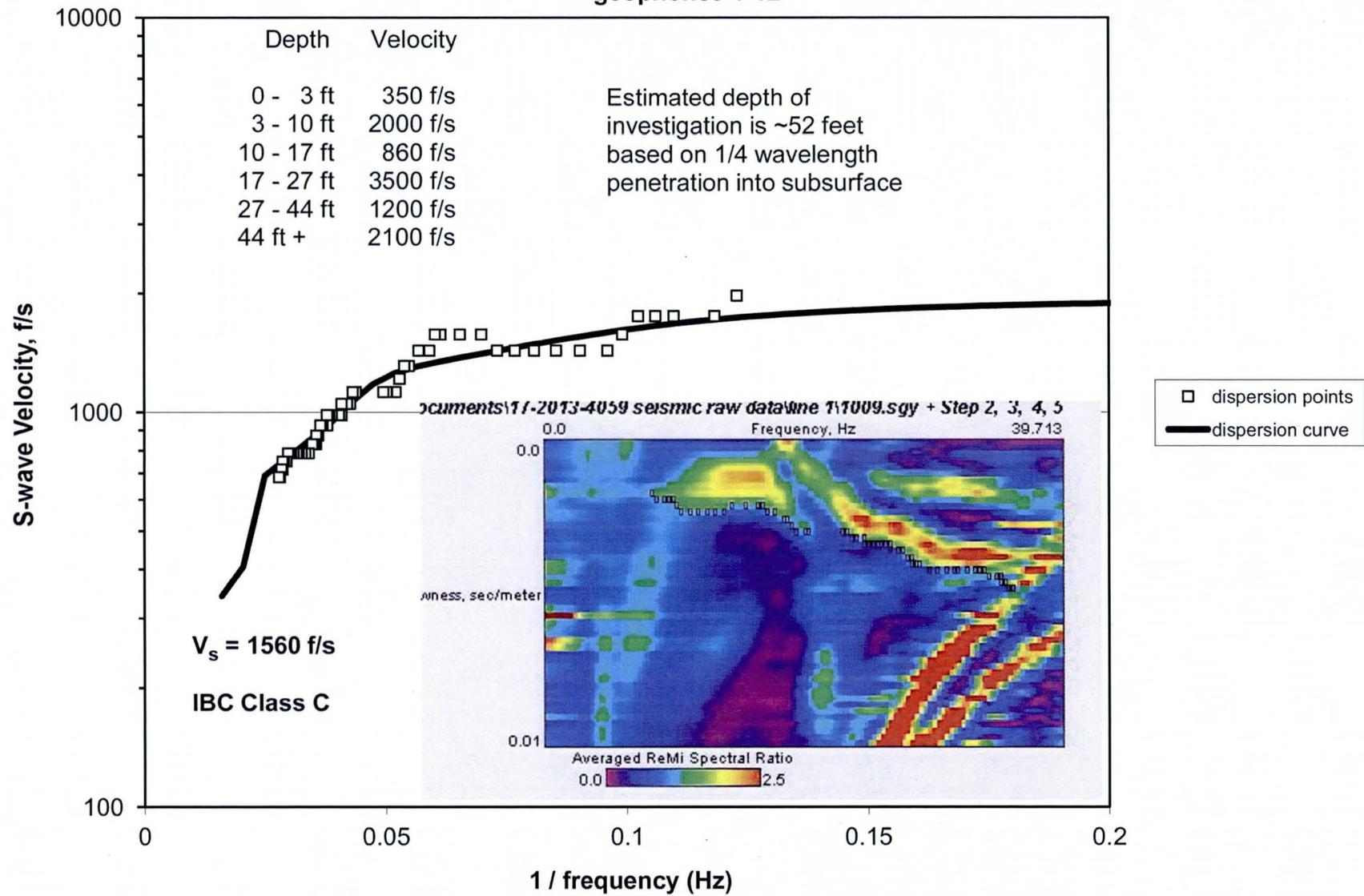


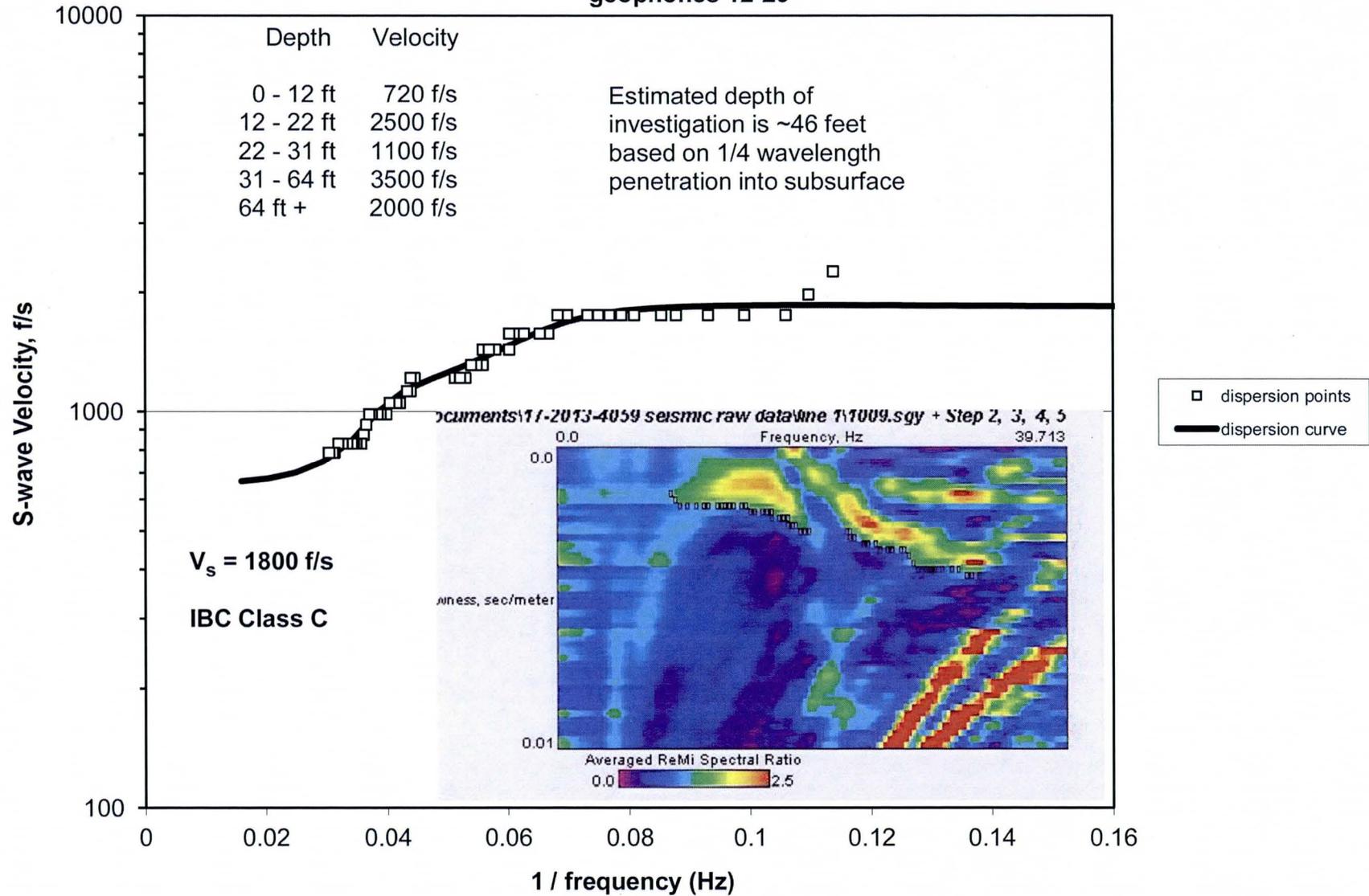


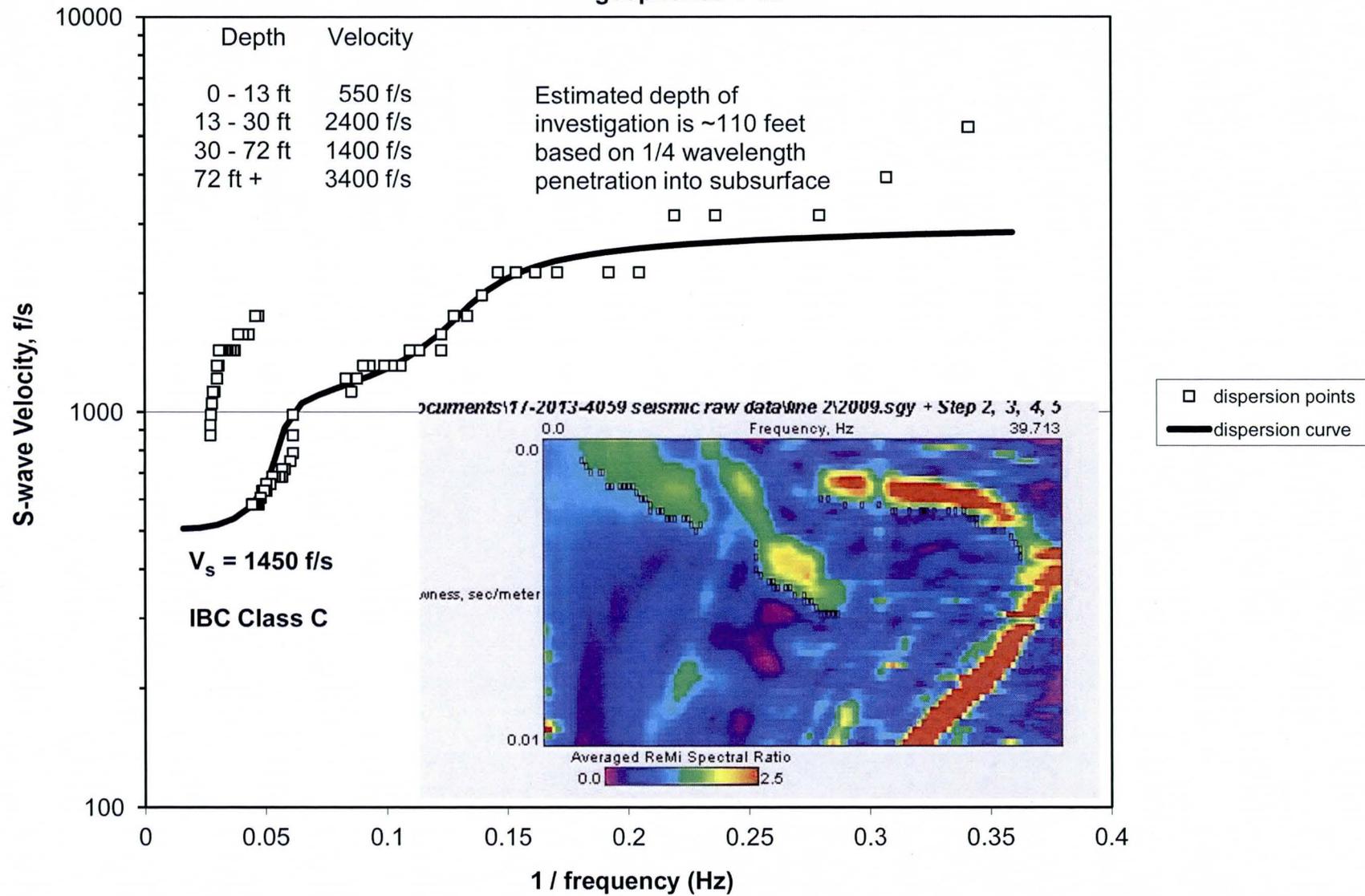


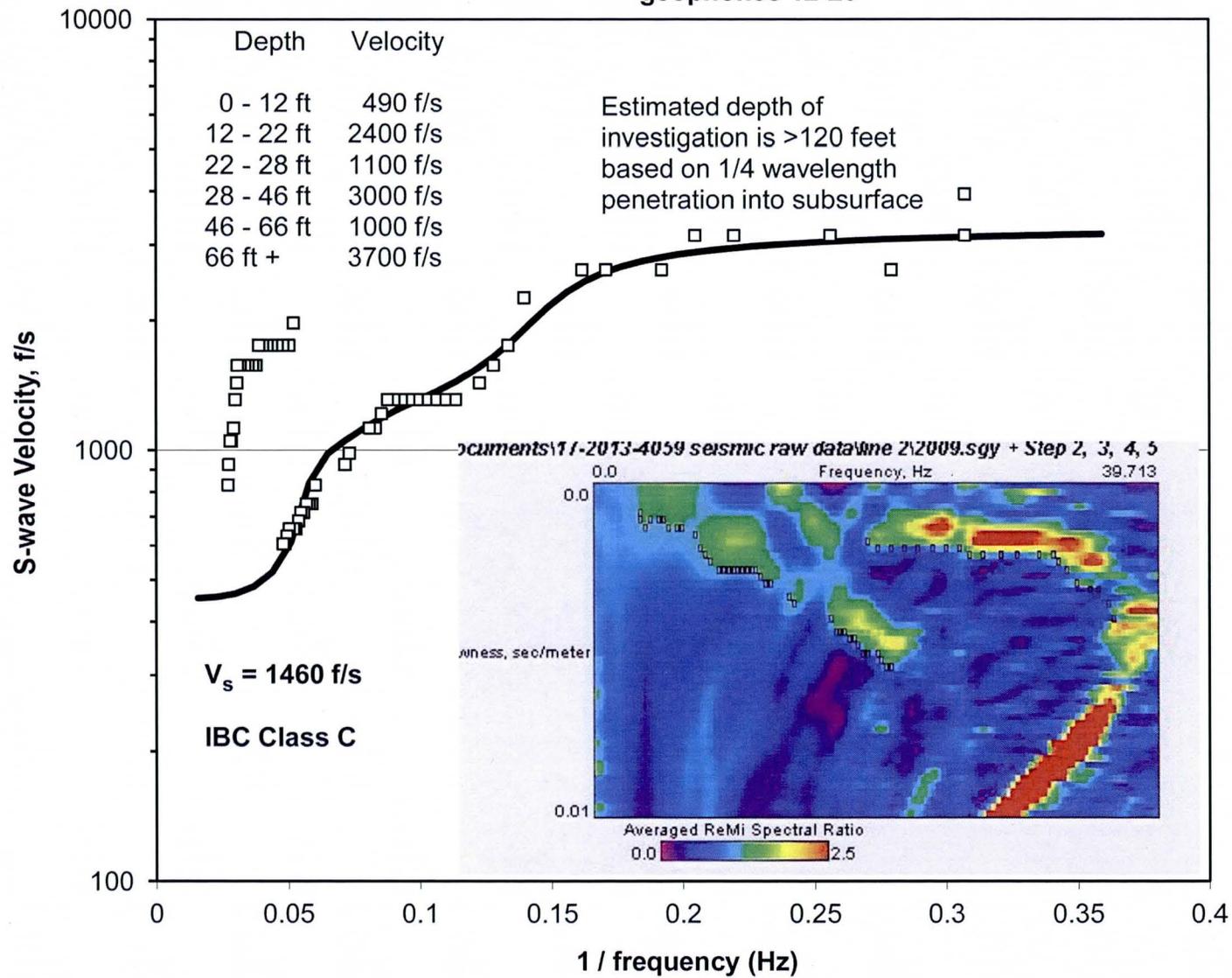
Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)

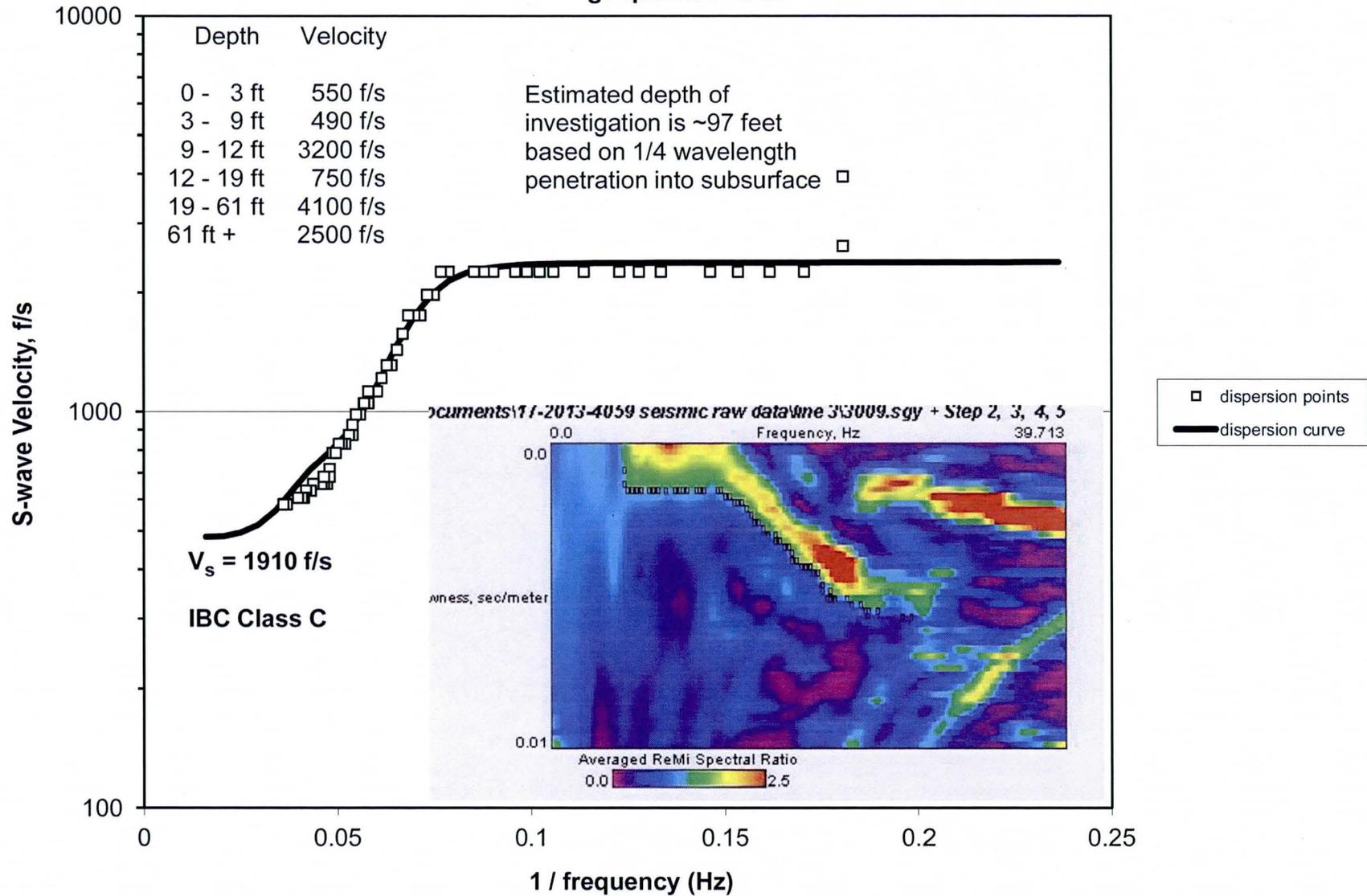


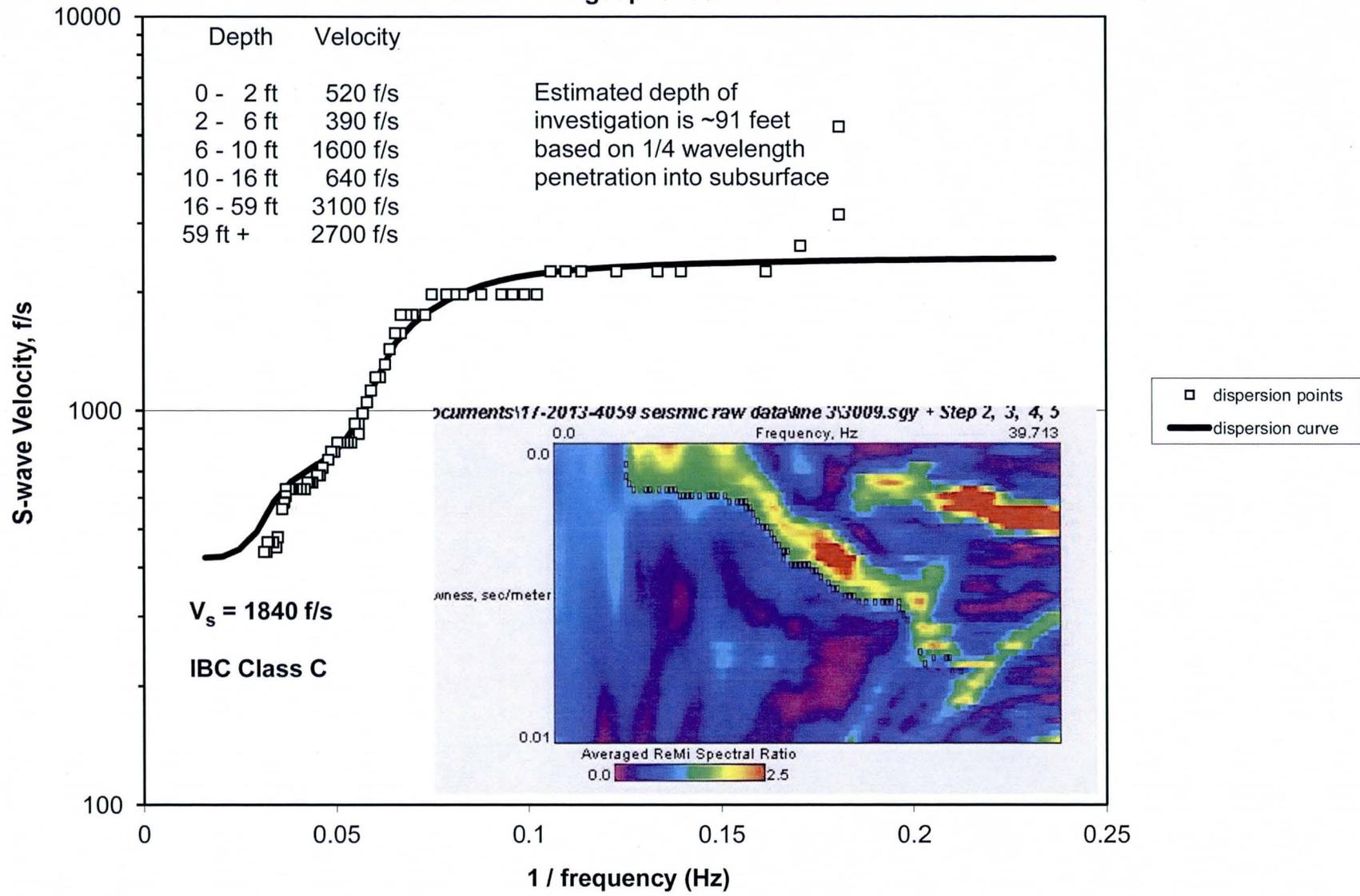


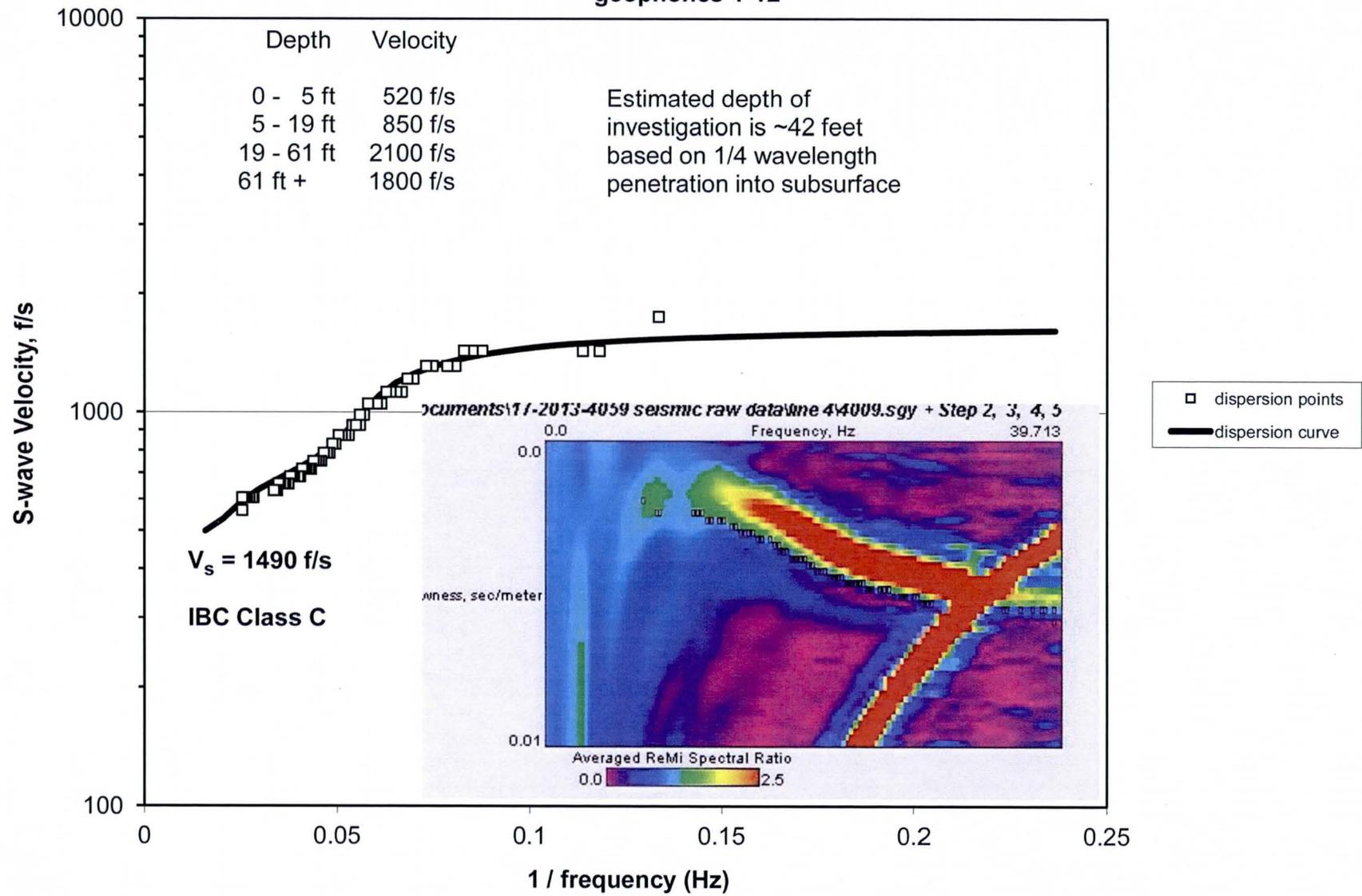


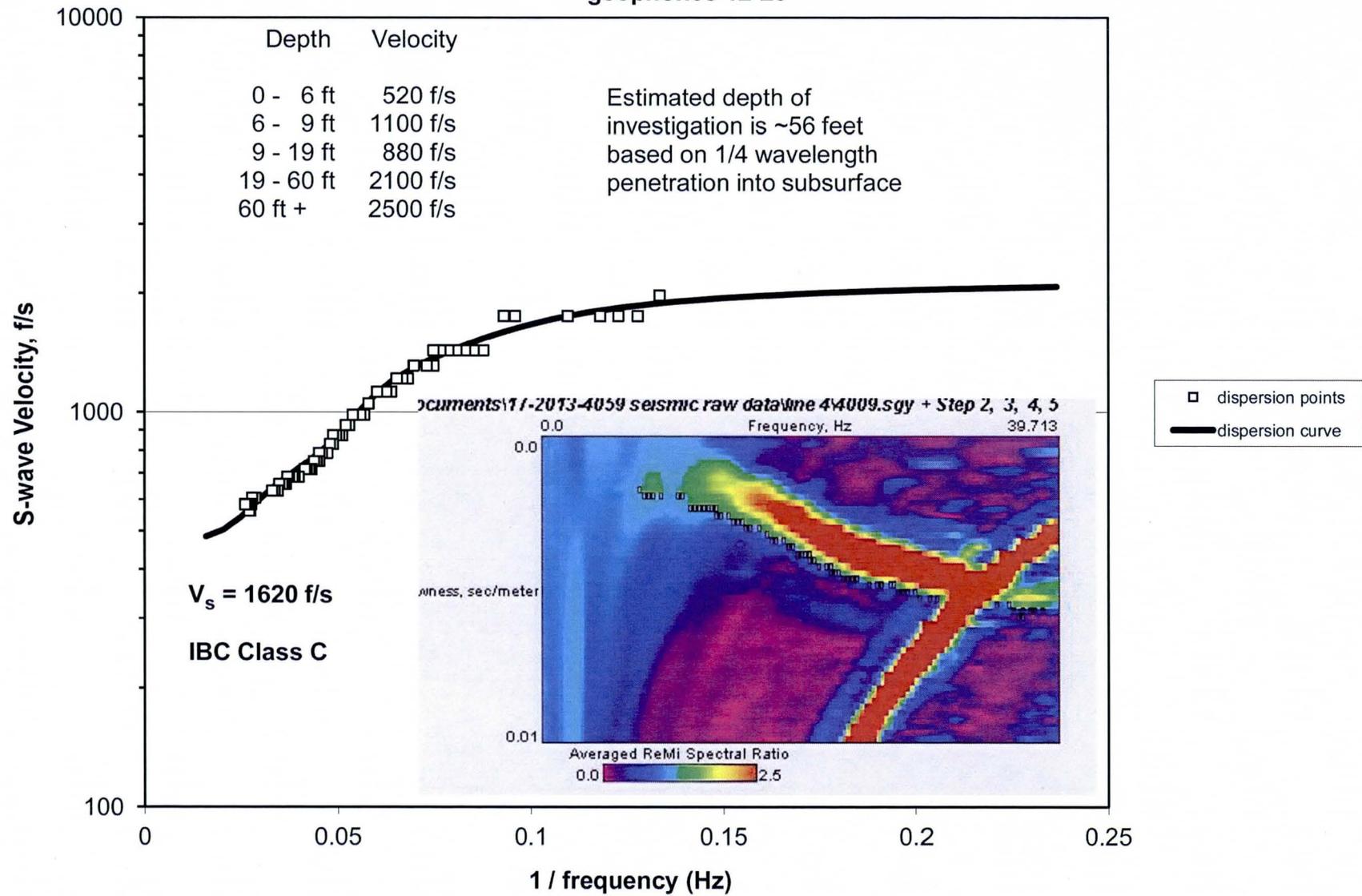


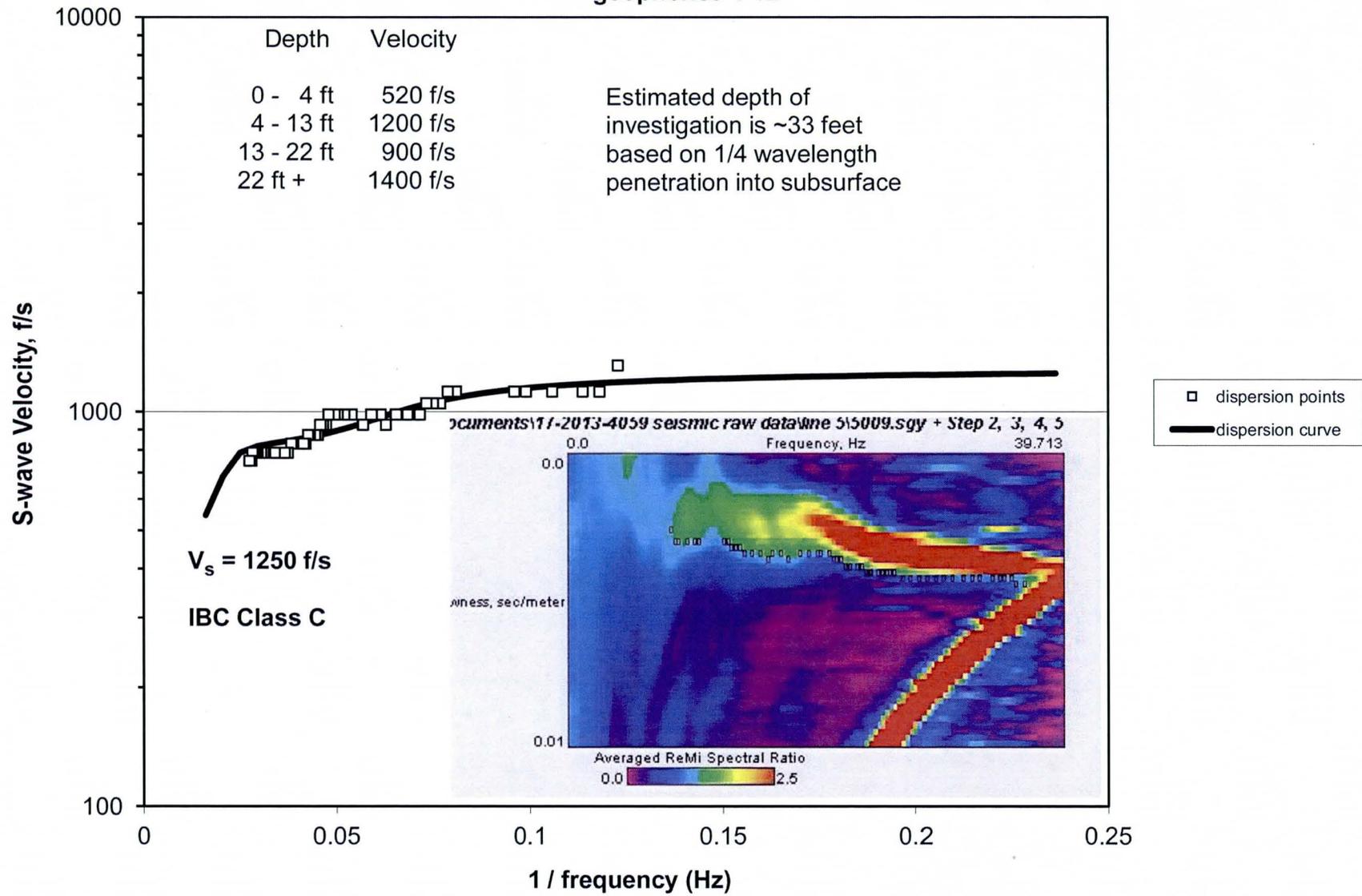


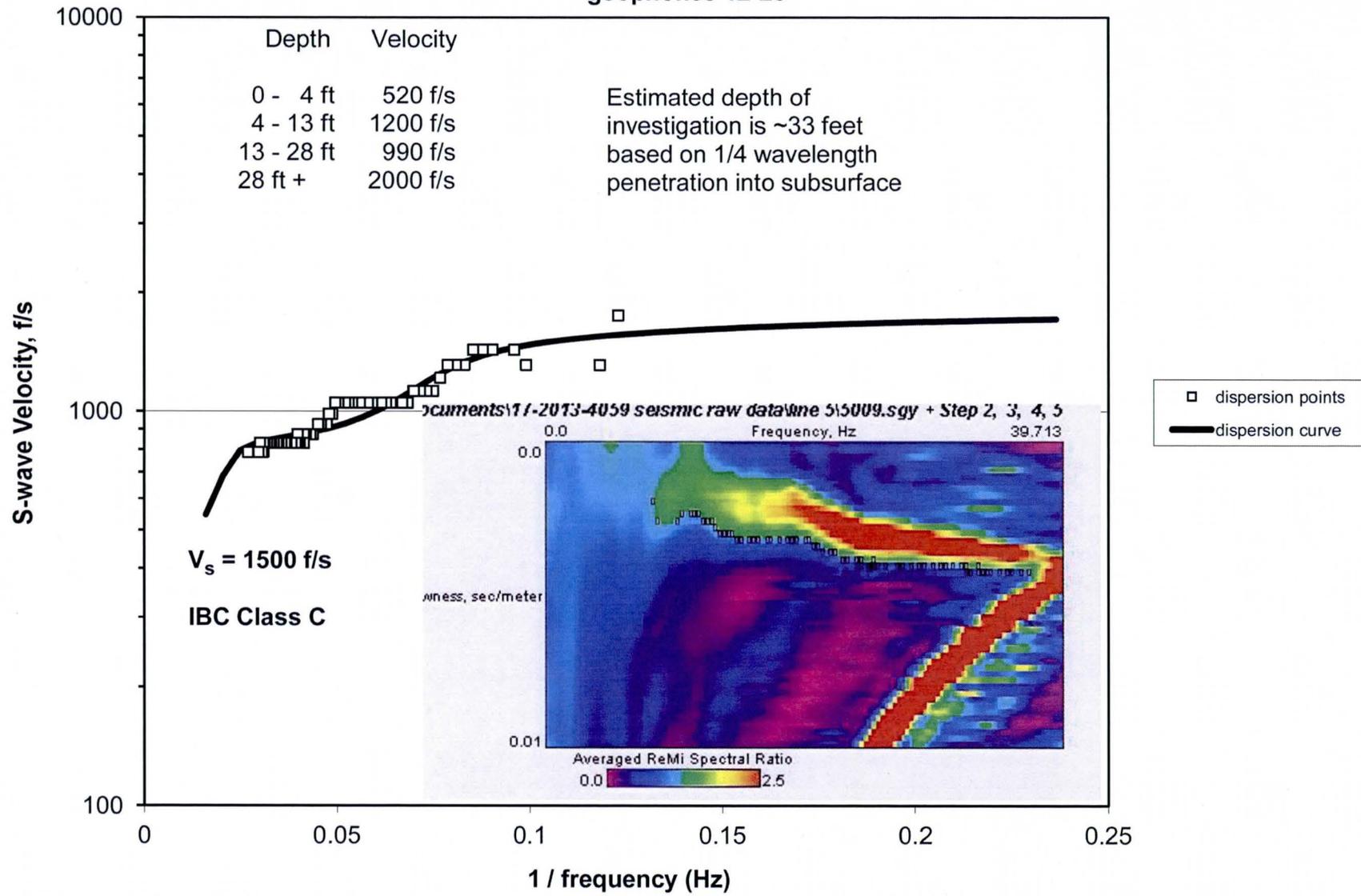


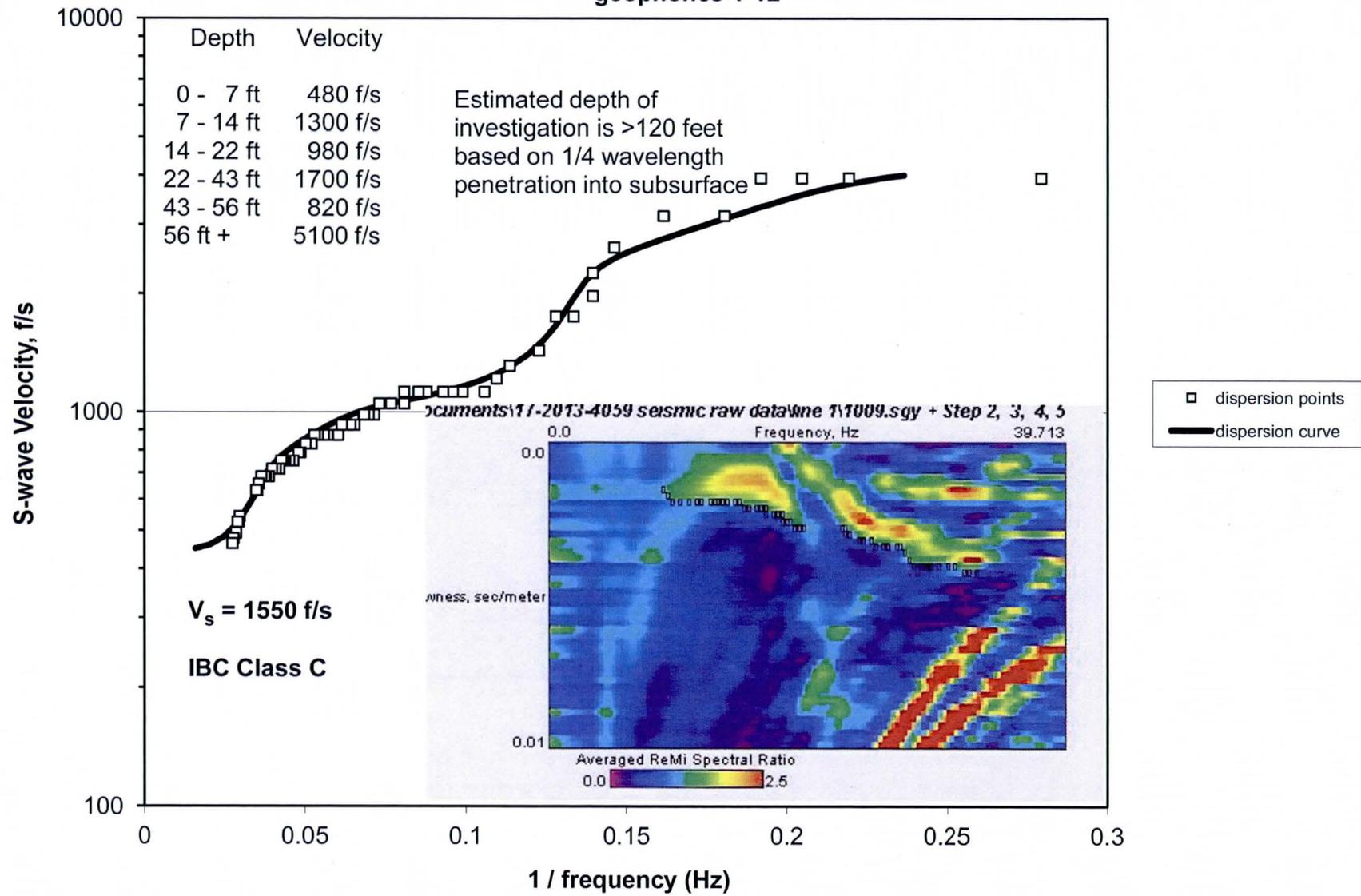


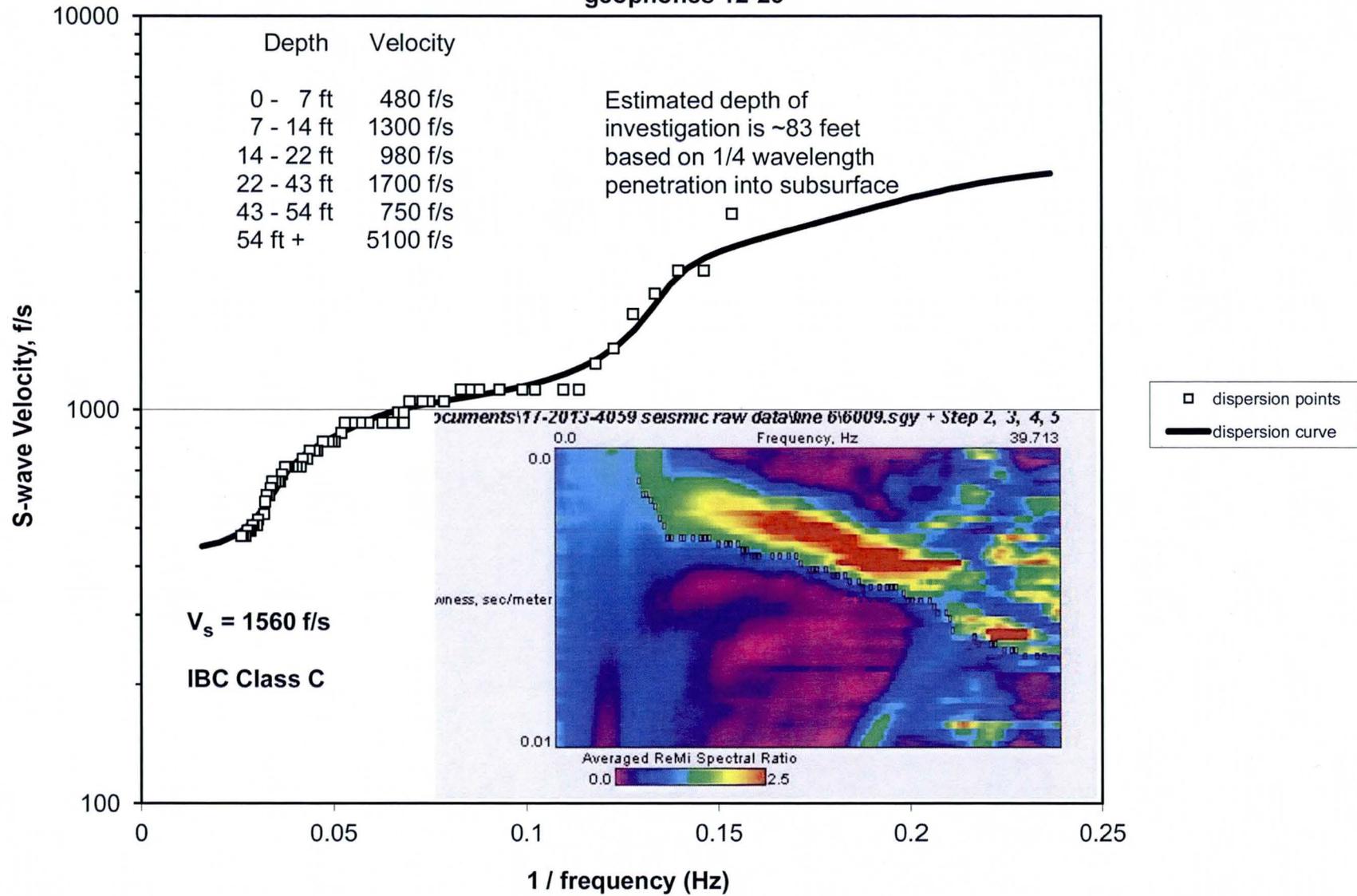














APPENDIX C
SOILS LABORATORY RESULTS

PROJECT: McMiken Dam Rehabilitation Project
LOCATION: Surprise Az
MATERIAL: Soil
SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
WORK ORDER NO: 4
DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS (ASTM D6913)
GROUP SYMBOL, USCS (ASTM D-2487)

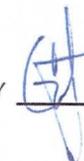
| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # |
|------------------|------|----|----|--------------|------|------|------|--------|-----|-----|--------|----|--------|------|------|--------|------|----|---------|-------|
| | | | | | Fine | | | Medium | | | Coarse | | Fine | | | Coarse | | | | |
| | | | | | #200 | #140 | #100 | #60 | #40 | #20 | #10 | #8 | #4 | 1/4" | 3/8" | 1/2" | 3/4" | 1" | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------|----|----|-----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TH-501, S-1 | SP-SM | NV | NP | 9.7 | 12 | 14 | 18 | 24 | 34 | 48 | 51 | 63 | 68 | 77 | 82 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 83 |
| TH-502, S-1 | GP-GM | NV | NP | 9.7 | 11 | 12 | 14 | 16 | 20 | 25 | 26 | 35 | 38 | 48 | 57 | 74 | 74 | 100 | 100 | 100 | 100 | 100 | 84 |
| TH-505, S-3 | CH | 58 | 31 | 57 | 65 | 71 | 77 | 83 | 91 | 98 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 87 |
| TH-506, S-3 | SM | 44 | 16 | 37 | 42 | 47 | 52 | 59 | 67 | 79 | 81 | 91 | 95 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 89 |
| TH-507, S-2 | SM | 32 | 8 | 22 | 26 | 31 | 38 | 50 | 64 | 78 | 81 | 90 | 94 | 97 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 90 |
| TH-508, S-1 | CL | 30 | 15 | 62 | 69 | 75 | 81 | 85 | 88 | 91 | 92 | 94 | 95 | 96 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 91 |
| TH-511, S-2 | SC | 44 | 20 | 25 | 30 | 35 | 40 | 47 | 56 | 69 | 72 | 89 | 95 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 95 |
| TH-513, S-1 | CL | 27 | 8 | 60 | 67 | 73 | 80 | 86 | 92 | 97 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 97 |
| TH-514, S-1 | SM | NV | NP | 18 | 21 | 25 | 30 | 36 | 44 | 58 | 62 | 80 | 86 | 92 | 95 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 98 |
| TH-516, S-2 | CL | 35 | 12 | 51 | 55 | 57 | 61 | 65 | 69 | 74 | 75 | 80 | 82 | 88 | 92 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |



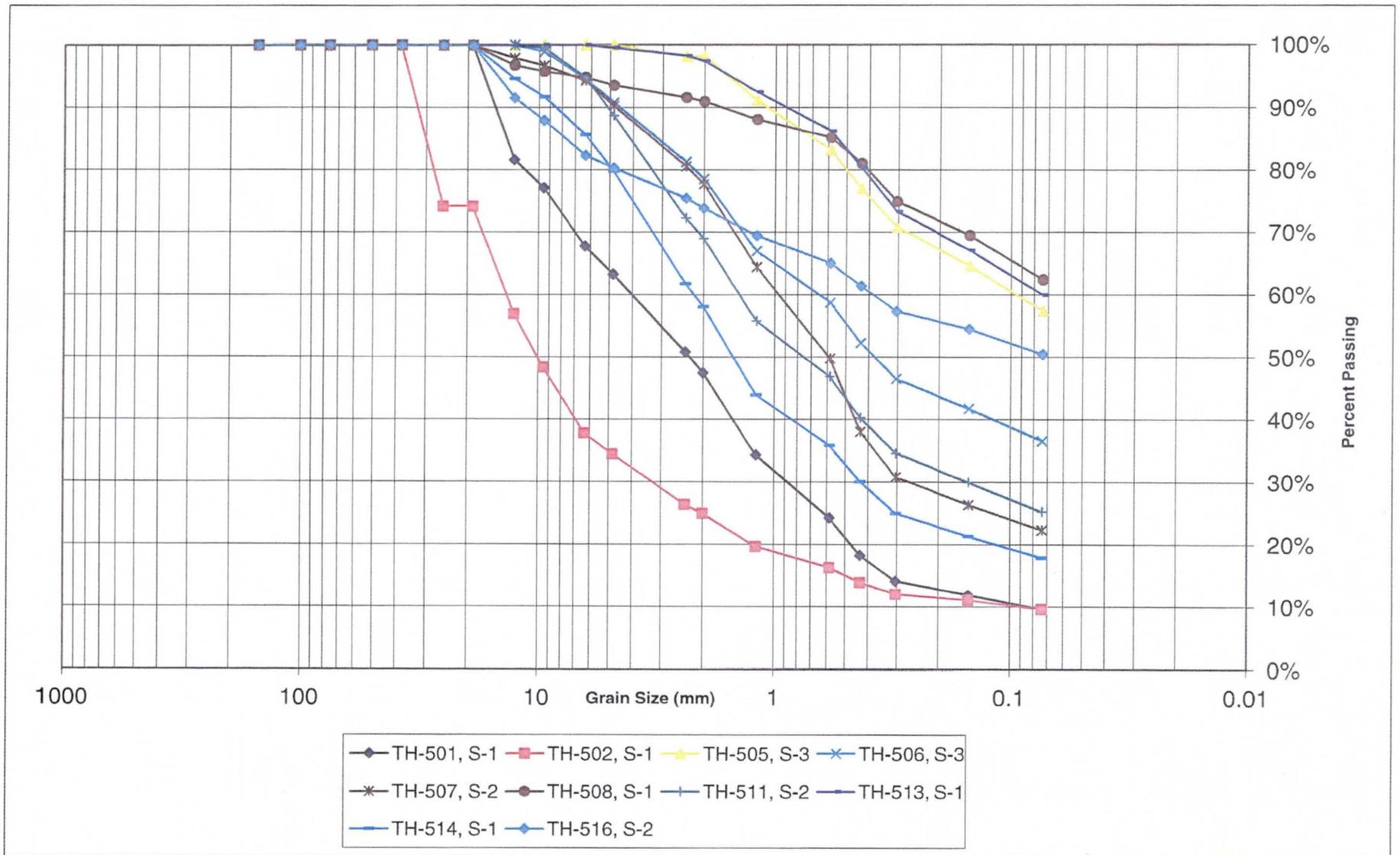
REVIEWED BY



PROJECT: McMiken Dam Rehabilitation Project
 LOCATION: Surprise Az
 SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
 WORK ORDER NO: 4
 DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS



REVIEWED BY

[Handwritten signature]

PROJECT: McMiken Dam Rehabilitation Project
 LOCATION: Surprise Az
 MATERIAL: Soil
 SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
 WORK ORDER NO: 4
 DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS (ASTM D6913)
 GROUP SYMBOL, USCS (ASTM D-2487)

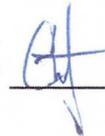
| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # |
|------------------|------|----|----|--------------|------|------|------|--------|-----|-----|--------|----|--------|------|------|--------|------|----|---------|-------|
| | | | | | Fine | | | Medium | | | Coarse | | Fine | | | Coarse | | | | |
| | | | | | #200 | #140 | #100 | #60 | #40 | #20 | #10 | #8 | #4 | 1/4" | 3/8" | 1/2" | 3/4" | 1" | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|-------|----|----|-----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TH-517, S-2 | SP-SM | NV | NP | 7.9 | 9 | 11 | 15 | 20 | 29 | 45 | 48 | 65 | 71 | 80 | 83 | 92 | 92 | 100 | 100 | 100 | 100 | 100 | 101 |
| TH-518, S-2 | SC | 31 | 12 | 23 | 27 | 30 | 35 | 42 | 52 | 64 | 67 | 77 | 82 | 89 | 91 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 102 |
| TH-519, S-1 | CL | 29 | 13 | 55 | 63 | 72 | 81 | 87 | 92 | 95 | 96 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 103 |
| TH-520, S-3 | SC | 32 | 12 | 22 | 27 | 33 | 45 | 57 | 66 | 77 | 80 | 90 | 93 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 104 |
| TH-521, S-2 | CL | 40 | 20 | 64 | 69 | 73 | 77 | 81 | 86 | 91 | 93 | 97 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 105 |
| TH-521, S-3 | SM | NV | NP | 12 | 15 | 17 | 22 | 28 | 37 | 51 | 54 | 67 | 74 | 84 | 92 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 106 |
| TH-523, S-3 | SC | 39 | 19 | 14 | 17 | 20 | 26 | 34 | 43 | 56 | 59 | 73 | 79 | 88 | 92 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 108 |
| TP-601, 3.5'-5.0' | SP-SC | 39 | 17 | 8.0 | 10 | 12 | 15 | 21 | 31 | 45 | 48 | 59 | 62 | 69 | 73 | 80 | 84 | 87 | 87 | 91 | 93 | 100 | 109 |
| TP-602, 0.0'-5.0' | SM | NV | NP | 39 | 48 | 55 | 63 | 68 | 73 | 80 | 81 | 86 | 89 | 94 | 96 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 110 |
| TP-603, 3.0'-5.0' | CL | 38 | 17 | 70 | 77 | 81 | 86 | 90 | 94 | 98 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 111 |



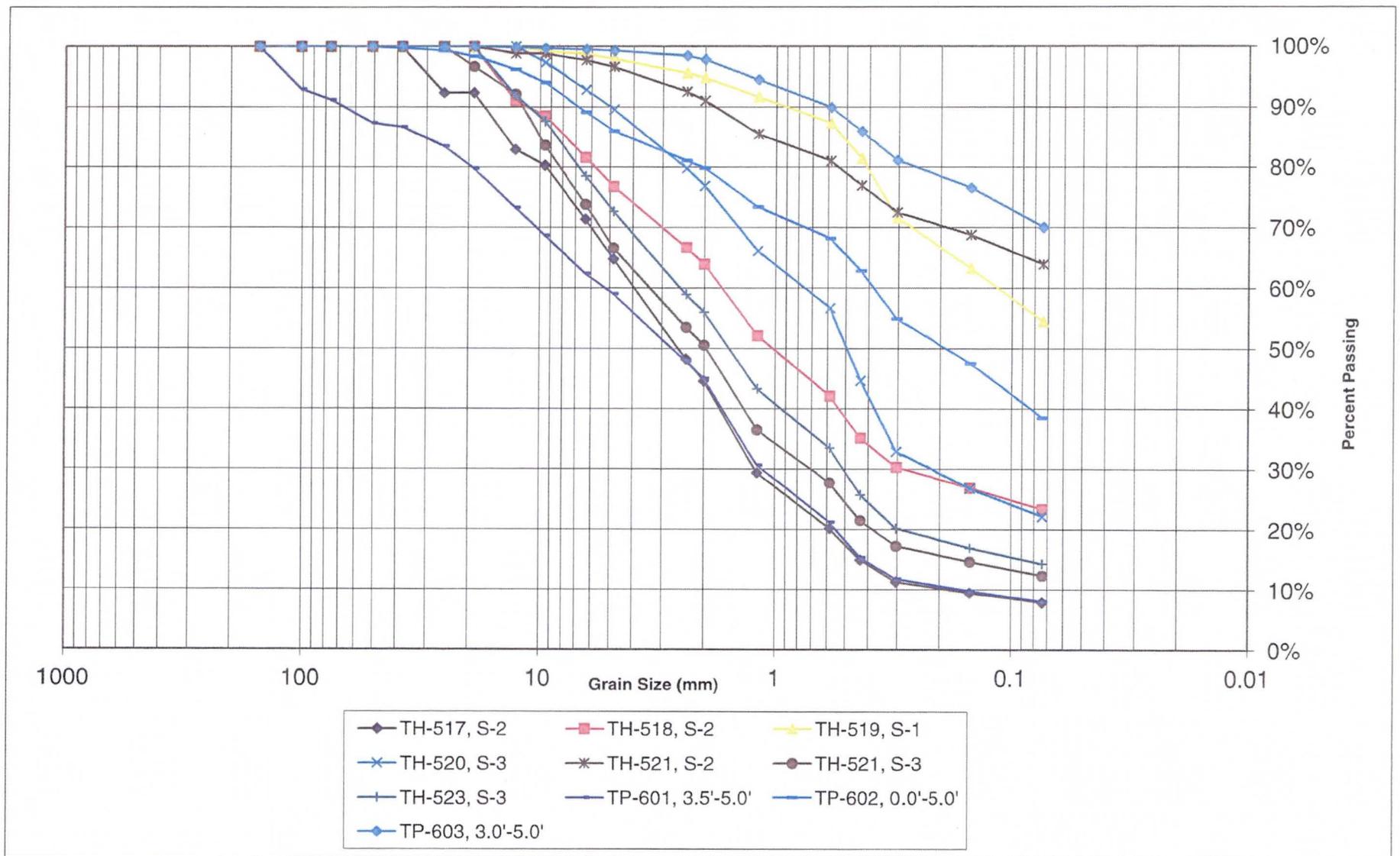
REVIEWED BY



PROJECT: McMiken Dam Rehabilitation Project
LOCATION: Surprise Az
SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
WORK ORDER NO: 4
DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS

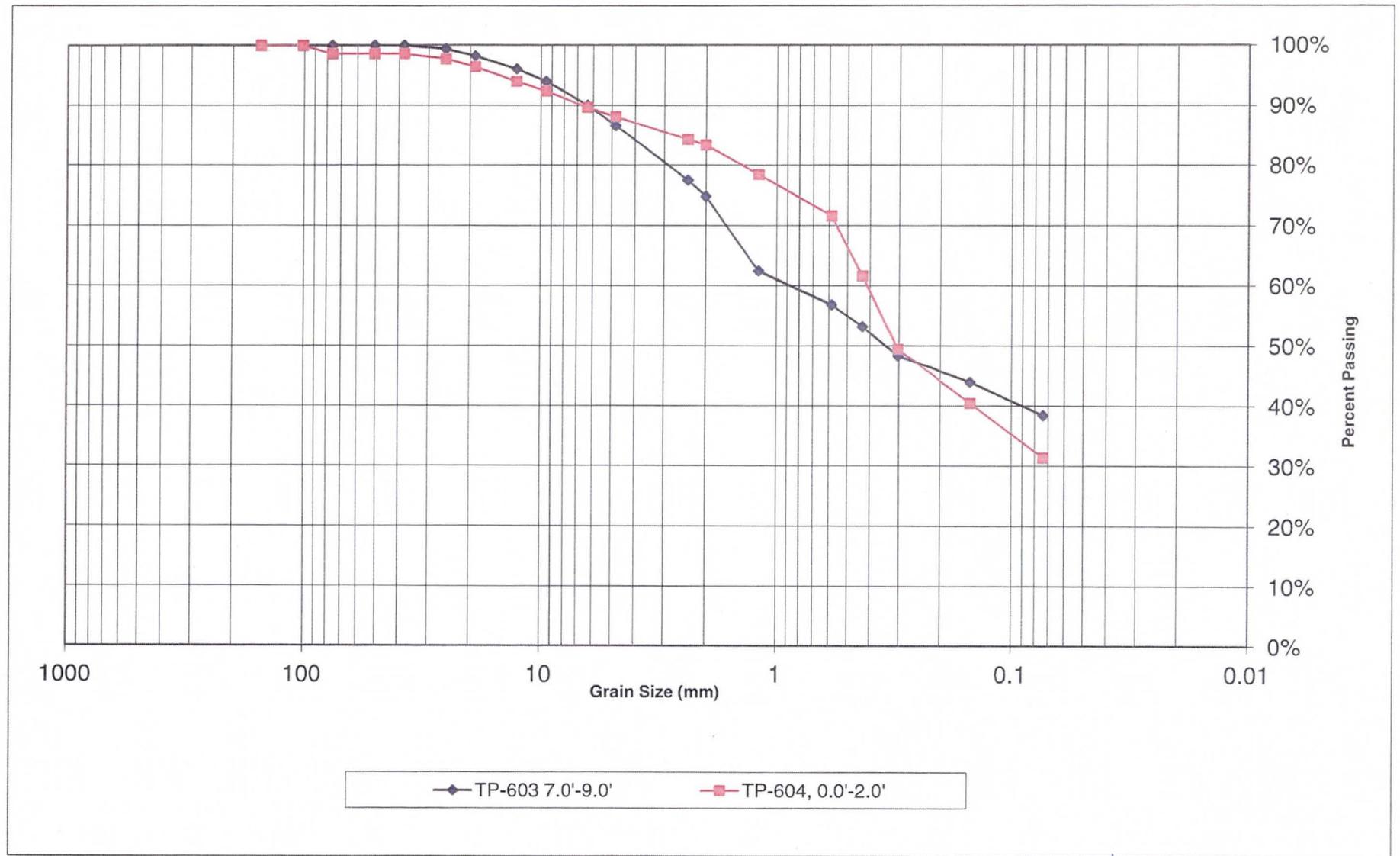


REVIEWED BY 

PROJECT: McMiken Dam Rehabilitation Project
LOCATION: Surprise Az
SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
WORK ORDER NO: 4
DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS



REVIEWED BY



PROJECT: McMicken Dam Rehabilitation Project
LOCATION: Surprise, Az
MATERIAL: Native Soil
SAMPLE SOURCE: See Below

JOB NO: 17-2013-4059
WORK ORDER NO: 4
LAB NO: See Below
DATE ASSIGNED: 5/13/14

MOISTURE CONTENT OF SOIL (ASTM D2216)

| LAB # | BORING & DEPTH | WET WT. (gram) | DRY WT. (gram) | MOISTURE CONTENT |
|-------|-------------------|-------------------|-------------------|---------------------|
| 83 | TH-501, S-1 | 270.5 | 268.2 | 0.9% |
| 84 | TH-502, S-1 | 210.2 | 209.5 | 0.3% |
| 86 | TH-504, S-2 | 349.6 | 335.5 | 4.2% |
| 87 | TH-505, S-3 | 123.1 | 116.1 | 6.0% |
| 88 | TH-506, S-1 | 279.5 | 267.4 | 4.5% |
| 89 | TH-506, S-3 | 309.9 | 296.1 | 4.7% |
| 90 | TH-507, S-2 | 233.9 | 226.8 | 3.1% |
| 91 | TH-508, S-1 | 295.9 | 285.3 | 3.7% |
| 93 | TH-509, S-2 | 254.3 | 244.7 | 3.9% |
| 94 | TH-510, S-3 | 435.1 | 426.7 | 2.0% |
| 95 | TH-511, S-2 | 209.2 | 195.8 | 6.8% |
| 96 | TH-512, S-2 | 213.3 | 206.7 | 3.2% |
| 97 | TH-513, S-1 | 247.1 | 236.1 | 4.7% |
| 98 | TH-514, S-1 | 407.7 | 402.2 | 1.4% |
| 99 | TH-515, S-1 | 400.9 | 369.5 | 8.5% |
| 100 | TH-516, S-2 | 229.1 | 220.5 | 3.9% |
| 101 | TH-517, S-2 | 378.6 | 372.7 | 1.6% |
| 102 | TH-518, S-2 | 273.6 | 266.7 | 2.6% |
| 103 | TH-519, S-1 | 256.2 | 240.9 | 6.4% |
| 104 | TH-520, S-3 | 291.7 | 282.8 | 3.1% |
| 105 | TH-521, S-2 | 286.2 | 274.1 | 4.4% |
| 106 | TH-521, S-3 | 307.8 | 303.3 | 1.5% |
| 108 | TH-523, S-3 | 306.9 | 299.0 | 2.6% |
| 109 | TP-601, 3.5'-5.0' | 1230.7 | 1190.0 | 3.4% |
| 110 | TP-602, 0.0'-5.0' | 1463.1 | 1396.9 | 4.7% |
| 111 | TP-603, 3.0'-5.0' | 890.8 | 831.5 | 7.1% |
| 112 | TP-603, 7.0'-9.0' | 1243.7 | 1198.3 | 3.8% |
| 114 | TP-604, 0.0'-2.0' | 1325.3 | 1297.5 | 2.1% |



REVIEWED BY



PROJECT: McMiken Dam Rehabilitation Project
 LOCATION: Surprise Az
 MATERIAL: Soil
 SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
 WORK ORDER NO: 4
 DATE ASSIGNED: 5/13/14

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # | | | |
|------------------|------|----|----|--------------|------|------|-----|-----|-----|-----|-----|----|--------|------|------|------|--------|--------|---------|-------|----|----|--|
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | Fine | | | Coarse | | | | | | |
| | | | | | | | | | | | | | 1/4" | 3/8" | 1/2" | 3/4" | 1" | 1 1/4" | 1 1/2" | 2" | 3" | 6" | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| TH-504, S-2 | SC | 40 | 16 | 39 | 53 | 64 | 69 | 73 | 83 | 87 | 89 | 95 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 86 |
| TH-506, S-1 | SC | 40 | 15 | 32 | 45 | 54 | 59 | 63 | 74 | 82 | 85 | 95 | 96 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 88 |
| TH-509, S-2 | SC | 48 | 22 | 36 | 48 | 58 | 62 | 67 | 76 | 82 | 85 | 94 | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 93 |
| TH-510, S-3 | SM | 27 | 3 | 19 | 26 | 34 | 39 | 43 | 53 | 62 | 65 | 79 | 83 | 93 | 96 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 94 |
| TH-512, S-2 | CL | 36 | 12 | 59 | 72 | 82 | 86 | 90 | 95 | 97 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 96 |
| TH-515, S-1 | SC | 44 | 26 | 34 | 48 | 66 | 72 | 77 | 84 | 87 | 88 | 91 | 93 | 95 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 99 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

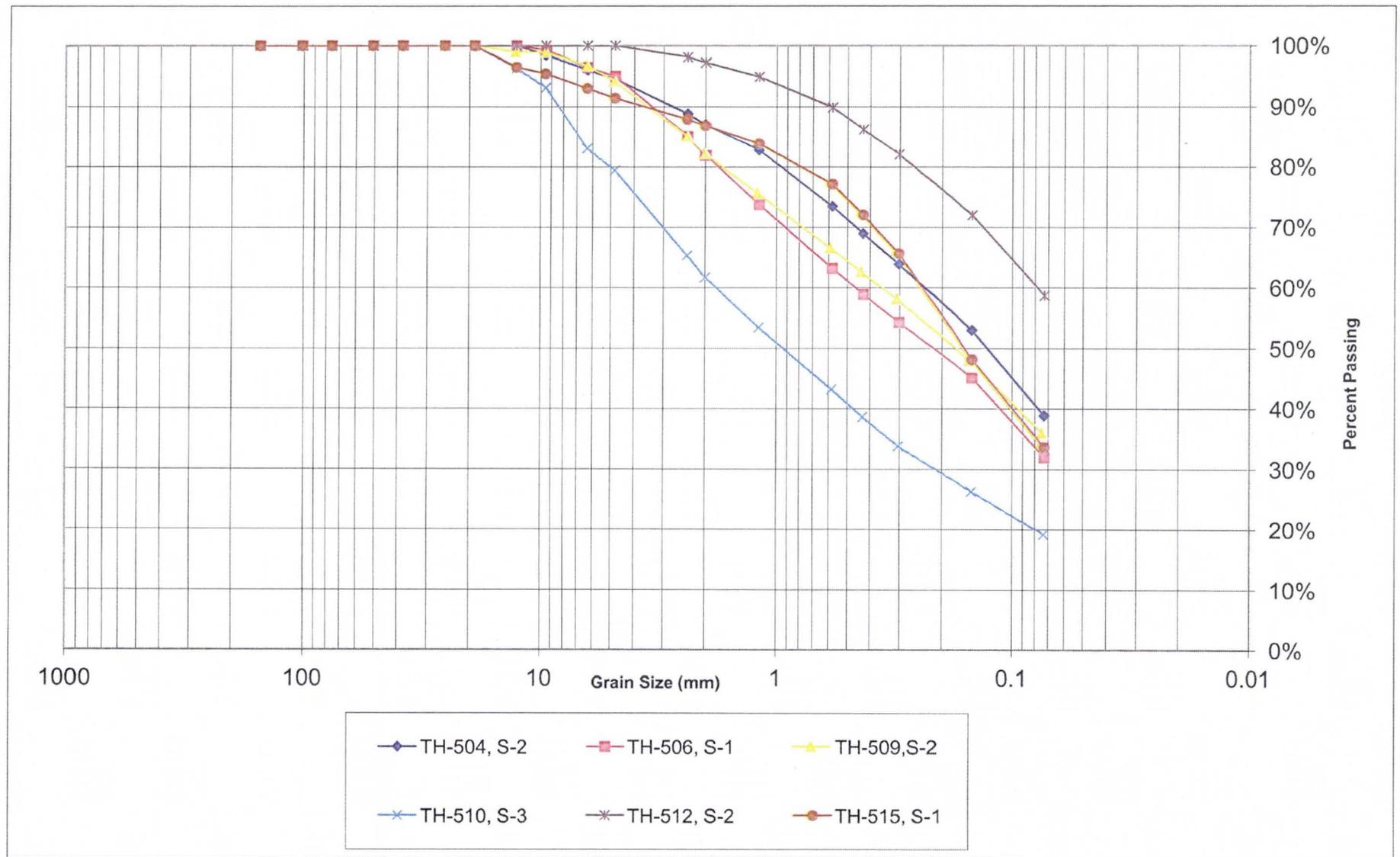


REVIEWED BY 

PROJECT: McMiken Dam Rehabilitation Project
LOCATION: Surprise Az
SAMPLE SOURCE: SEE BELOW

JOB NO: 17-2013-4059
WORK ORDER NO: 4
DATE ASSIGNED: 5/13/14

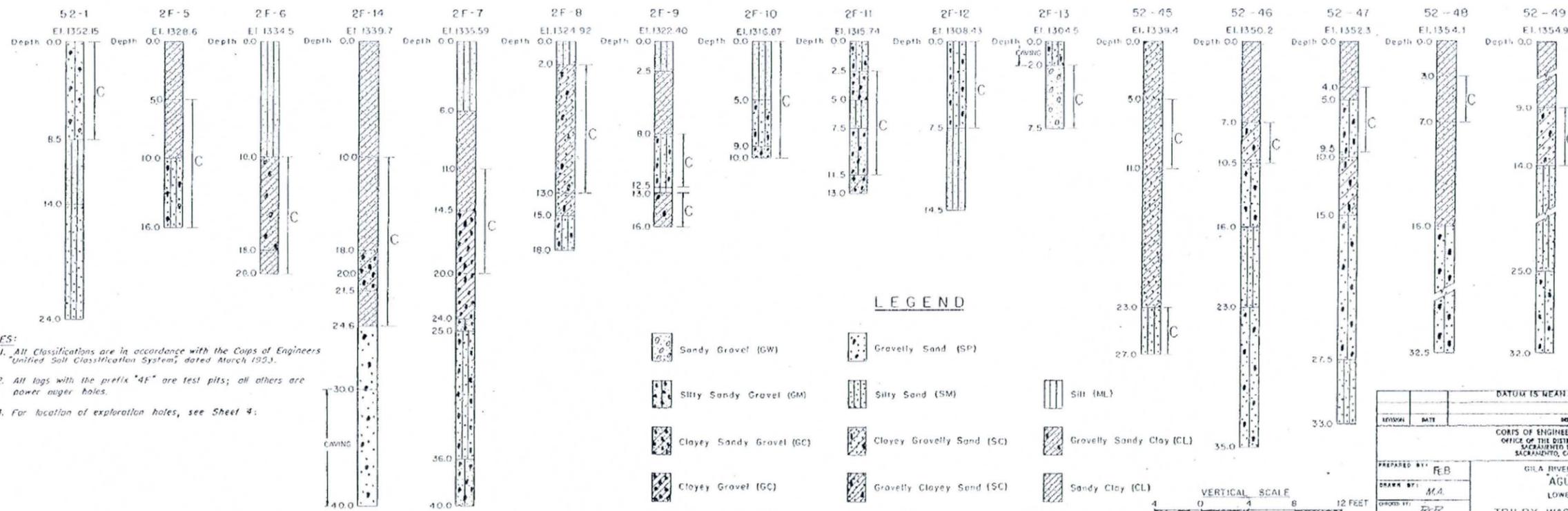
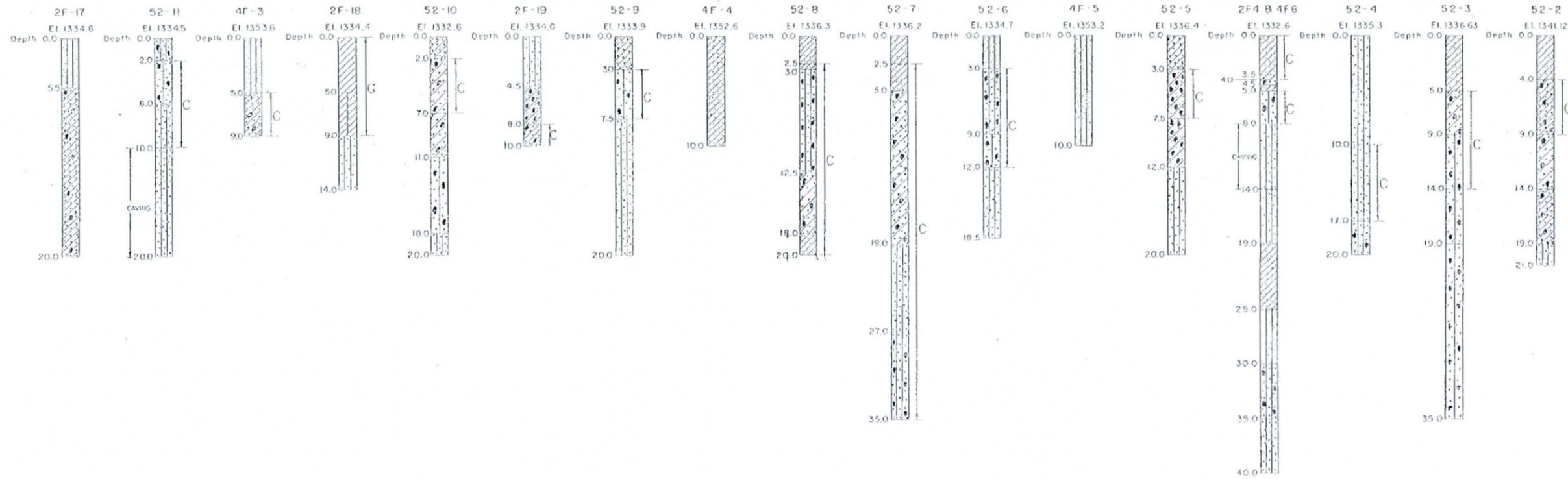
MECHANICAL SIEVE ANALYSIS



REVIEWED BY *[Signature]*



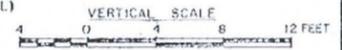
APPENDIX D
HISTORIC GEOTECHNICAL DATA



NOTES:
 1. All Classifications are in accordance with the Corps of Engineers Unified Soil Classification System, dated March 1953.
 2. All logs with the prefix "4F" are test pits; all others are power auger holes.
 3. For location of exploration holes, see Sheet 4:

LEGEND

| | | | | | |
|--|--------------------------|--|---------------------------|--|--------------------------|
| | Sandy Gravel (GW) | | Gravelly Sand (SP) | | Silt (ML) |
| | Silty Sandy Gravel (GM) | | Silty Sand (SM) | | Gravelly Sandy Clay (CL) |
| | Clayey Sandy Gravel (GC) | | Clayey Gravelly Sand (SC) | | Sandy Clay (CL) |
| | Clayey Gravel (GC) | | Gravelly Clayey Sand (SC) | | Silty Clay (CL) |
| | Silty Gravelly Sand (SM) | | Clayey Sand (SC) | | Lean Clay (CL) |
| | Gravelly Silty Sand (SM) | | Silty Silt (ML) | | |



"C" indicates the presence of caliche which is found in varying amounts and degrees of cementation.

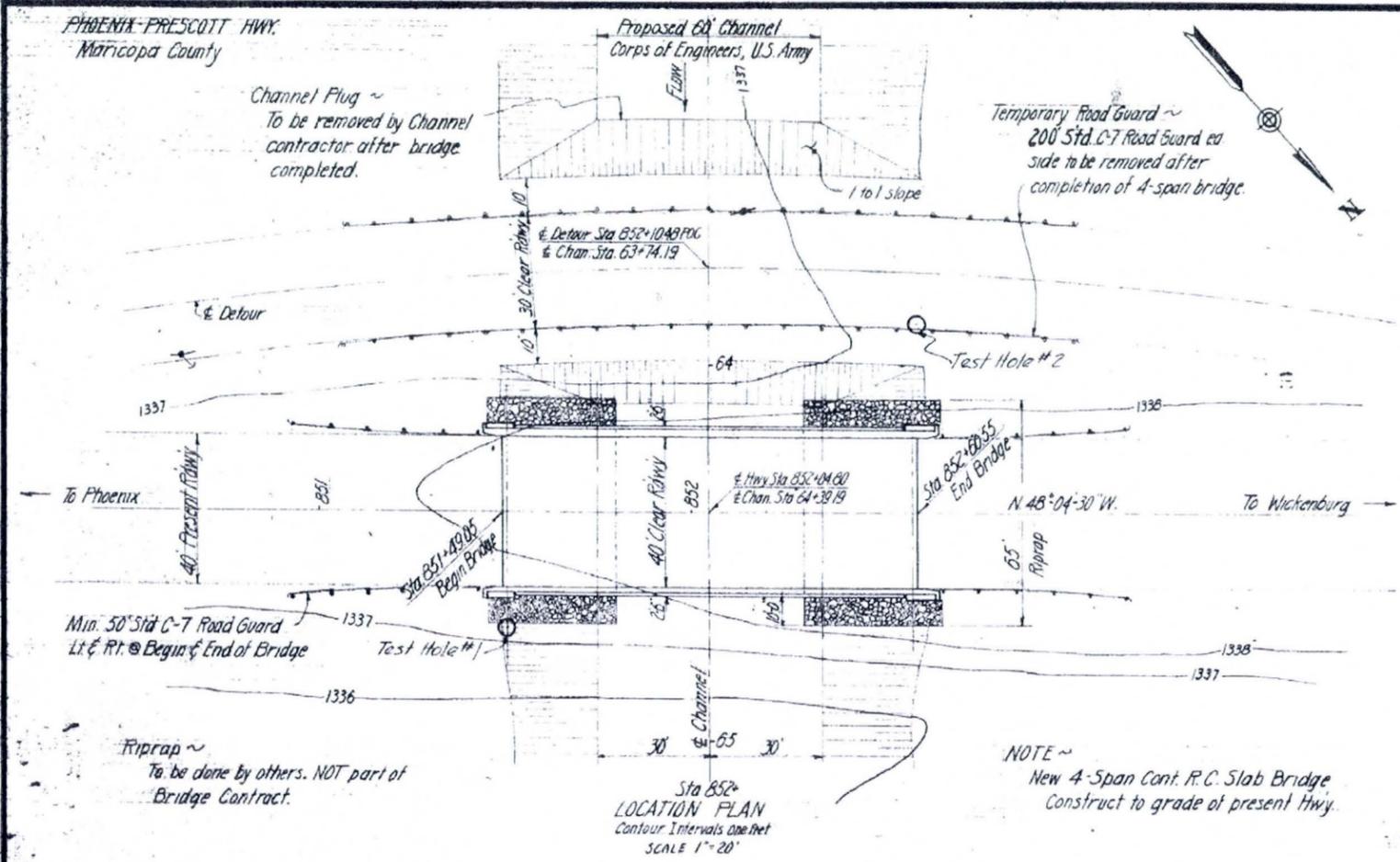
RECORD DRAWING-AS CONSTRUCTED
 CONT. NO. 107 76
 ORIGINAL FILE NO. 10702
 CHANGED 2/19/54
 This series of drawings is on file in Los Angeles District, Corps of Engineers, in working prints or referring to this sheet use the D.O. Series number shown in the margin below by this block.
 DATE: 2/19/54
 BY: [Signature]
 CHECKED: [Signature]
 APPROVED: [Signature]

DATUM IS MEAN SEA LEVEL

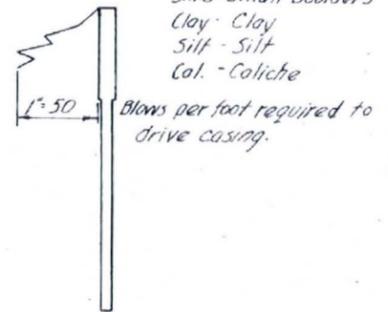
| | | | | |
|--|-------------------------------------|----------------------|--------------------------|-------------|
| REVISION | DATE | DESCRIPTION | BY | WT |
| CORPS OF ENGINEERS, U. S. ARMY OFFICE OF THE DISTRICT ENGINEER SACRAMENTO DISTRICT SACRAMENTO, CALIFORNIA | | | | |
| PREPARED BY: FEB | GILA RIVER AND TRIBUTARIES, ARIZONA | | | |
| DRAWN BY: MA | AGUA FRIA PROJECT | | | |
| ORDER BY: RCR | LOWER AGUA FRIA RIVER | | | |
| TRILBY WASH DETENTION BASIN DAM AND APPURTENANCES LOGS OF EXPLORATION HOLES | | | | |
| APPROVED: [Signature] | DATE: FEB 11/54 | SCALE: 1" = 4' VERT. | O.C.E. DWG. NO. 86-02-01 | SHEET NO. 6 |
| TO ACCOMPANY SPECIFICATIONS ERO-04-252-50-141 FILE NO. (D.O. SERIES) 151/64 | | | | |

PHOENIX-PRESCOTT HWY.
Maricopa County

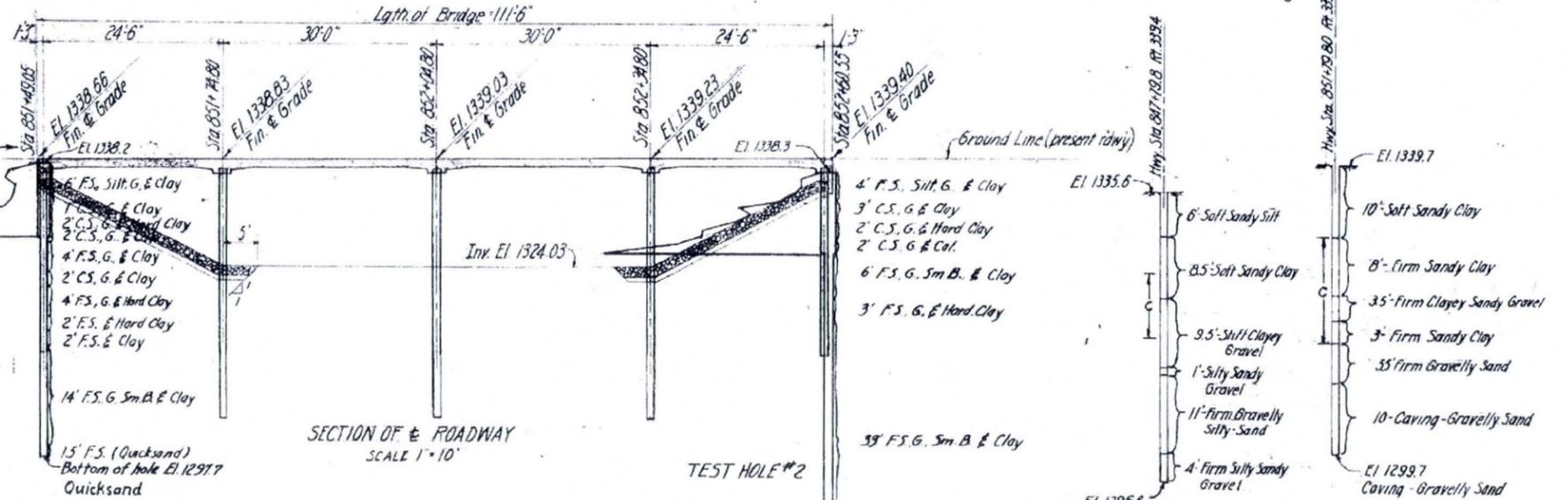
| FED. ROAD DIST. NO. | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | DATE BUILT |
|---------------------|---------|-------------|-----------|--------------|------------|
| 7 | ARIZONA | Non FA 84-A | 2A | 2 | 1956 |



LEGEND
 F.S. - Fine Sand
 C.S. - Course Sand
 G. - Gravel
 Sm.B. - Small Boulders
 Clay - Clay
 Silt - Silt
 Cal. - Caliche



NOTE ~
 New 4-Span Cont. R.C. Slab Bridge
 Construct to grade of present Hwy.



Note to Res. Engr. -
 This design requires that all piles be driven to min. bearing of 29 tons @ min. penetration elevations shown on plans.

THIS IS NOT A CONTRACT DRAWING

TEST HOLE #1
 Note: Holes #1 & #2 made by State Concrete Rotary Drill Oct. 1954

TEST HOLE #2
 Note: Test hole data for holes 2F6, 2F7, & 2F14 furnished by Corps of Engineers U.S. Army, Oct. 1953
 All Test Holes Machine Augered.
 C Indicates the presence of caliche, varying amounts & degrees of cementation.

| | | | |
|--------------|--------|------|--------|
| LAYOUT | R.A.H. | DATE | 3/54 |
| DESIGN | W.T.H. | DATE | 3/54 |
| ARCHITECTURE | | | |
| DRAWN | W.T.H. | DATE | 3/1/54 |
| TRACED | W.R.S. | DATE | 4/7/54 |
| CHECKED | R.J. | DATE | 4-8-54 |
| APPROVED | | | |
| SHEET NO. | 1A | OF | 4 |

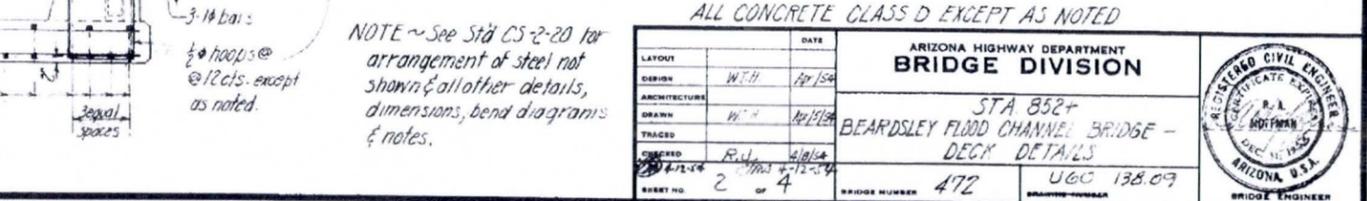
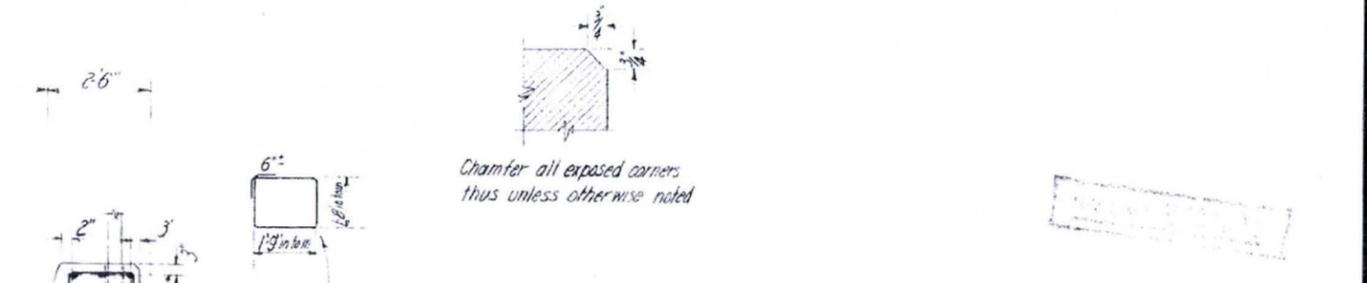
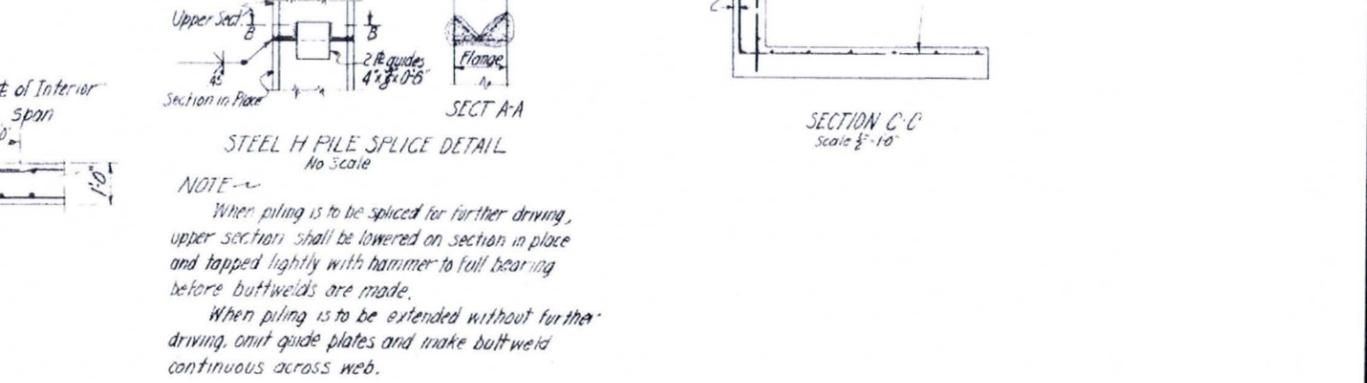
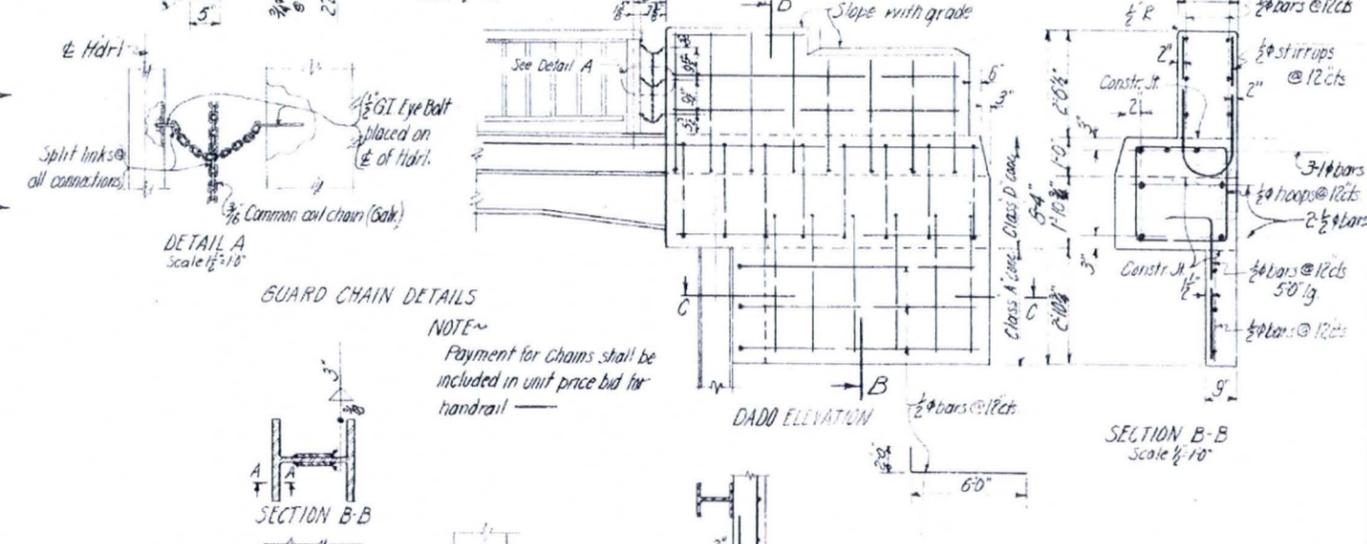
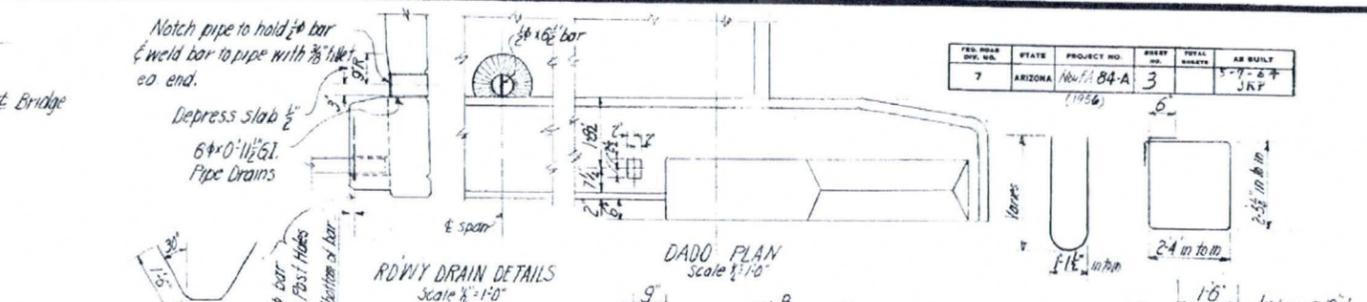
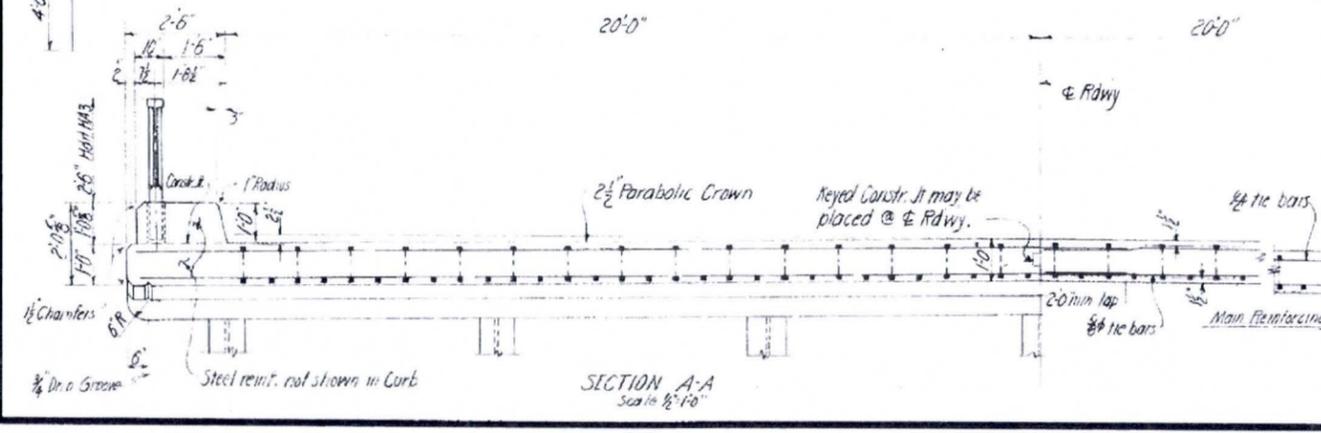
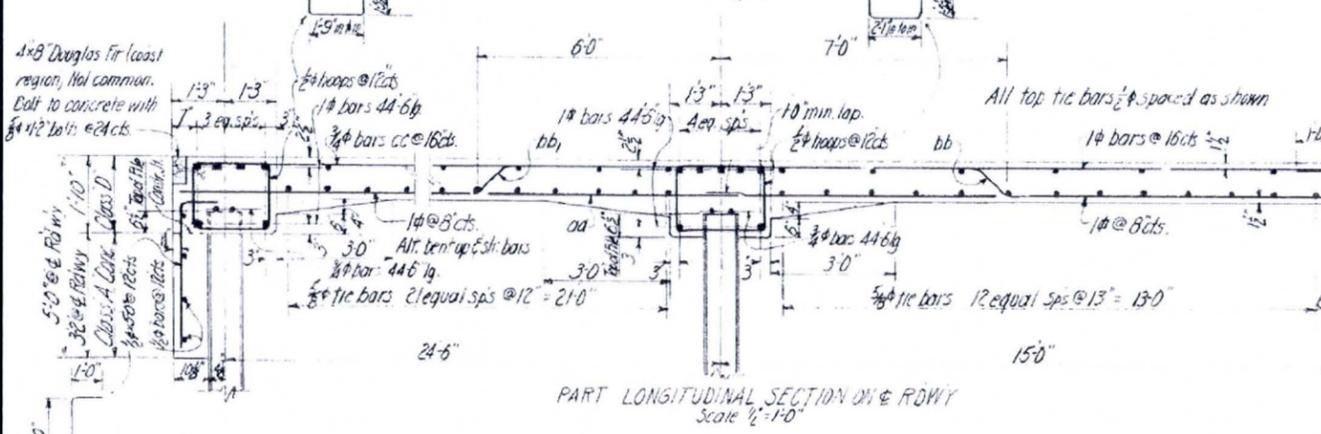
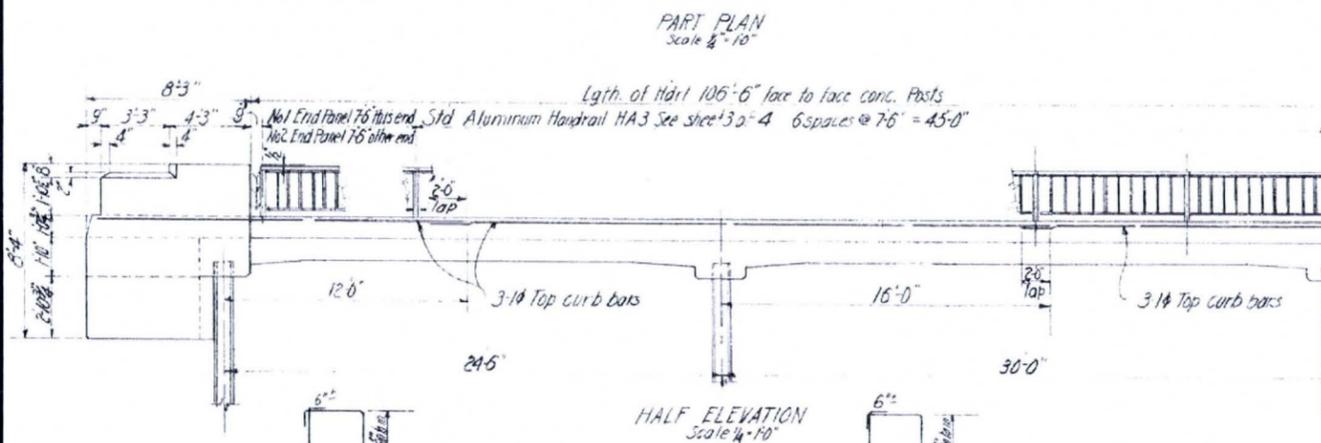
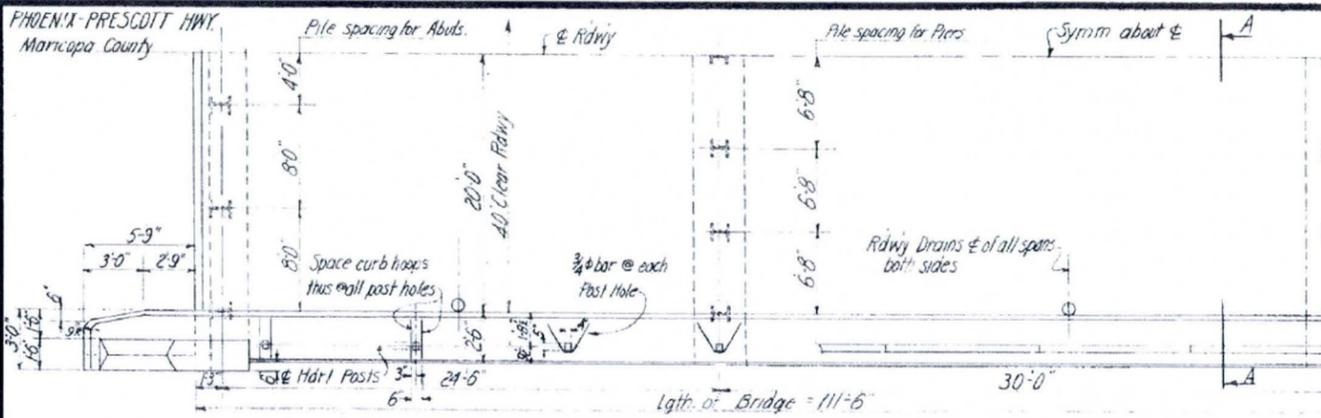
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA. 852+
BEARDSLEY FLOOD CHANNEL BRIDGE
TEST HOLE DATA

BRIDGE NUMBER 472
 U60 138.09

BRIDGE ENGINEER

Non FA 84-A 1956



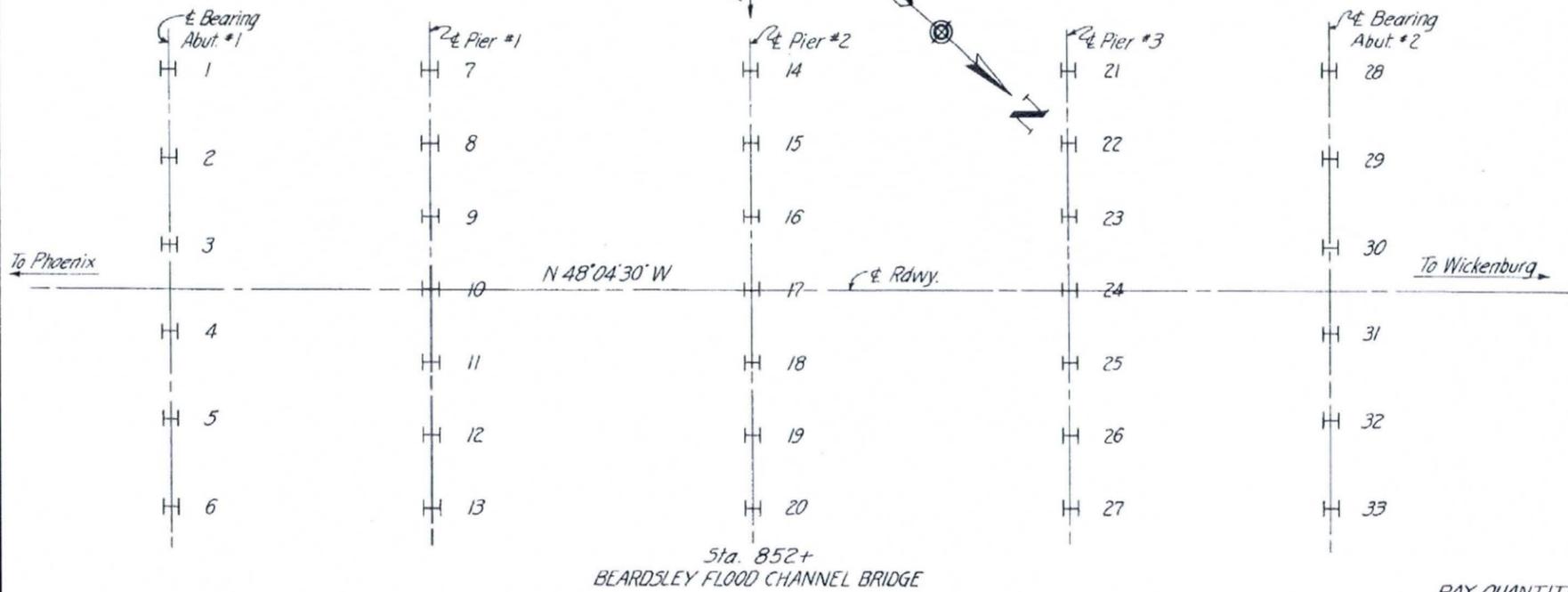
| FED. ROAD DIST. NO. | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|---------------------|---------|-------------|-----------|--------------|----------|
| 7 | ARIZONA | HWY 84-A | 3 | 5-7-27 | JRF |

ALL CONCRETE CLASS D EXCEPT AS NOTED

| | | | |
|--------------|-----------------|--|--------|
| LAYOUT | DATE | ARIZONA HIGHWAY DEPARTMENT BRIDGE DIVISION STA 852+ BEARDSLEY FLOOD CHANNEL BRIDGE - DECK DETAILS UGC 138.09 | |
| DESIGN | W.T.H. Apr 1964 | | |
| ARCHITECTURE | W.T.H. Apr 1964 | | |
| DRAWN | W.T.H. Apr 1964 | | |
| TRACED | R.V. Apr 1964 | | |
| CHECKED | R.V. Apr 1964 | BRIDGE NUMBER | 472 |
| DATE | 5-5-64 | SHEET NO. | 2 OF 4 |

| | |
|-----|----------|
| NO. | REVISION |
| 1 | AS NOTED |
| 2 | DATE |
| 3 | DATE |
| 4 | DATE |
| 5 | DATE |

PHOENIX - PRESCOTT HWY.
MARICOPA COUNTY



| FED. ROAD DIST. NO. | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|---------------------|---------|-------------|-----------|--------------|----------|
| 7 | ARIZONA | Non FAB4A | 34 | 5-7-54 | JRP |

(1956)

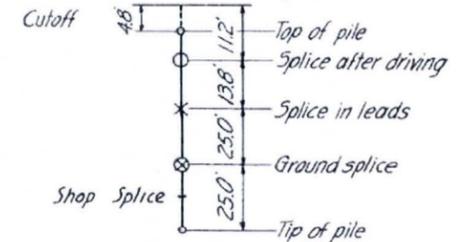
HAMMER DATA:

Type: Single Acting
 Make: Vulkan No. 1
 Weight of Ram: 5000 Lbs.
 Stroke: 3.0 feet
 Area of Piston: _____
 Effective Cylinder Pressure: _____

For single acting hammer
 $P = \frac{2WH}{s + 0.1}$

For double acting hammer
 $P = \frac{(W + ap)2H}{s + 0.1}$

P = Safe load in pounds
 W = Weight of hammer in pounds
 H = Length of stroke in feet
 s = Average penetration last 5 blows in inches
 a = Area of piston in square inches
 p = Mean effective pressure in pounds per square inch in working cylinder



PAY QUANTITIES

| Item | Description | Unit | As per plans | As built |
|------|-------------------------------|----------|--------------|----------|
| | | | 10BP42 | 10BP42 |
| 39-1 | Furnish & drive steel H piles | Lin. Ft. | 1035.00 | 1022.40 |
| 39-2 | Cutoff steel H piles | Lbs. | 250 | 529.2 |
| 39-3 | Splicing steel H piles | Each | 12 | 9 |

PILE LEGEND

CUTOFF LEGEND

- 12 5 Cutoff to stock pile
- 10 8 Cutoff used in pile indicated (Cutoff pile #10 used in pile #8)

Piling as per plans 10BP42 1035.0 Lin. Ft.
 Piling furnished 1035.0 do
 Cutoff 41.73 do
 Reused cutoff 29.13 do
 Piling left on hand (Scrap) 12.60 do
 Piling in place 1022.40 do
 Number of splices 9 Each
 Furnish complete inventory of piling left on hand all of which shall be hauled to Encanto Yard, Phoenix for storage.

Vertical Pile
All piles 10BP42

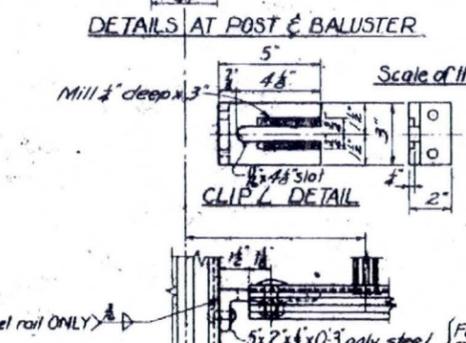
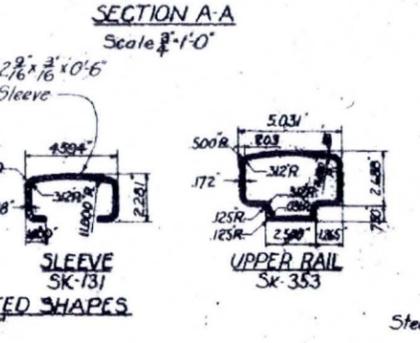
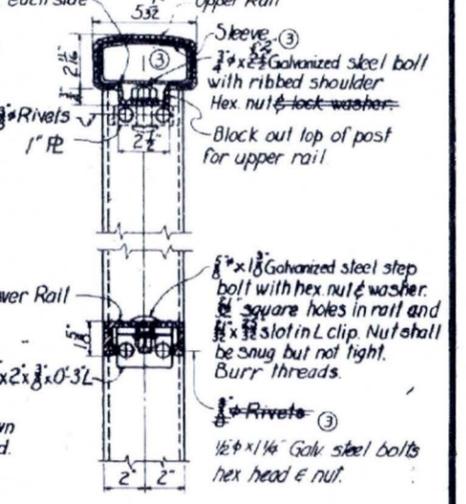
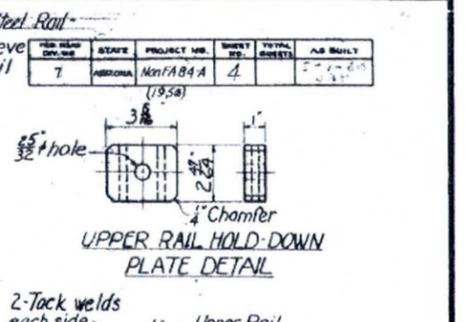
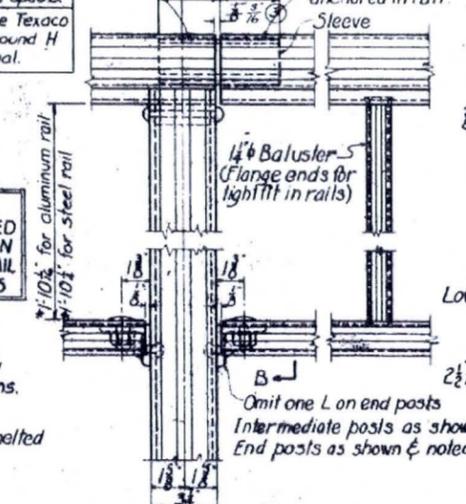
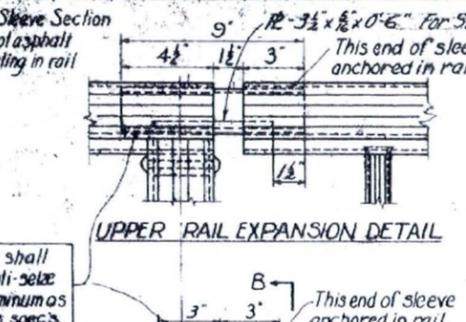
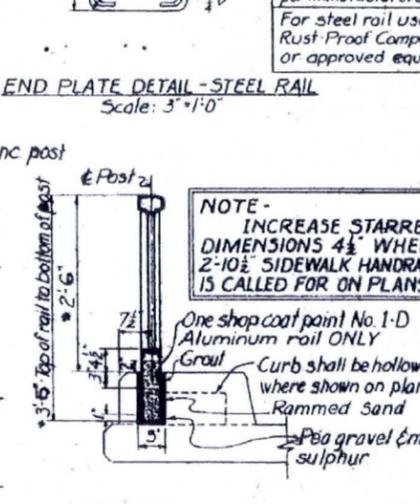
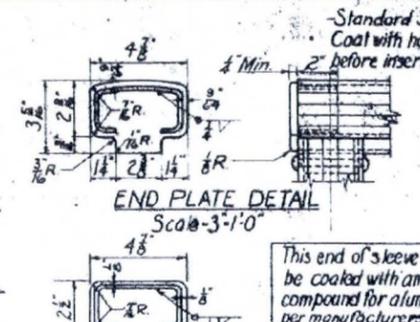
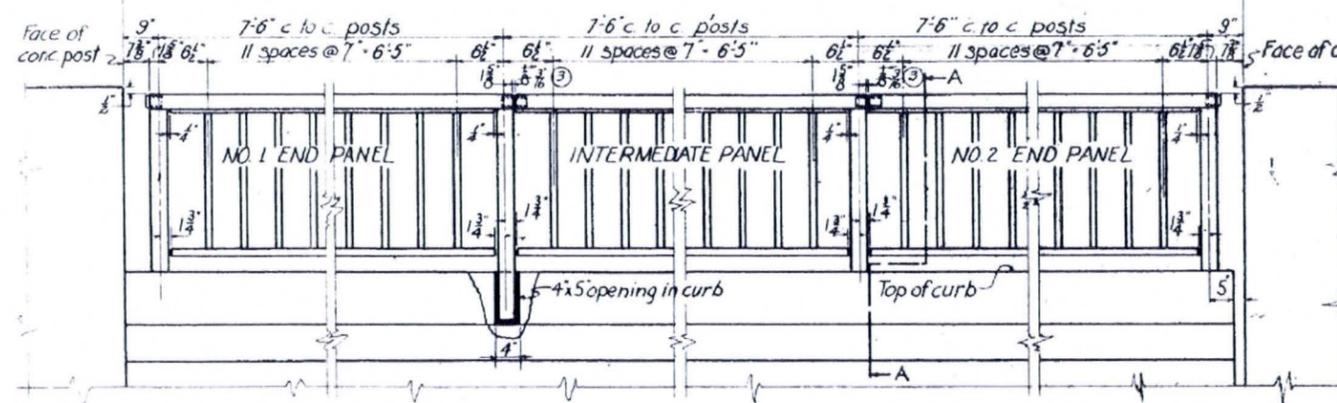
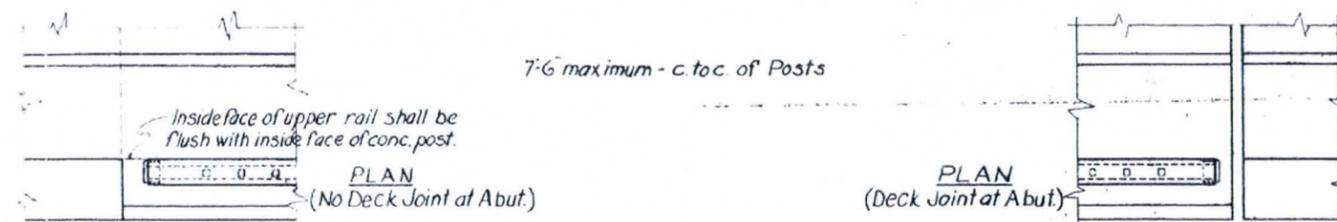
| Pile number | Abutment #1 | | | | | Pier #1 | | | | | |
|----------------------------------|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 1 s | 2 s | 3 s | 4 s | 5 s | 6 s | 7 s | 8 s | 9 s | 10 s | 11 s |
| Elevation top of pile | 1337.21 | 1337.31 | 1337.36 | 1337.36 | 1337.31 | 1337.21 | 1337.38 | 1337.47 | 1337.52 | 1337.54 | 1337.52 |
| Average penetration-s inches | 0.2750 | 0.2250 | 0.3250 | 0.3750 | 0.4000 | 0.2125 | 0.3375 | 0.3750 | 0.2500 | 0.2750 | 0.3500 |
| Safe bearing-Tons | 40.00 | 46.15 | 35.29 | 31.58 | 30.03 | 48.00 | 34.29 | 31.58 | 42.86 | 40.00 | 33.33 |
| Lin. Ft. of each piece furnished | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 34.45 | 34.86 | 34.26 | 35.00 | 35.00 |
| Elevation tip of pile | 1312.51 | 1313.02 | 1308.96 | 1312.98 | 1312.75 | 1312.62 | 1300.42 | 1300.11 | 1300.01 | 1303.57 | 1303.68 |

| Pile number | Pier #1 (cont) | | | | Pier #2 | | | | Pier #3 | | | |
|----------------------------------|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| | 12 s | 13 s | 14 s | 15 s | 16 s | 17 s | 18 s | 19 s | 20 s | 21 s | 22 s | |
| Elevation top of pile | 1337.47 | 1337.38 | 1337.58 | 1337.67 | 1337.72 | 1337.74 | 1337.72 | 1337.67 | 1337.58 | 1337.78 | 1337.88 | |
| Average penetration-s inches | 0.0750 | 0.2625 | 0.2125 | 0.1750 | 0.3250 | 0.2875 | 0.1250 | 0.1000 | 0.1000 | 0.2250 | 0.1500 | |
| Safe bearing-Tons | 85.71 | 41.38 | 48.00 | 54.55 | 33.29 | 38.71 | 66.67 | 75.00 | 75.00 | 46.25 | 60.00 | |
| Lin. Ft. of each piece furnished | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | |
| Elevation tip of pile | 1306.23 | 1302.46 | 1303.86 | 1303.77 | 1303.59 | 1302.86 | 1308.26 | 1308.61 | 1307.41 | 1303.19 | 1303.85 | |

| Pile number | Pier #3 (cont) | | | | Abutment #2 | | | | | | |
|----------------------------------|----------------|---------|---------|---------|-------------|---------|---------|---------|---------|---------|---------|
| | 23 s | 24 s | 25 s | 26 s | 27 s | 28 s | 29 s | 30 s | 31 s | 32 s | 33 s |
| Elevation top of pile | 1337.92 | 1337.94 | 1337.92 | 1337.88 | 1337.88 | 1337.95 | 1338.05 | 1338.10 | 1338.10 | 1338.05 | 1337.95 |
| Average penetration-s inches | 0.1500 | 0.1500 | 0.2000 | 0.2500 | 0.1500 | 0.3125 | 0.2875 | 0.3000 | 0.2250 | 0.3500 | 0.3250 |
| Safe bearing-Tons | 60.00 | 60.00 | 50.00 | 42.86 | 60.00 | 36.36 | 38.71 | 37.50 | 46.15 | 33.33 | 35.29 |
| Lin. Ft. of each piece furnished | 34.62 | 35.00 | 35.00 | 35.00 | 35.00 | 24.78 | 25.00 | 25.00 | 25.00 | 24.38 | 24.40 |
| Elevation tip of pile | 1302.75 | 1303.09 | 1303.22 | 1303.42 | 1304.01 | 1310.87 | 1313.32 | 1311.76 | 1313.94 | 1310.42 | 1310.30 |

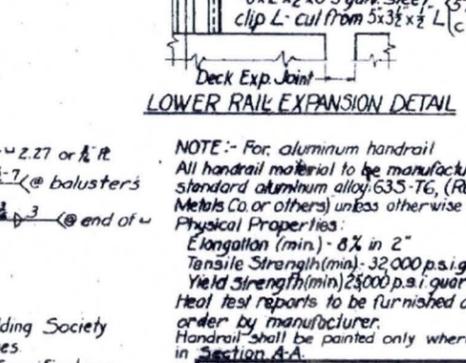
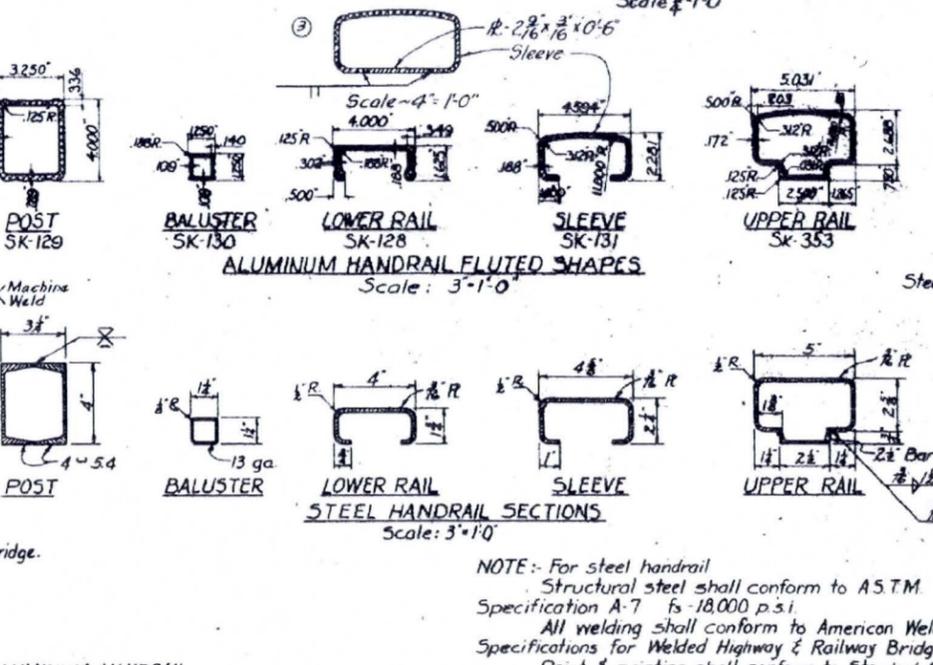
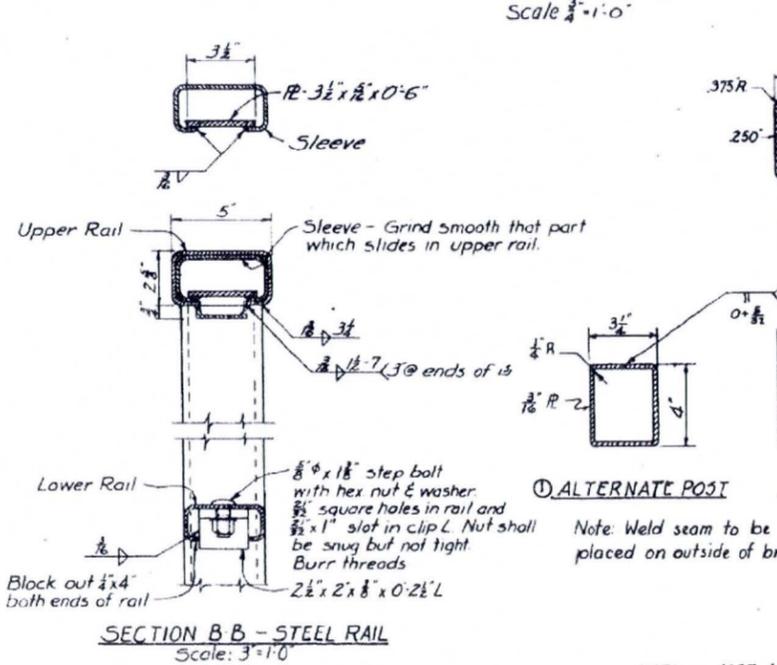
| | | |
|--------------|--------|--------------------------------|
| LAYOUT | DATE | ARIZONA HIGHWAY DEPARTMENT |
| DESIGN | | BRIDGE DIVISION |
| ARCHITECTURE | | Sta. 852+ |
| DRAWN | J.P. | BEARDSLEY FLOOD CHANNEL BRIDGE |
| TRACES | | BEARING PILE RECORD |
| CHECKED | J.A.W. | |
| SHEET NO. 2A | OF 4 | BRIDGE NUMBER 472 |
| | | U60.138.09 |

PHOENIX-PRESCOTT HWY.
Maricopa County



LIST OF MATERIALS

| No. Req'd. | Description |
|------------|---------------------|
| 2 | No. 1 End Panels |
| 2 | No. 2 End Panels |
| 24 | Intermediate Panels |
| 4 | End Plates |
| | Expansion Joints |



NOTE: For steel handrail
Structural steel shall conform to A.S.T.M. Specification A-7 fs-18,000 p.s.i.
All welding shall conform to American Welding Society Specifications for Welded Highway & Railway Bridges.
Paint & painting shall conform to Standard Specifications. Entire surface shall be painted.
Shop - 1st coat paint #1A or #1B.
Field - 1st coat paint #3
2nd coat paint #10

NOTE: For either handrail
Railing shall be completely assembled in field & posts shall be set to line & grade & plumbed vertically before sulphur sand & grout are poured.
Type of handrail, either aluminum or steel, shall be that called for on Plans or in Construction Special Provisions

NOTE - USE ALUMINUM HANDRAIL
See Deck Details sheet 2 of 4 for post hole spacing and other details.

| | | | |
|-------------------------------|-------------------------------|--|--|
| DATE | DATE | ARIZONA HIGHWAY DEPARTMENT BRIDGE DIVISION STN. 852+ BEARDSLEY FLOOD CHANNEL BRIDGE HANDRAIL DETAILS | |
| DESIGNED BY C.L.M. 11-2-53 | CHECKED BY R.C.W. 11-17-53 | BRIDGE NUMBER 472 | |

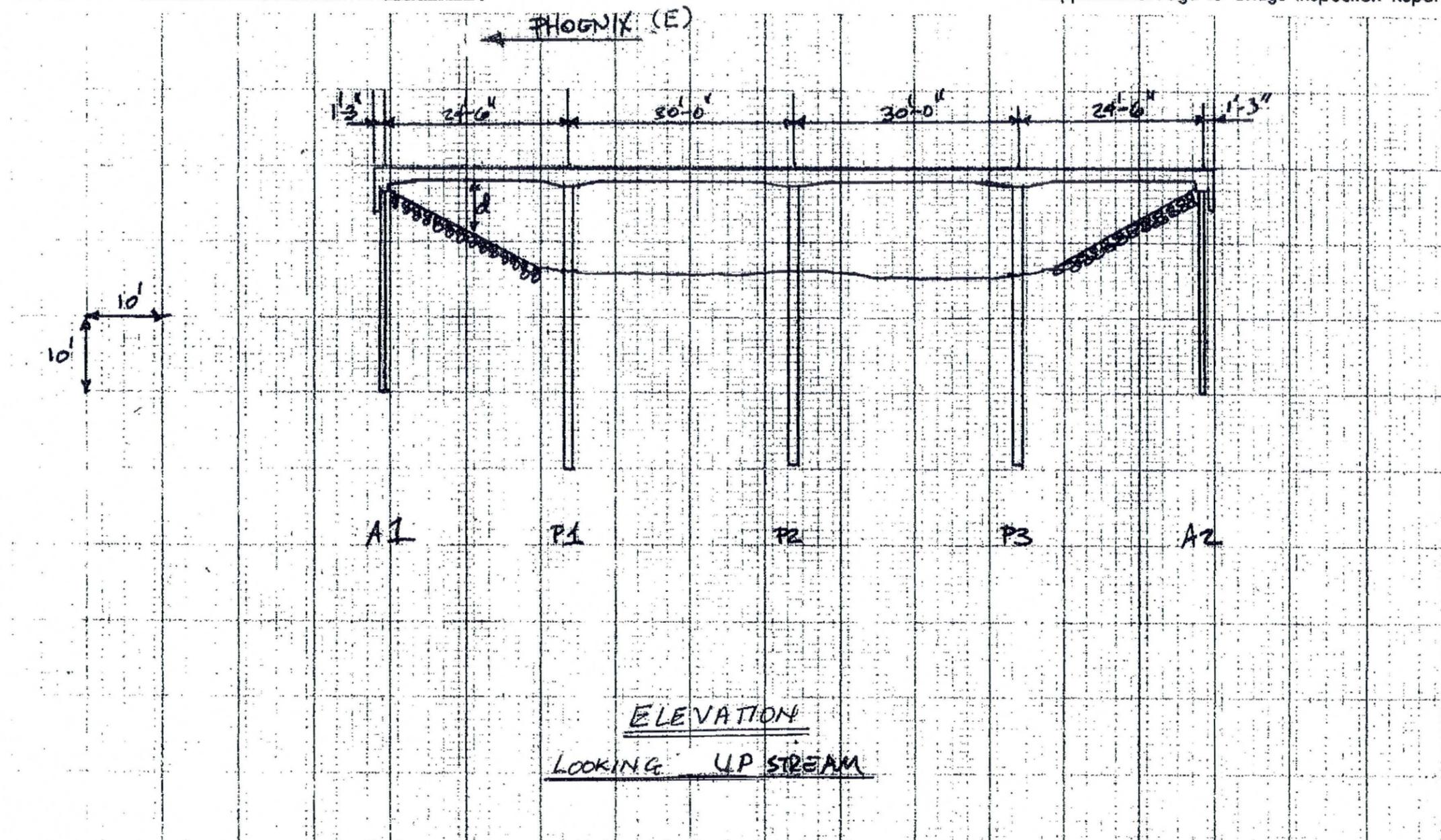
REVISION OF 4/11/52 - A.K.M.
 Upper rail welding revised, method of anchoring, upper rail eliminated, bar u shortened.
 11-12-53
 MASTER SHEET

Name of Structure: McMickon DAM FLOODWAY WB
 Structure No.: 00472
 Location Route: US 60 WB MP: 138.09

Appendix C
 Channel Profile

Arizona Dept. of Transportation
 Bridge Group
 Supplemental Page to Bridge Inspection Report

1/1



| Insp. No. | Insp. date | Insp. Initials | Location d | A1 | 5/6 span toe | P1 | midspan | P2 | midspan | P3 | 1/6 span toe | A2 |
|-----------|------------|----------------|------------|-------|--------------|--------------|---------|--------|---------|--------------|--------------|-------|
| 18 | 12/3/03 | GG/TB | | 0.8' | 11.3' | 11.8' | 12.6' | 11.4' | 12.9' | 11.4' | 11.5' | 0.9' |
| 20 | 2/11/08 | SK/ED | d/s | 0.53' | 7.68' | 11.29' | 12.98' | 11.95' | 12.71' | 10.51' | 6.63' | 0.5' |
| 21 | 12/2/07 | UB/CT | o/s | 2.10' | 7.88' | 11.65' | 12.99' | 12.08' | 12.64' | 11.50' | 7.22' | 1.67' |
| 22 | 11/21/11 | PW/CS | u/s | 1.3' | 10.5' | 11.2 11.5' | 12.8' | 12.1' | 13.4' | 11.7 11.4' | 11.1' | 2.1' |

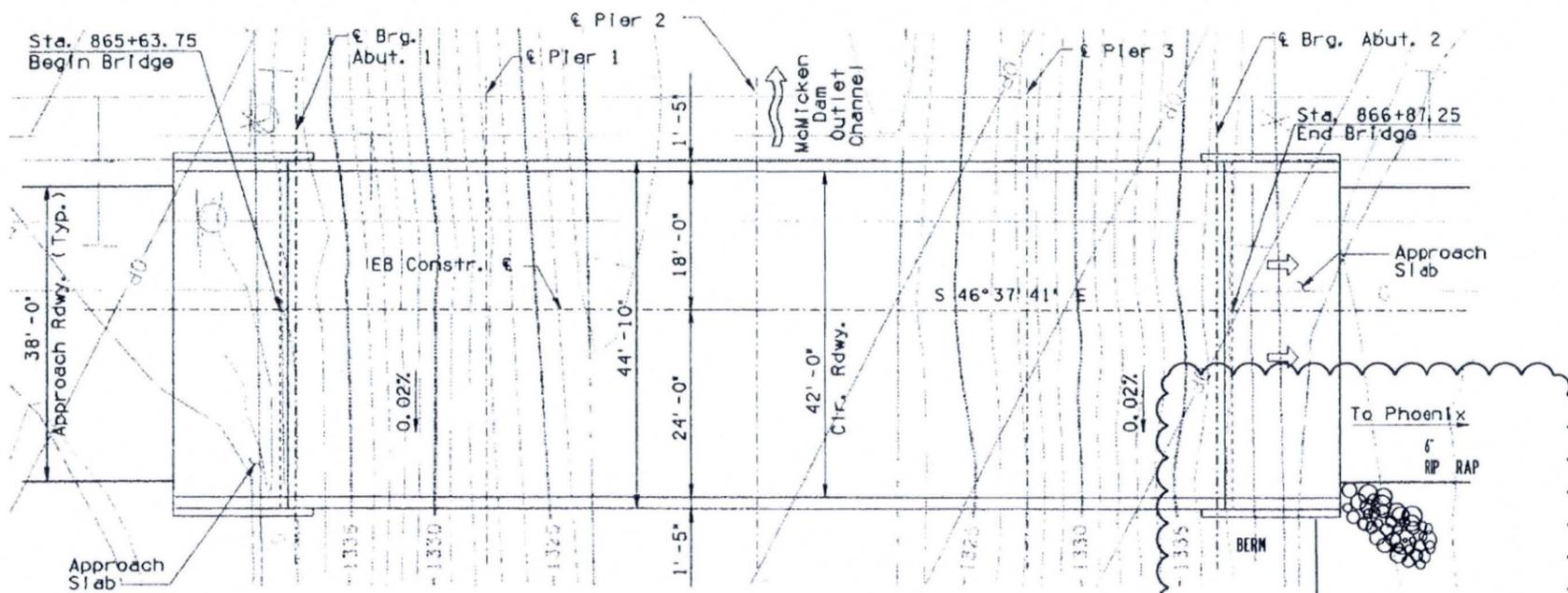
NSC

Note: 'd' is measured from the bottom of Girder or Slab.

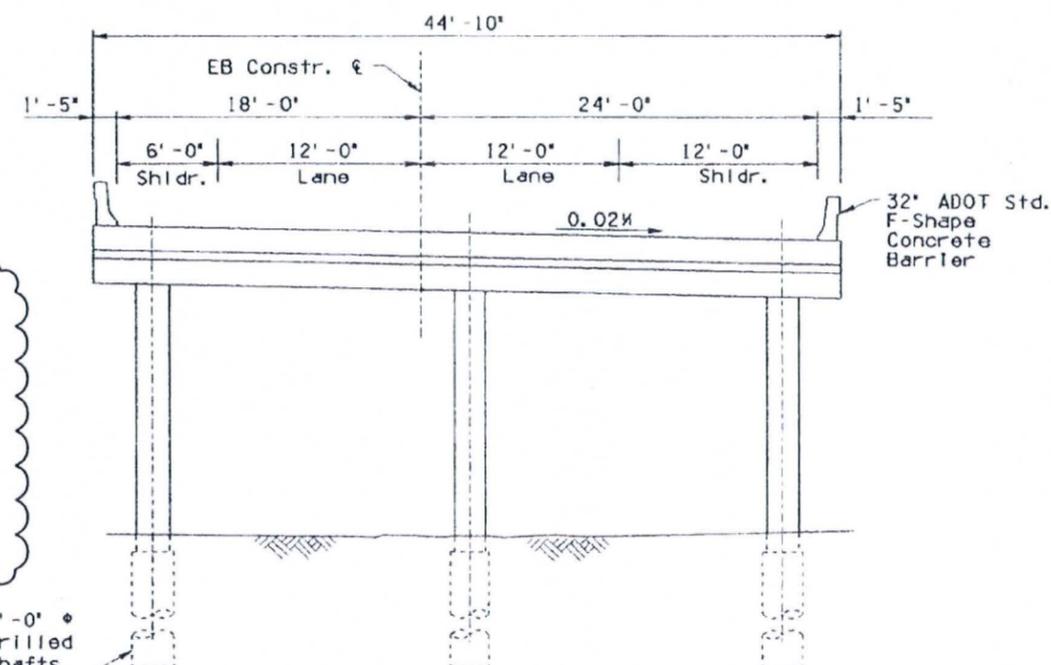
WICKENBURG-PHOENIX HWY. (US 60)
DEER VALLEY ROAD TO BEARDSLEY ROAD
MARICOPA COUNTY

| F.A.R.A. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 127 | 161 | DD 5/01/07 |

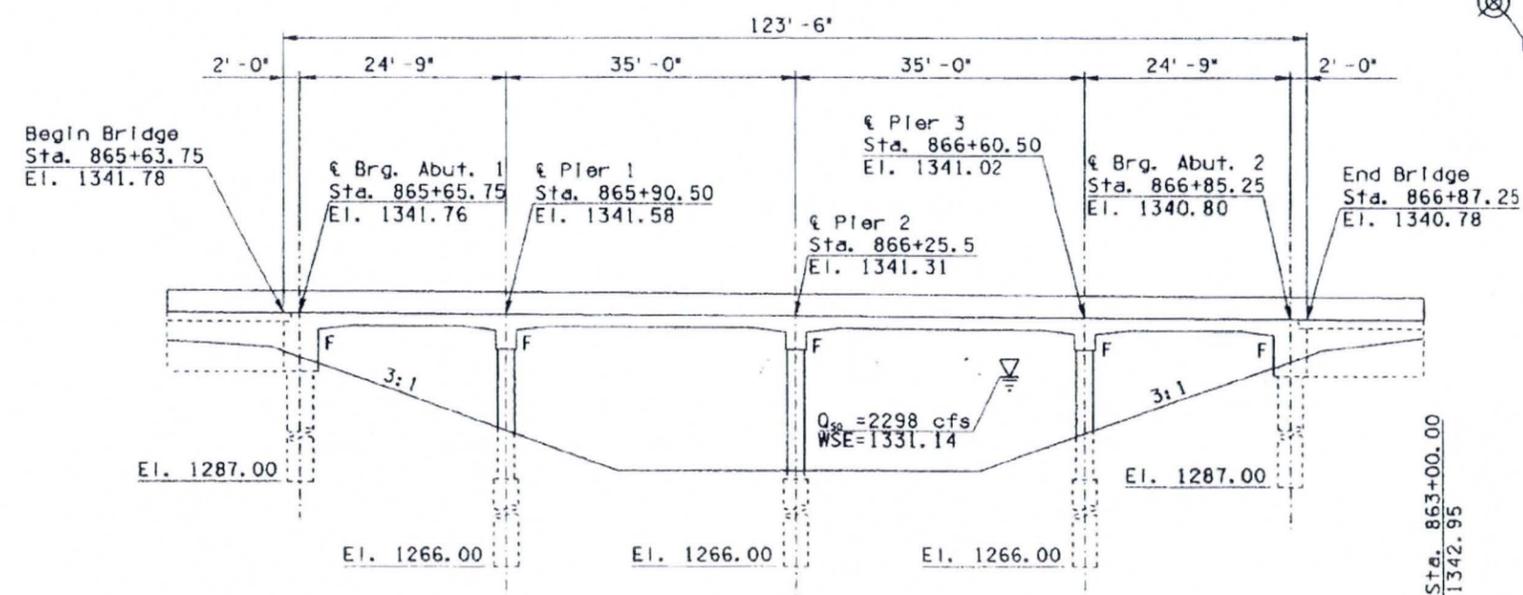
060 MA 136



LOCATION PLAN
New 4-Span C. I. P. Reinforced Concrete Continuous Slab Bridge
Contour Interval = 1'-0"
Scale: 1" = 10'-0"



TYPICAL SECTION AT PIER
Scale: 1" = 5'-0"



ELEVATION
Scale: 1" = 10'-0"
(Stations, elevations, and dimensions are measured along EB Constr. ϵ)

SHEET LIST

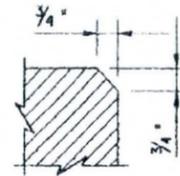
| TITLE | SHEET NO. |
|--------------------------------|-----------|
| GENERAL PLAN | 1 |
| GENERAL NOTES AND QUANTITIES | 2 |
| FOUNDATION DATA SHEETS | 3-8 |
| FOUNDATION LAYOUT | 9 |
| DRILLED SHAFT & COLUMN DETAILS | 10 |
| ABUTMENT PLAN & ELEVATION | 11 |
| ABUTMENT & WINGWALL DETAILS | 12 |
| PIER PLAN & ELEVATION | 13 |
| PIER DETAILS | 14 |
| DECK PLAN | 15 |
| DECK DETAILS | 16 |
| SCREED ELEVATIONS | 17 |

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| NO. | DATE | REVISIONS |
|-----|------|-----------|
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| | | | |
|-------------------------------------|--|---------------|--|
| DESIGNER: C. RODRIGUEZ 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP STA. 865+ McMicken Dam Outlet Chl Br EB GENERAL PLAN | | |
| DESIGN CHECKED: D. KERPATRICK 8/99 | | | |
| DRAWN: C. RODRIGUEZ 8/99 | | | |
| DRAWING CHECKED: D. KERPATRICK 8/99 | | | |
| Sverdrup CIVIL INC. | | | |
| US 60 | 138.09 | 2561 | LOCATION: DEER VALLEY RD. TO BEARDSLEY RD. |
| ROUTE | MILEPOST | STRUCTURE NO. | SHEET 1 OF 17 |

| FEDERAL REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 128 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



Chamfer all exposed corners as shown unless noted otherwise. This detail and note are applicable to all drawings pertaining to this bridge

CHAMFER DETAIL
N. T. S.

GENERAL NOTES

Construction Specifications - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, Edition of 2000.

Design Specifications - AASHTO Standard Specifications for Highway Bridges, 16th Edition 1996 and the 1997 through 1999 Interim Specifications.

Dead Load - Dead Load Includes allowance of 25 pounds per square foot for future wearing surface.

Loading Class - HS20-44 and/or Alternate Military Loading.

Seismic Performance Category A (Acc = 0.030 g)

Inventory and operating ratings for HS20-44 are in accordance with AASHTO Manual for Condition Evaluation of Bridges, Edition of 1994 and the 1995, 1996 and 1998 Interims in accordance with load factor method.

Inventory Rating HS - 28.5
Operating Rating HS - 47.6

All concrete shall be Class 'S' unless noted otherwise.

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing shall be furnished as Grade 60.

All bends and hooks shall meet the requirements of AASHTO Article 8.23. All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2 inch clear cover unless noted otherwise.

Stresses:
Superstructure except barriers (Deck) f'c = 4500 psi
f'c = 1800 psi
Abutments and Wingwalls f'c = 4500 psi
Columns f'c = 3500 psi
Drilled Shafts f'c = 3500 psi
Barriers f'c = 4000 psi
Grade 60 longitudinal deck reinf. fs = 24000 psi
All other Grade 60 fs = 24000 psi

Barriers shall be constructed after spans have taken dead load deflections. Barriers shall not be slip formed.

Dimensions shall not be scaled from drawings.

Standards

Structures section 1992 Standard Drawings: B-19.30, B-19.40

Bridge Groups SD Drawings: SD 1.01, SD 1.03, SD 2.01

| | Str. Excav. C. Y. | Str. Backfill C. Y. | Class 'S' Concrete | | Reinf. Steel lbs. | 30" Drilled Shafts Ln. Ft. |
|----------------|-------------------|---------------------|--------------------|------------------|-------------------|----------------------------|
| | | | fc' = 3500 C. Y. | fc' = 4500 C. Y. | | |
| Abutment 1 | 45 | 170 | - | 47 | 5615 | 144 |
| Pier 1 | 15 | - | 7 | 8 | 7575 | 156 |
| Pier 2 | 15 | - | 7 | 8 | 7575 | 156 |
| Pier 3 | 15 | - | 7 | 8 | 7575 | 156 |
| Abutment 2 | 60 | 130 | - | 47 | 5615 | 141 |
| Superstructure | - | - | - | 316 | 77815 | - |
| Total | 150 | 300 | 21 | 434 | 111770 | 753 |
| As-Built Total | | | | | | |

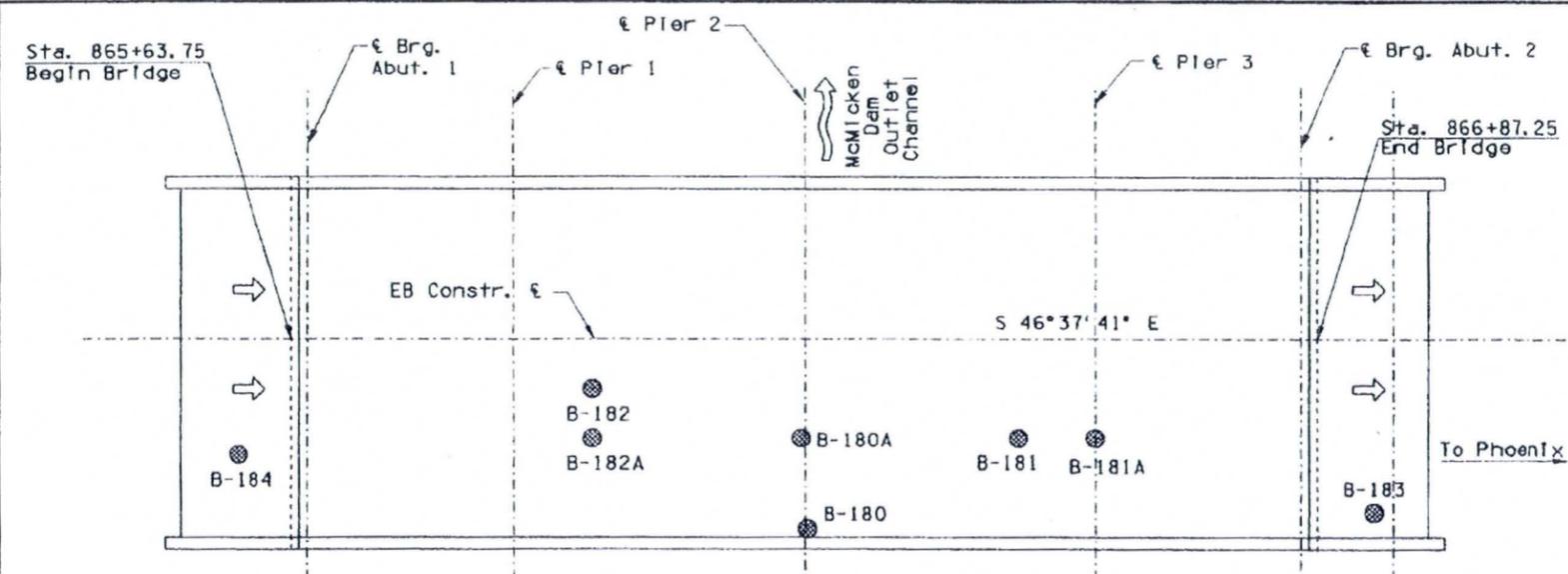
Bridge Barrier 247ft,
Approach Slab 1345ft,
Three Beam 3 ea.

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| | |
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| DATE | DESCRIPTION |
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|------------------------------|----------------|---------------|--|--|--|
| DESIGN | C. RODRIGUEZ | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP | | |
| DESIGN CHECKED | D. KIRKPATRICK | 8/99 | | | |
| DRAWN | H. BRUNN | 8/99 | | | |
| DRAWING CHECKED | D. KIRKPATRICK | 8/99 | | | |
| Sverdrup CIVIL INC | | | STA. 865+ MCMICKEN DAM OUTLET CHL BR EB GENERAL NOTES AND QUANTITIES | | |
| US 60 | 138.09 | 2561 | LOCATION: DEER VALLEY RD. TO BEARDSLEY RD. | | |
| ROUTE | MILEPOST | STRUCTURE NO. | SHEET 2 OF 17 | | |

| FEDERAL REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 129 | 161 | DD 5/04/07 |
| 060 MA 136 | | | | | |



LOCATION PLAN
Scale: 1" = 10' - 0"

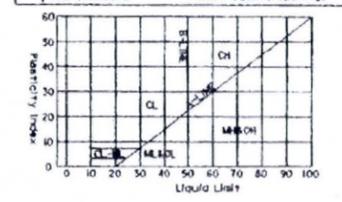
SOIL LEGEND

| SAMPLE DESIGNATION | DESCRIPTION |
|--------------------|---|
| AS | Auger Sample- A grab sample taken directly from auger flights. |
| BS | Large Bulk Sample- A grab sample taken directly from auger flights. |
| S | Spoon Sample- Standard Penetration Test (ASTM D-1586) Driving a 2.0 inch outside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the first 12 inches of penetration is the Standard Penetration Resistance (SPR). |
| RS | Ring Sample- Driving a 3.0 inch outside diameter spoon equipped with a series of 2.42 inside diameter, 1 inch long brass rings into undisturbed soil for one 12 inch increment by the same means of the spoon sample. The blows required for the 12 inches of penetration are recorded. |
| LS | Liner Sample- Standard Penetration Test driving a 2.0 inch outside diameter split spoon equipped with two 3 inch long, 7/8 inch inside diameter brass liners, separated by a 1 inch long spacer, into undisturbed soil by the same means of the spoon sample. |
| ST | Shelby Tube- A 2.0 inch outside diameter thin-walled tube continuously pushed into undisturbed soil by a rapid motion, without impact or twisting (ASTM D-1587). |
| | Continuous Penetration Resistance- Driving a 2.0 inch outside diameter "Bulldog" Penetrometer* continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12 inch increment are recorded. |

| CONSISTENCY | | | RELATIVE DENSITY | |
|---------------|--------------|-----------|------------------|--------------|
| Clays & Silts | Blows/Foot * | Strength† | Sands & Gravels | Blows/Foot * |
| Very Soft | 0-2 | 0-0.25 | Very Loose | 0-4 |
| Soft | 2-4 | 0.25-0.5 | Loose | 5-10 |
| Firm | 5-8 | 0.5-1.0 | Medium Dense | 11-30 |
| Stiff | 9-15 | 1-2 | Dense | 31-50 |
| Very Stiff | 16-30 | 2-4 | Very Dense | > 50 |
| Hard | > 30 | > 4 | | |

* Number of blows of a 140 lb hammer free falling 30 inches to drive a 2 inch O.D. split spoon sampler (ASTM D-1586)
† Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer.

| MAJOR DIVISIONS | GRAPH SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS | PARTICLE SIZE | | | |
|----------------------|---|---------------|--------------------------------|---------------|------------|-------------|------------|
| | | | | Lower Limit | | Upper Limit | |
| | | | | mm | Sieve Size | mm | Sieve Size |
| Coarse Grained Soils | Gravel and Gravelly Soils | GW | Well Graded Gravels | | | | |
| | | GP | Poorly Graded Gravels | | | | |
| | 50% Coarse Fraction is > #4 w/ fines | GM | Silty Gravels | | | | |
| | More than 50% of material is larger than #200 sieve size | GC | Clayey Gravels | | | | |
| Sand and Sandy Soils | Clean Sands | SW | Well Graded Sands | | | | |
| | | SP | Poorly Graded Sands | | | | |
| | 50% Coarse Fraction is < #4 w/ fines | SM | Silty Sand | | | | |
| | More than 50% of material is smaller than #200 sieve size | SC | Clayey Sand | | | | |
| Fine Grained Soils | Silts and Clays | ML | Inorganic Silts, Low P.I. | | | | |
| | Liquid Limit is less than 50% | CL | Inorganic Clays, Low P.I. | | | | |
| | | OL | Organic Silts, High P.I. | | | | |
| | More than 50% of material is smaller than #200 sieve size | MH | Inorganic Silts, High P.I. | | | | |
| Highly Organic Soils | | OH | Inorganic Clays, High P.I. | | | | |
| | | CH | Organic Clays, High P.I. | | | | |
| | | PT | Peat and Humus, Highly Organic | | | | |
| | | | | | | | |



GENERAL NOTES:

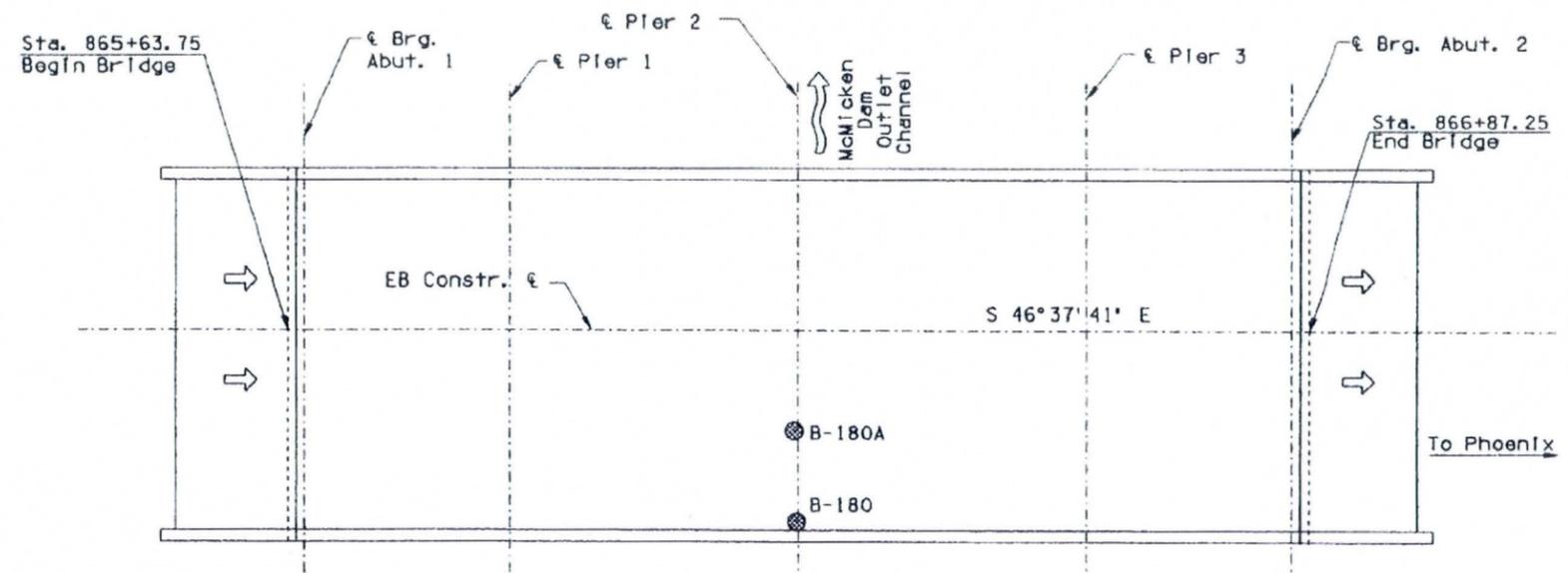
- General soil and rock (where encountered) strata descriptions and indicated boundaries are based on engineering interpretation of available subsurface information by the geotechnical engineer and may not reflect actual variation in subsurface conditions between borings and samples. The location of contacts between strata shown on the logs are generally approximate, and changes between material types may be gradual rather than abrupt. Classification of soil materials is in general accordance with ASTM D 2488-93 and is based on field observation unless accompanied by mechanical analysis presented in the Geotechnical Report.
- The observed water levels and/or moisture conditions indicated on the boring logs are as recorded at the time of exploration. These water levels and/or moisture conditions may vary considerably, with time, according to the prevailing climate, rainfall or other factors and are otherwise dependent upon the duration of and methods used in the exploration program.
- Sound Engineering judgment was exercised in preparing the subsurface information presented on these sheets. This information was prepared and is intended for design and estimate purposes. Its presentation on the plans or elsewhere is for the purpose of providing intended users with access to the same information as the State and its designers. This subsurface information interpretation is presented in good faith and is not intended as a substitute for personal investigation, independent interpretations or judgement of the contractor.

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| DATE | LOCATION | REVISIONS |
|------|----------|-----------|
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| | | |

| | | | |
|---|------------|------|---|
| DESIGN | M. SPEEDIE | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP STA. 865+ McMicken Dam Outlet Chl Br EB FOUNDATION DATA SHEET |
| DESIGN CHECKED | G. CREASER | 8/99 | |
| DRAWN | B. BROWN | 8/99 | |
| DRAWING CHECKED | M. SPEEDIE | 8/99 | |
| SPEEDIE AND ASSOCIATES US 60 ROUTE 138.09 2561 DEER VALLEY RD. TO BEARDSLEY RD. | | | 14388 GREGG ALAN CREASER 8/10/07 |

| FED. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 130 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



LOCATION PLAN
Scale: 1" = 10' - 0"

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 9803205A DATE: 3-15-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: R. Wood
 LOCATION: Beardley to Morrilstown CONTRACTOR: Heber Mining Co.
 BORING NO.: B-180 STATION: 866+25, 23R+
 RIG TYPE: CME-55 ELEVATION: 1323.5

| DEPTH IN FEET | NO CORING DATA RECOVERY | SPT BLOW/6" | DRILLING DATA | AVERAGE RATE (MIN/HR) | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-------------------------|-------------|---------------|-----------------------|-------|---|
| 0 | | | | | | Brown SANDY SILT/SANDY CLAY (M/C/L Dry) |
| 2.0 | | | | | | Dense Brown CLAYEY SAND/SILTY SAND (S/C/M Dry) |
| 12-20-21 | | | | | | |
| 8.0 | | | | | | Dense Grayish Brown SILTY SAND (M Dry to Moist) with Trace Gravel |
| 12-17-18 | | | | | | |
| 14.0 | | | | | | 14 Feet Cobble Region |
| 12-10-14 | | | | | | Medium Dense Grayish Brown WELL GRADED SAND (M Dry) with Trace Gravel and Trace Cobbles |
| 20.0 | | | | | | |
| 18-15-14 | | | | | | Medium Dense Brown CLAYEY SAND (S/C Moist) |
| 22.0 | | | | | | Very Dense Grayish Brown WELL GRADED SAND (M Dry to Moist) with Some Gravel and Cobbles |
| 50/4" | | | | | | |
| 25.0 | | | | | | |
| 25-20-21 | | | | | | |
| 30.0 | | | | | | |
| 35.0 | | | | | | |
| 38.0 | | | | | | Very Dense Brown CLAYEY SAND/SILTY SAND (S/C/M Moist) with Trace Gravel |
| 22-20-35 | | | | | | |
| 42.0 | | | | | | Very Dense Grayish Brown WELL GRADED SAND (M Dry to Moist) with Little Gravel |
| 50/12" | | | | | | |
| 48.0 | | | | | | Dense Brown CLAYEY SAND (S/C Moist) with Trace Gravel |
| 11-12-21 | | | | | | |
| 53.0 | | | | | | |
| 25-20-20 | | | | | | Very Dense Grayish Brown WELL GRADED SAND (M Dry to Moist) with Trace Gravel |
| 58.0 | | | | | | |
| 27-45-48 | | | | | | Very Dense Brown CLAYEY SAND (S/C Moist) |
| 91.0 | | | | | | End of Boring |

| Depth | Hour | Date |
|-------|------|------|
| Dry | | |

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 9803205A DATE: 1-4-01 GEOL/TECH: T. Rhelnschmidt
 PROJECT NAME: US 60 DRILLER: M. Stroud
 LOCATION: Beardley to Morrilstown CONTRACTOR: Heber Mining
 BORING NO.: B-180A STATION: 866+25, 12R+
 RIG TYPE: CME-75 ELEVATION: 1323.5

| DEPTH IN FEET | NO CORING DATA RECOVERY | SPT BLOW/6" | DRILLING DATA | AVERAGE RATE (MIN/HR) | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-------------------------|-------------|---------------|-----------------------|-------|--|
| 0 | | | | | | CLAYEY SAND/SANDY CLAY (S/C/L Dry) Brown Dense |
| 8.0 | | | | | | SANDY SILTY SAND (M/S/M Moist) Brown Dense |
| 12-18-17 | | | | | | |
| 15.0 | | | | | | WELL GRADED SAND (S/M Moist) Grayish Brown Very Dense with Trace Gravel |
| 35-50/3" | | | | | | |
| 25.0 | | | | | | GRAVELLY SAND (M/M Moist) Grayish Brown Very Dense with Possible Cobbles |
| 50/6" | | | | | | |
| 40.5 | | | | | | WELL GRADED SAND (M/M Moist) Grayish Brown Dense with Little Gravel |
| 17-16-29 | | | | | | |
| 44.0 | | | | | | CLAYEY SAND (S/C Moist) Brown Dense |

| Depth | Hour | Date |
|-------|------|------|
| Dry | | |

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 9803205A DATE: 1-4-01 GEOL/TECH: T. Rhelnschmidt
 PROJECT NAME: US 60 DRILLER: M. Stroud
 LOCATION: Beardley to Morrilstown CONTRACTOR: Heber Mining
 BORING NO.: B-180A STATION: 866+25, 12R+
 RIG TYPE: CME-75 ELEVATION: 1323.5

| DEPTH IN FEET | NO CORING DATA RECOVERY | SPT BLOW/6" | DRILLING DATA | AVERAGE RATE (MIN/HR) | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-------------------------|-------------|---------------|-----------------------|-------|--|
| 0 | | | | | | CLAYEY SAND (S/C Moist) Brown Dense |
| 30-15-19 | | | | | | |
| 53.0 | | | | | | WELL GRADED SAND (S/M Moist) Brown Very Dense with Trace Gravel |
| 28-28-35 | | | | | | |
| 62.0 | | | | | | CLAYEY SAND (S/C Moist) Brown Dense with Some Clayey Layering |
| 13-16-18 | | | | | | |
| 12-18-21 | | | | | | |
| 15-26-30 | | | | | | |
| 50/4" | | | | | | |
| 79.0 | | | | | | WELL GRADED SAND (S/M Moist) Grayish Brown Very Dense with Little Gravel |
| End of Boring | | | | | | |

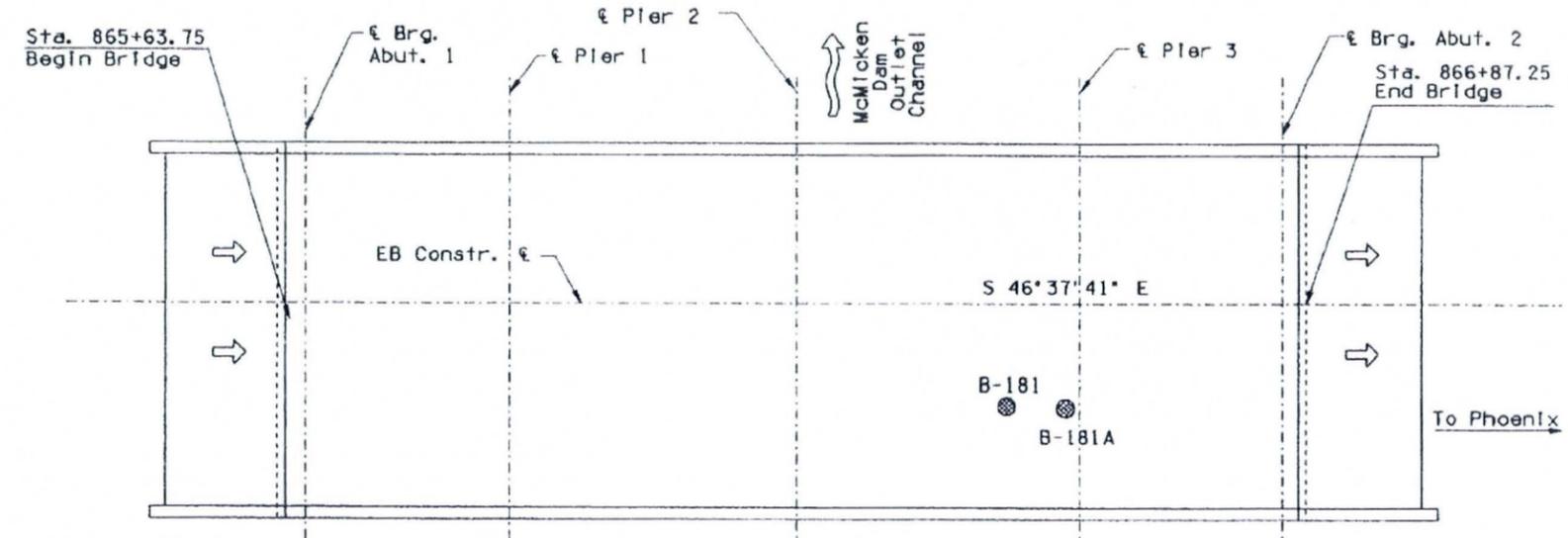
| Depth | Hour | Date |
|-------|------|------|
| Dry | | |

| | | | | |
|-------------------------------|------------|---------------|---|---------------|
| DESIGN | M. SPEER | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP STA. 865+ McMICKEN DAM OUTLET CHL BR EB FOUNDATION DATA SHEET | |
| DESIGN CHECKED | G. CREASER | 8/99 | | |
| DRAWN | M. BROWN | 8/99 | | |
| CHECKED | M. SPEER | 8/99 | | |
| SPEEDIE AND ASSOCIATES | | | LOCATION: DEER VALLEY RD. TO BEARDSLEY RD. | SHEET 4 OF 17 |
| US 60 | 138.09 | 2561 | | |
| ROUTE | MILEPOST | STRUCTURE NO. | | |

PLOTTED BY: edgar DATE PLOTTED: 30-JAN-2001 06:21
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| DATE | LOCATION | REVISION |
|------|----------|----------|
| | | |

| FED. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 131 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



GEOTECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A
 PROJECT NAME: US 60
 LOCATION: Beardsley to Morrilstown
 BORING NO.: B-181
 RIG TYPE: CME-55
 DATE: 3-15-99
 GEOL/TECH: K. Gravel
 DRILLER: R. Wood
 CONTRACTOR: Heber Mining Co.
 STATION: 866+55; 7Rt.
 ELEVATION: 1325.6

LOCATION PLAN
 Scale: 1" = 10'-0"

GEOTECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A
 PROJECT NAME: US 60
 LOCATION: Beardsley to Morrilstown
 BORING NO.: B-181A
 RIG TYPE: CME 75
 DATE: 1-4-01
 GEOL/TECH: T. Rhoads
 DRILLER: M. Stroud
 CONTRACTOR: Heber Mining
 STATION: 866+55, 12Rt
 ELEVATION: 1325.6

GEOTECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A
 PROJECT NAME: US 60
 LOCATION: Beardsley to Morrilstown
 BORING NO.: B-181A
 RIG TYPE: CME-75
 DATE: 1-4-01
 GEOL/TECH: T. Rhoads
 DRILLER: M. Stroud
 CONTRACTOR: Heber Mining
 STATION: 866+55, 12Rt
 ELEVATION: 1325.6

| DEPTH IN FEET | NO. CORING DATA | SPT BLOWS/6" | DRILLING DATA | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-----------------|--------------|---------------|----------------------|--|
| | RECOVERY | | NOTES | AVERAGE RATE (IN/FT) | |
| 5 | | 37-37-22 | | | Hard Brown SANDY CLAY (CL-Dry) |
| 10 | | 38-12 | | | Dense Grayish Brown SILTY FINE SAND (SM-Dry) |
| 15 | | 38-20-22 | | | |
| 20 | | 37-12-14 | | | Very Stiff Brown SANDY SILT/SANDY CLAY (CL/M-Moist) |
| 25 | | 51-50-6 | | | Very Dense Brown WELL GRADED SAND (SM-Dry to Moist) with Trace to Little Gravel |
| 30 | | 26-50-4 | | | |
| 35 | | 20-38-50 | | | 33 Feet: Cobbles Begin Very Dense Grayish Brown WELL GRADED SAND (SM-Dry to Moist) with Sand Gravel and Cobbles |
| 40 | | 44-12 | | | Dense Brown CLAYEY SAND (SC-Moist) with Some Gravel and Cobbles |
| 45 | | 23-28-28 | | | Very Dense Orange Brown WELL GRADED SAND (SM-Dry to Moist) with Little Gravel |
| 48.0 | | | | | Hard Brown SANDY SILT (ML-Moist) |
| 52.0 | | 31-16-19 | | | Very Dense Grayish Brown WELL GRADED SAND (SM-Moist) with Little Gravel |
| 55 | | 55-40-48 | | | |
| 58.5 | | | | | Very Dense CLAYEY SAND/SILTY SAND (SC/SM-Moist) |
| 61.0 | | 24-33-34 | | | |

| DEPTH IN FEET | NO. CORING DATA | SPT BLOWS/6" | DRILLING DATA | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-----------------|--------------|---------------|----------------------|---|
| | RECOVERY | | NOTES | AVERAGE RATE (IN/FT) | |
| 5 | | | | | SANDY CLAY (CL-Dry); Browns Stiff |
| 10 | | 9-9-11 | | | SILTY SAND (SM-Dry to Moist); Browns Medium Dense |
| 15 | | | | | |
| 20 | | 9-10-14 | | | SILTY SAND (SM-Moist); Browns Dense with Some Clay |
| 25 | | | | | SAND/GRAVELLY SAND (SM-Moist); Browns Very Dense |
| 30 | | 30-50-4 | | | |
| 35 | | | | | |
| 40 | | 18-26-28 | | | WELL GRADED SAND (SM-Moist); Browns Dense with Trace Gravel |
| 45 | | | | | |
| 50 | | 15-20-21 | | | SILTY SAND (SM-Moist); Browns Dense |
| 55 | | | | | |

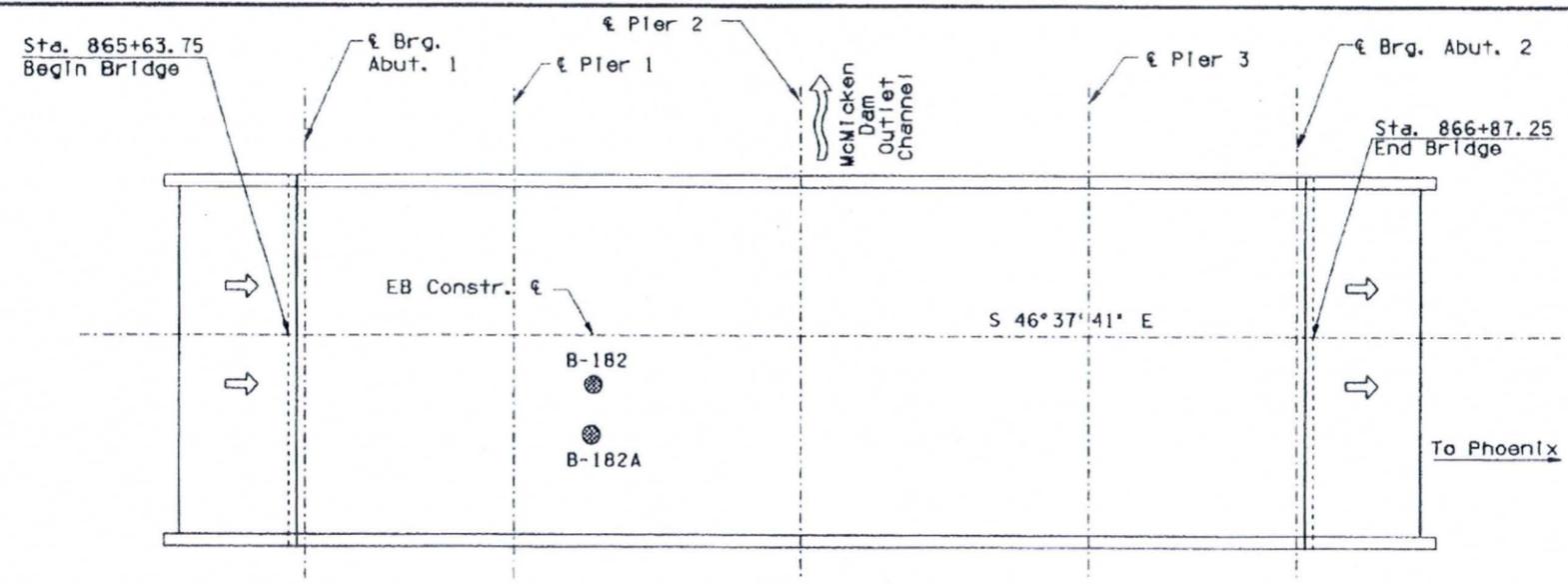
| DEPTH IN FEET | NO. CORING DATA | SPT BLOWS/6" | DRILLING DATA | GRAPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|-----------------|--------------|---------------|----------------------|--|
| | RECOVERY | | NOTES | AVERAGE RATE (IN/FT) | |
| 65 | | 20-26-4 | | | SILTY SAND (SM-Moist); Browns Dense |
| 70 | | 30-41-26 | | | |
| 75 | | 13-18-24 | | | |
| 80 | | 32-24-24 | | | |
| | | 50-50-6 | | | WELL GRADED SAND (SM-Moist); Browns Very Dense |

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| CURTAIN NO. | FINISH DATE |
|-------------|-------------|
| | |

| | | | |
|-------------------------------|-----------------|--|----------------------------------|
| DESIGN CHECKED: M. SPEER | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP | |
| DESIGN CHECKED: G. CREASER | 8/99 | | |
| DRAWN: H. BROWN | 8/99 | | |
| DRAWING CHECKED: M. SPEER | 8/99 | | |
| SPEEDIE AND ASSOCIATES | | STA. 865+ McMICKEN DAM OUTLET CHL BR EB FOUNDATION DATA SHEET | |
| US 60 ROUTE | 138.09 MILEPOST | 2561 STRUCTURE NO. | DEER VALLEY RD. TO BEARDSLEY RD. |

| FED. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2156 | 132 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



LOCATION PLAN
Scale: 1" = 10'-0"

**GEOTECHNICAL SERVICES
BORING LOG**

PROJECT NO.: 980320SA DATE: 3-16-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: R. Wood
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Heber Mining Co.
 BORING NO.: B-182 STATION: 866+00.67R1
 RIG TYPE: CME-75 ELEVATION: 1324.0

| DEPTH IN FEET | NO. LOGGING DATA ENVELOPES | DOB | SPT BLOWS/FT | DRILLING DATA NOTES | REMARKS | GROUP | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------------------|-----|--------------|---------------------|---------|-------|---|
| 0 | | | | | | | Surface to Very Dense Brown SANDY CLAY (CL-Dry) |
| 5 | | | 50/10" | | | | Dense to Very Dense Brown SANDY CLAY (CL-Dry) 8.0 |
| 10 | | | 45/12" | | | | Dense Brown SILTY SAND (SM-Dry) 13.0 |
| 15 | | | 66-36-15" | | | | Dense Grayish Brown POSSIBLY GRADED FINE SAND (SP-Dry) 18.0 |
| 20 | | | 19-26-28/6" | | | | Very Dense Brown SILTY SAND (SM-Dry to Moist) with little Gravel 24.5 Feet: Some Gravel |
| 25 | | | 36-26-25/6" | | | | |
| 30 | | | 23-29/4" | | | | |
| 35 | | | 21-50/4" | | | | |
| 40 | | | 23-50/4" | | | | |
| 45 | | | 16-18-22" | | | | Dense Brown POSSIBLY GRADED FINE SAND (SM-Moist) with Trace Gravel 43.0 |
| 48.0 | | | | | | | |
| 52.5 | | | 16-16-21" | | | | Dense Brown SILTY SAND (SM-Moist) 52.5 |
| 54 | | | 22-35-33/6" | | | | Very Dense to Dense Grayish Brown WELL GRADED SAND (SM-Moist) with Trace Gravel |
| 60 | | | 11-18-22" | | | | End of Boring 61.0 |

| | | |
|-------|------|------|
| Depth | Hour | Date |
| | | |

**GEOTECHNICAL SERVICES
EXPLORATION LOG**

PROJECT NO.: 980320SA DATE: 1-3-01 GEOL/TECH: T. Rheinschmidt
 PROJECT NAME: US 60 DRILLER: M. Stroud
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Heber Mining
 BORING NO.: B-182A STATION: 866+00.12R1
 RIG TYPE: CME-75 ELEVATION: 1324.0

| DEPTH IN FEET | NO. LOGGING DATA ENVELOPES | DOB | SPT BLOWS/FT | DRILLING DATA NOTES | REMARKS | GROUP | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------------------|-----|--------------|---------------------|---------|-------|--|
| 0 | | | | | | | Surface to Very Dense Brown SANDY CLAY (CL-Dry) |
| 5 | | | | | | | |
| 10 | | | 8-10-12" | | | | SILTY SAND (SM-Dry); Brown Medium Dense 9.0 |
| 15 | | | | | | | WELL GRADED SAND (SM-Dry); Brown Medium Dense with Trace Gravel and 0% to 10% Cobbles 12.0 |
| 20 | | | 8-10-18" | | | | |
| 25 | | | | | | | GRAVELLY SAND/SANDY GRAVEL (SM-Dry); Brown Very Dense with 5% to 10% Cobbles 24.0 |
| 30 | | | 30-26-18" | | | | |
| 35 | | | | | | | |
| 40 | | | 17-20-24" | | | | WELL GRADED SAND (SM-Moist); Brown Very Dense with Trace Silt and Trace Gravel 38.0 |
| 45 | | | | | | | |
| 50 | | | 13-30-18" | | | | SILTY SAND (SM-Moist); Brown Medium Dense 47.0 |
| 55 | | | | | | | |
| 60 | | | 27-37-48" | | | | |
| 65 | | | 11-19-19" | | | | |
| 70 | | | 15-14-20" | | | | WELL GRADED SAND (SM-Moist); Grayish Brown Dense with Trace Gravel 68.0 |
| 75 | | | 16-18-21" | | | | |
| 80 | | | 31-50-57" | | | | End of Boring 81.0 |

| | | |
|-------|------|------|
| Depth | Hour | Date |
| | | |

DESIGN: M. SPEEDIE 8/99
 DESIGN CHECKED: C. CREAGER 8/99
 DRAWING CHECKED: M. SPEEDIE 8/99



ARIZONA DEPARTMENT OF TRANSPORTATION
 INTERMODAL TRANSPORTATION DIVISION
 BRIDGE GROUP
 STA. 865+
 McMICKEN DAM OUTLET CHL BR EB
 FOUNDATION DATA SHEET

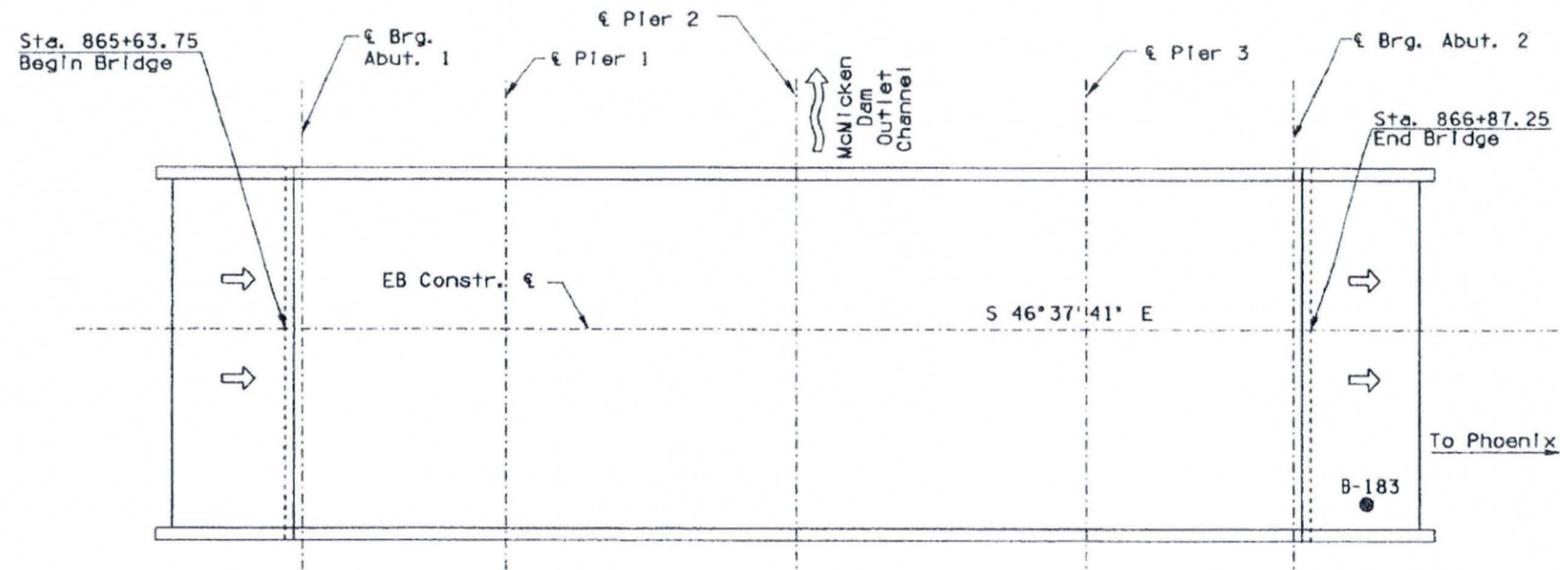


US 60 ROUTE 138.09 2561
 DEER VALLEY RD. TO BEARDSLEY RD.

PLOTTED BY: edg@ebs.com DATE PLOTTED: 30-JAN-2001 07:00
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| DATE | LOCATION | REVISIONS |
|------|----------|-----------|
| | | |

| F.J.R.A. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 133 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



LOCATION PLAN
Scale: 1" = 10'-0"

GEO TECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A DATE: 3-19-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: B. Freeman
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Heber Mining Co.
 BORING NO.: B-183 STATION: 866+94; 21R1.
 RIG TYPE: LC 60 ELEVATION: 1337.0

| DEPTH IN FEET | NO CORING DATA | | SPT BLOWS/FT | DRILLING DATA NOTES | GRAIN | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------|-----|--------------|---------------------|-------|---|
| | RECOVERY | GRD | | | | |
| 5 | | | 6-9-5 | | | STIFF Brown SANDY CLAY (CL-Dry) |
| 10 | | | 50/10* | | | Very Dense Brown CLAYEY SAND (SC-Dry) with Trace Gravel and Weak to Moderate Calcareous Cementation |
| 15 | | | 5-12-14 | | | Medium Dense Brown CLAYEY SAND (SC-Dry) with Little Gravel |
| 20 | | | 4-16-24 | | | Hard Brown SANDY CLAY (CL-Dry) with Trace Gravel and Trace Weak Calcareous Cementation |
| 25 | | | 4-10-12 | | | Medium Dense Brown SILTY SAND (SM-Dry) with Little Gravel |
| 30 | | | 9-11-13 | | | |
| 35 | | | 31-11-13 | | | Very Stiff Brown SANDY SILT (ML-Moist) |
| 40 | | | 35-50/46* | | | Very Dense Grayish Brown WELL GRADED SAND (SW-Dry) with Trace Gravel |
| 45 | | | 35-18-24 | | | Dense Reddish Brown WELL GRADED SAND (SW-Moist) with Little Clay and Little Gravel |
| | | | | | | Very Dense Brown WELL GRADED |

GEO TECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A DATE: 3-19-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: B. Freeman
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Heber Mining Co.
 BORING NO.: B-183 STATION: 866+94; 21R1.
 RIG TYPE: LC 60 ELEVATION: 1337.0

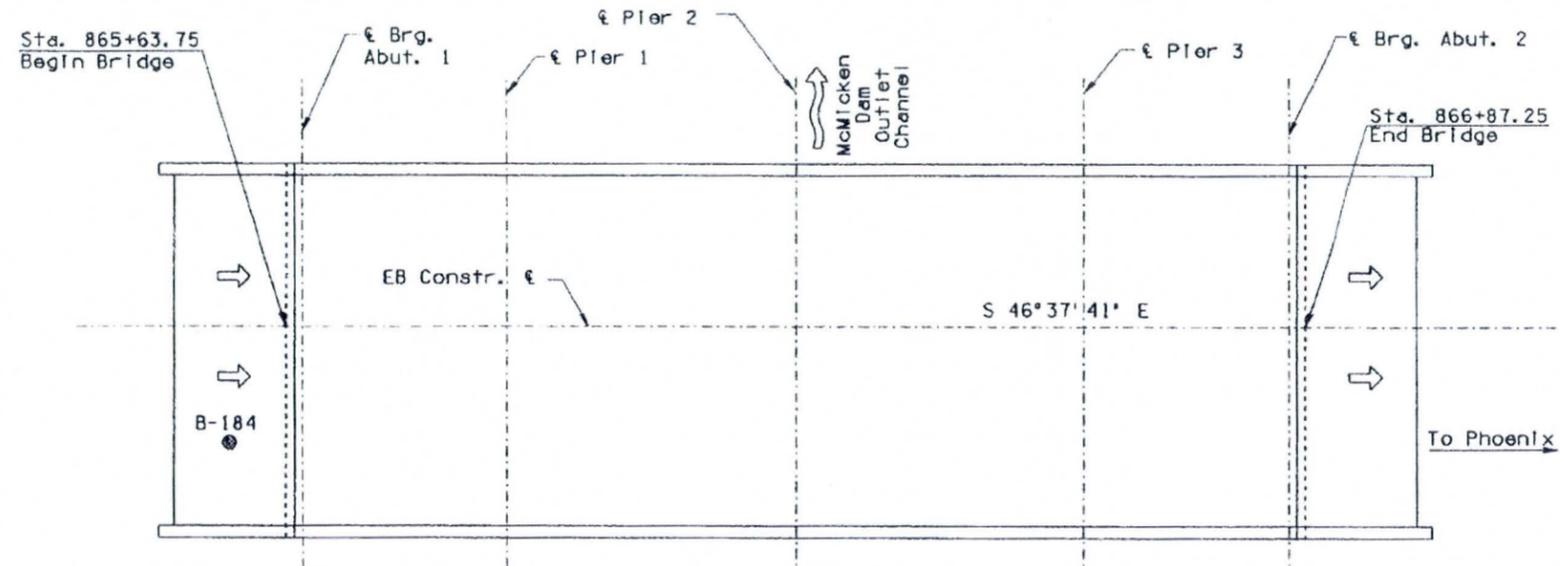
| DEPTH IN FEET | NO CORING DATA | | SPT BLOWS/FT | DRILLING DATA NOTES | GRAIN | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------|-----|--------------|---------------------|-------|--|
| | RECOVERY | GRD | | | | |
| 55 | | | 20-50/25* | | | SAND (SW-Moist) with Some Gravel |
| 60 | | | 75/12* | | | |
| 65 | | | 31-42-36/12* | | | Dense Brown SILTY FINE SAND (SP-SW-Moist) |
| 70 | | | 16-18-25 | | | |
| 75 | | | 23-16-36/12* | | | Very Dense Grayish Brown WELL GRADED SAND (SW-Moist) with Some Gravel and Trace Silt |
| 80 | | | | | | End of Boring |

| | | | | |
|-------------------------------|------------|---------------|---|---------------|
| DESIGN | M. SPEER | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP STA. 865+ McMICKEN DAM OUTLET CHL BR EB FOUNDATION DATA SHEET | |
| DESIGN CHECKED | G. CREASER | 8/99 | | |
| DRAWN | H. BROWN | 8/99 | | |
| DRAWING CHECKED | M. SPEER | 8/99 | | |
| SPEEDIE AND ASSOCIATES | | | LOCATION: DEER VALLEY RD. TO BEARDSLEY RD. | SHEET 7 OF 17 |
| US 60 | 138.09 | 2561 | | |
| ROUTE | MILEPOST | STRUCTURE NO. | | |

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| COPY NO. | PRINTED NAME | REVISIONS | LOCATION | DATE |
|----------|--------------|-----------|----------|------|
| | | | | |

| F.U.R.A. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARZ. | 022-2(56) | 134 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



GEO TECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A DATE: 2-23-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: B. Freeman
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Hebar Mining Co.
 BORING NO.: B-184 STATION: 865+57; 14R1.
 RIG TYPE: LC 60 ELEVATION: 1339.0

| DEPTH IN FEET | NO CORING DATA | | SPT BLOWS/5' | DRILLING DATA NOTES | AVERAGE RATE (MIN/FT) | GRPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------|-----|--------------|---------------------|-----------------------|------|---|
| | RECOVERY | SPD | | | | | |
| 5 | | | 5-9-3 | | | | Medium Dense Brown CLAYEY SAND (SC Dry) with Little Gravel |
| 8.0 | | | | | | | |
| 10 | | | 9-15-22 | | | | Hard Brown SANDY CLAY (CL Dry) with Weak Calcareous Cementation |
| 13.0 | | | | | | | |
| 15 | | | 22-12* | | | | Very STIFF to Hard Light Brown SANDY SILT (ML Dry) with Weak Calcareous Cementation |
| 20 | | | 16-26-35/6* | | | | |
| 23.0 | | | | | | | |
| 25 | | | 7-11-14 | | | | Medium Dense Brown SILTY FINE SAND (SP/SM Dry) with Trace to Little Gravel |
| 30 | | | 19-18-30 | | | | |
| 35 | | | 23-25-21 | | | | |
| 40 | | | 30/5* | | | | Very Dense Grayish Brown WELL GRADED SAND (SW Dry) with Some Gravel |
| 45 | | | 30/5* | | | | |
| 48.0 | | | | | | | Dense Brown SILTY SAND |

GEO TECHNICAL SERVICES
BORING LOG

PROJECT NO.: 9803205A DATE: 2-23-99 GEOL/TECH: K. Gravel
 PROJECT NAME: US 60 DRILLER: B. Freeman
 LOCATION: Beardsley to Morrilstown CONTRACTOR: Hebar Mining Co.
 BORING NO.: B-184 STATION: 866+5; 14R1.
 RIG TYPE: LC 60 ELEVATION: 1339.0

| DEPTH IN FEET | NO CORING DATA | | SPT BLOWS/5' | DRILLING DATA NOTES | AVERAGE RATE (MIN/FT) | GRPH | VISUAL CLASSIFICATION & REMARKS |
|---------------|----------------|-----|--------------|---------------------|-----------------------|------|--|
| | RECOVERY | SPD | | | | | |
| 5 | | | 14-16-19 | | | | (SM Dry) |
| 57.0 | | | 16-23-25 | | | | |
| 60 | | | 40/12* | | | | Dense Grayish Brown WELL GRADED SAND (SW Dry to Moist) with Some Gravel |
| 61.2 | | | | | | | STIFF to Very STIFF Brown SANDY CLAY (CL Dry) |
| 68.0 | | | 18-27-18 | | | | Dense Gray WELL GRADED SAND (SW Dry) with Some Gravel |
| 70 | | | 4-8-12 | | | | Medium Dense Grayish Brown POORLY GRADED SAND (SP-Moist) with Trace Gravel |
| 71.0 | | | | | | | End of Boring |

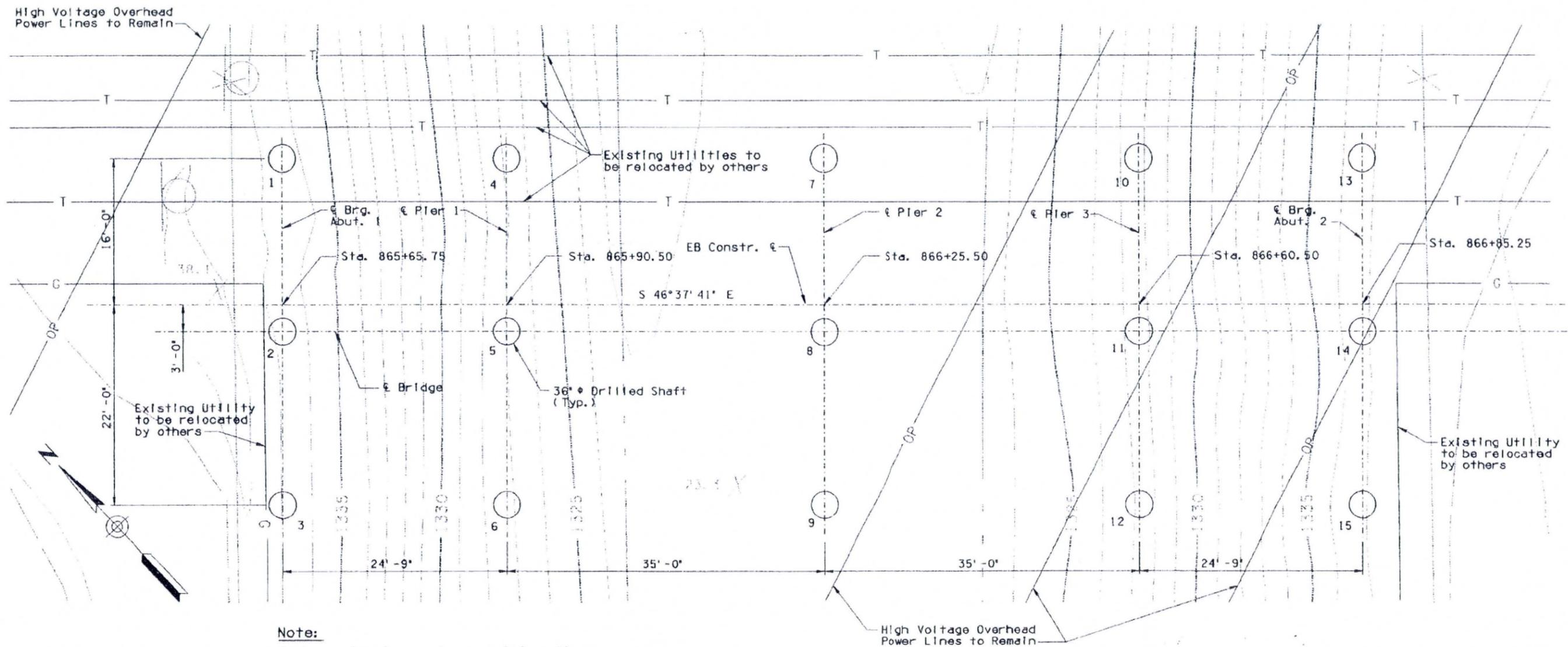
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| DATE | REVISION | LOCATION |
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|-------------------------------|------------|------|--|---------------|
| DESIGN | M. SPEEDIE | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP | |
| DESIGN CHECKED | C. CREASER | 8/99 | | |
| DRAWN | N. BROWN | 8/99 | | |
| DRAWING CHECKED | M. SPEEDIE | 8/99 | | |
| SPEEDIE AND ASSOCIATES | | | STA. 865+ McMICKEN DAM OUTLET CHL BR EB FOUNDATION DATA SHEET | |
| US 60 | 138.09 | 2561 | DEER VALLEY RD. TO BEARDSLEY RD. | SHEET 8 OF 17 |

| F.A.R.A. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 135 | 161 | 00 5/04/07 |

060 MA 136



Note:
 Contours, bearings and survey information are provided by URS Griener, ADOT
 Survey Number 3506, Tracs H4573 S1D

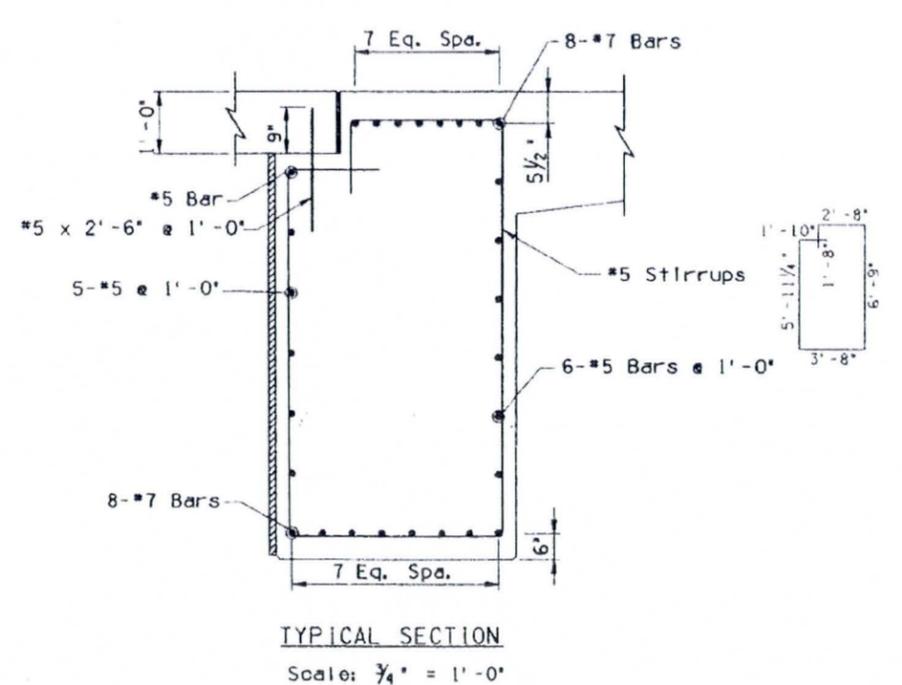
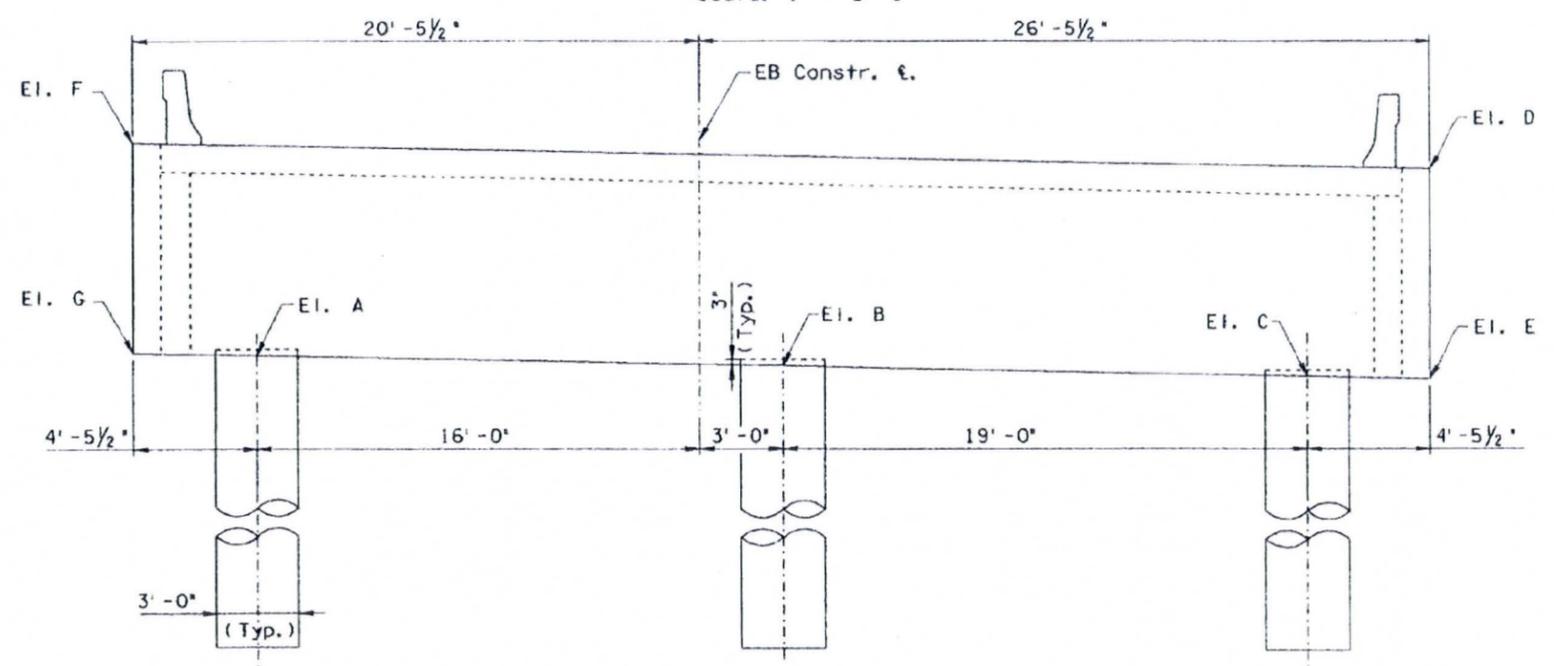
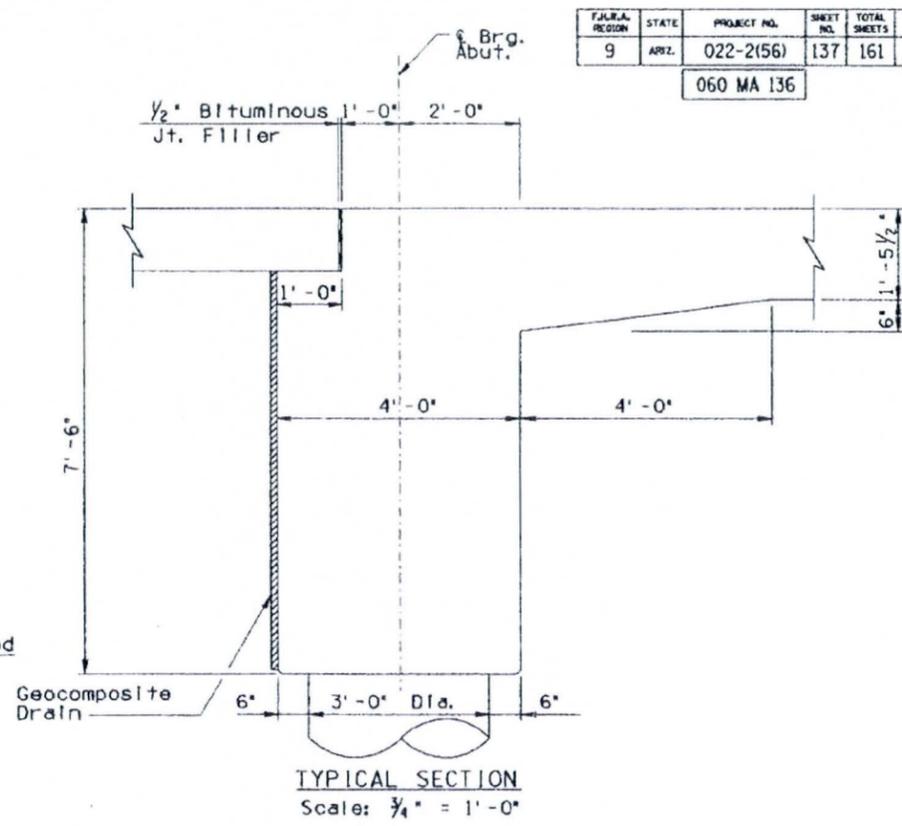
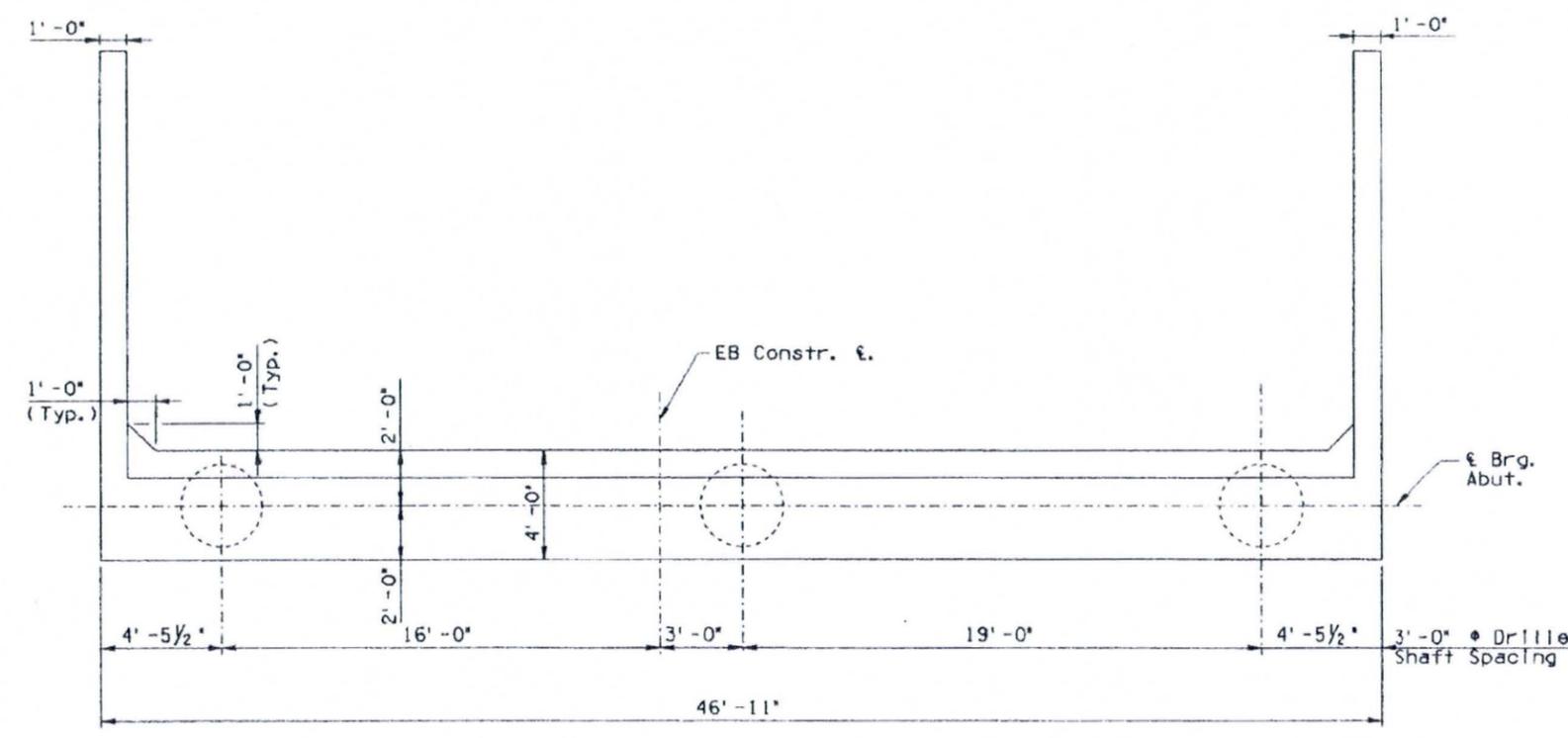
FOUNDATION LAYOUT
 Contour Interval = 1'-0"
 Scale: 1/16" = 1'-0"

| DATE | LOCATION | REVISION |
|------|----------|----------|
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| | | |

| | | | |
|-----------------|----------------|---------------|---|
| DESIGN | C. RODRIGUEZ | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP |
| DESIGN CHECKED | D. KIRKPATRICK | 8/99 | |
| DRAWN | H. BRIDEN | 8/99 | |
| DRAWING CHECKED | D. KIRKPATRICK | 8/99 | Sverdrup CIVIL INC STA. 865+ McMICKEN DAM OUTLET CHL BR EB FOUNDATION LAYOUT |
| US 60 | 138.09 | 2561 | |
| ROUTE | MILEPOST | STRUCTURE NO. | LOCATION DEER VALLEY RD. TO BEARDSLEY RD. SHEET 9 OF 17 |

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 FILE: p1214617226.ecsv78pav1729adgn.vicmcken217anfdi.dgn

| FEDERAL REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(156) | 137 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |



| | EI. A | EI. B | EI. C | EI. D | EI. E | EI. F | EI. G |
|---------|---------|---------|---------|---------|---------|---------|---------|
| Abut. 1 | 1334.59 | 1334.20 | 1333.82 | 1341.23 | 1333.73 | 1342.17 | 1334.67 |
| Abut. 2 | 1333.62 | 1333.24 | 1332.86 | 1340.27 | 1332.77 | 1341.21 | 1333.71 |

NOTE:
Elevations given are at the ϵ of Brg. Abut.

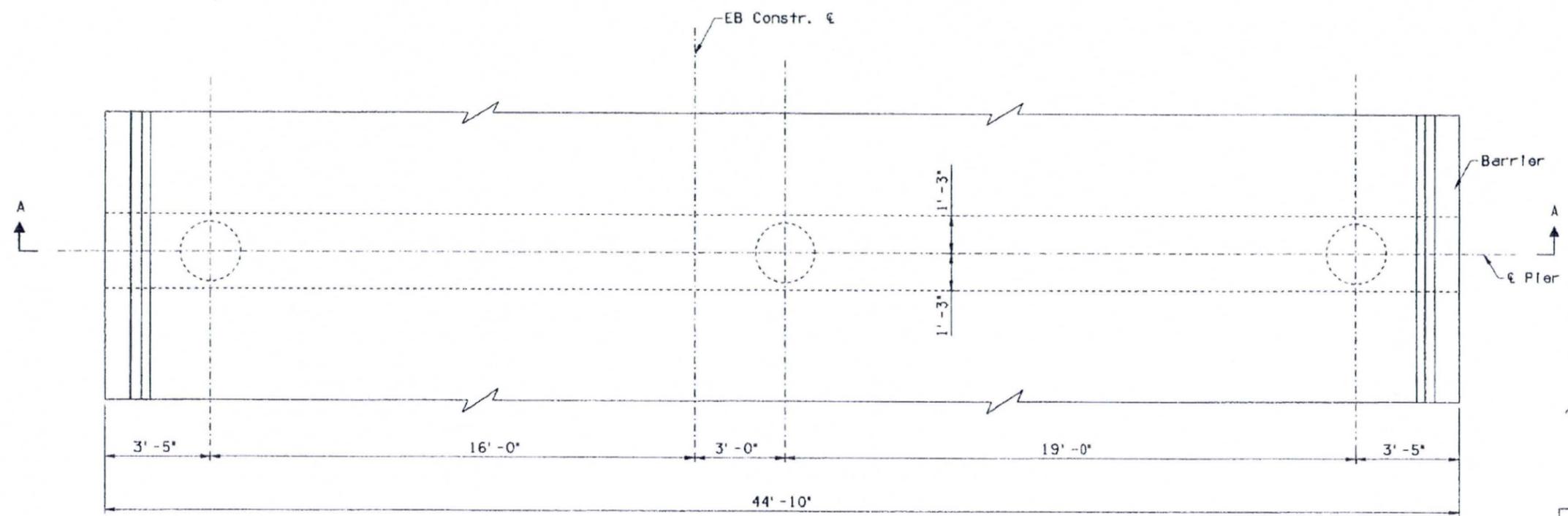
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|-------------------------------|----------------|------|---|----------------|
| DESIGN | C. RODRIGUEZ | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP STA. 865+ McMICKEN DAM OUTLET CHL BR EB ABUTMENT PLAN AND ELEVATION LOCATION DEER VALLEY RD. TO BEARDSLEY RD. | |
| DESIGN CHECKED | EL. TORPATRICK | 8/99 | | |
| DRAWN | C. RODRIGUEZ | 8/99 | | |
| BRIDGE CHECKED | EL. TORPATRICK | 8/99 | | |
| Sverdrup CIVIL INC. | | | US 60 138.09 2561 ROUTE MILEPOST STRUCTURE NO. | SHEET 11 OF 17 |

PLOTTED BY: ascp@arizona.gov DATE PLOTTED: 31-Jan-2021 14:24
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| NO. | REVISION | DATE | BY |
|-----|----------|------|----|
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| FEDERAL REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 139 | 161 | 00 5/04/07 |

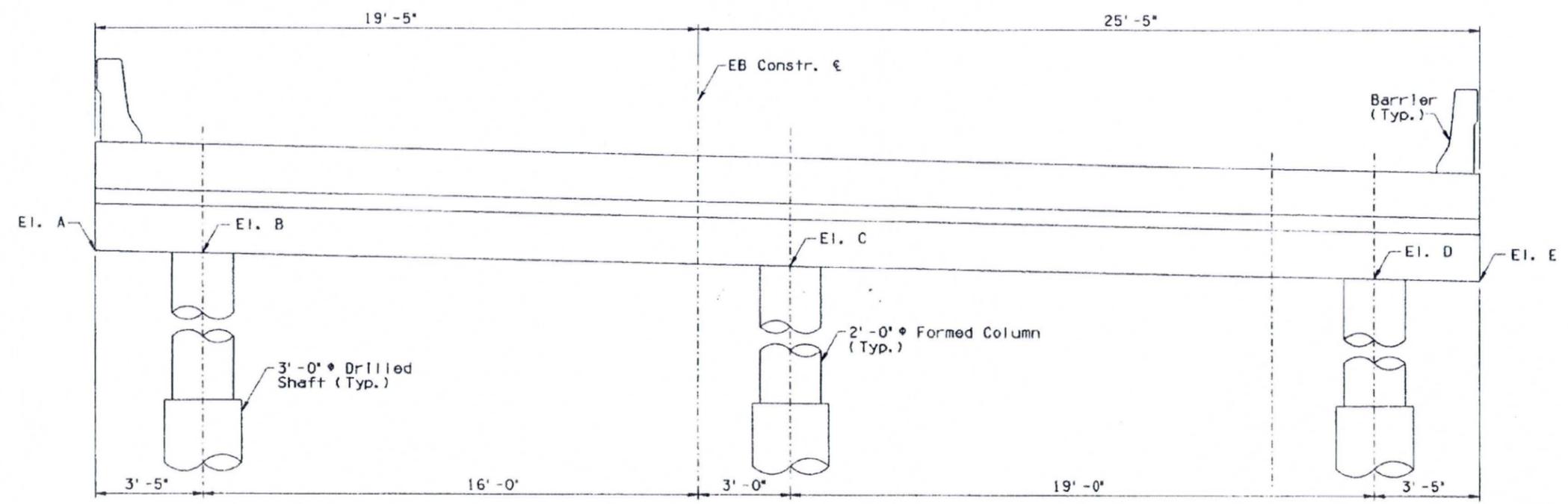
060 MA 136



PLAN
Scale: 1/2" = 1'-0"

| | Pier 1 | Pier 2 | Pier 3 |
|-------|---------|---------|---------|
| EI. A | 1338.51 | 1338.24 | 1337.95 |
| EI. B | 1338.45 | 1338.18 | 1337.89 |
| EI. C | 1338.06 | 1337.79 | 1337.50 |
| EI. D | 1337.68 | 1337.41 | 1337.12 |
| EI. E | 1337.61 | 1337.34 | 1337.05 |

NOTE:
Elevations given are at the C of Pier.



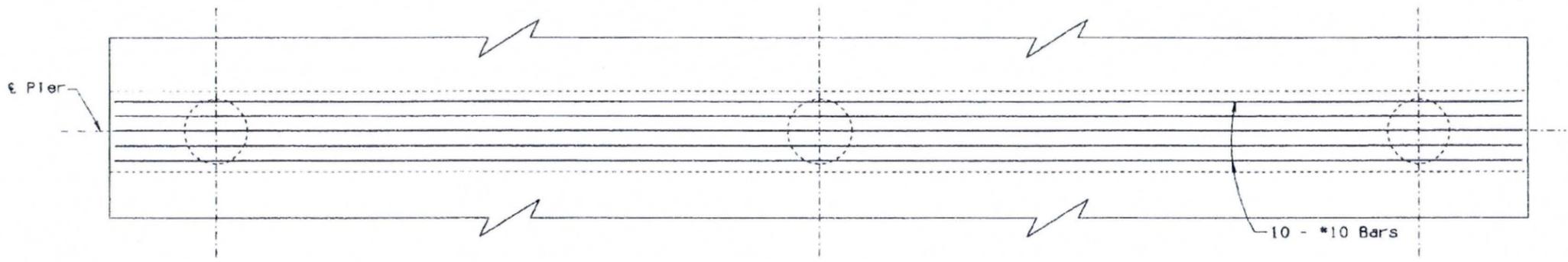
SECTION A-A
(Looking Ahead Station)
Scale: 1/2" = 1'-0"

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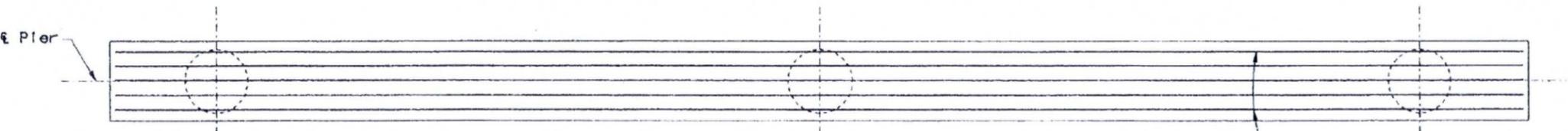
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| DRAWN | S. BROWN | 8/99 | | |
| DRAWING CHECKED | D. KIRKPATRICK | 8/99 | STA. 865+ McMICKEN DAM OUTLET CHL BR EB PIER PLAN AND ELEVATION | |
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| ROUTE MILEPOST STRUCTURE NO. | | | SHEET 13 OF 17 | |

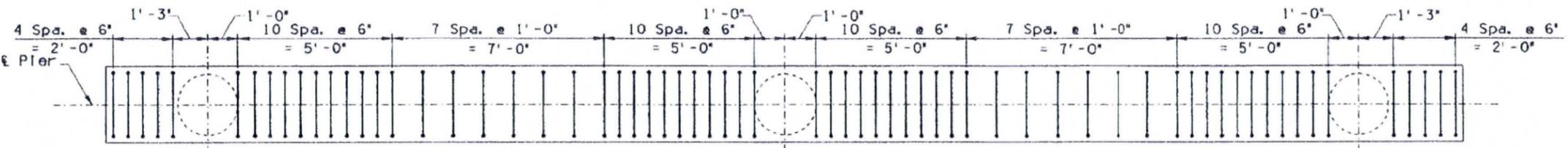
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| 060 MA 136 | | | | | |



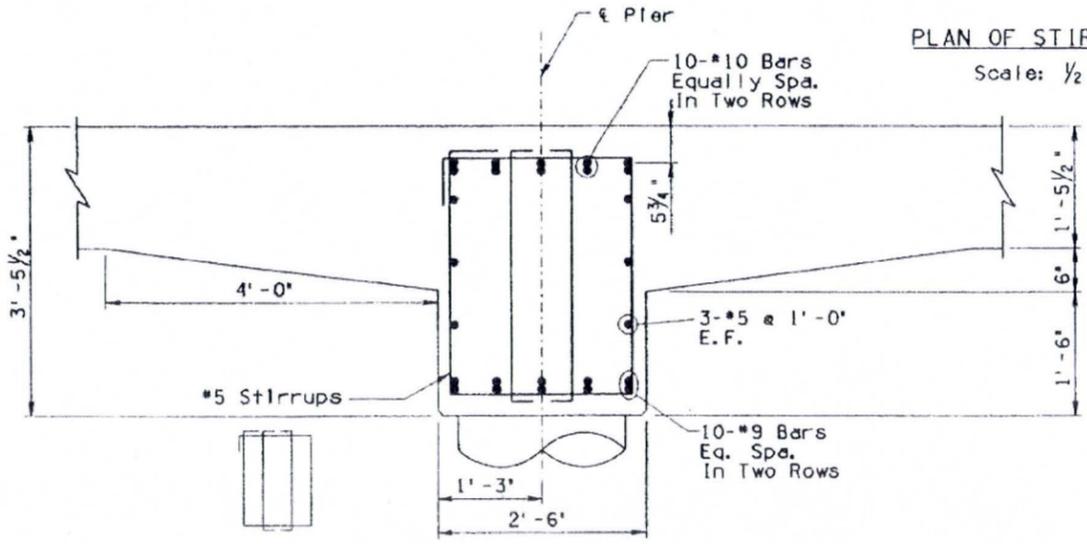
PLAN OF TOP STEEL
Scale: 1/2" = 1'-0"



PLAN OF BOTTOM STEEL
Scale: 1/2" = 1'-0"



PLAN OF STIRRUP SPACING
Scale: 1/2" = 1'-0"



TYPICAL SECTION
Scale: 1" = 1'-0"

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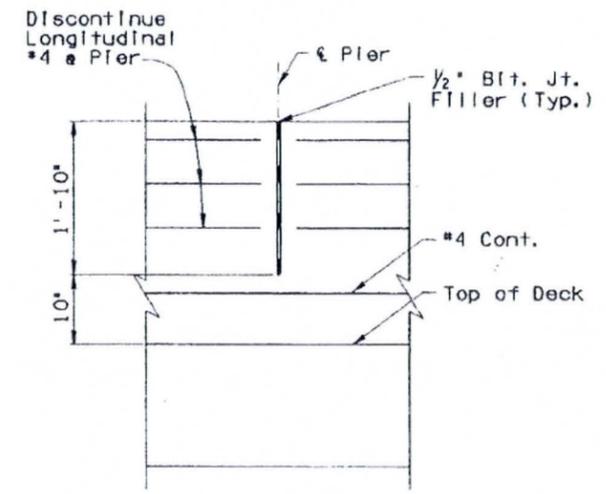
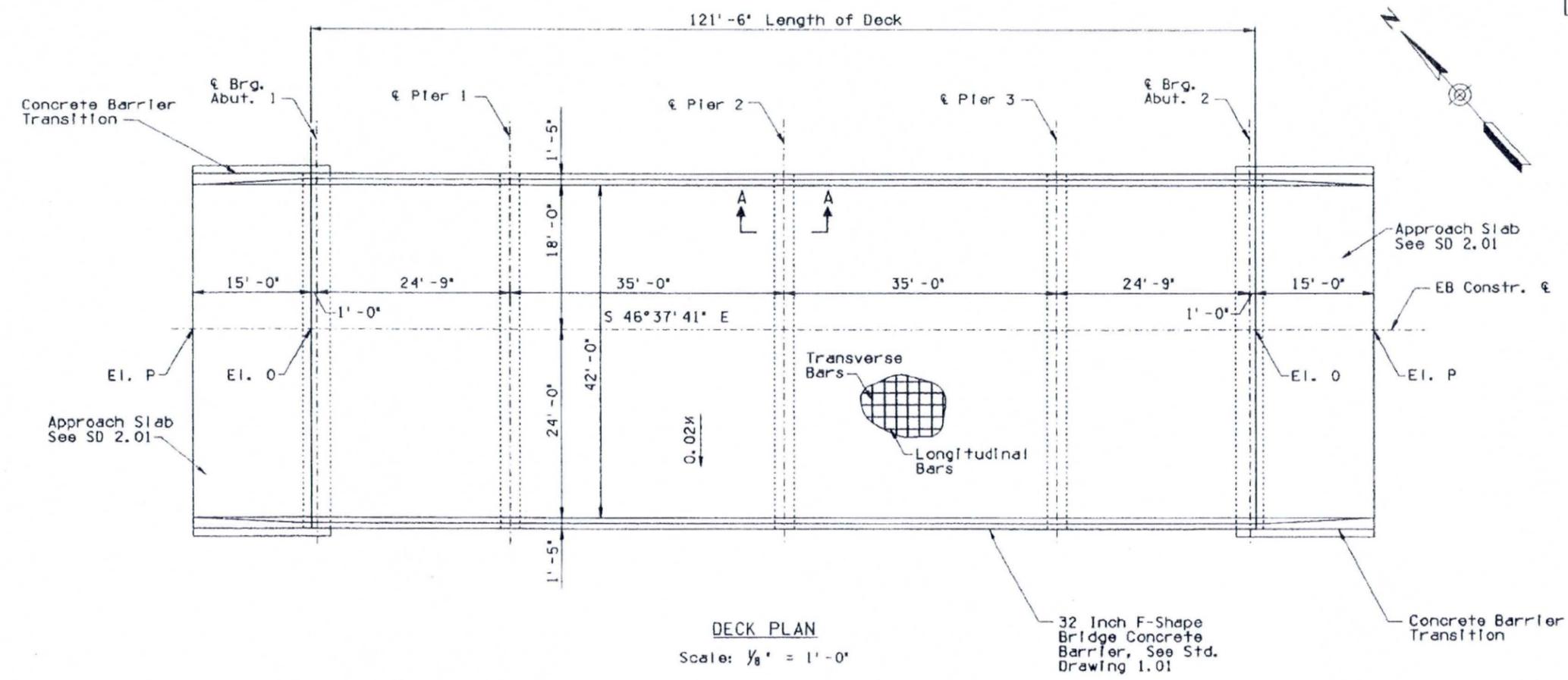
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| DESIGN CHECKED | D. KIRKPATRICK | 8/99 | |
| DRAWN | C. RODRIGUEZ | 8/99 | |
| DRAWING CHECKED | D. KIRKPATRICK | 8/99 | |
| Sverdrup CIVIL INC. | | | STA. 865+ McMICKEN DAM OUTLET CHL BR EB PIER DETAILS |
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| TRACS NO. H 4573 01C | | | 022-21561 |



SHEET 14 OF 17

| FEDERAL REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|----------------|-------|-------------|-----------|--------------|------------|
| 9 | ARIZ. | 022-2(56) | 141 | 161 | 00 5/04/07 |

060 MA 136



| Location | TOP OF SLAB ELEVATIONS | | | |
|-----------|------------------------|---------|------------|---------|
| | Abutment 1 | | Abutment 2 | |
| | El. P | El. O | El. P | El. O |
| Lt. Edge | 1342.26 | 1342.16 | 1341.04 | 1341.18 |
| Constr. € | 1341.87 | 1341.77 | 1340.65 | 1340.79 |
| Rt. Edge | 1341.36 | 1341.26 | 1340.14 | 1340.28 |

| | | | | |
|-----------------|---------------|------|--|--|
| DESIGN | C. RODRIGUEZ | 8/99 | ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP | |
| DESIGN CHECKED | D. KARPATZICK | 8/99 | | |
| DRAWN | H. BROWN | 8/99 | | |
| DRAWING CHECKED | D. KARPATZICK | 8/99 | STA. 865+ McMICKEN DAM OUTLET CHL BR EB DECK PLAN | |
| US 60 | 138.09 | 2561 | LOCATION DEER VALLEY RD. TO BEARDSLEY RD. | |

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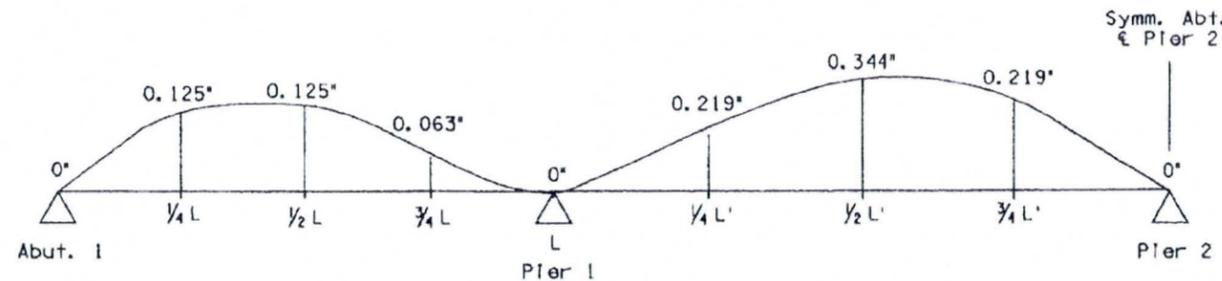
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|-----------------|-------|-------------|-----------|--------------|------------|
| F.H.R.A. REGION | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
| 9 | ARIZ. | 022-2(56) | 143 | 161 | 00 5/04/07 |
| 060 MA 136 | | | | | |

BRIDGE SCREED ELEVATIONS @ 2' -6" INTERVALS

| | | | | | | | | | | | | | |
|-----------|-------------|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|------------|-----------|
| | Beg. Bridge | CL Brg. Abut 1 | 865+68.25 | 865+70.75 | 865+73.25 | 865+75.75 | 865+78.25 | 865+80.75 | 865+83.25 | 865+85.75 | 865+88.25 | CL Pier 1 | 865+93.00 |
| LT EDGE | 1342.16 | 1342.15 | 1342.14 | 1342.12 | 1342.11 | 1342.09 | 1342.07 | 1342.05 | 1342.03 | 1342.01 | 1341.99 | 1341.97 | 1341.96 |
| CONST. CL | 1341.77 | 1341.76 | 1341.75 | 1341.73 | 1341.72 | 1341.70 | 1341.68 | 1341.66 | 1341.64 | 1341.62 | 1341.60 | 1341.58 | 1341.57 |
| RT EDGE | 1341.26 | 1341.25 | 1341.24 | 1341.23 | 1341.21 | 1341.19 | 1341.18 | 1341.16 | 1341.13 | 1341.11 | 1341.09 | 1341.08 | 1341.06 |
| | | | | | | | | | | | | | |
| | 865+95.50 | 865+98.00 | 866+00.50 | 866+03.00 | 866+05.50 | 866+08.00 | 866+10.50 | 866+13.00 | 866+15.50 | 866+18.00 | 866+20.50 | 866+23.00 | CL Pier 2 |
| LT EDGE | 1341.94 | 1341.93 | 1341.92 | 1341.90 | 1341.89 | 1341.87 | 1341.85 | 1341.82 | 1341.80 | 1341.77 | 1341.75 | 1341.72 | 1341.70 |
| CONST. CL | 1341.56 | 1341.54 | 1341.53 | 1341.52 | 1341.50 | 1341.48 | 1341.46 | 1341.44 | 1341.41 | 1341.39 | 1341.36 | 1341.34 | 1341.31 |
| RT EDGE | 1341.05 | 1341.03 | 1341.02 | 1341.01 | 1340.99 | 1340.97 | 1340.95 | 1340.93 | 1340.90 | 1340.88 | 1340.85 | 1340.83 | 1340.81 |
| | | | | | | | | | | | | | |
| | 866+28.00 | 866+30.50 | 866+33.00 | 866+35.50 | 866+38.00 | 866+40.50 | 866+43.00 | 866+45.50 | 866+48.00 | 866+50.50 | 866+53.00 | 866+55.50 | 866+58.00 |
| LT EDGE | 1341.68 | 1341.67 | 1341.65 | 1341.64 | 1341.62 | 1341.61 | 1341.59 | 1341.57 | 1341.54 | 1341.52 | 1341.49 | 1341.46 | 1341.43 |
| CONST. CL | 1341.30 | 1341.28 | 1341.27 | 1341.25 | 1341.24 | 1341.22 | 1341.20 | 1341.18 | 1341.15 | 1341.13 | 1341.10 | 1341.07 | 1341.05 |
| RT EDGE | 1340.79 | 1340.77 | 1340.76 | 1340.74 | 1340.73 | 1340.71 | 1340.69 | 1340.67 | 1340.64 | 1340.62 | 1340.59 | 1340.56 | 1340.54 |
| | | | | | | | | | | | | | |
| | CL Pier 3 | 866+63.00 | 866+65.50 | 866+68.00 | 866+70.50 | 866+73.00 | 866+75.50 | 866+78.00 | 866+80.50 | 866+83.00 | CL Brg. Abut 2 | End Bridge | |
| LT EDGE | 1341.41 | 1341.39 | 1341.37 | 1341.35 | 1341.33 | 1341.31 | 1341.29 | 1341.26 | 1341.24 | 1341.21 | 1341.19 | 1341.18 | |
| CONST. CL | 1341.02 | 1341.00 | 1340.98 | 1340.96 | 1340.94 | 1340.92 | 1340.90 | 1340.88 | 1340.85 | 1340.82 | 1340.80 | 1340.79 | |
| RT EDGE | 1340.51 | 1340.49 | 1340.47 | 1340.45 | 1340.43 | 1340.41 | 1340.39 | 1340.37 | 1340.34 | 1340.32 | 1340.29 | 1340.28 | |

Note:

1) Bridge Screed Elevations and Dead Load Camber Diagram Include dead load deflections and account for long term creep and shrinkage.



DEAD LOAD CAMBER DIAGRAM

N. T. S.

NOTES:

Forms shall be cambered for dead load deflections, vertical curvature, form deflections and falsework settlement. Camber figures given are for dead load only.

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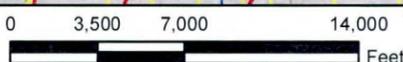
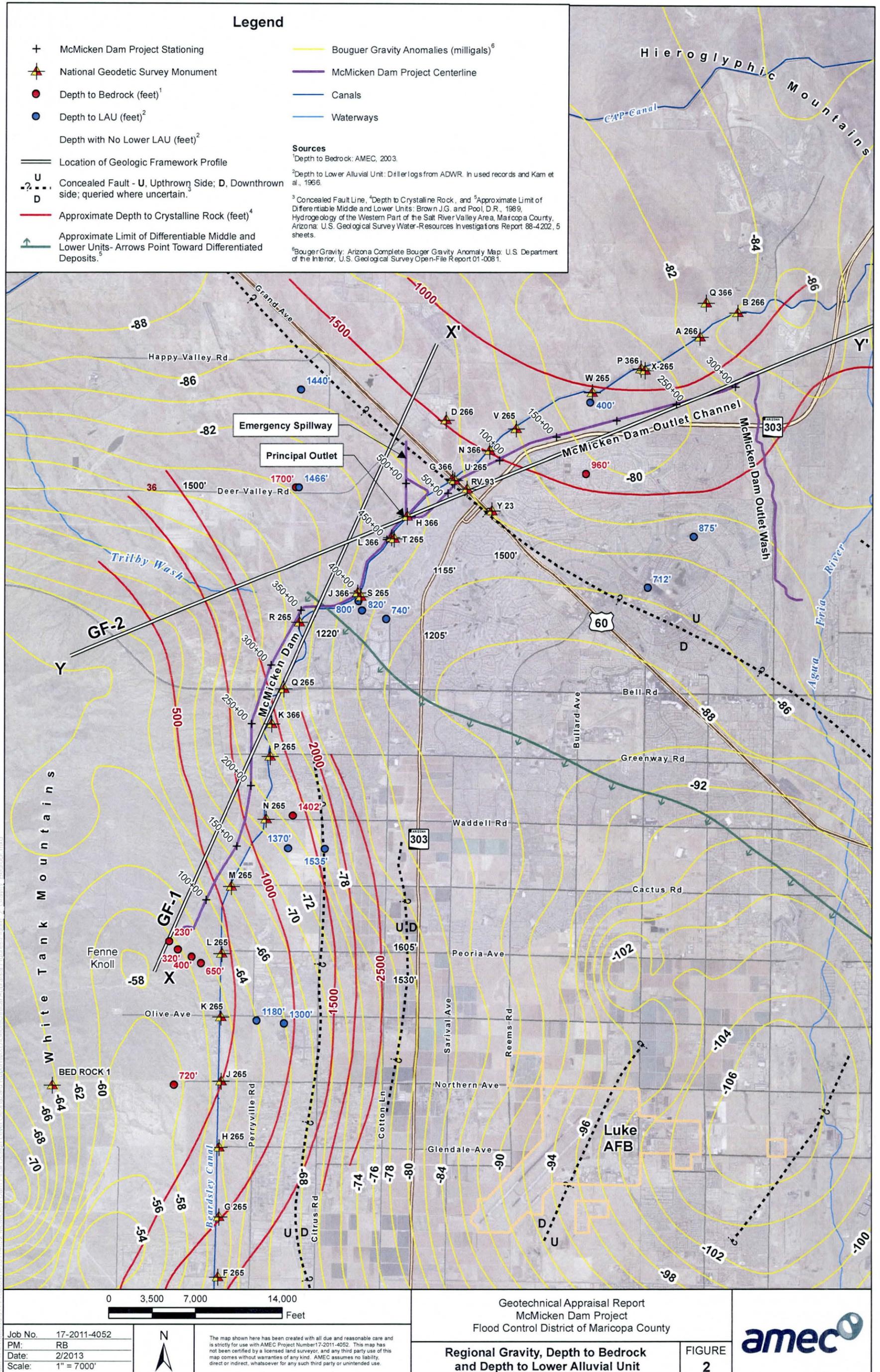
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| GRABBY | N. BROWN | 8/99 | |
| DRAWING CHECKED | D. KUBIATYCK | 8/99 | |
| Sverdrup CIVIL INC | | | STA. 865+ MCMICKEN DAM OUTLET CHL BR EB SCREED ELEVATIONS |
| US 60 | 138.09 | 2561 | LOCATION DEER VALLEY RD. TO BEARDSLEY RD. |
| TRACS NO. H 4573 OIC | | | SHEET 17 OF 17 |

Legend

- + McMicken Dam Project Stationing
- ▲ National Geodetic Survey Monument
- Depth to Bedrock (feet)¹
- Depth to LAU (feet)²
- Depth with No Lower LAU (feet)²
- Location of Geologic Framework Profile
- Concealed Fault - U, Uplifted Side; D, Downthrown side; queried where uncertain.
- Approximate Depth to Crystalline Rock (feet)⁴
- Approximate Limit of Differentiable Middle and Lower Units - Arrows Point Toward Differentiated Deposits.⁵
- Bouguer Gravity Anomalies (milligals)⁶
- McMicken Dam Project Centerline
- Canals
- Waterways

Sources

¹Depth to Bedrock: AMEC, 2003.
²Depth to Lower Alluvial Unit: Driller logs from ADWR. In used records and Kam et al., 1966.
³Concealed Fault Line, ⁴Depth to Crystalline Rock, and ⁵Approximate Limit of Differentiable Middle and Lower Units: Brown J.G. and Pool, D.R., 1989, Hydrogeology of the Western Part of the Salt River Valley Area, Maricopa County, Arizona: U.S. Geological Survey Water-Resources Investigations Report 88-4202, 5 sheets.
⁶Bouguer Gravity: Arizona Complete Bouguer Gravity Anomaly Map: U.S. Department of the Interior, U.S. Geological Survey Open-File Report 01-0081.



Job No. 17-2011-4052
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 Date: 2/2013
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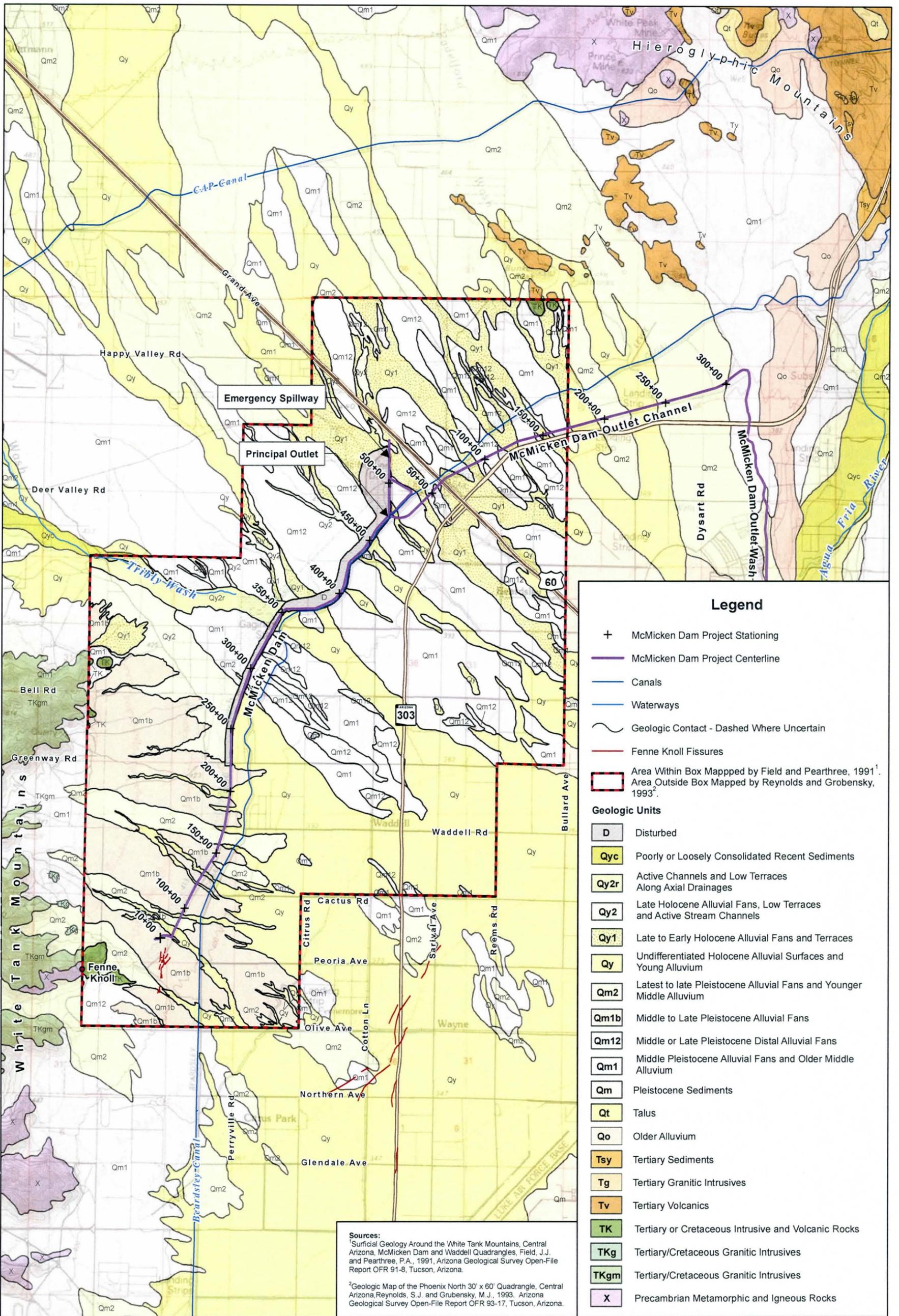


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Geotechnical Appraisal Report
 McMicken Dam Project
 Flood Control District of Maricopa County
**Regional Gravity, Depth to Bedrock
 and Depth to Lower Alluvial Unit**

FIGURE
2





Legend

- + McMicken Dam Project Stationing
- McMicken Dam Project Centerline
- Canals
- Waterways
- - - Geologic Contact - Dashed Where Uncertain
- Fenne Knoll Fissures
- Area Within Box Mapped by Field and Pearthree, 1991¹. Area Outside Box Mapped by Reynolds and Grobnsky, 1993².

Geologic Units

| | |
|---|--|
| D | Disturbed |
| Qyc | Poorly or Loosely Consolidated Recent Sediments |
| Qy2r | Active Channels and Low Terraces Along Axial Drainages |
| Qy2 | Late Holocene Alluvial Fans, Low Terraces and Active Stream Channels |
| Qy1 | Late to Early Holocene Alluvial Fans and Terraces |
| Qy | Undifferentiated Holocene Alluvial Surfaces and Young Alluvium |
| Qm2 | Latest to late Pleistocene Alluvial Fans and Younger Middle Alluvium |
| Qm1b | Middle to Late Pleistocene Alluvial Fans |
| Qm12 | Middle or Late Pleistocene Distal Alluvial Fans |
| Qm1 | Middle Pleistocene Alluvial Fans and Older Middle Alluvium |
| Qm | Pleistocene Sediments |
| Qt | Talus |
| Qo | Older Alluvium |
| Tsy | Tertiary Sediments |
| Tg | Tertiary Granitic Intrusives |
| Tv | Tertiary Volcanics |
| TK | Tertiary or Cretaceous Intrusive and Volcanic Rocks |
| TKg | Tertiary/Cretaceous Granitic Intrusives |
| TKgm | Tertiary/Cretaceous Granitic Intrusives |
| X | Precambrian Metamorphic and Igneous Rocks |

Sources:
¹ Surficial Geology Around the White Tank Mountains, Central Arizona, McMicken Dam and Waddell Quadrangles, Field, J.J. and Pearthree, P.A., 1991, Arizona Geological Survey Open-File Report OFR 91-8, Tucson, Arizona.
² Geologic Map of the Phoenix North 30' x 60' Quadrangle, Central Arizona, Reynolds, S.J. and Grubbs, M.J., 1993, Arizona Geological Survey Open-File Report OFR 93-17, Tucson, Arizona.

0 3,500 7,000 14,000
 Feet

Job No. 17-2011-4052
 PM: RB
 Date: 2/2013
 Scale: 1" = 7000'

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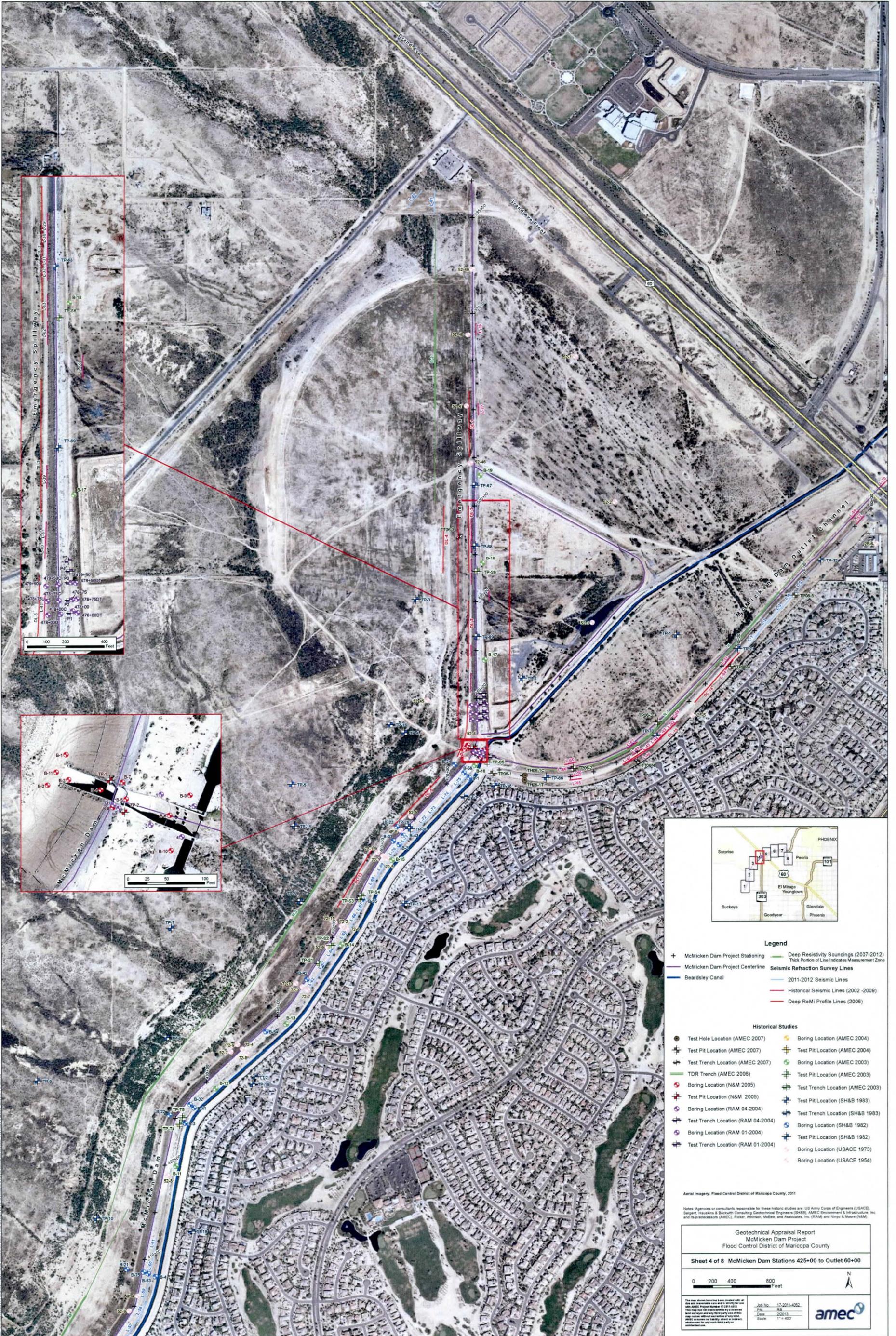
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Geotechnical Appraisal Report
 McMicken Dam Project
 Flood Control District of Maricopa County

Surficial Geologic Map

FIGURE
3





Legend

- + McMicken Dam Project Stationing
- McMicken Dam Project Centerline
- Beardsley Canal
- Deep Resistivity Soundings (2007-2012)
- Thick Portion of Line Indicates Measurement Zone
- Seismic Refraction Survey Lines**
- 2011-2012 Seismic Lines
- Historical Seismic Lines (2002-2009)
- Deep ReM Profile Lines (2006)

Historical Studies

- Test Hole Location (AMEC 2007)
- Test Pit Location (AMEC 2007)
- Test Trench Location (AMEC 2007)
- TDR Trench (AMEC 2006)
- Boring Location (N&M 2005)
- Boring Location (RAM 04-2004)
- Test Trench Location (RAM 04-2004)
- Boring Location (RAM 01-2004)
- Test Trench Location (RAM 01-2004)
- Boring Location (AMEC 2004)
- Test Pit Location (AMEC 2004)
- Boring Location (AMEC 2003)
- Test Pit Location (AMEC 2003)
- Test Pit Location (AMEC 2003)
- Test Pit Location (SH&B 1983)
- Test Trench Location (SH&B 1983)
- Boring Location (SH&B 1982)
- Test Pit Location (SH&B 1982)
- Boring Location (USACE 1973)
- Boring Location (USACE 1954)

Aerial Imagery: Flood Control District of Maricopa County, 2011

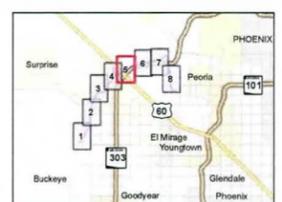
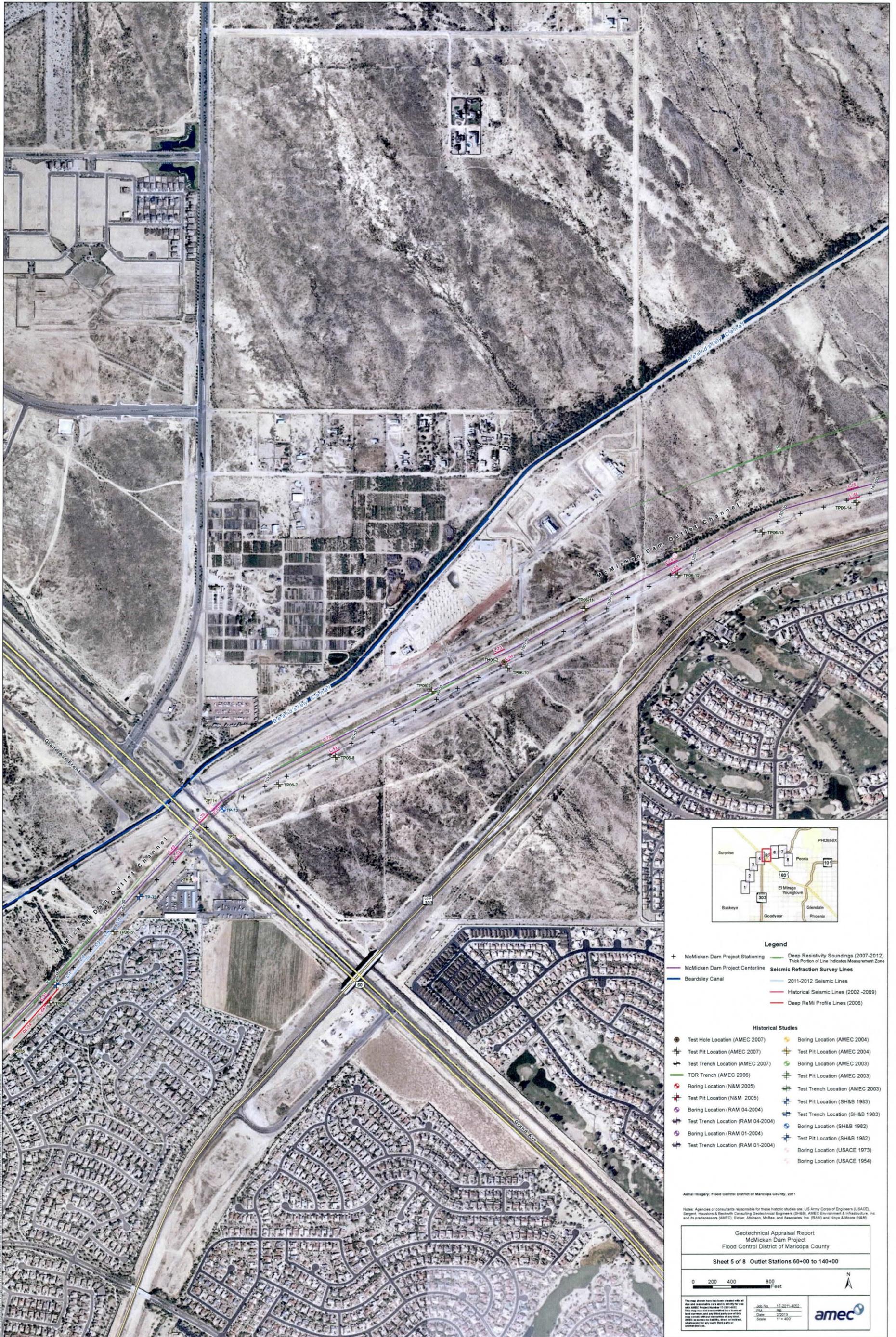
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Geotechnical Appraisal Report
McMicken Dam Project
Flood Control District of Maricopa County

Sheet 4 of 8 McMicken Dam Stations 425+00 to Outlet 60+00

0 200 400 800 Feet

Job No. 17-2011-0252
Date: 2/20/13
Scale: 1" = 400'



- Legend**
- + McMicken Dam Project Stationing
 - McMicken Dam Project Centerline
 - Beardsley Canal
 - Deep Resistivity Soundings (2007-2012)
 - Thick Portion of Line Indicates Measurement Zone
 - Seismic Refraction Survey Lines
 - 2011-2012 Seismic Lines
 - Historical Seismic Lines (2002 -2009)
 - Deep ReMi Profile Lines (2006)
- Historical Studies**
- Test Hole Location (AMEC 2007)
 - ⊕ Test Pit Location (AMEC 2007)
 - ⊕ Test Trench Location (AMEC 2007)
 - TDR Trench (AMEC 2006)
 - Boring Location (N&M 2005)
 - ⊕ Test Pit Location (N&M 2005)
 - ⊕ Boring Location (RAM 04-2004)
 - ⊕ Test Trench Location (RAM 04-2004)
 - ⊕ Boring Location (RAM 01-2004)
 - ⊕ Test Trench Location (RAM 01-2004)
 - Boring Location (AMEC 2004)
 - ⊕ Test Pit Location (AMEC 2004)
 - ⊕ Boring Location (AMEC 2003)
 - ⊕ Test Pit Location (AMEC 2003)
 - ⊕ Test Trench Location (AMEC 2003)
 - ⊕ Test Pit Location (SH&B 1983)
 - ⊕ Test Trench Location (SH&B 1983)
 - ⊕ Boring Location (SH&B 1982)
 - ⊕ Test Pit Location (SH&B 1982)
 - ⊕ Boring Location (USACE 1973)
 - ⊕ Boring Location (USACE 1954)

Aerial Imagery: Flood Control District of Maricopa County, 2011

Notes: Agencies or consultants responsible for these historic studies are: US Army Corps of Engineers (USACE), Seeger, Hawkins & Beckwith Consulting Geotechnical Engineers (SH&B), AMEC Environment & Infrastructure, Inc. and its predecessors (AMEC), Rickel, Alorton, McBe, and Associates, Inc. (RAM) and Ninyo & Moore (N&M)

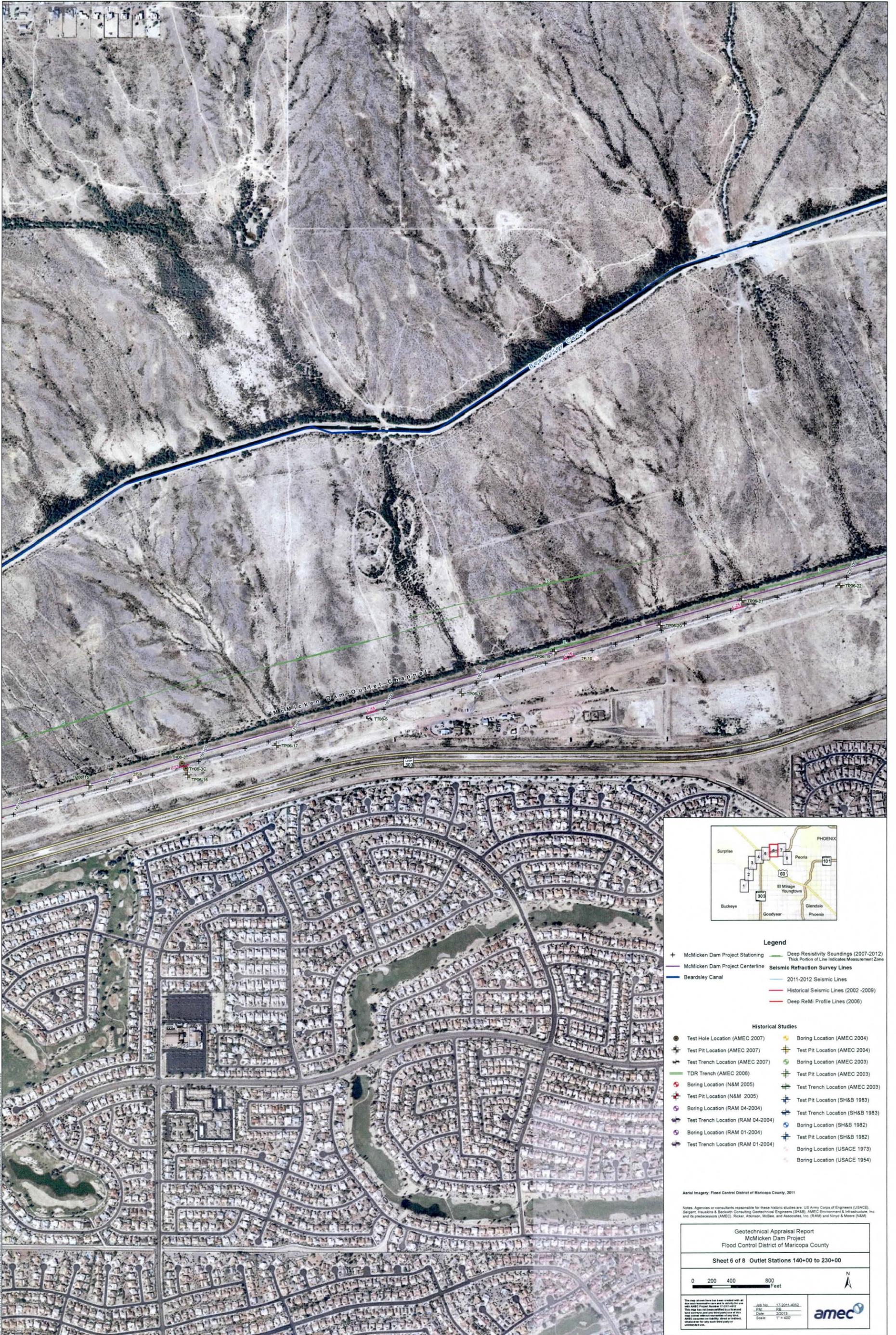
Geotechnical Appraisal Report
McMicken Dam Project
 Flood Control District of Maricopa County

Sheet 5 of 8 Outlet Stations 60+00 to 140+00

0 200 400 800 Feet

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| Job No. | 17-2011-052 |
| Drawn By | RB |
| Date | 2/20/13 |
| Scale | 1" = 400' |



- Legend**
- + McMicken Dam Project Stationing
 - McMicken Dam Project Centerline
 - Beardsley Canal
 - Deep Resistivity Soundings (2007-2012)
 - Thick Portion of Line Indicates Measurement Zone
 - Seismic Refraction Survey Lines**
 - 2011-2012 Seismic Lines
 - Historical Seismic Lines (2002 -2009)
 - Deep ReMi Profile Lines (2006)
- Historical Studies**
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 - ⊕ Test Pit Location (AMEC 2007)
 - ⊕ Test Trench Location (AMEC 2007)
 - ⊕ TDR Trench (AMEC 2006)
 - ⊕ Boring Location (N&M 2005)
 - ⊕ Test Pit Location (RAM 04-2004)
 - ⊕ Test Trench Location (RAM 04-2004)
 - ⊕ Boring Location (RAM 01-2004)
 - ⊕ Test Trench Location (RAM 01-2004)
 - ⊕ Boring Location (AMEC 2004)
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 - ⊕ Boring Location (SH&B 1982)
 - ⊕ Test Pit Location (SH&B 1982)
 - ⊕ Boring Location (USACE 1973)
 - ⊕ Boring Location (USACE 1954)

Aerial Imagery: Flood Control District of Maricopa County, 2011

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Geotechnical Appraisal Report
McMicken Dam Project
Flood Control District of Maricopa County

Sheet 6 of 8 Outlet Stations 140+00 to 230+00

0 200 400 800 Feet

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Job No. 17-2011-4052
PM RB
Date 2/20/13
Scale 1" = 400'



Legend

- + McMicken Dam Project Stationing
- McMicken Dam Project Centerline
- Beardsley Canal
- Deep Resistivity Soundings (2007-2012)
- Seismic Refraction Survey Lines
 - 2011-2012 Seismic Lines
 - Historical Seismic Lines (2002-2009)
 - Deep ReMi Profile Lines (2006)

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- ⊕ Test Pit Location (AMEC 2007)
- ⊕ Test Trench Location (AMEC 2007)
- ⊕ TDR Location (AMEC 2006)
- ⊕ Boring Location (N&M 2005)
- ⊕ Test Pit Location (N&M 2005)
- ⊕ Boring Location (RAM 04-2004)
- ⊕ Test Trench Location (RAM 04-2004)
- ⊕ Boring Location (RAM 01-2004)
- ⊕ Test Trench Location (RAM 01-2004)
- ⊕ Boring Location (AMEC 2004)
- ⊕ Test Pit Location (AMEC 2004)
- ⊕ Boring Location (AMEC 2003)
- ⊕ Test Pit Location (AMEC 2003)
- ⊕ Test Trench Location (AMEC 2003)
- ⊕ Test Pit Location (SH&B 1983)
- ⊕ Test Trench Location (SH&B 1983)
- ⊕ Boring Location (SH&B 1982)
- ⊕ Test Pit Location (SH&B 1982)
- ⊕ Boring Location (USACE 1973)
- ⊕ Boring Location (USACE 1954)

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Geotechnical Appraisal Report
 McMicken Dam Project
 Flood Control District of Maricopa County

Sheet 7 of 8 Outlet Stations 230+00 to 310+00 and Outlet Wash

0 200 400 800 Feet

Job No. 17-2011-0252
 PM: RB
 Date: 2/20/13
 Scale: 1" = 400'

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 15+00
Upper Downstream Slope
 SURFACE ELEV. 1333.7'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | CL | | |
| 1 | | | | | | | |
| 2 | | | | 6 | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|--|---|
| ASTM D2292 Nuclear Density at 2.0' Dry Density 96 pcf | SANDY CLAY , rare fine grained, subangular to subrounded gravel, some fine to medium grained, subangular to subrounded sand, weakly cemented, low to medium plasticity, dark brown |
| | Stopped Digging at 2' |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-1C

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 15+00
Lower Downstream Slope
 SURFACE ELEV. 1333.2'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|---|---|
| | | | | | | | |
| 0 | | | D | | SC | | CLAYEY SAND , trace of fine grained, subangular to subrounded gravel, considerable fine to medium grained, subangular to subrounded sand, weakly to moderately cemented, low to medium plasticity, brown |
| 1 | | | | | | | |
| 2 | | | | 6 | | ASTM D2292 Nuclear Density at 2.0' Dry Density 110 pcf | |
| 3 | | | | | | | Stopped Digging at 2' |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-1T

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 100+00
Middle Downstream Slope
 SURFACE ELEV. 1333.7'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|--|--|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | SM | | |
| 1 | | | | 6 | | ASTM D2292 Nuclear Density at 1.5' Dry Density 102 pcf | SILTY SAND WITH GRAVEL, some fine grained, subangular to subrounded gravel, some fine to medium grained, subangular to subrounded sand, strongly cemented, nonplastic to low plasticity, light brown |
| 2 | | | | | | | Stopped Digging at 1'6" |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-2

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 160+00
Upper Downstream Slope
 SURFACE ELEV. 1327.7'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|---|------|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | SM | | |
| 1 | | | | | | | |
| 2 | | | | 4 | | ASTM D2292 Nuclear Density at 2.0' Dry Density 108 pcf | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

REMARKS

SOIL DESCRIPTION

SILTY SAND, trace of fine grained, subangular to subrounded gravel, some medium to coarse grained, subangular to subrounded sand, uncemented, nonplastic to low plasticity, brown

Stopped Digging at 2'

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-3C

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 160+00
Lower Downstream Slope
 SURFACE ELEV. 1331.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|-------------|------|---|---|
| | | | | | | DEPTH | HOUR | | |
| 0 | | | D | | CL | | | | SANDY CLAY , trace of fine grained, subangular to subrounded gravel, some fine to medium grained, subangular to subrounded sand, low plasticity, brown |
| 1 | | | | | | | | | |
| 2 | | | | 9 | | | | ASTM D2292 Nuclear Density at 2.5' Dry Density 93 pcf | |
| 3 | | | | | | | | | Stopped Digging at 2'6" |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-3T

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 240+00
Upper Downstream Slope
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|---|-----------------------|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | SC | | |
| 1 | | | | | | | |
| 2 | | | | 7 | | ASTM D2292 Nuclear Density at 2.0' Dry Density 89 pcf | Stopped Digging at 2' |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

REMARKS SOIL DESCRIPTION

CLAYEY SAND, trace of fine grained, subangular to subrounded gravel, some fine to medium grained, subangular to subrounded sand, weakly cemented, medium to high plasticity, brown

ASTM D2292 Nuclear Density at 2.0' Dry Density 89 pcf

Stopped Digging at 2'

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TH06-4C

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 240+00
Lower Downstream Slope
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|--|--|---|-----------------------|
| | | | | | | | | | |
| 0 | | | D | | SC | | | CLAYEY SAND WITH GRAVEL , some fine grained, subangular to subrounded gravel, some fine to medium grained, subangular to subrounded sand, weakly cemented, low to medium plasticity, brown | |
| 1 | | | | | | | | | |
| 2 | | | | 13 | | ASTM D2292 Nuclear Density at 2.0' Dry Density 78 pcf | | | Stopped Digging at 2' |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TH06-4T

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 11/22/06

BACKHOE TYPE Hand Dug Test Pit
 LOCATION O.C Sta. 300+00
Middle Downstream Slope
 SURFACE ELEV. 1315.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|--|---|
| | | | | | | | |
| 0 | | | D | | SC-SM | | CLAYEY SAND , considerable fine to medium grained, subangular to subrounded sand, strongly cemented, low plasticity, light brown |
| 1 | | | | 6 | | ASTM D2292 Nuclear Density at 1.5' Dry Density 100 pcf | |
| 2 | | | | | | | Stopped Digging at 1'6" |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

- SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TH06-5

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/7/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 10+00
Downstream
 SURFACE ELEV. 1334.3'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | | | CL/SC | slightly moist | SAND & CLAY , predominantly fine grained, subangular to subrounded, uncemented, medium to high plasticity, reddish-brown |
| 1 | | | | | | | |
| 2 | | | D | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | note: Stage I cementation & trace of fine grained gravel below 3'6" |
| 5 | | | | | SC | slightly moist | CLAYEY SAND , predominantly fine to medium grained sand, Stage I+ cementation, low to medium plasticity, dark reddish-brown |
| 6 | | | | | | | |
| 7 | | | D | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, some to considerable well graded gravel, subangular to subrounded, Stage II to II+ cementation, medium plasticity, tan to white |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-1

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/7/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 10+00
Downstream
 SURFACE ELEV. 1334.3'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SC/GC | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | D | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

REMARKS SOIL DESCRIPTION

slightly moist **SAND & GRAVEL WITH CLAY**, continued
 note: Stage II cementation below 10'
 note: SC zone, predominantly fine to medium grained sand from 11' to 12'
 note: decrease in fines below 12', possible SP/GP

Stopped Backhoe at 13'

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-1

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 20+00
Channel
 SURFACE ELEV. 1326.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|---|---|
| | | | | | | | | |
| 0 | | | D | | CL | slightly moist | SANDY CLAY , predominantly fine grained sand, Stage I, medium plasticity, reddish-brown | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | CL-SC | slightly moist | SANDY CLAY TO CLAYEY SAND , predominantly fine grained sand, Stage I to I+ cementation, medium plasticity, brown | |
| 5 | | | | | | | | |
| 6 | | | | | | | | note: trace of fine grained gravel below 6' |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | SC | slightly moist |
| 10 | | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-2

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 20+00
Channel
 SURFACE ELEV. 1326.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|---|
| | | | | | | DEPTH | HOUR |
| 10 | | | D | | SC | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | slightly moist | CLAYEY SAND, continued |
| 14 | | | | | | | note: predominantly fine to medium grained sand & Stage I cementation below 11' |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | Stopped Backhoe at 13' |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-2

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 30+00
Channel
 SURFACE ELEV. 1326.8'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | CL-ML | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | D | | SM | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

REMARKS

SOIL DESCRIPTION

SANDY CLAY TO SANDY SILT, predominantly fine grained sand, Stage I to I+ cementation, medium to high plasticity, brown

SILTY SAND, trace of clay, well graded sand, trace of fine grained gravel, subangular, Stage II to II+ cementation, low plasticity, light brown to tan

note: increase in fine grained gravel & brown in color, Stage I to II cementation below 5'

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-3

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 30+00
Channel
 SURFACE ELEV. 1326.8'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|-------------|------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SM | | |
| 11 | | | | | SM | | |
| 12 | | D | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | Stopped Backhoe at 15' |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

REMARKS SOIL DESCRIPTION

SILTY SAND, continued

SILTY SAND, predominantly fine grained sand, subangular to subrounded, uncemented, low plasticity, dark brown

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-3



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 40+00
Downstream
 SURFACE ELEV. 1328.0'
 DATUM NAVD 88

| GROUNDWATER | | |
|-------------|------|------|
| DEPTH | HOUR | DATE |
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|---|--|
| | | | | | | | | |
| 0 | | | | | CL/SC | slightly moist | SAND & CLAY , predominantly fine to medium grained sand, Stage I cementation, medium plasticity, reddish-brown | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | D | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, predominantly well graded gravel, Stage I+ cementation, medium plasticity, light brown to tan |
| 4 | | | | | | | | |
| 5 | | | D | | | | | note: decrease in fines, Stage II cementation & low plasticity below 5' |
| 6 | | | | | | | | |
| 7 | | | | | | | | note: possible SW/GW zone from 7'6" to 8'6", Stage I+ to II cementation & low to medium plasticity |
| 8 | | | | | | | | note: increase in fines, Stage I+ cementation, light brown to tan below 8'6" |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-4

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/7/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 40+00
Downstream
 SURFACE ELEV. 1328.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 10 | | | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY, continued |
| 11 | | | D | | SC | slightly moist | CLAYEY SAND WITH GRAVEL, predominantly well graded sand, trace to some coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, low to medium plasticity, tan to white |
| 12 | | | | | | | Backhoe refused at 11'6" |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-4



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 50+00
Downstream
 SURFACE ELEV. 1335.9'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | | | |
|---------------|---------------|--------|-------------|--|--|-------------|-------------------------|--|--|
| | | | | | | DEPTH | HOUR | | |
| 0 | | | D | | SC | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | SC/GC | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | D | | | | |
| 9 | | | | | D | | | | |
| 10 | | | | | | | Backhoe refused at 9'6" | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|--|
| slightly moist | CLAYEY SAND WITH GRAVEL , trace to some fine grained gravel, subangular to subrounded, trace of silt, considerable fine grained sand, Stage I cementation, low to medium plasticity, light brown note: well graded sand & increase in fine grained gravel & medium plasticity below 3' |
| slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, well graded gravel, Stage II+ to III cementation, low to medium plasticity, tan to white (possible GC-GW below 6') note: Stage II cementation & reddish-brown to white below 9' |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-5

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 70+00
Channel
 SURFACE ELEV. 1339.6'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | D | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, some fine grained gravel, subangular to subrounded, predominantly fine to medium grained sand, Stage I to I+ cementation, low plasticity, light brown to brown |
| 1 | | | | | | | |
| 2 | | | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , some fine grained gravel, subangular to subrounded, predominantly well graded sand, subangular to subrounded, uncemented to Stage I, low to medium plasticity, reddish-brown |
| 3 | | | | | | | |
| 4 | | | D | | | | |
| 5 | | | | | | | note: Stage I cementation below 5' |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | SC | slightly moist | CLAYEY SAND WITH GRAVEL , predominantly fine to medium grained sand, trace to some gravel, subangular, rare cobbles up to 3" in diameter, Stage I cementation, low plasticity, reddish-brown |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-7

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 70+00
Channel
 SURFACE ELEV. 1339.6'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SC | | |
| 11 | | | D | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | Stopped Backhoe at 13' |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-7



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 80+00
Downstream
 SURFACE ELEV. 1338.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|-------------------|----------------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | [Hatched pattern] | | | | SC | | |
| 1 | | | | | | | |
| 2 | [Hatched pattern] | [Wavy pattern] | D | | SC/CL | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | [Hatched pattern] | | | | SC | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|--|
| slightly moist | CLAYEY SAND WITH GRAVEL , predominantly fine to medium grained sand, some coarse grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, brown |
| slightly moist | SAND & CLAY , predominantly fine grained sand, uncemented to Stage I cementation, medium to high plasticity, light brown to brown note: increase in fine grained sand & Stage I cementation below 4' |
| slightly moist | CLAYEY SAND , trace of fine grained gravel, predominantly fine grained sand, Stage I cementation, medium to high plasticity, dark brown |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-8

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 80+00
Downstream
 SURFACE ELEV. 1338.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|--------------------------|------|
| | | | | | | DEPTH | HOUR |
| 10 | | | D | | SC | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | Stopped Backhoe at 12'6" | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-8



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 90+00
Channel
 SURFACE ELEV. 1326.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|---|
| | | | | | | | |
| 0 | | | | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly well graded sand, considerable fine grained gravel, subangular to subrounded, Stage I+ to II cementation, low to medium plasticity, light brown |
| 2 | | | D | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, considerable predominantly fine grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, brown to reddish-brown note: predominantly fine to medium grained sand, Stage I cementation at 5' |
| 8 | | | D | | SC | slightly moist | CLAYEY SAND WITH GRAVEL , rare cobbles up to 4" in diameter, predominantly fine grained sand, Stage I+, low to medium plasticity, brown |
| 9 | | | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , trace of cobbles up to 4 1/2" in diameter, predominantly fine to medium grained sand, considerable gravel, subangular to subrounded, Stage II to II+ cementation, low to medium plasticity, light brown to brown |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-9

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 90+00
Channel
 SURFACE ELEV. 1326.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|------------------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY, continued |
| 11 | | | D | | | | |
| 12 | | | | | | | Stopped Backhoe at 12' |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-9

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 100+00
Downstream
 SURFACE ELEV. 1336.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | D | | GM-GC | slightly moist | CLAYEY TO SILTY GRAVEL , predominantly well graded sand & gravel, subangular to subrounded, Stage I to I+ cementation, low plasticity, light brown to brown |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | CL/SC | slightly moist | SAND & CLAY , predominantly fine grained, subangular to subrounded, Stage I cementation, medium to high plasticity, brown to reddish-brown |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | D | | | | note: dark reddish-brown color below 7' |
| 8 | | | | | | | |
| 9 | | | | | GC | slightly moist | CLAYEY GRAVEL , predominantly well graded sand, predominantly well graded gravel, subangular to subrounded, Stage I cementation, medium to high plasticity, brown |
| 10 | | | | | | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-10

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 100+00
Downstream
 SURFACE ELEV. 1336.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|----------------|---|
| | | | | | | DEPTH | HOUR |
| | | | | | | REMARKS | SOIL DESCRIPTION |
| 10 | | | D | | GC | slightly moist | CLAYEY GRAVEL , continued note: Stage I+ cementation & light brown in color below 10'6" |
| 11 | | | | | | | |
| 12 | | | | | | | Stopped Backhoe at 12' |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-10

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 110+00
Channel
 SURFACE ELEV. 1324.3'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------------|-----------------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | [Diagonal Hatching] | | | | SC-GC | | |
| 1 | | | | | | | |
| 2 | [Diagonal Hatching] | [Wavy Hatching] | D | | CL/SC | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | [Diagonal Hatching] | [Wavy Hatching] | D | | SC-GC | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|---|
| slightly moist | SAND & GRAVEL WITH CLAY , considerable predominantly coarse grained gravel, predominantly well graded sand, Stage I+ to II cementation, low plasticity, light brown |
| slightly moist | SAND & CLAY , predominantly fine grained sand, Stage I cementation, medium plasticity, reddish-brown |
| slightly moist | SAND & GRAVEL WITH CLAY , considerable predominantly coarse grained gravel, subangular to subrounded, predominantly well graded sand, Stage I cementation, low to medium plasticity, brown to reddish-brown note: CL-SC zones from 8' to 9' note: decrease in coarse grained gravel, subangular to subrounded below 9' |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-11

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 110+00
Channel
 SURFACE ELEV. 1324.3'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|------------------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SC-GC | slightly moist | SAND & GRAVEL WITH CLAY, continued |
| 11 | | | | | | | |
| 12 | | | | | | | Stopped Backhoe at 12' |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-11



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 120+00
Downstream
 SURFACE ELEV. 1331.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------------|------------------|--------|-------------|---|--|----------------|--|
| | | | | | | | |
| 0 | | | | | SC | slightly moist | CLAYEY SAND WITH GRAVEL , considerable predominantly fine to medium grained sand, considerable predominantly fine grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, light brown note: predominantly well graded gravel, subangular to subrounded, light brown to tan below 4' note: Stage I+ cementation below 6' |
| 1 | | D | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | D | | | | | |
| 6 | | | | | | | |
| 8 | | | | | SC-GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly fine grained sand, considerable predominantly well graded gravel, subangular to subrounded, Stage I+ cementation, low to medium plasticity, light brown to tan |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-12

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 120+00
Downstream
 SURFACE ELEV. 1331.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|--|
| | | | | | | DEPTH | HOUR |
| 10 | | | D | | SC-GC | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | slightly moist | SAND & GRAVEL WITH CLAY, continued note: Stage I cementation & well graded sand below 10' |
| 14 | | | | | | | Stopped Backhoe at 13' |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-12

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 130+00
Downstream
 SURFACE ELEV. 1327.9'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | | | | | GC | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | SC | | |
| 6 | | | | | | | |
| 7 | | D | | | GC | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|--|
| slightly moist | GRAVEL WITH CLAY , trace of silt, predominantly well graded sand, predominantly coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, medium plasticity, light brown to tan |
| slightly moist | CLAYEY SAND WITH GRAVEL , predominantly fine grained sand, some coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, medium to high plasticity, light brown to tan |
| slightly moist | CLAYEY GRAVEL , predominantly well graded sand, predominantly coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, medium to high plasticity, light brown to tan (white blocky areas) |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-13

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 130+00
Downstream
 SURFACE ELEV. 1327.9'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 10 | | | D | | GC | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

REMARKS

SOIL DESCRIPTION

slightly moist

CLAYEY GRAVEL, continued

Stopped Backhoe at 12'

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-13



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 140+00
Downstream
 SURFACE ELEV. 1328.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|--|---|
| 0 | | | D | | SC | slightly moist | CLAYEY SAND , trace of silt, predominantly fine grained sand, uncemented, medium plasticity, light brown to tan | |
| 1 | | | | | | | | |
| 2 | | | | | | | | note: increase in medium to coarse grained sand, fine grained gravel & Stage I cementation below 2' |
| 3 | | | | | | | | |
| 4 | | | D | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly fine grained sand, considerable predominantly coarse grained gravel, subangular to subrounded, Stage I to I+ cementation, medium to high plasticity, light brown to tan | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | GC | slightly moist | CLAYEY GRAVEL , predominantly well graded sand, considerable predominantly coarse grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, light brown to tan | |
| 9 | | | | | | | | |
| 10 | | | | | | | note: uncemented to Stage I cementation & reddish-brown at 10' | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-14

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 140+00
Downstream
 SURFACE ELEV. 1328.4'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | GC | | |
| 11 | | | | | | | |
| 12 | | | D | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|---|
| slightly moist | CLAYEY GRAVEL, continued |
| | note: Stage I+ to II cementation & light brown to tan below 11' |
| | Stopped Backhoe at 13' |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-14

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 150+00
Channel
 SURFACE ELEV. 1322.4
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | D | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, considerable coarse grained gravel, subangular to subrounded, predominantly well graded sand, uncemented Stage I, low to medium plasticity, light brown to brown |
| 1 | | | | | | | |
| 2 | | | | | | | note: decrease in coarse grained gravel at 2' |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | D | | CL | slightly moist | SANDY CLAY , trace of silt, predominantly fine grained sand, uncemented Stage I to I+, medium to high plasticity, brown to reddish-brown |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | D | | SM | slightly moist | SILTY SAND WITH GRAVEL , trace of clay, trace to some coarse grained gravel, subangular to subrounded, predominantly fine grained sand, Stage I+ to II cementation, medium plasticity, light brown to brown |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-15

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 150+00
Channel
 SURFACE ELEV. 1322.4
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|-----------------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SM | slightly moist | SILTY SAND WITH GRAVEL, continued |
| 11 | | | | | | | |
| 12 | | | | | | | Stopped Backhoe at 11'6" |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-15



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 160+00
Downstream
 SURFACE ELEV. 1323.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | DEPTH | HOUR |
| 0 | | | | | SC-SM | slightly moist | SILTY TO CLAYEY SAND , predominantly fine grained sand, trace of fine grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, brown to light brown |
| 1 | | | | | | | |
| 2 | | | | | | | note: Stage I to I+ below 2' |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 4 | | D | | | GC-GM | slightly moist | GRAVEL WITH SILT & CLAY , predominantly coarse grained gravel, subangular to subrounded, considerable predominantly well graded sand, Stage I to I+ cementation, medium plasticity, light brown |
| 5 | | | | | | | |
| 6 | | D | | | SC | slightly moist | CLAYEY SAND , trace of coarse grained gravel, subangular to subrounded, predominantly well graded sand, Stage I to I+ cementation, medium plasticity, light brown |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | GC | slightly moist | CLAYEY GRAVEL , predominantly well graded sand, predominantly coarse grained gravel, subangular to subrounded, Stage I+ cementation, light brown |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-16

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 160+00
Downstream
 SURFACE ELEV. 1323.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | GC | | |
| 11 | | | | | | | |
| 12 | | D | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|--------------------------|
| slightly moist | CLAYEY GRAVEL, continued |
| | Stopped Backhoe at 12'6" |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-16



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 170+00
Downstream
 SURFACE ELEV. 1318.2'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|--|---|
| | | | | | | | | |
| 0 | | | | | CL/SC | slightly moist | SAND & CLAY , predominantly fine grained sand, uncemented to Stage I, medium to high plasticity, reddish-brown | |
| 1 | | | | | | | | |
| 2 | | | D | | | | | note: increase in fine grained sand & Stage I cementation & dark reddish-brown below 2' |
| 3 | | | | | | | | |
| 4 | | | D | | SC | slightly moist | CLAYEY SAND , trace of coarse grained gravel, trace of silt, predominantly fine grained sand, Stage I+ cementation, medium plasticity, light brown | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly well graded sand, considerable predominantly coarse grained gravel, Stage I cementation, low plasticity, brown | |
| 8 | | | | | | | | |
| 9 | | | D | | | | | note: Stage II to II+ cementation & brown to tan below 9' |
| 10 | | | | | | | | Backhoe refused at 10' |

- SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-17

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 190+00
Downstream
 SURFACE ELEV. 1319.1'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | | | CL/SC | slightly moist | SAND & CLAY , predominantly fine grained sand, uncemented, medium to high plasticity, reddish-brown |
| 1 | | D | | | | | |
| 2 | | | | | | | note: Stage I to I+ cementation & brown in color below 2' |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | D | | | | | note: trace to some coarse grained gravel, subangular to subrounded below 6' |
| 7 | | | | | | | |
| 8 | | | | | | | note: Stage I+ cementation below 8' (blocky appearance to samples) |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-18

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/6/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 190+00
Downstream
 SURFACE ELEV. 1319.1'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|----------------|------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | CL/SC | slightly moist | SAND & CLAY, continued |
| 11 | | D | | | | | |
| 12 | | | | | | | Stopped Backhoe at 12' |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-18

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 200+00
Channel
 SURFACE ELEV. 1317.2'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|-------------|------|
| | | | | | | DEPTH | HOUR |
| 0 | | | D | | SM | | |
| 1 | | | | | | | |
| 2 | | | D | | SM/GM | | |
| 3 | | | | | GM | | |
| 4 | | | | | | | |
| 5 | | | D | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

| REMARKS | SOIL DESCRIPTION |
|----------------|---|
| slightly moist | SILTY SAND WITH GRAVEL , trace of clay, trace to some coarse grained gravel, subangular to subrounded, predominantly fine grained sand, Stage I+ to II cementation, medium to high plasticity, light brown |
| slightly moist | SAND & GRAVEL WITH SILT , trace of clay, considerable coarse grained gravel, subangular to subrounded, predominantly fine grained sand, Stage II to II+ cementation, low to medium plasticity, light brown to tan |
| slightly moist | GRAVEL & SAND WITH SILT , rare cobbles up to 3" in diameter, trace of clay, considerable predominantly coarse grained gravel, subangular to subrounded, predominantly well graded sand, subangular to subrounded, Stage II+ to III cementation, low to medium plasticity, tan to white |
| | Backhoe refused at 5'6" |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-19

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/5/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 210+00
Downstream
 SURFACE ELEV. 1317.1'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|---|
| | | | | | | | |
| 0 | | | D | | SM-GM | slightly moist | SAND & GRAVEL WITH SILT , trace of cobbles up to 2 1/2" in diameter, trace of clay, predominantly well graded sand, considerable coarse grained gravel, subangular to subrounded, Stage I to I+ cementation, light brown |
| 1 | | | | | | | |
| 2 | | | | | GM-GC | slightly moist | GRAVEL WITH SILT & CLAY , trace of cobbles up to 3" in diameter, predominantly well graded sand, predominantly coarse grained gravel, subangular to subrounded, Stage II+ to III cementation, low plasticity, tan to white |
| 3 | | | | | | | |
| 4 | | | D | | | | |
| 5 | | | | | | | Backhoe refused at 5' |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-20



JOB NO. 6-117-001025 DATE 12/4/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 220+00
Channel
 SURFACE ELEV. 1316.1'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|---|
| | | | | | | | |
| 0 | | | | | SM | slightly moist | SILTY SAND WITH GRAVEL , trace of clay, trace to some fine grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, light brown |
| 2 | | | D | | GM-SP | slightly moist | GRAVEL WITH SAND & SILT , trace of clay, predominantly well graded sand, predominantly coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, low to medium plasticity, light brown to tan note: increase in clay & decrease in cementation (Stage I) |
| 6 | | | D | | SM-GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly fine grained sand, considerable predominantly fine grained gravel, subangular to subrounded, Stage I+ to II cementation, low to medium plasticity, light brown note: predominantly fine grained gravel below 7' |
| 8 | | | | | SM | slightly moist | SILTY SAND WITH GRAVEL , trace of clay, trace of coarse grained gravel, predominantly fine grained, Stage I+ to II cementation, low plasticity, light brown Backhoe refused at 10' |

- SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-21



GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | | | |
|---------------|-------------------|--------|-------------|--|--|----------------|--|--|--|
| | | | | | | DEPTH | HOUR | | |
| 0 | [Hatched pattern] | | | | SC-SM | slightly moist | SILTY TO CLAYEY SAND , predominantly fine grained sand, uncemented to Stage I, medium plasticity, light brown | | |
| 1 | | | | | | | | | |
| 2 | [Hatched pattern] | D | | | CL | slightly moist | SANDY CLAY , predominantly fine grained sand, Stage I cementation, medium to high plasticity, reddish-brown | | |
| 3 | | | | | | | | | |
| 4 | [Hatched pattern] | | | | SC/GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, considerable fine grained gravel, Stage II+ to III cementation, medium to high plasticity, tan to white | | |
| 5 | | | | | D | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | D | | | | | | | |
| 9 | | | | | | | Backhoe refused at 8'6" | | |
| 10 | | | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-22

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/1/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 240+00
Downstream
 SURFACE ELEV. 1319.6'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|---|
| 0 | | | D | | SM | slightly moist | SILTY SAND , trace of gravel, predominantly fine grained sand, Stage I, low plasticity to nonplastic, light brown |
| 1 | | | | | | | |
| 2 | | | | | SC | slightly moist | CLAYEY SAND , predominantly fine to medium grained sand, weakly cemented (Stage I to I+), medium to high plasticity, reddish-brown |
| 3 | | | | | | | |
| 4 | | | D | | | | note: trace to some gravel below 4' |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | GC | slightly moist | CLAYEY SAND & GRAVEL , trace of silt, well graded sand & gravel, subrounded to rounded, weakly lime cemented (Stage II), low plasticity, brown |
| 8 | | | | | | | note: occasional lense of GP-GP |
| 9 | | | D | | | | note: Stage II+ to III below 8'6" |
| 10 | | | | | | | Backhoe refused at 10' |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-23



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 250+00
Channel
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly well graded sand, considerable predominantly coarse grained gravel, Stage I cementation, low to medium plasticity, brown to reddish-brown note: Stage I+ cementation below 1'6" |
| 1 | | D | | | | | |
| 2 | | | | | | | |
| 3 | | | | | SM-SC | slightly moist | SILTY TO CLAYEY SAND WITH GRAVEL , trace of clay, some coarse grained gravel, subangular to subrounded, predominantly well graded sand, Stage I to I+ cementation, low to medium plasticity, brown to reddish-brown note: predominantly fine grained sand below 6' |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | D | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | note: Stage I to I+ cementation below 8' & increase in medium to coarse grained sand, subangular to subrounded |
| 9 | | D | | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly well graded sand, considerable predominantly coarse grained gravel, Stage I+ to II cementation, low to medium plasticity, brown to light brown |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-24

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/5/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 250+00
Channel
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------------|------------------|--------|-------------|---|--|-------------|------------------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SM/GM | | |
| | | | | | | REMARKS | SOIL DESCRIPTION |
| | | | | | | | SAND & GRAVEL WITH SILT, continued |
| 11 | | | | | | | Backhoe refused at 10'6" |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-24

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/1/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 260+00
Downstream
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| 0 | | | | | SM | slightly moist | SILTY SAND , trace of gravel, predominantly fine grained sand, uncemented (Stage I), low plasticity to nonplastic, light brown |
| 1 | | | D | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | GM | slightly moist | SILTY SAND & GRAVEL , occasional cobble, well graded sand & gravel, subrounded, weakly lime cemented (Stage I), nonplastic, light brown note: occasional lense of GP-GM |
| 5 | | | D | | | | |
| 6 | | | | | SM | slightly moist | SILTY SAND & GRAVEL , predominantly fine to medium grained sand, predominantly fine grained gravel, weakly lime cemented (Stage II), low plasticity, light brown note: interbedded with 2' to 3' thick lenses of GP-GM, occasional cobble, uncemented, nonplastic, brown |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-25

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/1/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 260+00
Downstream
 SURFACE ELEV. 1320.0'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|----------------|--------------------------------|
| | | | | | | DEPTH | HOUR |
| 10 | | | | | SM | slightly moist | SILTY SAND & GRAVEL, continued |
| 11 | | | | | | | Stopped Backhoe at 11' |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-25

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/1/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 272+00
Downstream
 SURFACE ELEV. 1311.7'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | DEPTH | HOUR |
| | | | | | | REMARKS | SOIL DESCRIPTION |
| 0 | | | | | CL | slightly moist | SANDY CLAY , some silt, predominantly fine grained sand, medium to high plasticity, light reddish-brown note: occasional zone of SC |
| 1 | | | | | | | |
| 2 | | | D | | CL | slightly moist | SANDY CLAY , trace of silt, predominantly fine grained sand, weakly lime cemented (Stage I to I+), medium to high plasticity, reddish-brown |
| 3 | | | | | | | |
| 4 | | | | | SM | slightly moist | SILTY SAND , trace to some gravel, predominantly fine to medium grained sand, weakly to moderately lime cemented (Stage II+), low plasticity, light brown note: occasional gravelly zone & occasional zone SP-SM/GP-GM |
| 5 | | | | | | | |
| 6 | | | D | | | | |
| 7 | | | | | | | |
| 8 | | | | | SM | slightly moist | SILTY SAND , trace of gravel, predominantly fine grained sand, weakly lime cemented (Stage II to II+), low plasticity to nonplastic, light brown note: sand coarsens with depth, increase in gravel (Stage I to I+) |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-26

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/1/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 272+00
Downstream
 SURFACE ELEV. 1311.7'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | GROUNDWATER | |
|---------------|---------------|--------|-------------|--|--|----------------|------------------------|
| | | | | | | DEPTH | HOUR |
| | | | | | | REMARKS | SOIL DESCRIPTION |
| 10 | | | D | | SM | slightly moist | SILTY SAND, continued |
| 11 | | | | | | | Stopped Backhoe at 11' |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

SAMPLE TYPE
 B - Undisturbed Bulk Sample
 D - Disturbed Bulk Sample
 U - 3" O.D. 2.42" I.D. tube sample
 A - Drill Cuttings
 G - Grab sample

LOG OF TEST PIT NO. TP06-26

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/5/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 282+50
Downstream
 SURFACE ELEV. 1314.5'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|-------------------|----------------|-------------|--|--|----------------|---|
| | | | | | | | |
| 0 | [Hatched pattern] | | | | SC | slightly moist | CLAYEY SAND , trace of fine grained gravel, predominantly fine grained sand, Stage I to I+ cementation, reddish-brown |
| 1 | | | | | | | |
| 2 | [Hatched pattern] | [Wavy pattern] | D | | SC-CL | slightly moist | SAND & CLAY , predominantly fine grained sand, Stage I+ to II cementation, medium to high plasticity, light brown to tan |
| 3 | | | | | | | |
| 4 | [Hatched pattern] | | | | | | |
| 5 | | | | | | | |
| 6 | [Hatched pattern] | | | | SC-GC | slightly moist | SAND & GRAVEL WITH CLAY , predominantly well graded sand, considerable coarse grained gravel, Stage II+ to III cementation, low to medium plasticity, tan to white |
| 7 | | [Wavy pattern] | D | | | | |
| 8 | | | | | | | Backhoe refused at 7'6" |
| 9 | | | | | | | |
| 10 | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-27

PROJECT Wittmann ADMP



JOB NO. 6-117-001025 DATE 12/5/06

BACKHOE TYPE Volvo BL70
 LOCATION Sta. 297+50
Channel
 SURFACE ELEV. 1309.9'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | SOIL DESCRIPTION |
|---------------|---------------|--------|-------------|--|--|----------------|--|
| | | | | | | | |
| 0 | | | D | | SC | slightly moist | CLAYEY SAND , predominantly fine grained, sand, Stage I to I+ cementation, medium to high plasticity, brown to reddish-brown note: uncemented to Stage I cementation & reddish-brown at 1' |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | SC | slightly moist | SANDY CLAY WITH GRAVEL , trace of silt, predominantly well graded sand, subangular to subrounded, considerable coarse grained gravel, subangular to subrounded, Stage I+ to II cementation, medium plasticity, light brown to tan note: decrease in cementation (Stage I) & fine to medium grained sand below 5' |
| 4 | | | D | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | D | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | note: increase in cementation (Stage II) below 9' |
| 10 | | | | | | | Stopped Backhoe at 9'6" |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-28



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 300+00
Downstream
 SURFACE ELEV. 1311.2'
 DATUM NAVD 88

GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|---|------------------|--|
| | | | | | | REMARKS | SOIL DESCRIPTION | | |
| 0 | | | | | SC-CL | slightly moist | SAND & CLAY , predominantly fine grained sand, trace of coarse grained gravel, Stage I to I+ cementation, medium plasticity, brown to reddish-brown | | |
| 1 | | | | | | | | | |
| 2 | | | D | | SM/GM | slightly moist | SAND & GRAVEL WITH SILT , trace of clay, predominantly well graded sand, considerable coarse grained gravel, Stage II to III cementation, low plasticity, tan to white | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | note: increase in fines (clay) at 4' | | |
| 5 | | | | | | | | | |
| 6 | | | D | | | | | | |
| 7 | | | | | | | Backhoe refused at 7' | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

SAMPLE TYPE

- B - Undisturbed Bulk Sample
- D - Disturbed Bulk Sample
- U - 3" O.D. 2.42" I.D. tube sample
- A - Drill Cuttings
- G - Grab sample

LOG OF TEST PIT NO. TP06-29



BACKHOE TYPE Volvo BL70
 LOCATION Sta. 307+50
Downstream
 SURFACE ELEV. 1311.1'
 DATUM NAVD 88

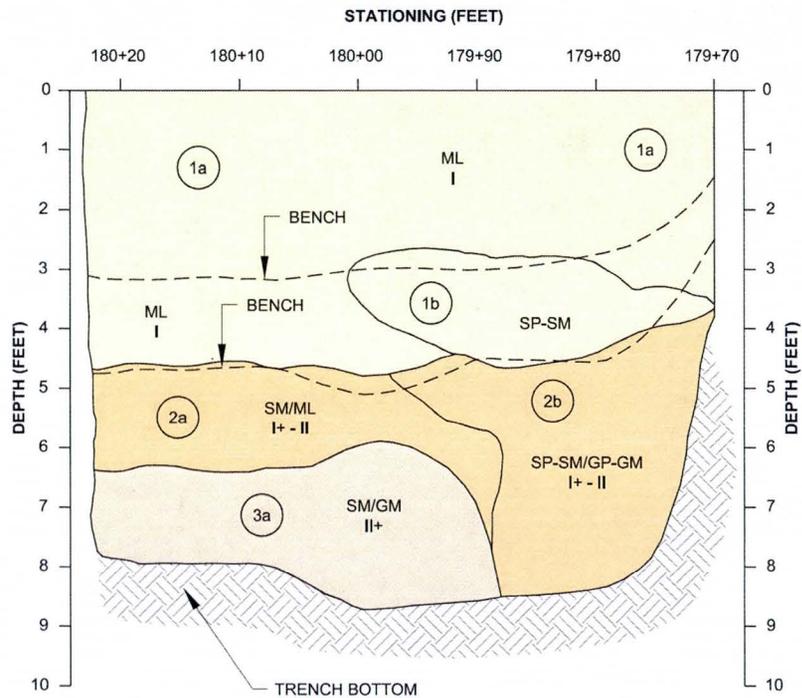
GROUNDWATER

| DEPTH | HOUR | DATE |
|-------|------|------|
| | none | |

| Depth in Feet | Graphical Log | Sample | Sample Type | Moisture Content Percent of Dry Weight | Unified Soil Classification or Rock Unit | REMARKS | | SOIL DESCRIPTION | |
|---------------|---------------|--------|-------------|--|--|----------------|---|------------------|--|
| | | | | | | REMARKS | SOIL DESCRIPTION | | |
| 0 | | | | | SC | slightly moist | CLAYEY SAND , trace of coarse grained gravel, subangular to subrounded, predominantly fine grained sand, uncemented to Stage I, low to medium plasticity, light brown to brown | | |
| 1 | | D | | | | | | | |
| 2 | | | | | SC-CL | slightly moist | CLAYEY SAND TO SANDY CLAY , predominantly fine grained sand, Stage I to I+ cementation, medium to high plasticity, reddish-brown | | |
| 3 | | D | | | | | | | |
| 4 | | | | | | | note: Stage II cementation, tan in color below 4' | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | note: increase in coarse grained gravel & Stage I+ to II cementation below 8'6" | | |
| 10 | | | | | | | Backhoe refused at 9'6" | | |

- SAMPLE TYPE
- B - Undisturbed Bulk Sample
 - D - Disturbed Bulk Sample
 - U - 3" O.D. 2.42" I.D. tube sample
 - A - Drill Cuttings
 - G - Grab sample

LOG OF TEST PIT NO. TP06-30



1a - (ML) Sandy silt, trace of clay, predominantly fine grained sand, Stage I, nonplastic to low plasticity, light brown

note: occasional sandy/gravelly lens

1b - (SP-SM) Sand with silt, some gravel, well graded sand, nonplastic, brown

note: occasional lens of silty sand

2a - (SM/ML) Sandy silt to silty sand, trace of clay, predominantly fine to medium grained sand, weakly lime cemented (Stage I+ - II), nonplastic to low plasticity, light brown

2b - (SP-SM/GP-GM) Sand & gravel with silt, rare cobble, well graded sand, predominantly fine grained gravel, subangular to subrounded, weakly cemented (Stage I+ - II), nonplastic, brown

3a - (SM/GM) Silty sand & gravel, well graded sand, predominantly fine grained gravel, subangular to subrounded, weakly to moderately lime cemented (Stage II+), nonplastic to low plasticity, light grayish-brown

KEY

| | | | |
|--|--------------------------------------|------------------|--|
| | EOLIAN/ALLUVIAL UNIT - 1 HOLOCENE | SM (I,II) | USCS SOIL CLASSIFICATION WITH STAGE OF CARBONATE MORPHOLOGY |
| | ALLUVIAL UNIT - 2 PLEISTOCENE | | CONTACT |
| | ALLUVIAL UNIT - 3 PLEISTOCENE | | TEST TRENCH BENCH |
| | | | SOIL DISCONTINUITY |

| | |
|---------|--------------|
| JOB NO. | 6-117-001025 |
| DESIGN: | KCF |
| DRAWN: | GWH |
| DATE: | 12/2006 |
| SCALE: | AS SHOWN |

TRENCH LOG

TRENCH INVESTIGATION
WITTMANN ADMP

FIGURE
TT06-5



PROJECT: Wittmann ADMP McMicken Dam
 LOCATION:
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 1
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # |
|------------------|------|----|----|--------------|------|------|-----|-----|--------|-----|--------|----|--------|------|------|--------|------|----|---------|-------|
| | | | | | Fine | | | | Medium | | Coarse | | Fine | | | Coarse | | | | |
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | 1/4" | 3/8" | 1/2" | 3/4" | 1" | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|---|
| TH06-1T | SC | 39 | 21 | 46 | 54 | 62 | 66 | 69 | 75 | 80 | 81 | 86 | 89 | 94 | 96 | 98 | 98 | 98 | 100 | 100 | 100 | 100 | 1 |
| TH06-1C | CL | 31 | 14 | 51 | 60 | 67 | 70 | 73 | 80 | 85 | 87 | 91 | 93 | 96 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 2 |
| TH06-2 | SM | 22 | 3 | 33 | 46 | 57 | 60 | 62 | 66 | 70 | 71 | 81 | 85 | 92 | 95 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 3 |
| TH06-3T | CL | 30 | 12 | 54 | 66 | 75 | 78 | 80 | 84 | 86 | 87 | 91 | 93 | 96 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 4 |
| TH06-3C | SM | 22 | 2 | 37 | 53 | 63 | 66 | 69 | 74 | 79 | 80 | 87 | 89 | 93 | 95 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 5 |
| TH06-4T | SC | 36 | 16 | 38 | 48 | 55 | 58 | 60 | 65 | 68 | 69 | 75 | 78 | 84 | 88 | 92 | 94 | 95 | 97 | 100 | 100 | 100 | 6 |
| TH06-4C | SC | 73 | 47 | 34 | 45 | 55 | 59 | 63 | 69 | 74 | 76 | 83 | 87 | 94 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 7 |
| TH06-5 | SC-SM | 21 | 5 | 34 | 48 | 63 | 70 | 76 | 85 | 90 | 92 | 97 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 8 |
| | | | | | | | | | | | | | | | | | | | | | | | |



REVIEWED BY 

PROJECT: Wittmann ADMP McMicken Dam
 LOCATION: Arizona
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 2
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # |
|------------------|------|----|----|--------------|------|------|-----|-----|-----|-----|-----|----|--------|------|--|--|--------|--|---------|-------|
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | Fine | | | Coarse | | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-------|----|----|-----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| TP06-26 @ 10.0-11.0' | SC | 35 | 13 | 29 | 42 | 52 | 55 | 58 | 62 | 67 | 69 | 78 | 82 | 89 | 93 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 20 |
| TP06-25 @ 1.0-2.0' | SM | NV | NP | 41 | 62 | 79 | 84 | 88 | 92 | 95 | 95 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 21 |
| TP06-24 @ 1.0-2.0' | SP-SM | 25 | 2 | 8.4 | 12 | 18 | 24 | 32 | 43 | 52 | 55 | 70 | 76 | 86 | 91 | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 23 |
| TP06-24 @ 6.0-7.0' | SM | 37 | 12 | 29 | 42 | 51 | 55 | 58 | 65 | 72 | 74 | 90 | 92 | 95 | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 24 |
| TP06-24 @ 9.0-10.0' | SC | 37 | 15 | 28 | 39 | 47 | 51 | 55 | 63 | 70 | 72 | 81 | 87 | 95 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 25 |
| TP06-23 @ 0.0-1.0' | SM | NV | NP | 31 | 43 | 56 | 61 | 66 | 72 | 77 | 78 | 83 | 86 | 90 | 92 | 96 | 99 | 100 | 100 | 100 | 100 | 100 | 26 |
| TP06-23 @ 5.0-6.0' | CL | 30 | 15 | 56 | 70 | 82 | 85 | 88 | 92 | 94 | 95 | 98 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 27 |



REVIEWED BY

Cmg

PROJECT: Wittmann ADMP McMicken Dam
 LOCATION: Arizona
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 2
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # | | | | |
|------------------|------|----|----|--------------|------|------|-----|-----|-----|-----|-----|----|--------|------|--|--|--------|--|---------|-------|--|--|--|--|
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | Fine | | | Coarse | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|-------|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| TP06-22 @ 2.0-3.0' | CL | 42 | 21 | 60 | 74 | 81 | 84 | 87 | 90 | 92 | 93 | 96 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 29 |
| TP06-21 @ 2.0-3.0' | SC | 36 | 15 | 15 | 21 | 27 | 30 | 34 | 43 | 51 | 55 | 71 | 77 | 85 | 90 | 94 | 97 | 98 | 100 | 100 | 100 | 100 | 100 | 32 |
| TP06-21 @ 6.0-7.7' | SP-SC | 29 | 7 | 12 | 18 | 29 | 36 | 41 | 49 | 55 | 58 | 72 | 79 | 89 | 93 | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 33 |
| TP06-21 @ 9.0-10.0' | SP-SC | 33 | 12 | 12 | 19 | 30 | 35 | 40 | 48 | 55 | 58 | 70 | 76 | 86 | 92 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 34 |
| TP06-20 @ 0.0-1.0' | SM | NV | NP | 12 | 17 | 22 | 25 | 27 | 32 | 40 | 43 | 59 | 64 | 75 | 84 | 92 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 35 |
| TP06-20 @ 4.0-5.0' | SP-SM | NV | NP | 6.6 | 10 | 15 | 18 | 20 | 25 | 33 | 36 | 55 | 59 | 70 | 77 | 83 | 90 | 92 | 95 | 97 | 100 | 100 | 100 | 36 |
| TP06-19 @ 0.0-1.0' | SC | 32 | 14 | 38 | 49 | 56 | 58 | 60 | 64 | 68 | 69 | 77 | 83 | 92 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 37 |
| TP06-19 @ 2.0-3.0 | GC | 32 | 14 | 15 | 22 | 28 | 32 | 35 | 41 | 46 | 48 | 57 | 62 | 72 | 78 | 86 | 92 | 95 | 95 | 100 | 100 | 100 | 100 | 38 |



REVIEWED BY CNY

PROJECT: Wittmann ADMP McMicken Dam
 LOCATION: Arizona
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 2
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # | | | | |
|------------------|------|----|----|--------------|------|------|-----|-----|--------|-----|-----|----|--------|------|------|------|------|----|---------|-------|--------|--------|----|----|
| | | | | | Fine | | | | Medium | | | | Coarse | | | | Fine | | | | Coarse | | | |
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | 1/4" | 3/8" | 1/2" | 3/4" | 1" | | | 1 1/4" | 1 1/2" | 2" | 3" |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-------|----|----|-----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| TP06-14 @ 0.0-1.0' | CL-ML | 21 | 5 | 50 | 69 | 81 | 84 | 87 | 91 | 95 | 95 | 98 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 52 |
| TP06-14 @ 4.0-5.0' | SM | 20 | 2 | 40 | 52 | 62 | 65 | 70 | 77 | 82 | 84 | 90 | 92 | 95 | 96 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 53 |
| TP06-14 @ 12.0-13.0' | SP-SC | 25 | 5 | 11 | 16 | 22 | 25 | 28 | 33 | 41 | 43 | 61 | 69 | 81 | 89 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 54 |
| TP06-13 @ 2.0-3.0' | SC-SM | 24 | 6 | 32 | 43 | 53 | 57 | 60 | 65 | 69 | 71 | 79 | 82 | 87 | 90 | 92 | 95 | 97 | 97 | 100 | 100 | 100 | 100 | 55 |
| TP06-13 @ 7.0-8.0' | SC | 39 | 20 | 41 | 71 | 63 | 67 | 70 | 76 | 80 | 81 | 88 | 91 | 95 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 56 |
| TP06-12 @ 1.0-2.0' | SC | 33 | 14 | 39 | 48 | 55 | 57 | 60 | 65 | 69 | 71 | 79 | 83 | 89 | 92 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 58 |
| TP06-12 @ 5.0-6.0' | SC | 36 | 17 | 44 | 61 | 74 | 76 | 79 | 82 | 86 | 87 | 93 | 95 | 97 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 59 |
| TP06-11 @ 2.0-3.0' | CL | 39 | 16 | 65 | 80 | 86 | 88 | 89 | 92 | 93 | 94 | 95 | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 61 |
| TP06-11 @ 6.0-7.0' | SP-SC | 49 | 29 | 8.6 | 10 | 12 | 13 | 16 | 26 | 38 | 41 | 56 | 63 | 75 | 82 | 92 | 95 | 100 | 100 | 100 | 100 | 100 | 100 | 62 |



REVIEWED BY cy

PROJECT: Wittmann ADMP McMicken Dam
 LOCATION: Arizona
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 2
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # | | | |
|------------------|------|----|----|--------------|------|------|-----|-----|-----|-----|-----|----|--------|------|--|--|--------|--|---------|-------|--|--|--|
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | Fine | | | Coarse | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

PERCENT PASSING BY WEIGHT

| | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-------|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|----|
| TP06-07 @ 11.0-12.0' | SP-SC | 26 | 8 | 8.1 | 11 | 20 | 27 | 38 | 60 | 72 | 75 | 84 | 86 | 91 | 93 | 96 | 98 | 100 | 100 | 100 | 100 | 100 | 75 |
| TP06-05 @ 0.0-1.0' | SM | 21 | 3 | 27 | 42 | 55 | 59 | 61 | 67 | 72 | 74 | 83 | 86 | 91 | 94 | 96 | 98 | 98 | 99 | 99 | 100 | 100 | 76 |
| TP06-05 @ 8.0-9.0' | GP | NV | NP | 4.9 | 7 | 9 | 11 | 12 | 19 | 27 | 32 | 52 | 60 | 73 | 80 | 87 | 91 | 93 | 94 | 94 | 100 | 100 | 77 |
| TP06-04 @ 3.0-4.0' | SC | 28 | 10 | 22 | 30 | 40 | 43 | 47 | 53 | 60 | 62 | 72 | 77 | 85 | 90 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 79 |
| TP06-04 @ 5.0-6.0' | SP | 26 | 6 | 4.9 | 8 | 15 | 20 | 25 | 33 | 41 | 44 | 59 | 65 | 76 | 84 | 91 | 96 | 99 | 100 | 100 | 100 | 100 | 80 |
| TP06-03 @ 0.0-1.0' | SC | 35 | 16 | 43 | 55 | 66 | 71 | 76 | 82 | 87 | 88 | 93 | 95 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 82 |
| TP06-03 @ 3.0-4.0' | SM | 33 | 9 | 21 | 29 | 38 | 42 | 46 | 53 | 62 | 65 | 80 | 86 | 95 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 83 |
| TP06-03 @ 12.0-13.0' | SM | NV | NP | 15 | 23 | 49 | 67 | 77 | 87 | 90 | 90 | 94 | 95 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 84 |
| TP06-02 @ 0.0-2.0' | SC | 30 | 13 | 40 | 50 | 61 | 67 | 72 | 81 | 87 | 89 | 93 | 95 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 85 |
| TP06-02 @ 6.0-8.0' | SC | 36 | 13 | 29 | 38 | 51 | 56 | 60 | 68 | 73 | 75 | 83 | 86 | 91 | 95 | 98 | 100 | 100 | 100 | 100 | 100 | 100 | 86 |



REVIEWED BY CMA

PROJECT: Wittmann ADMP McMicken Dam
 LOCATION: Arizona
 SAMPLE SOURCE: SEE BELOW

JOB NO: 6-117-001025 PH 1
 WORK ORDER NO: 2
 DATE ASSIGNED: 11/28/06

MECHANICAL SIEVE ANALYSIS
 GROUP SYMBOL, USCS (ASTM D-2487)

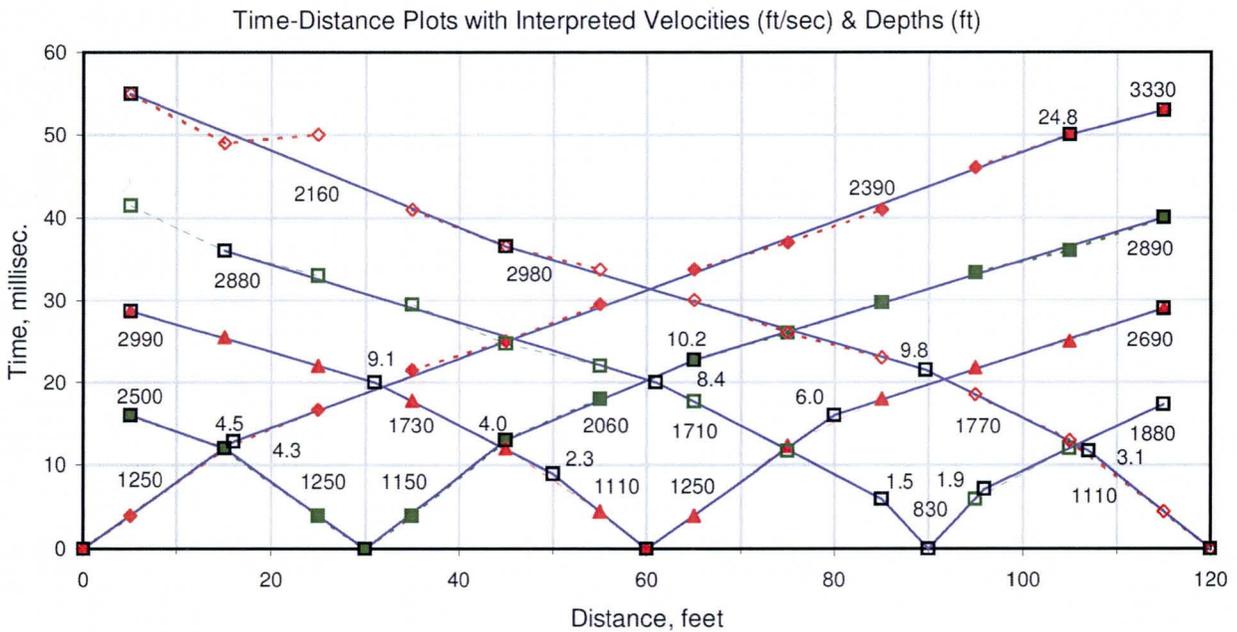
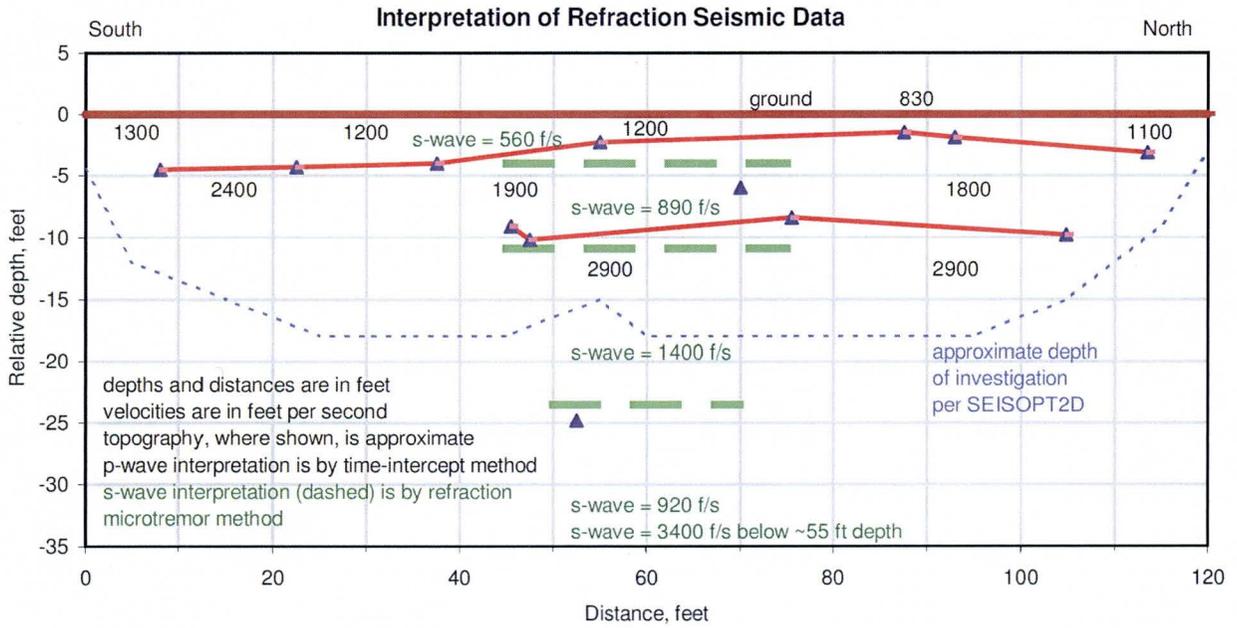
| Location & Depth | USCS | LL | PI | Silt or Clay | SAND | | | | | | | | GRAVEL | | | | | | COBBLES | Lab # | | | |
|------------------|------|----|----|--------------|------|------|-----|-----|-----|-----|-----|----|--------|------|------|------|--------|--------|---------|-------|----|----|--|
| | | | | | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | Fine | | | Coarse | | | | | | |
| | | | | | | | | | | | | | 1/4" | 3/8" | 1/2" | 3/4" | 1" | 1 1/4" | 1 1/2" | 2" | 3" | 6" | |

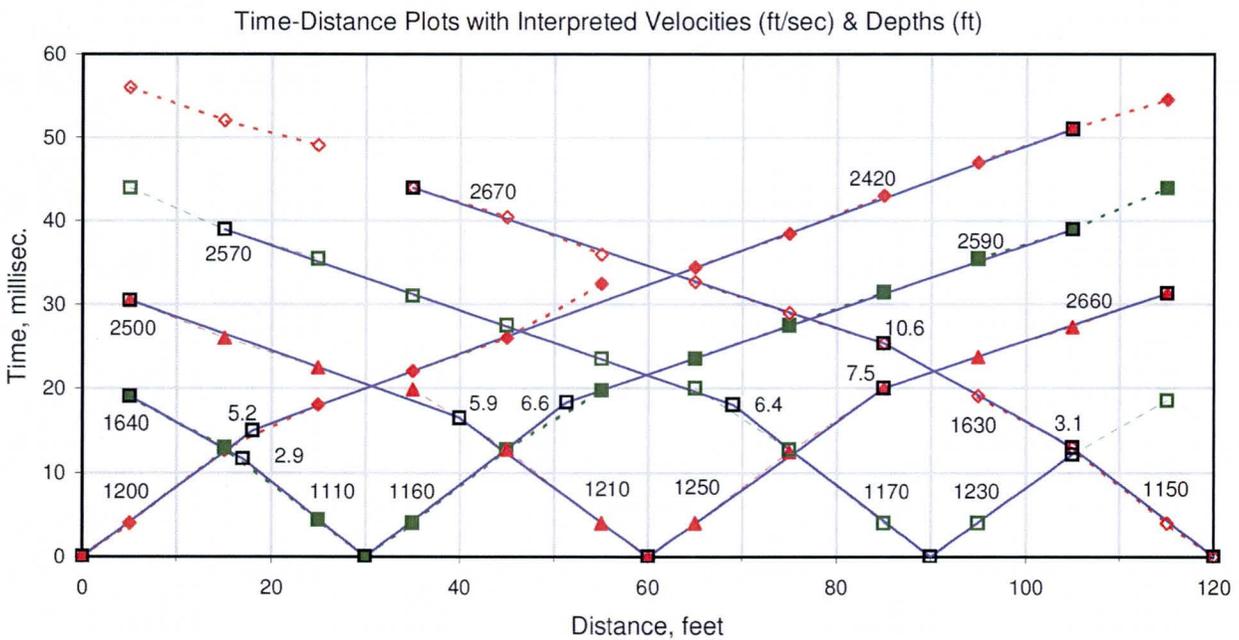
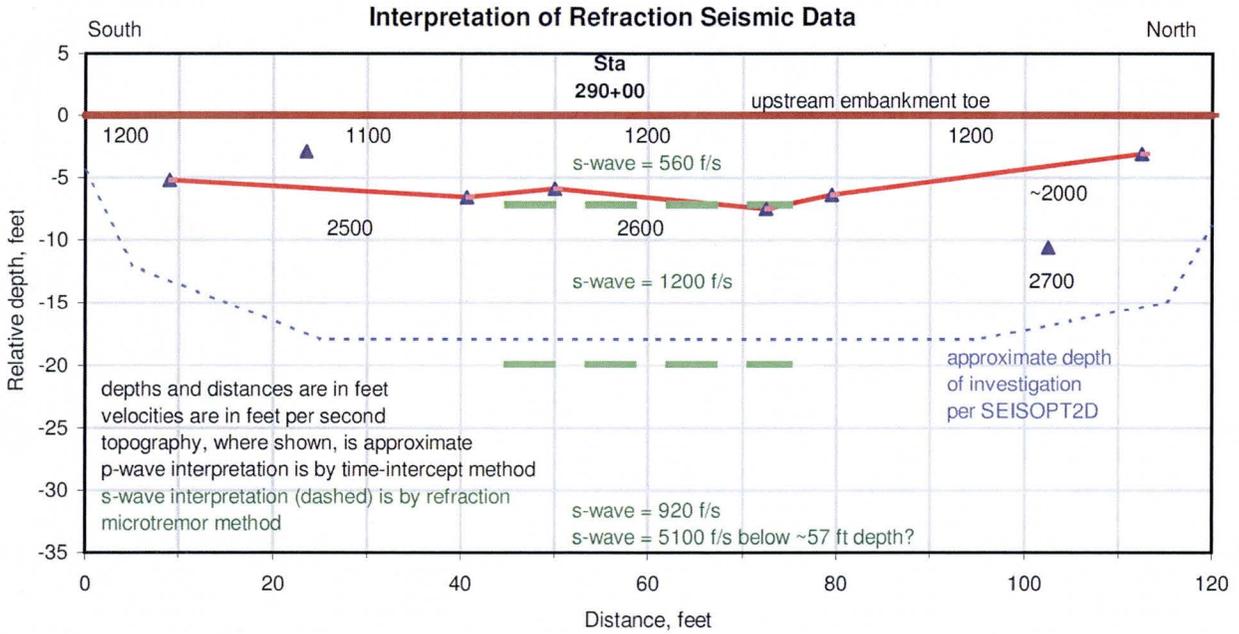
PERCENT PASSING BY WEIGHT

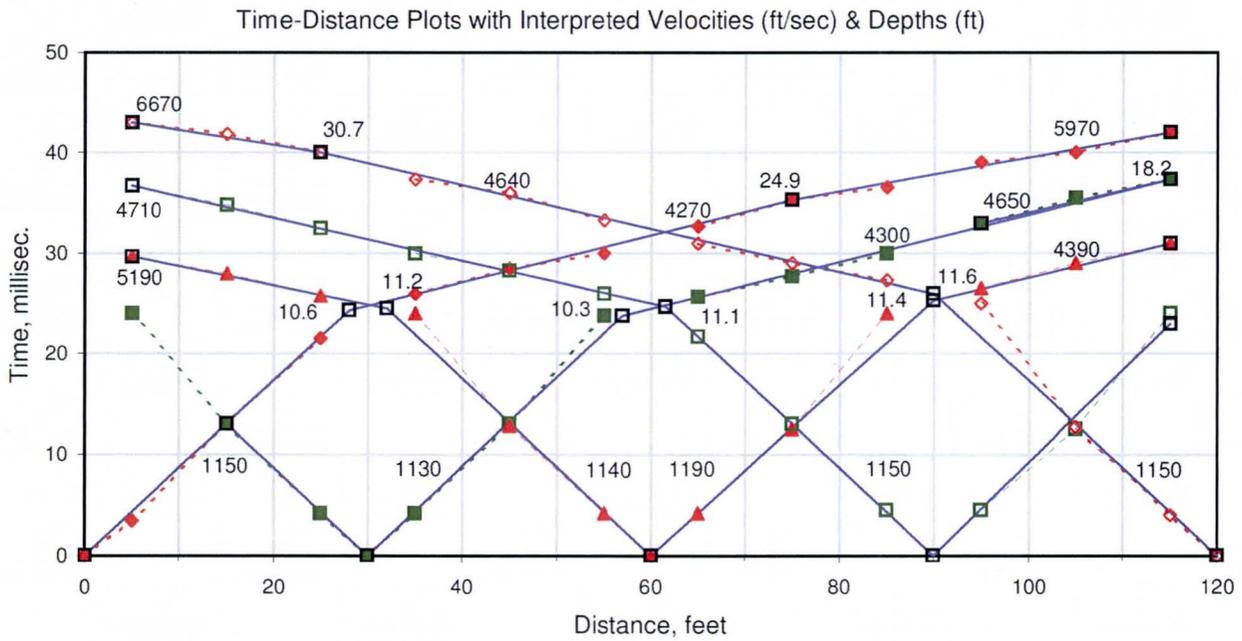
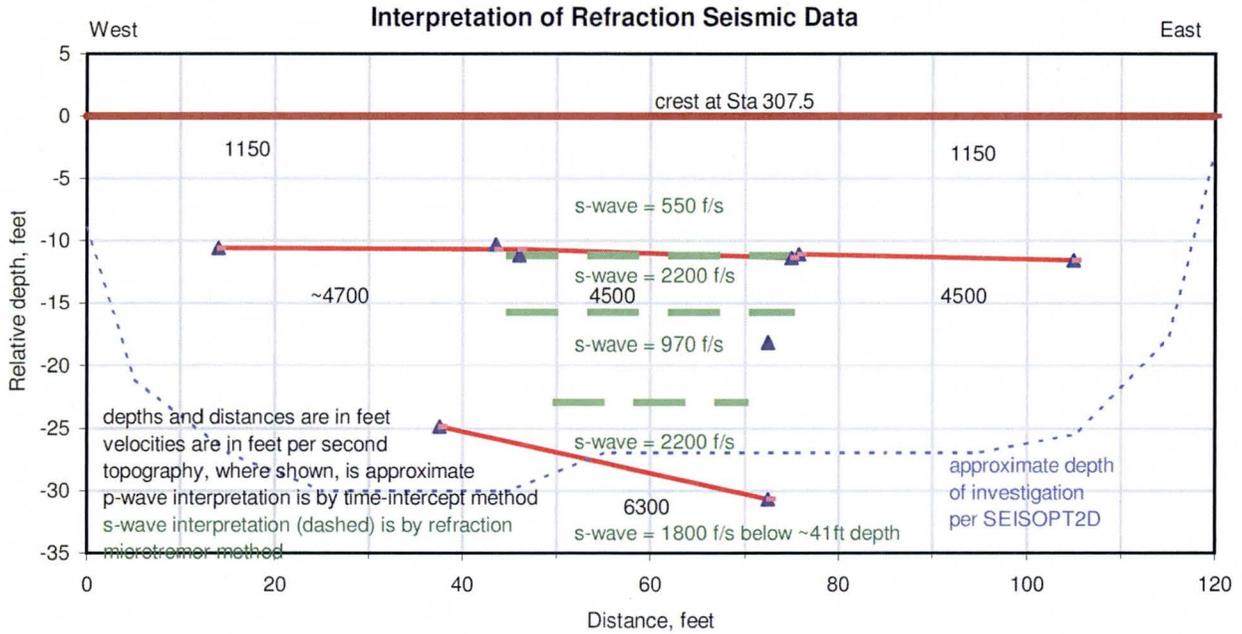
| Location & Depth | USCS | LL | PI | #200 | #100 | #50 | #40 | #30 | #16 | #10 | #8 | #4 | 1/4" | 3/8" | 1/2" | 3/4" | 1" | 1 1/4" | 1 1/2" | 2" | 3" | 6" | Lab # | |
|----------------------|-------|----|----|------|------|-----|-----|-----|-----|-----|----|----|------|------|------|------|-----|--------|--------|-----|-----|-----|-------|----|
| TP06-02 @ 10.0-12.0' | SP-SM | NV | NP | 8.8 | 15 | 30 | 40 | 50 | 62 | 69 | 72 | 81 | 85 | 91 | 94 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 87 |
| TP06-01 @ 2.0-3.0' | SC | 27 | 10 | 48 | 73 | 88 | 92 | 94 | 97 | 97 | 98 | 98 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 88 |
| TP06-01 @ 7.0-8.0' | SC | 36 | 14 | 30 | 42 | 51 | 55 | 59 | 66 | 72 | 75 | 87 | 90 | 95 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 89 |
| TP06-01 @ 12.0-13.0' | SP-SM | NV | NP | 11 | 19 | 35 | 46 | 57 | 71 | 77 | 79 | 87 | 89 | 93 | 95 | 97 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 90 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
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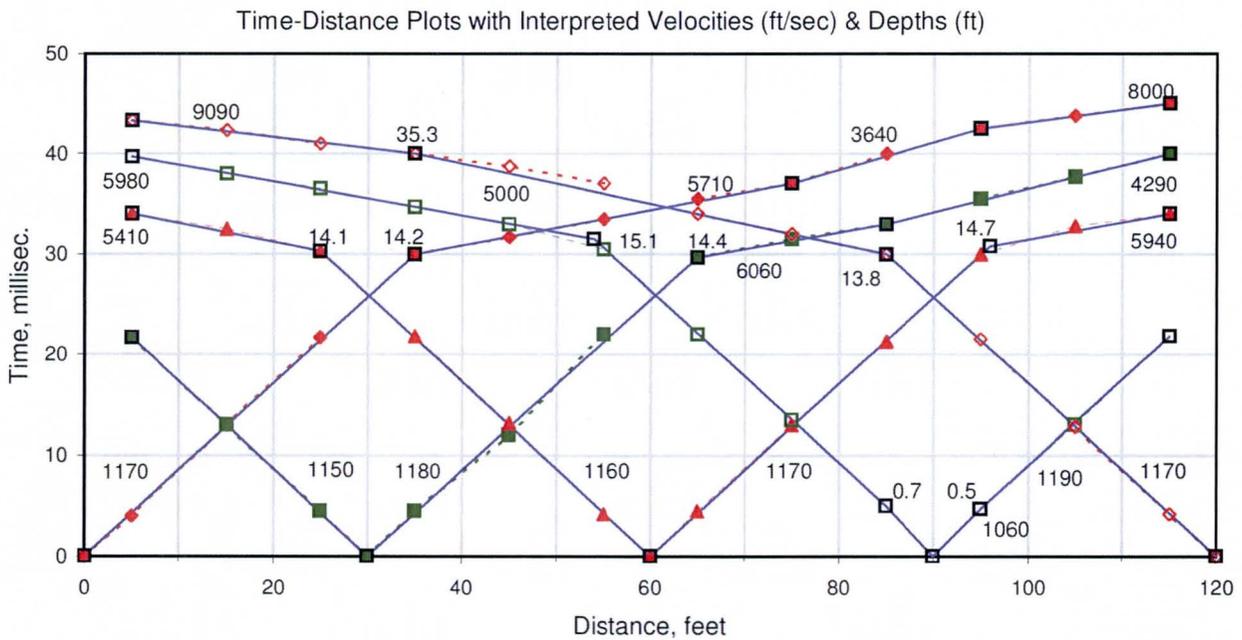
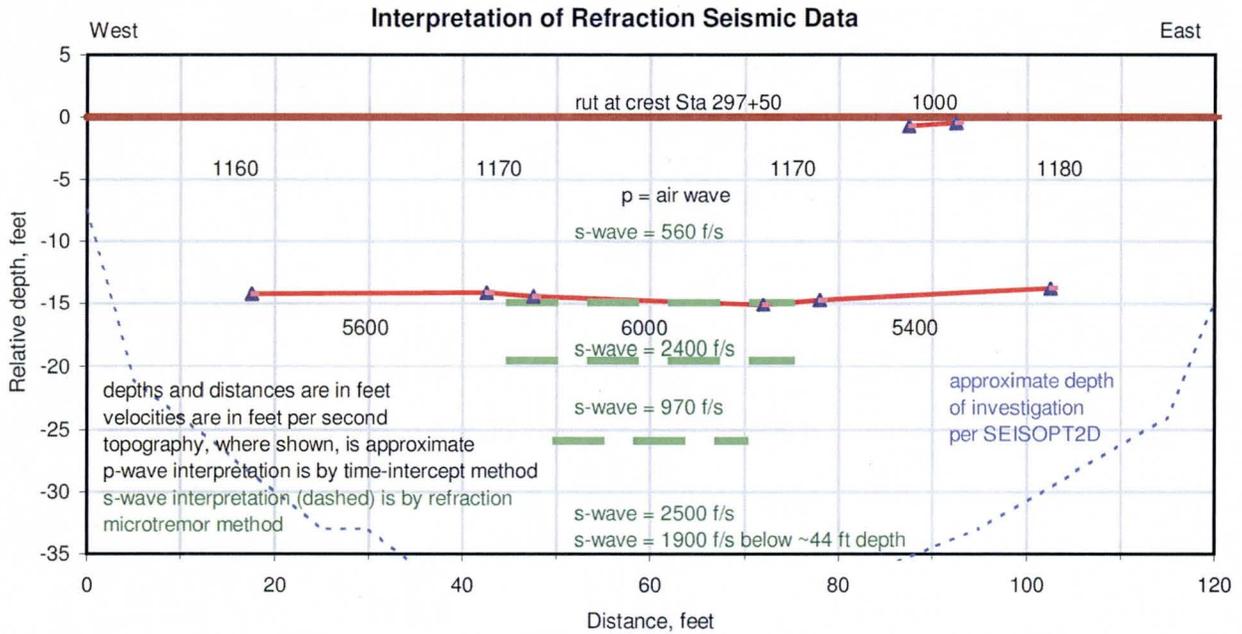


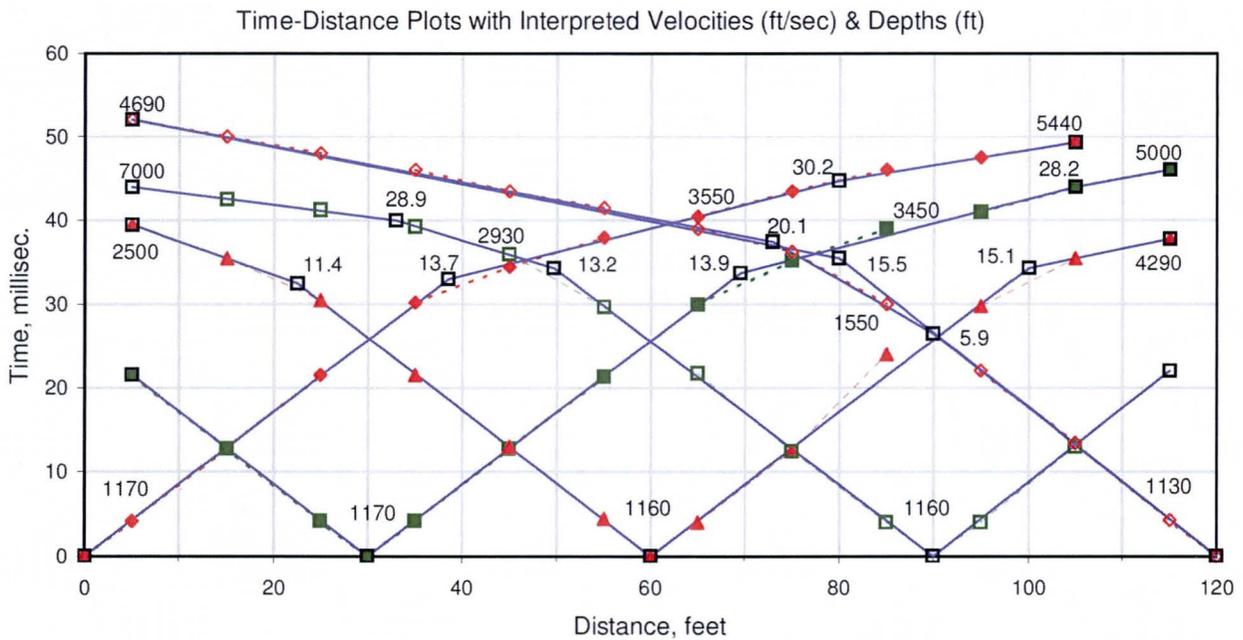
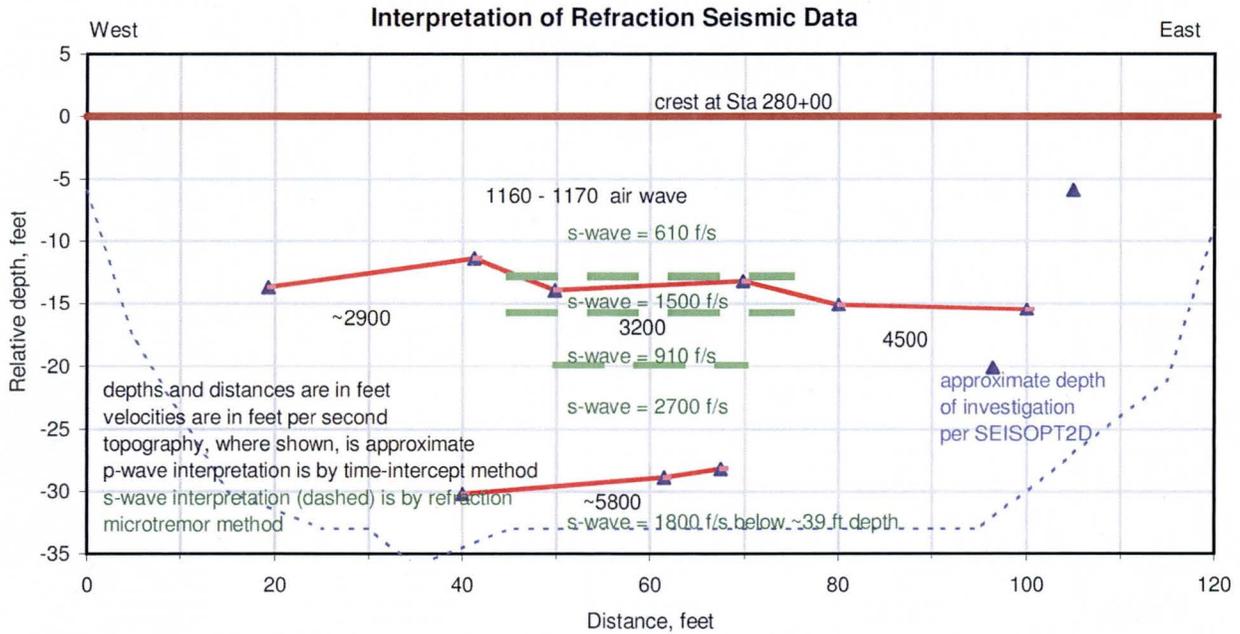
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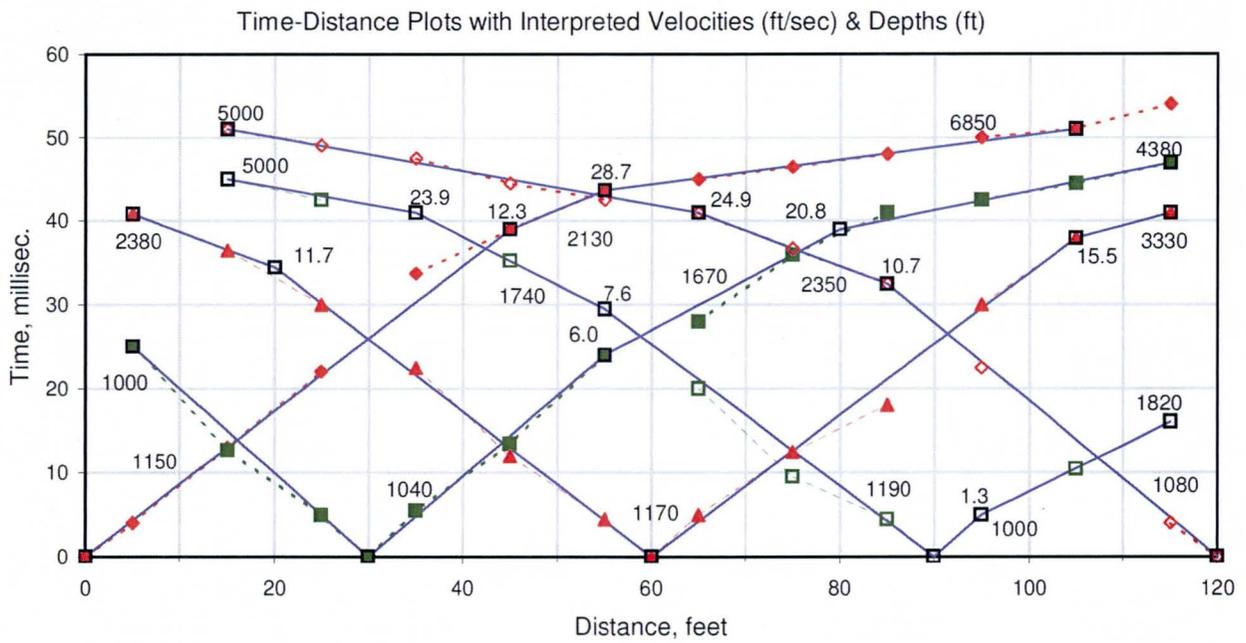
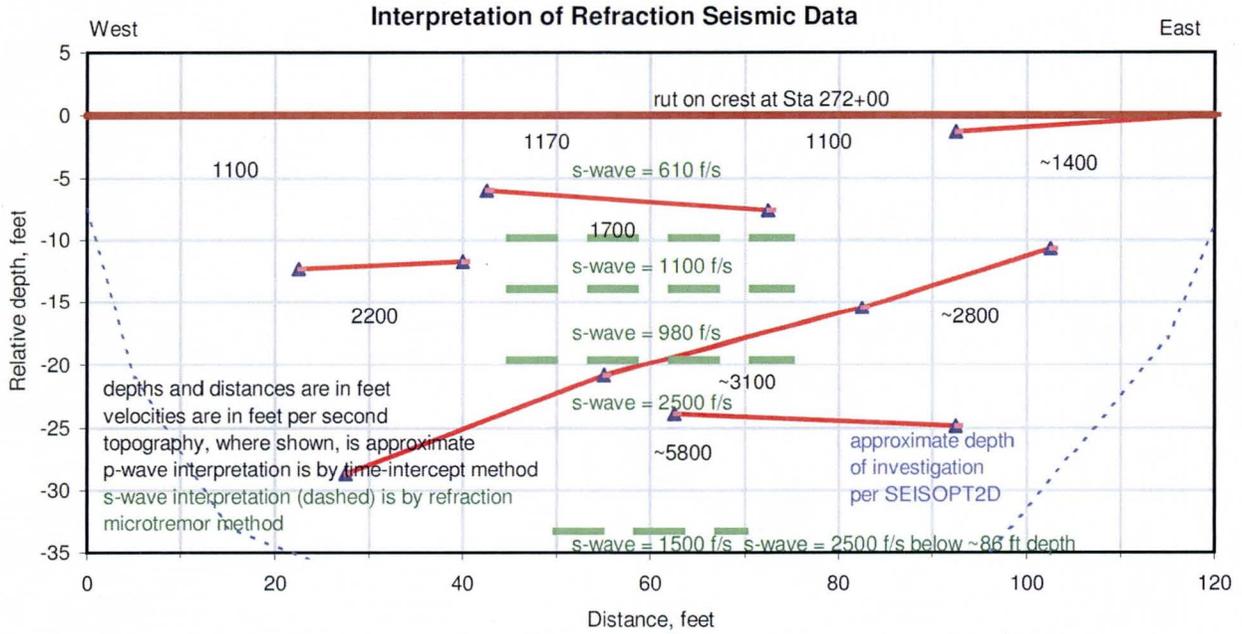


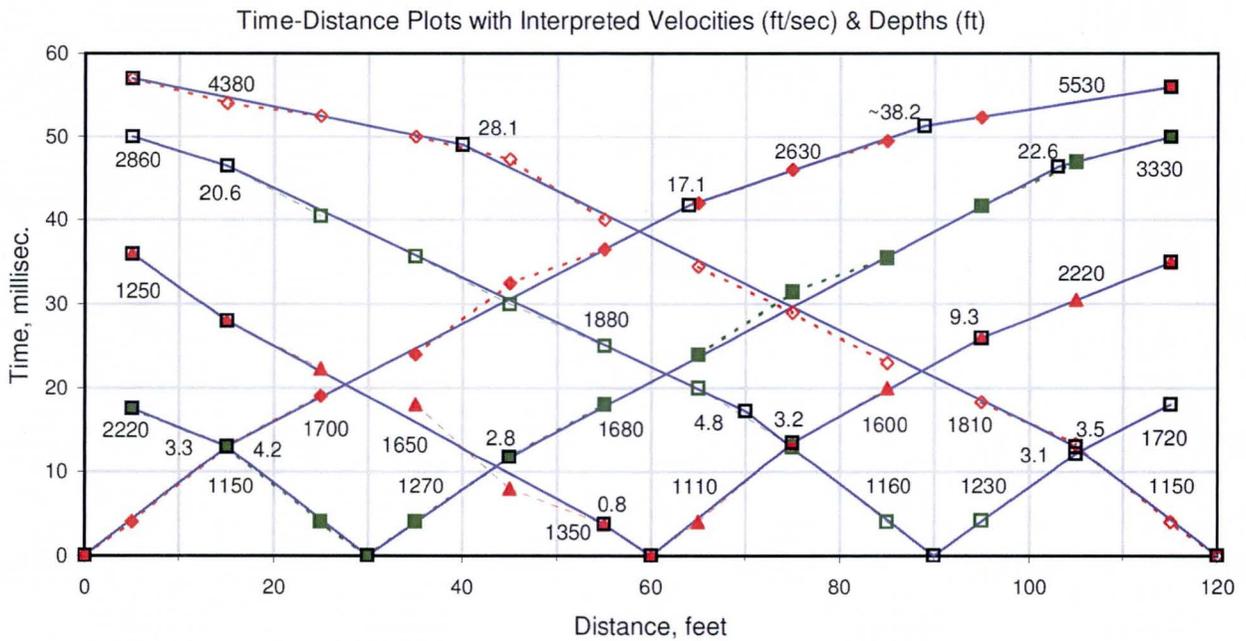
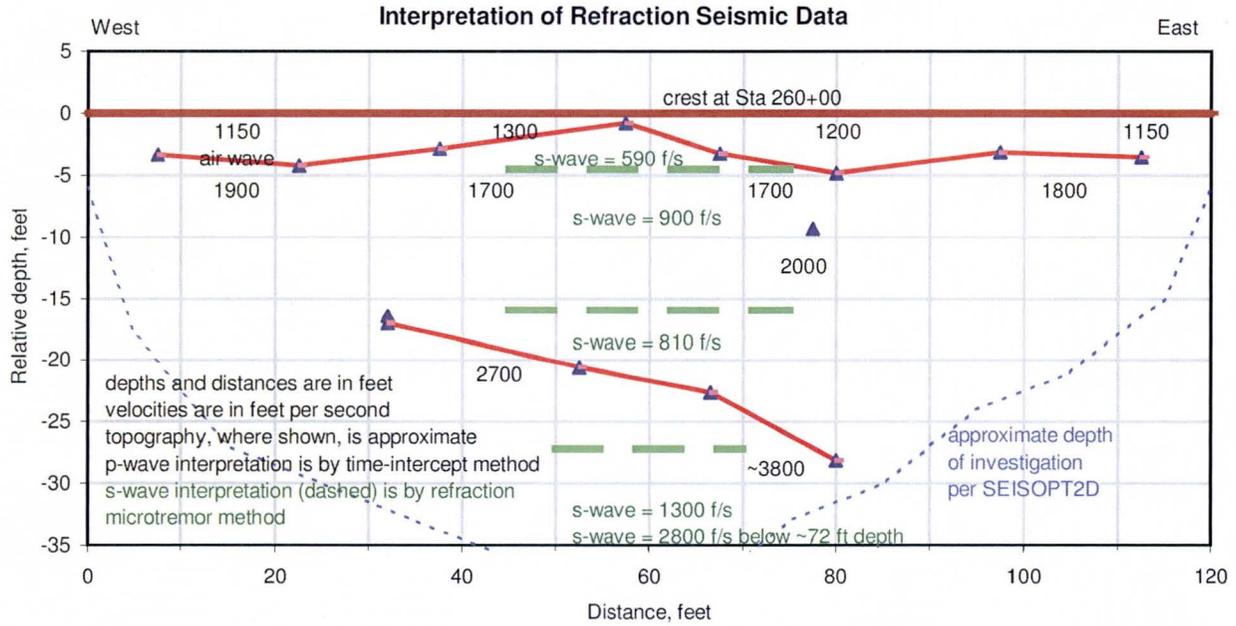


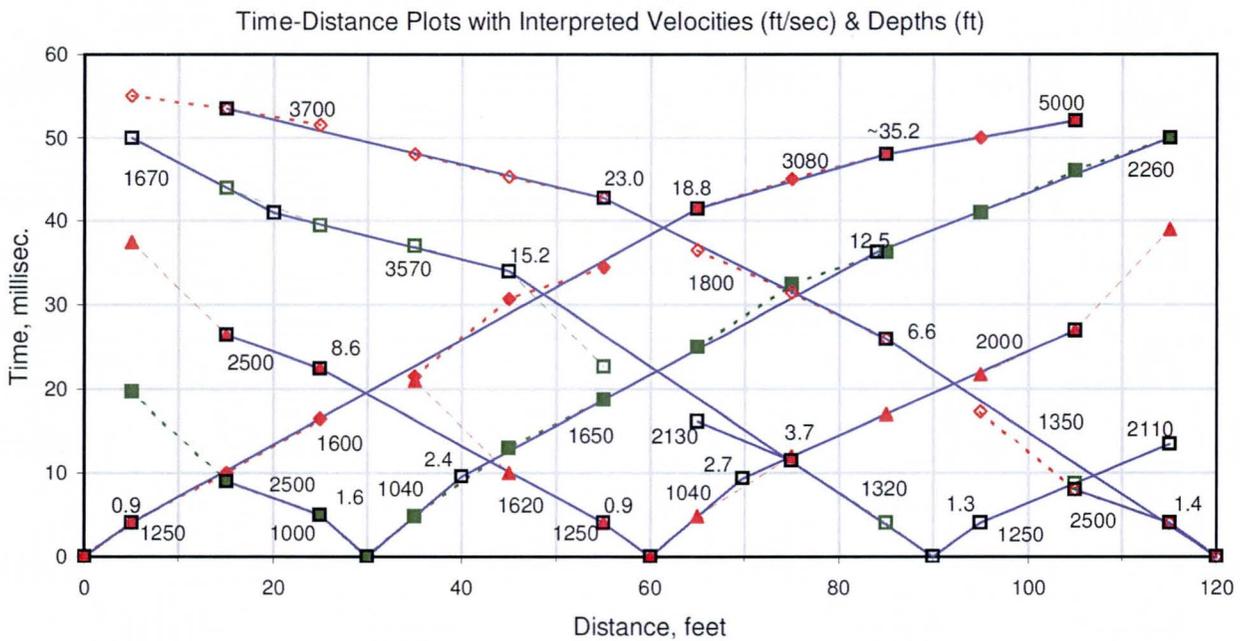
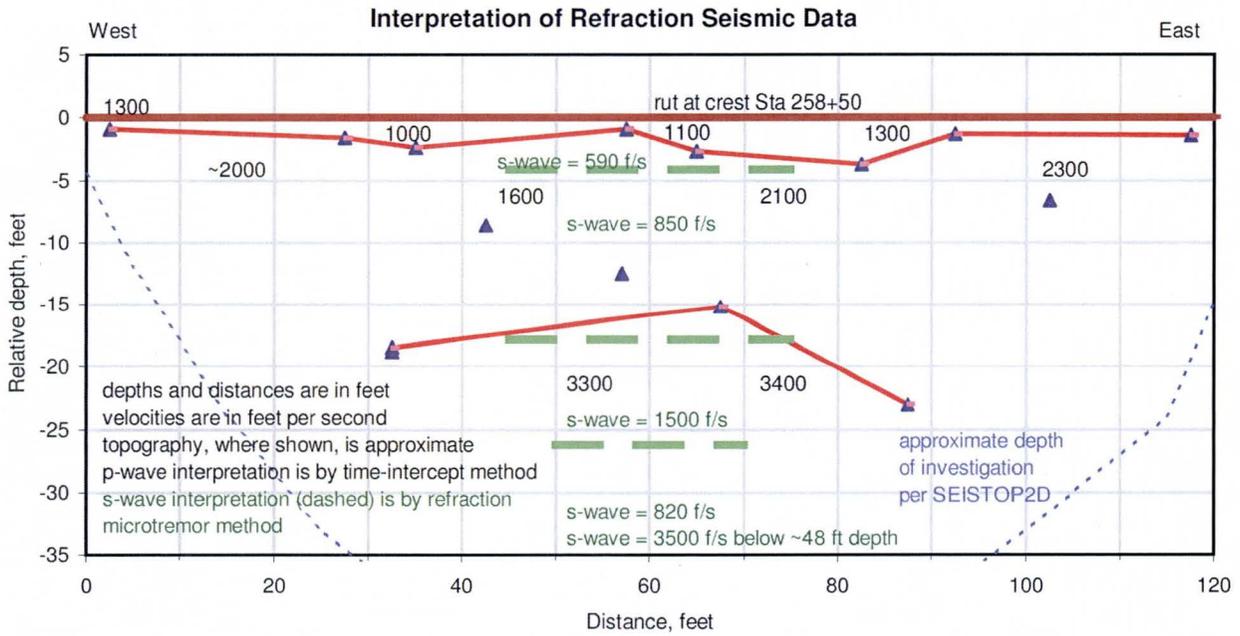


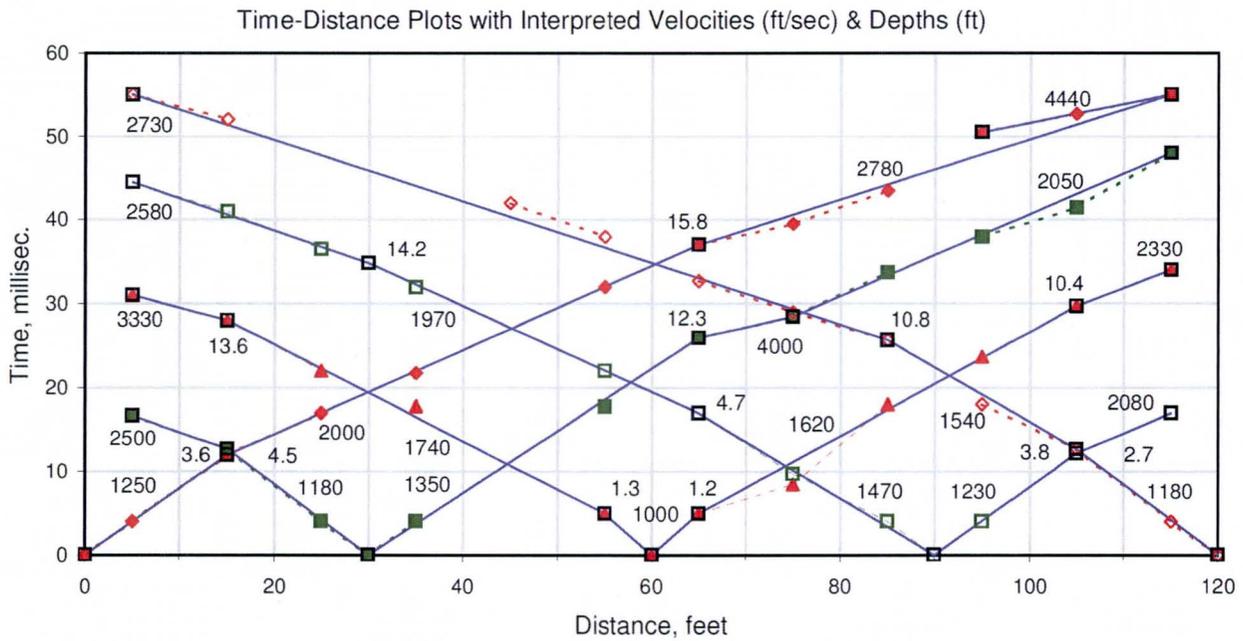
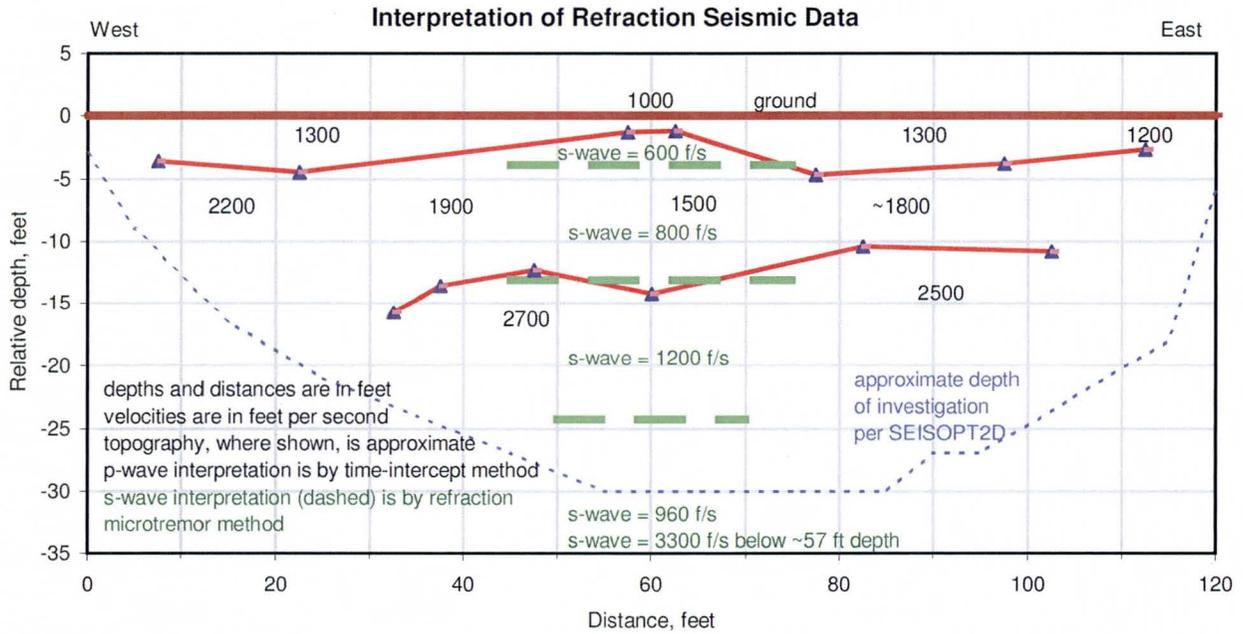


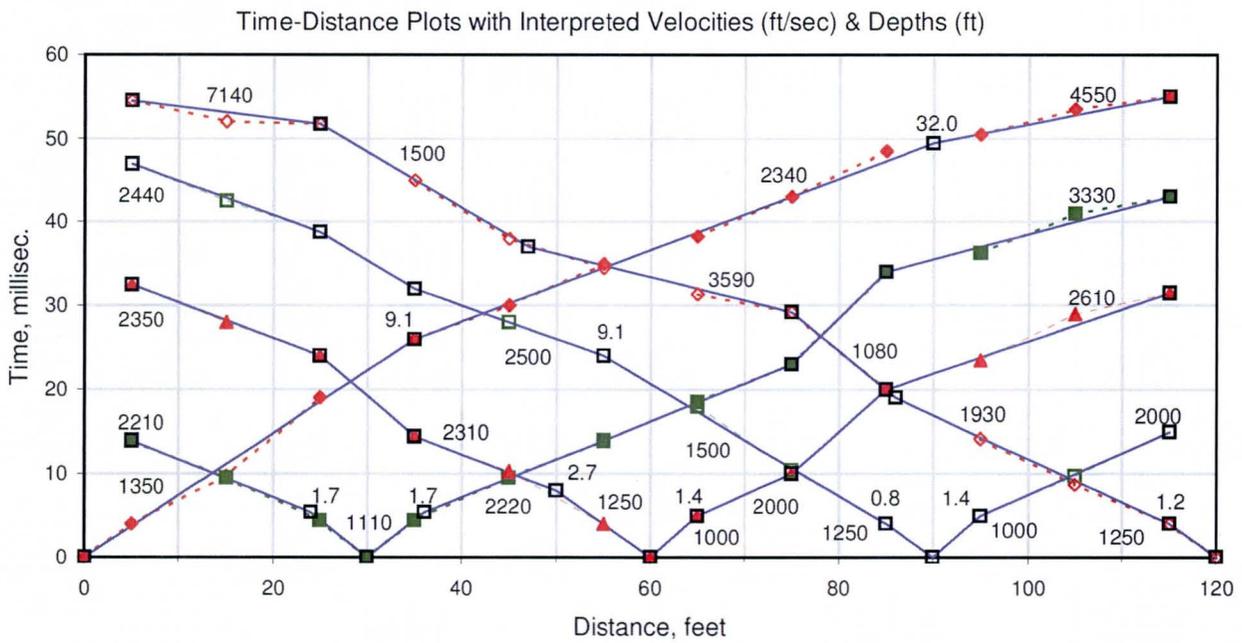
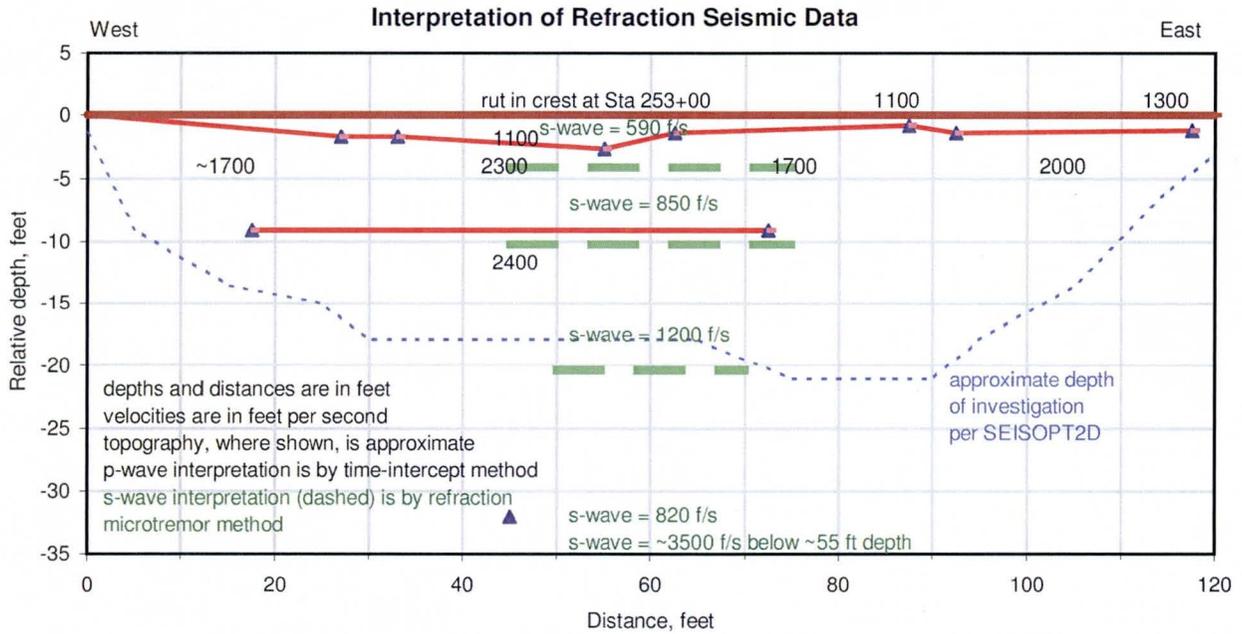


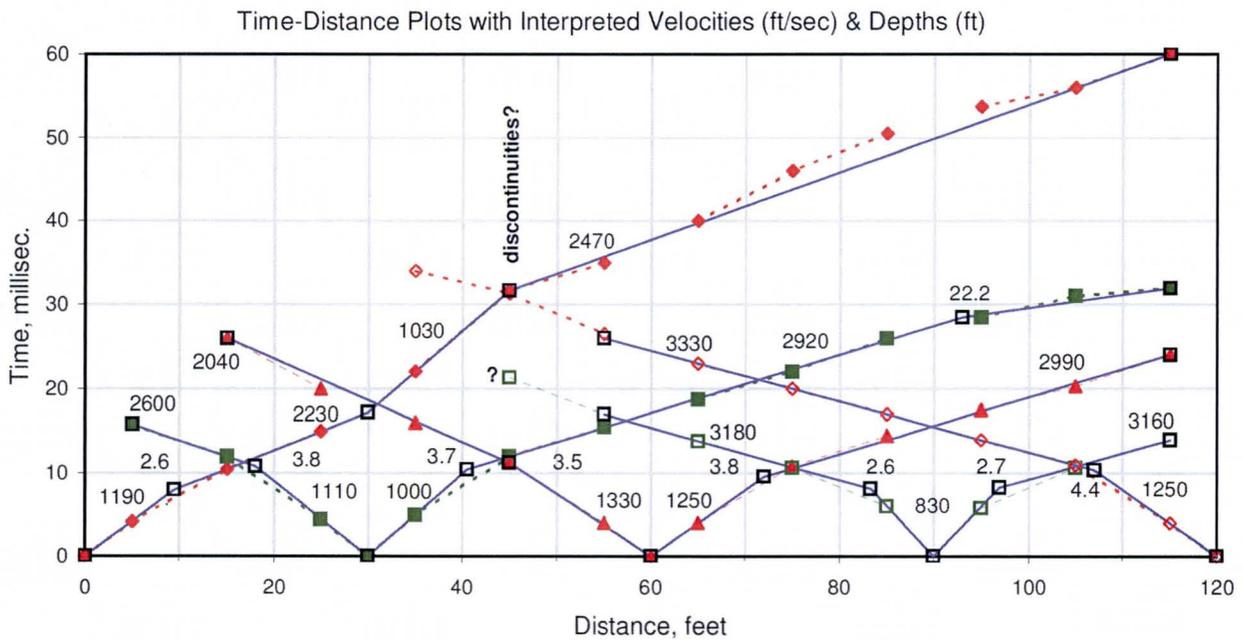
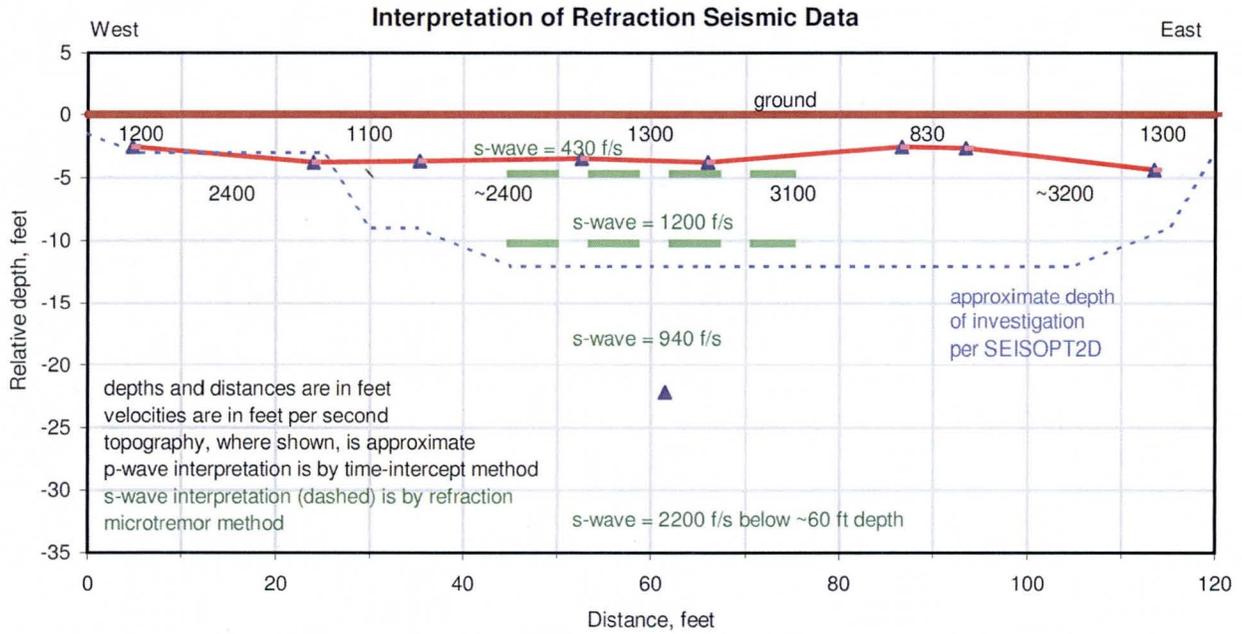


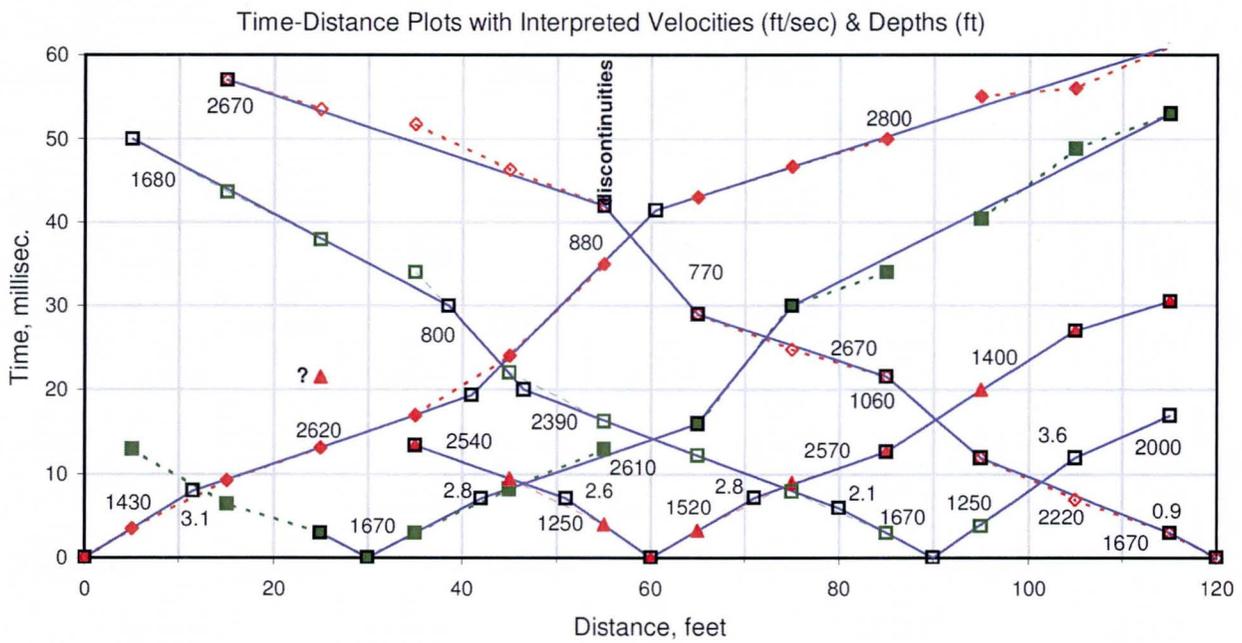
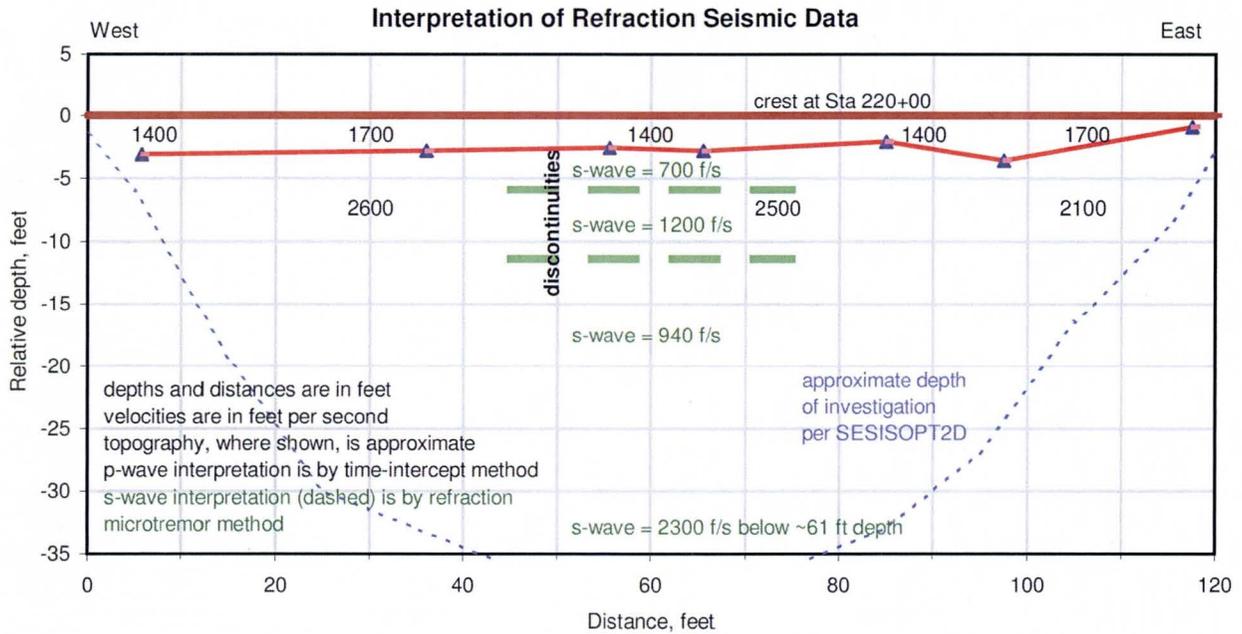


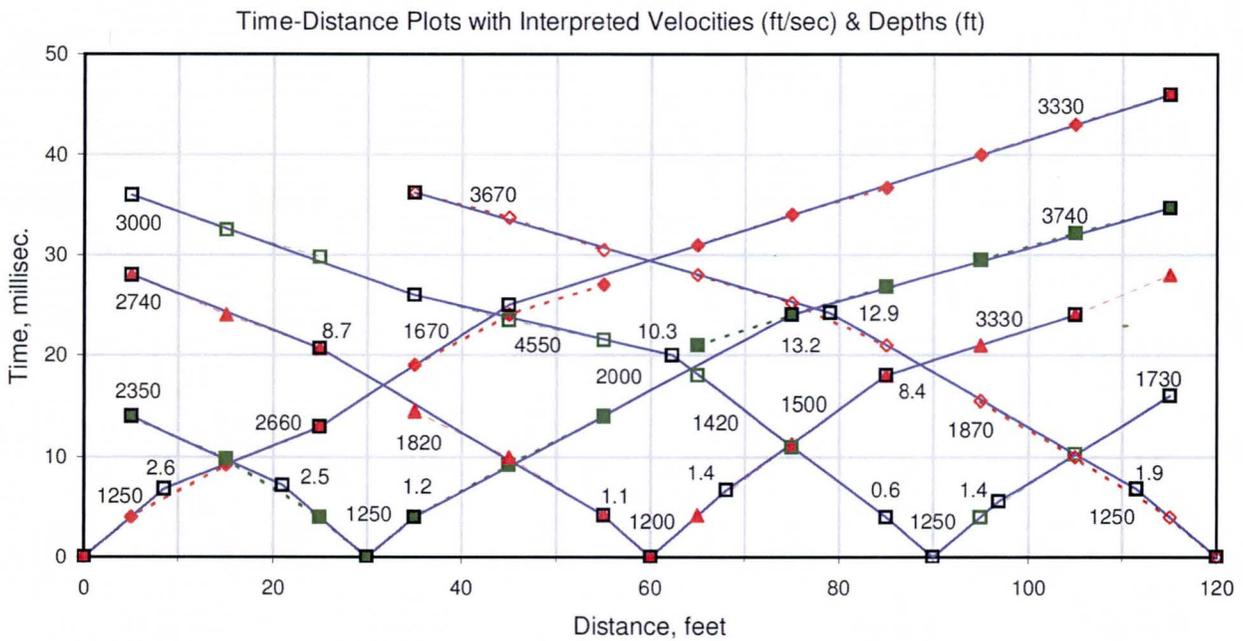
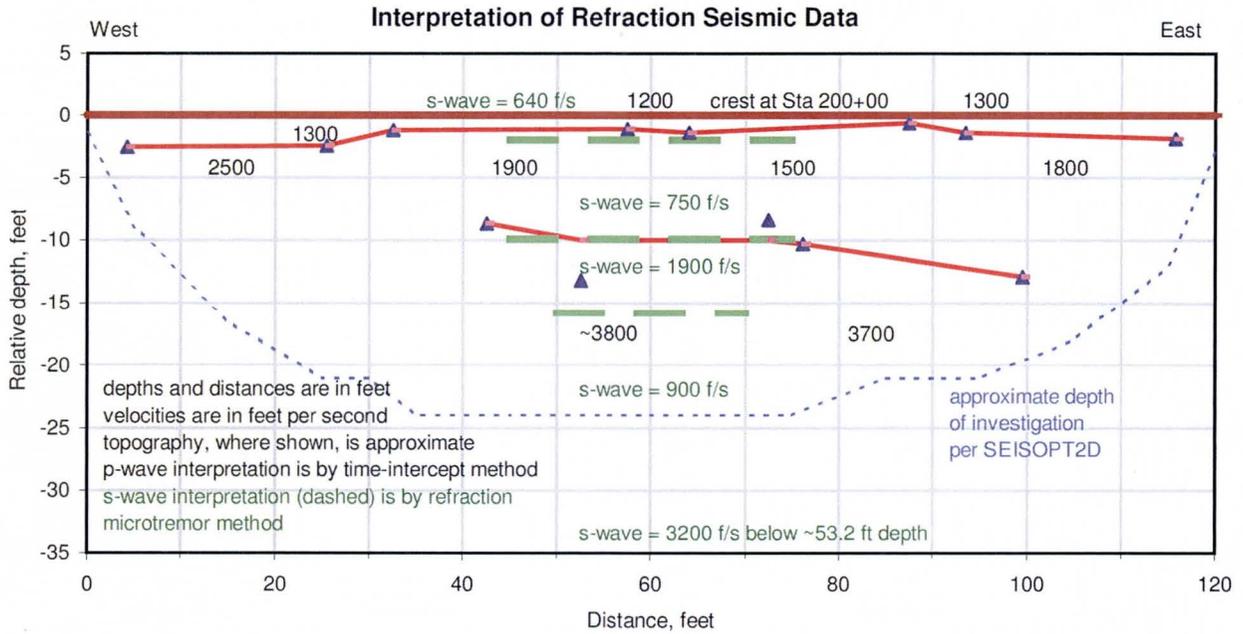


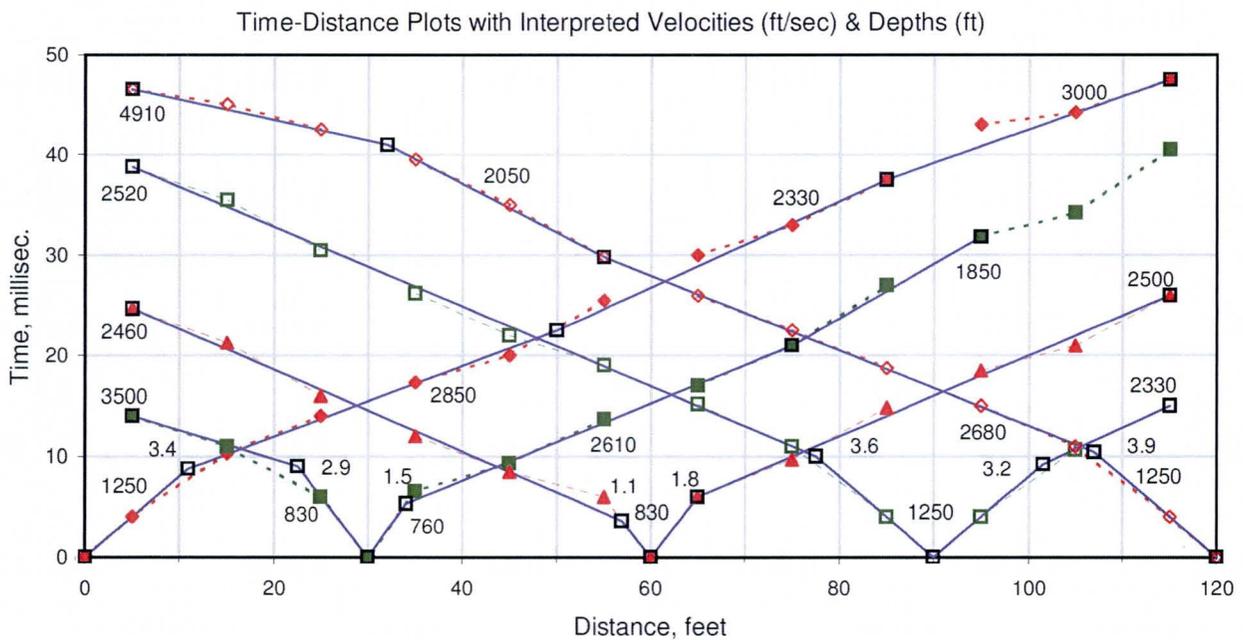
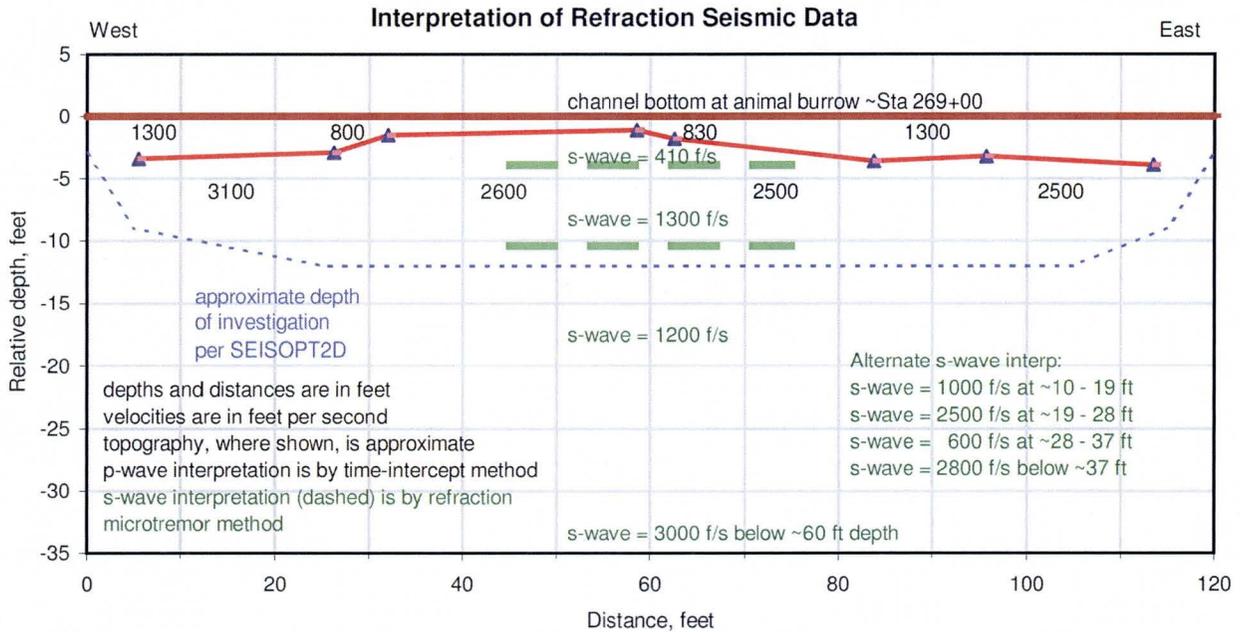


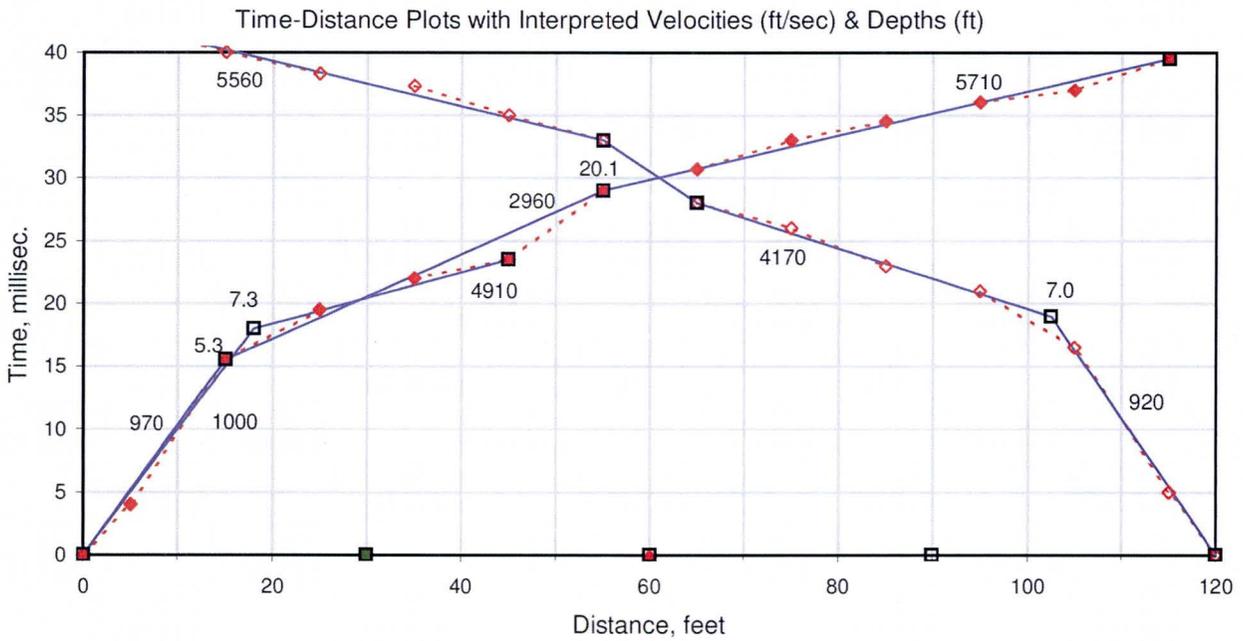
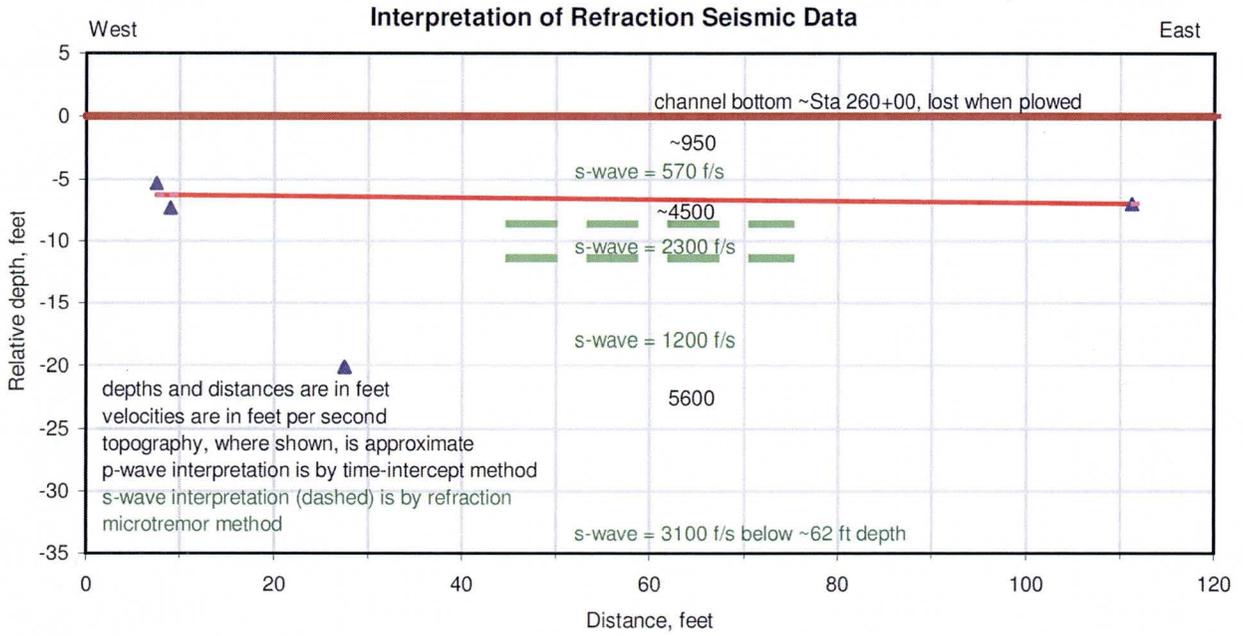


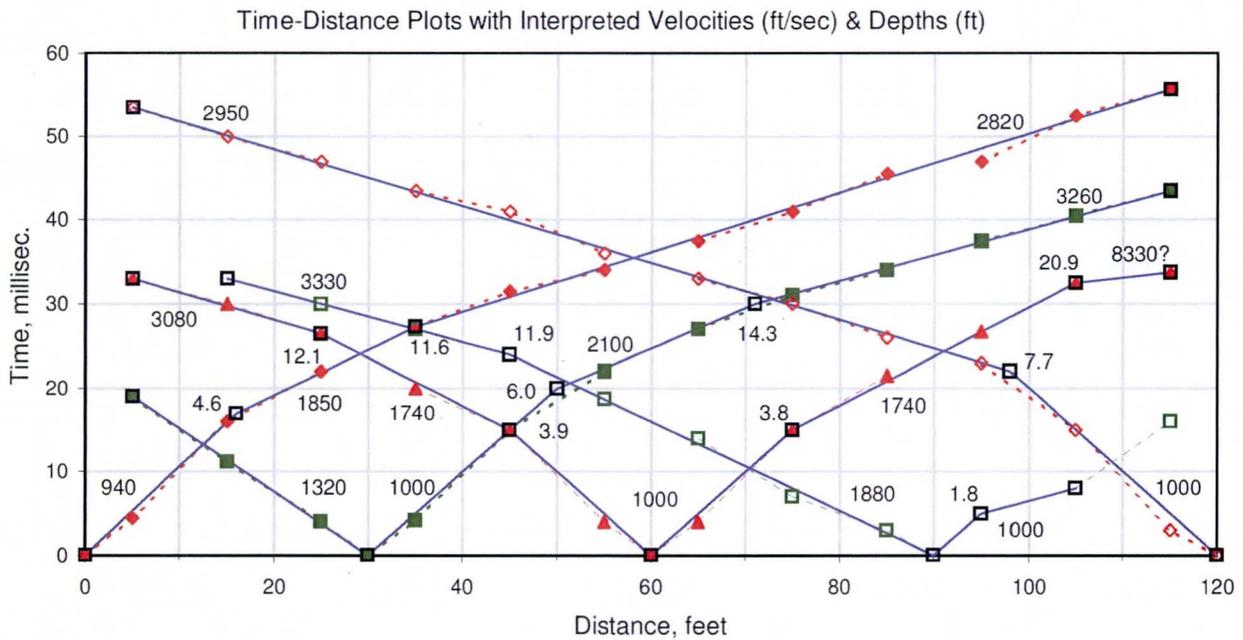
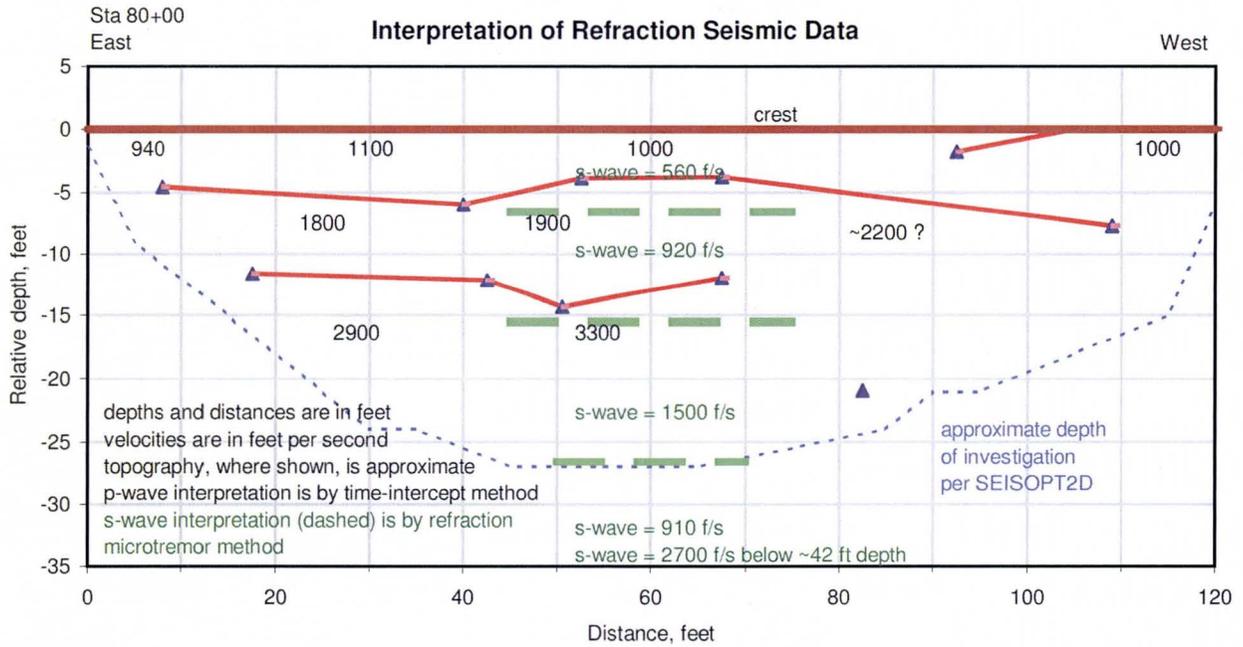


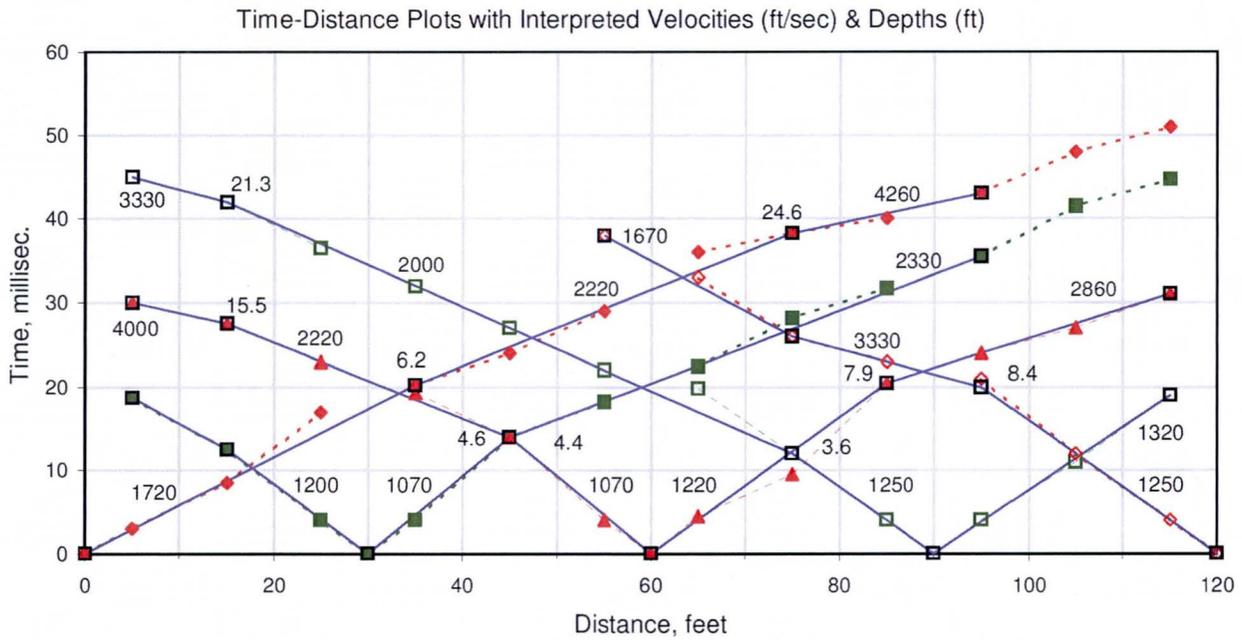
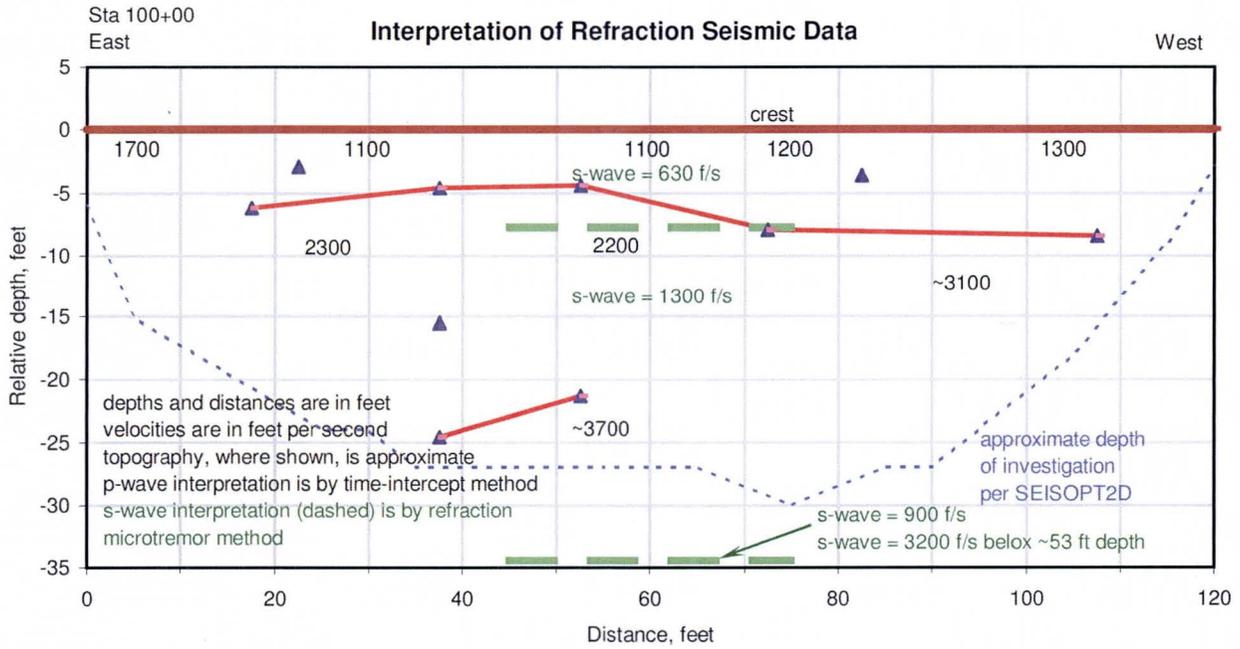


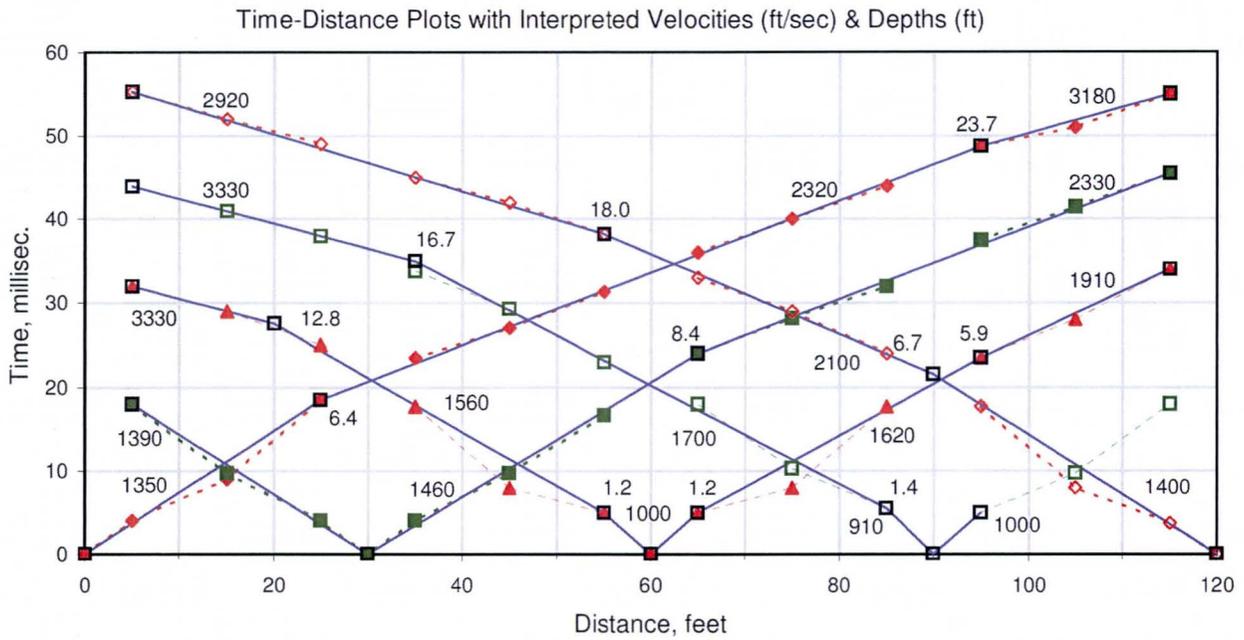
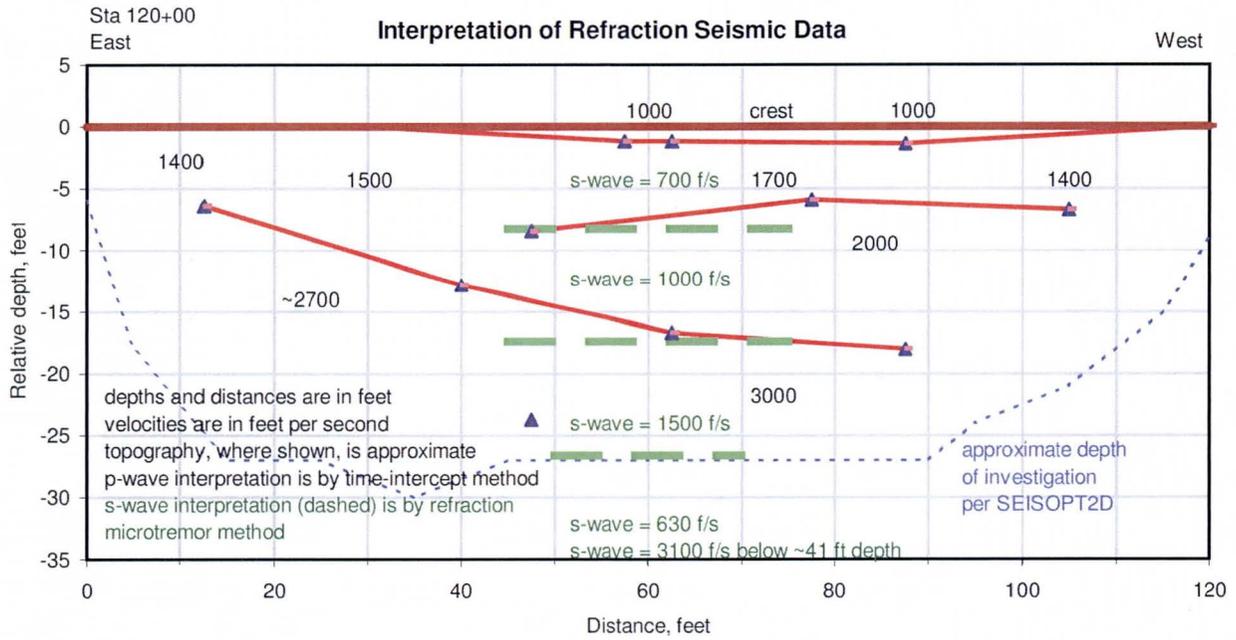


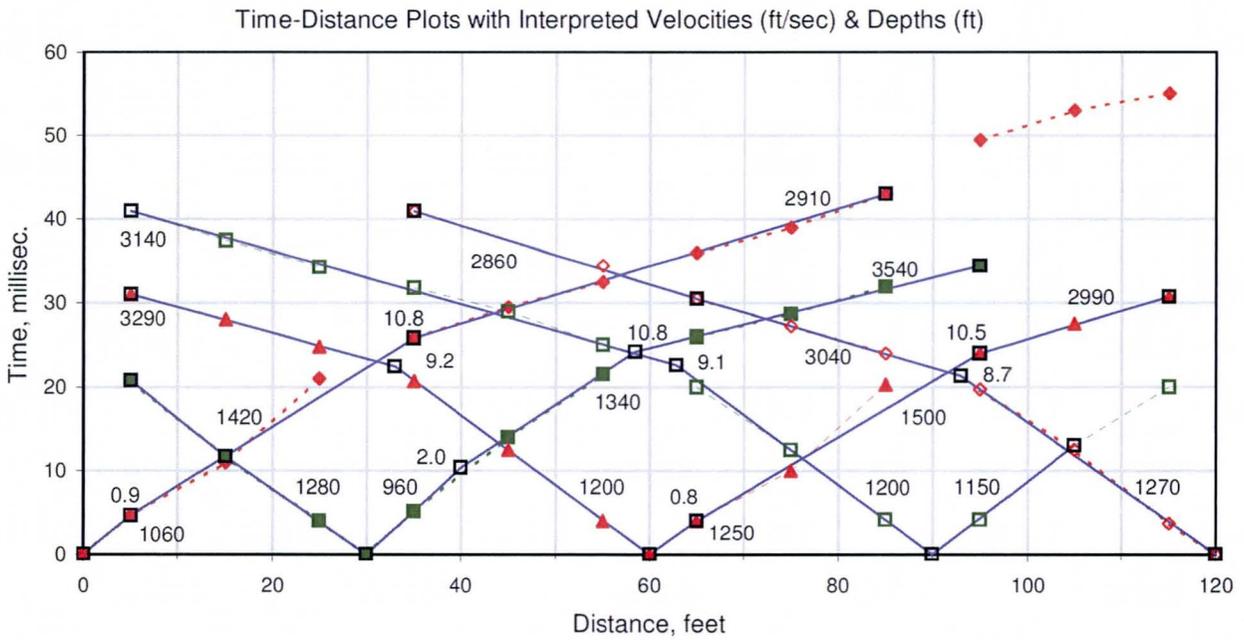
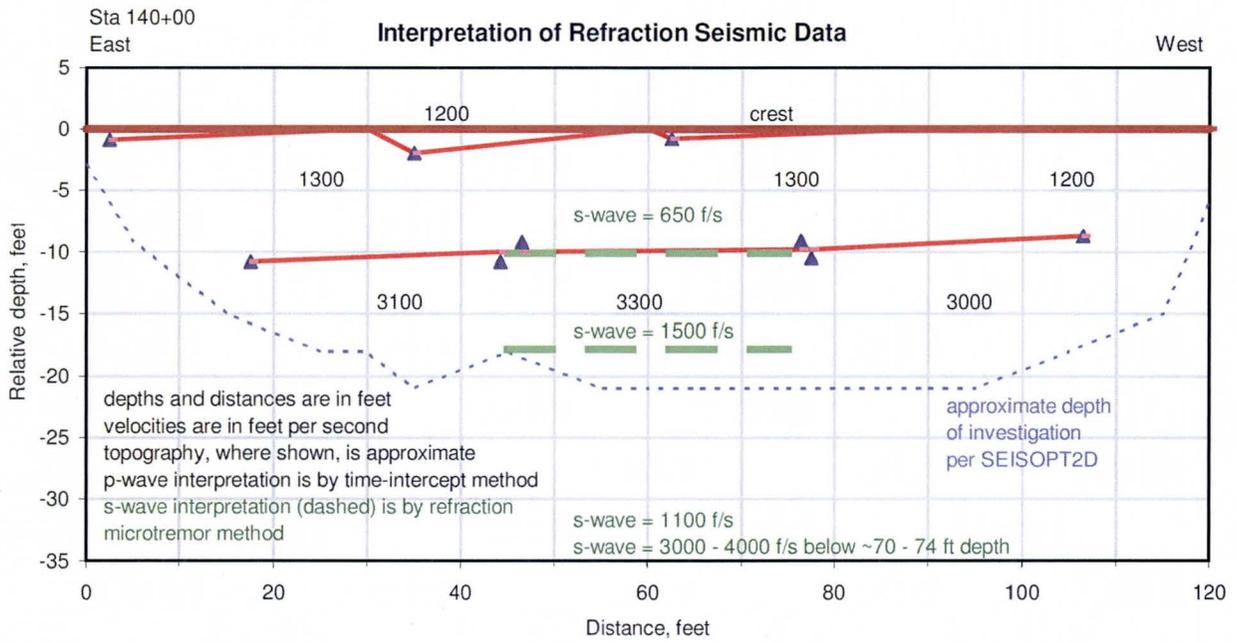


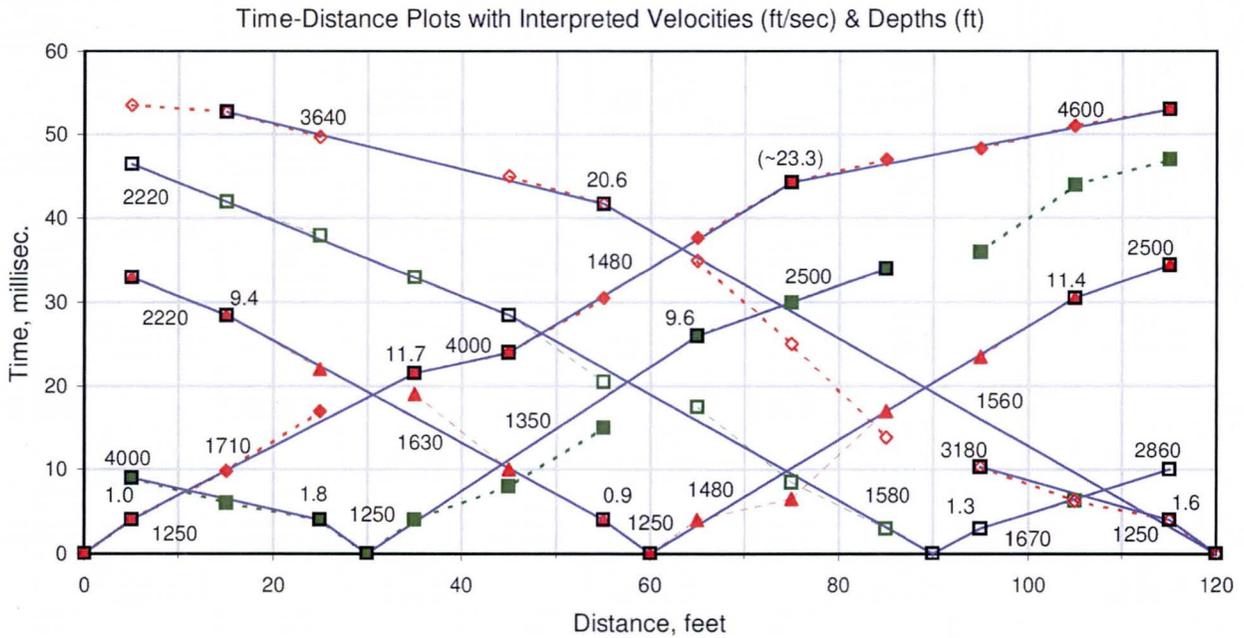
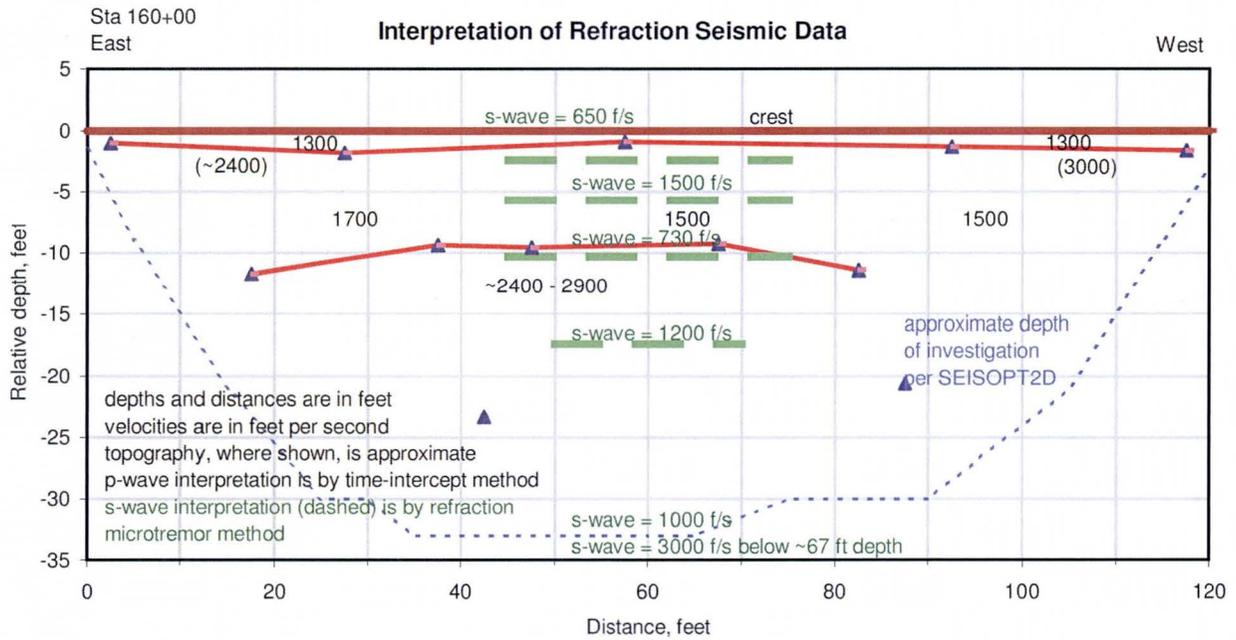


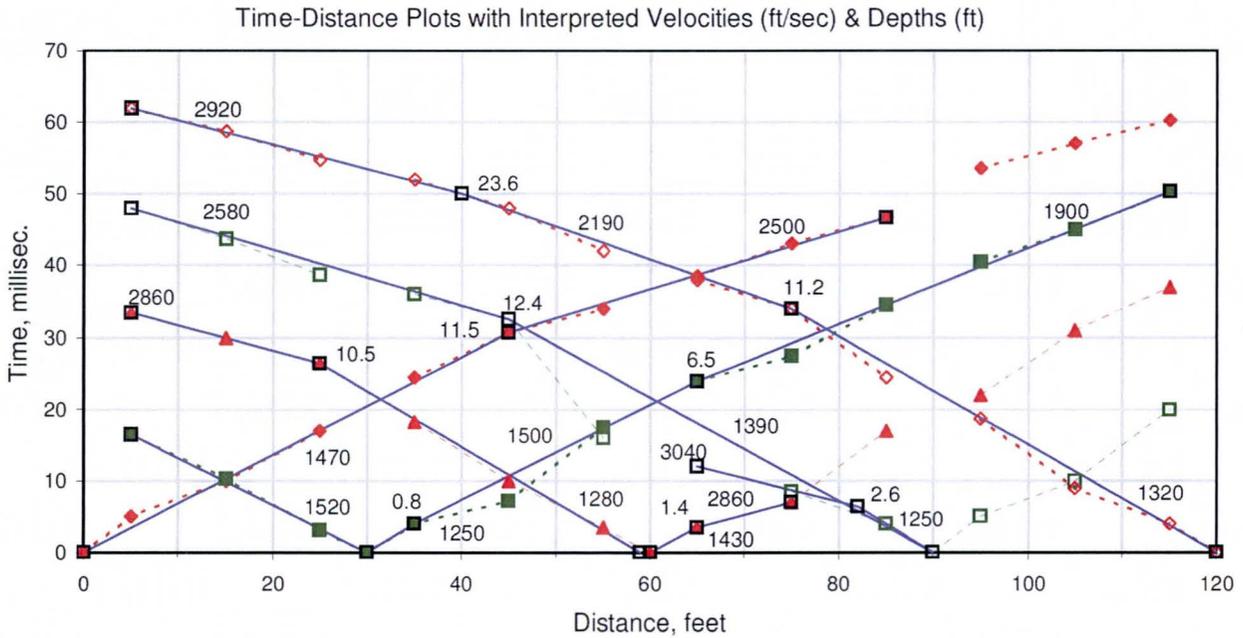
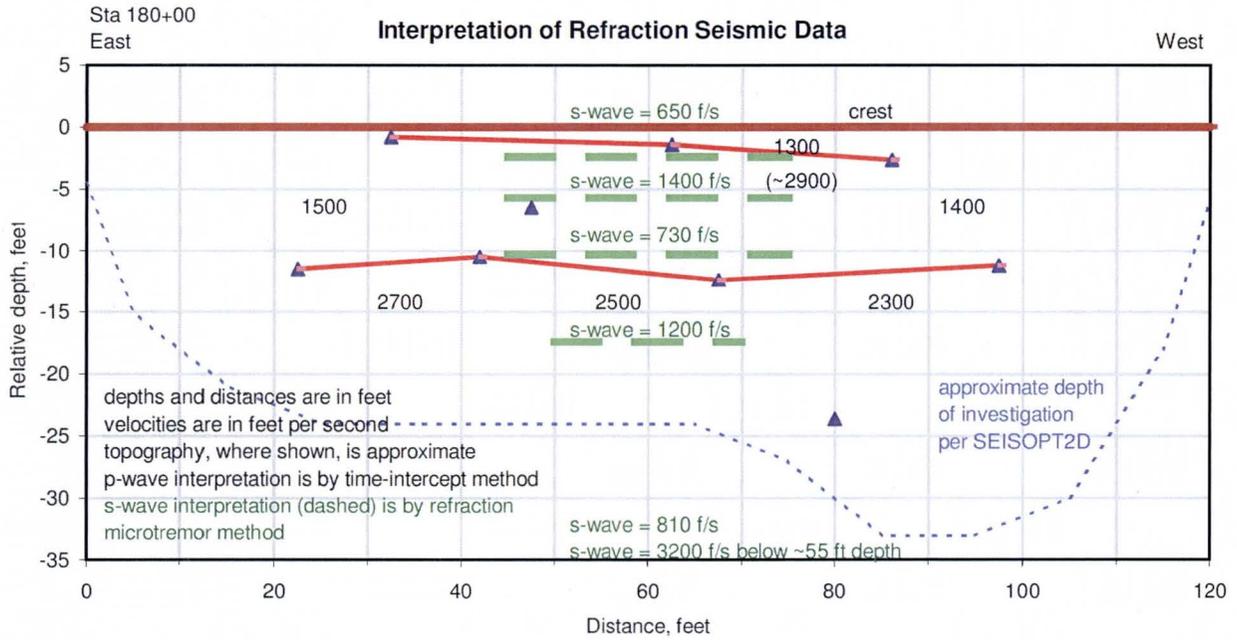


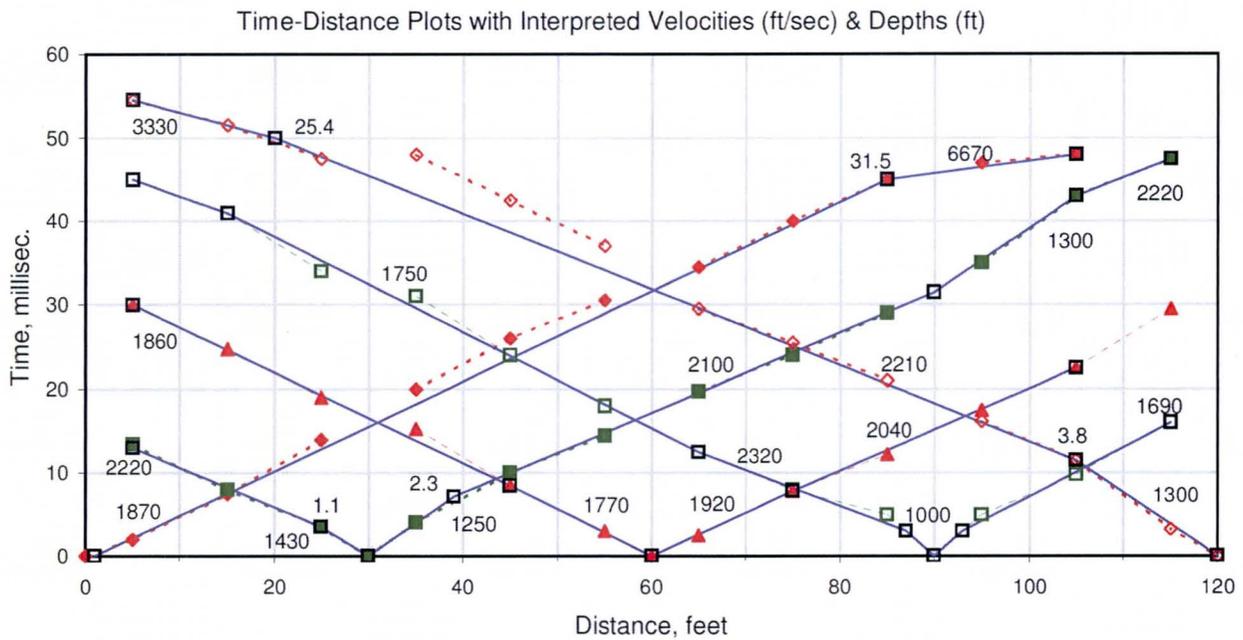
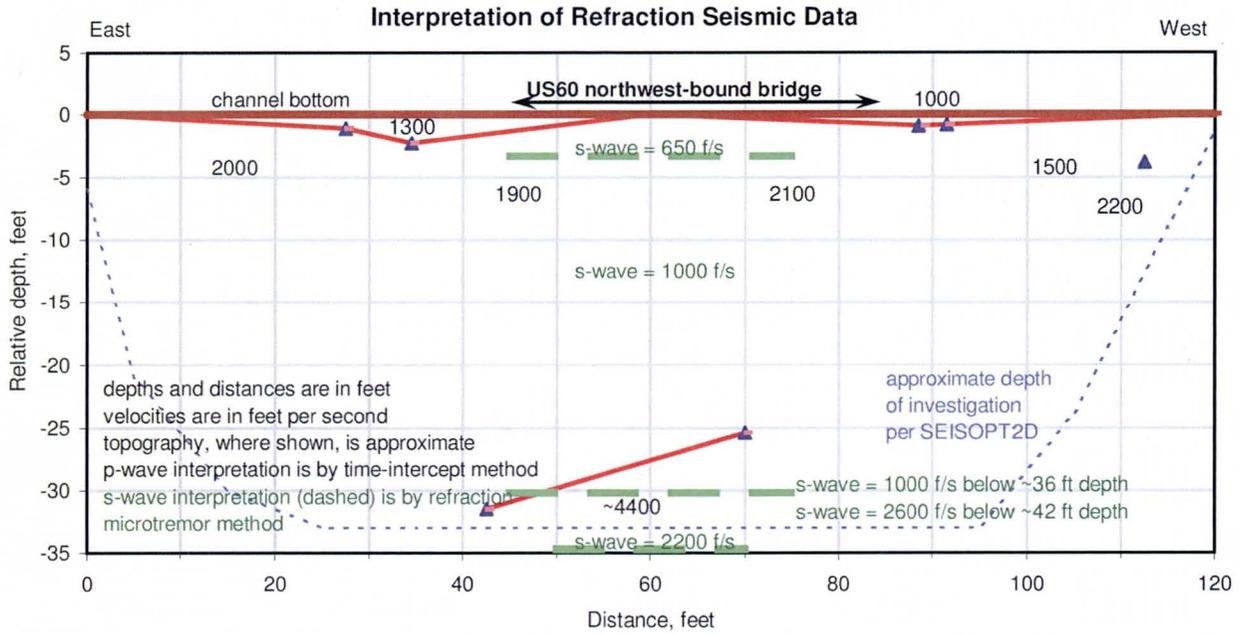


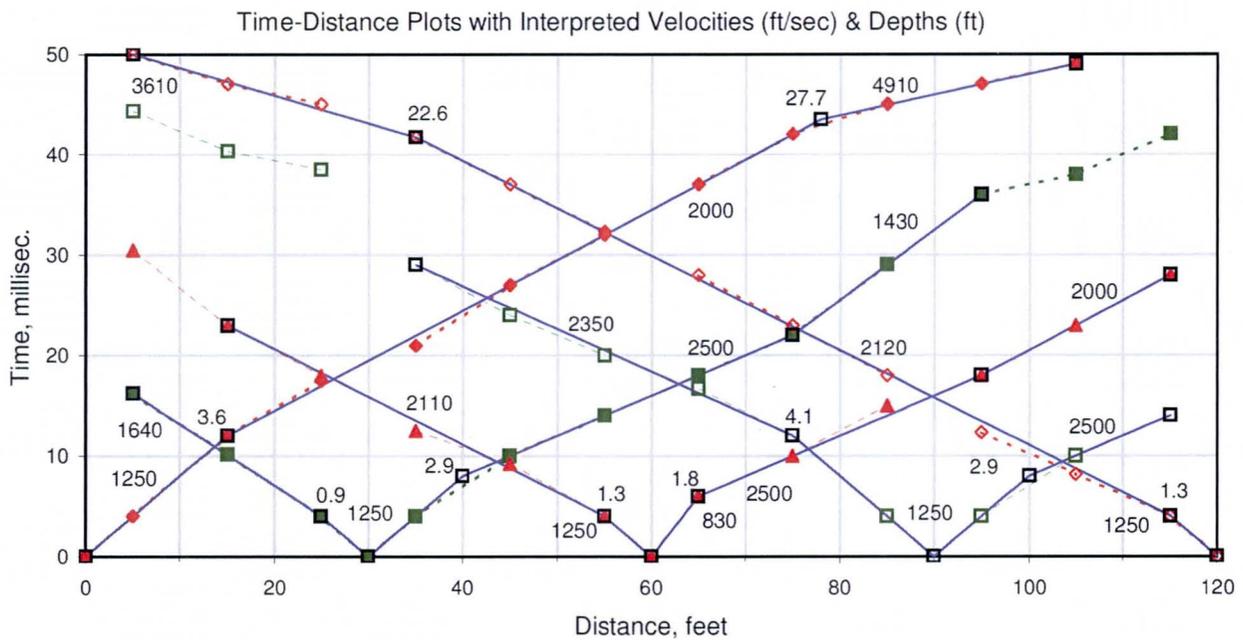
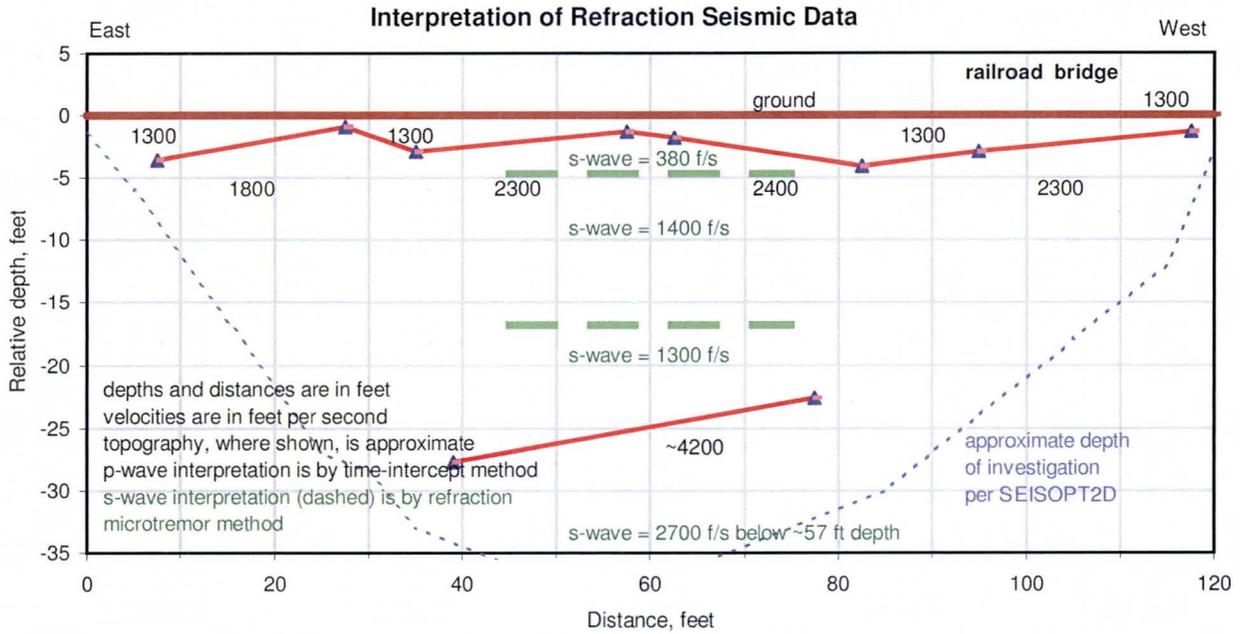


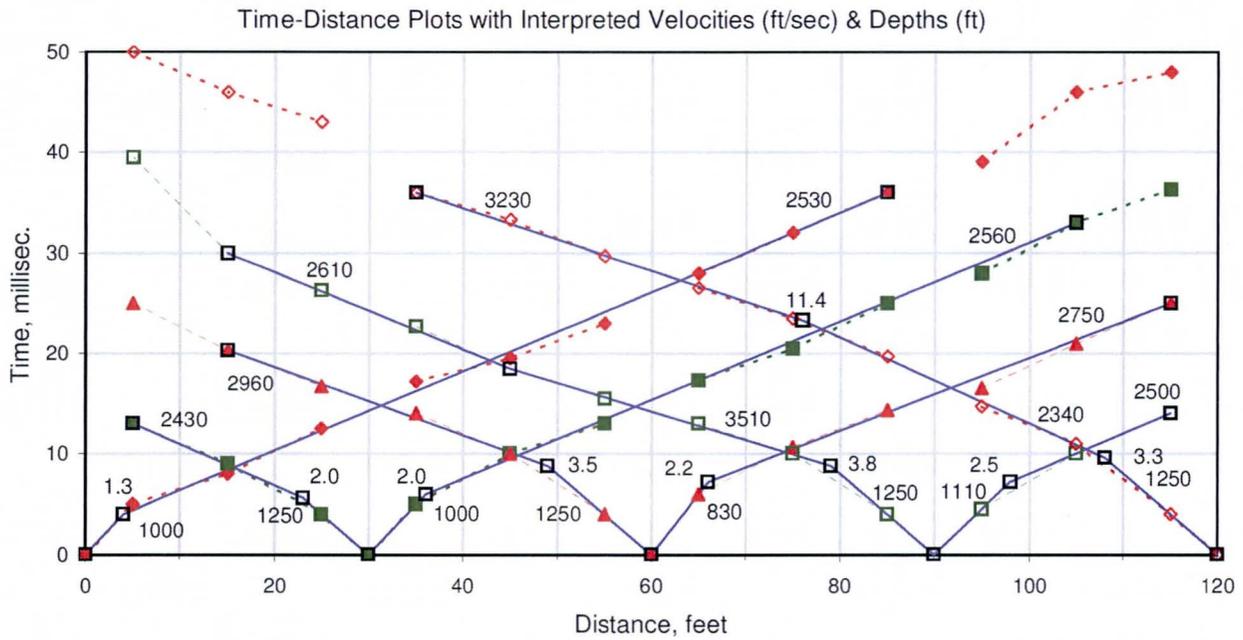
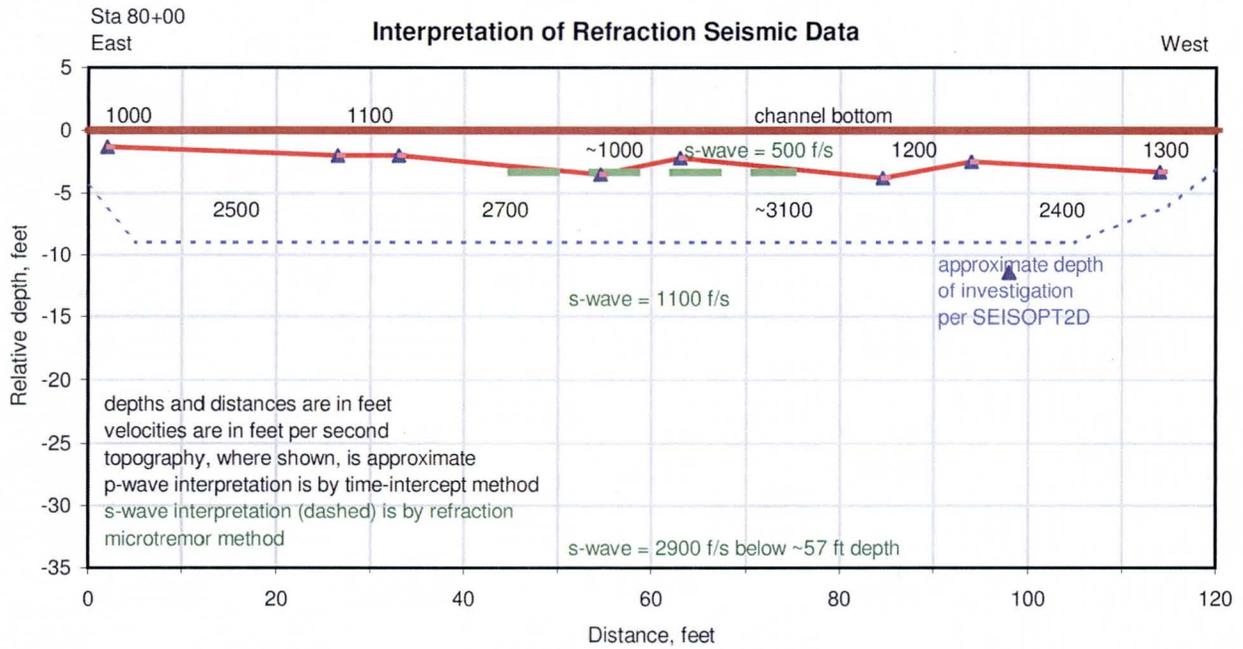


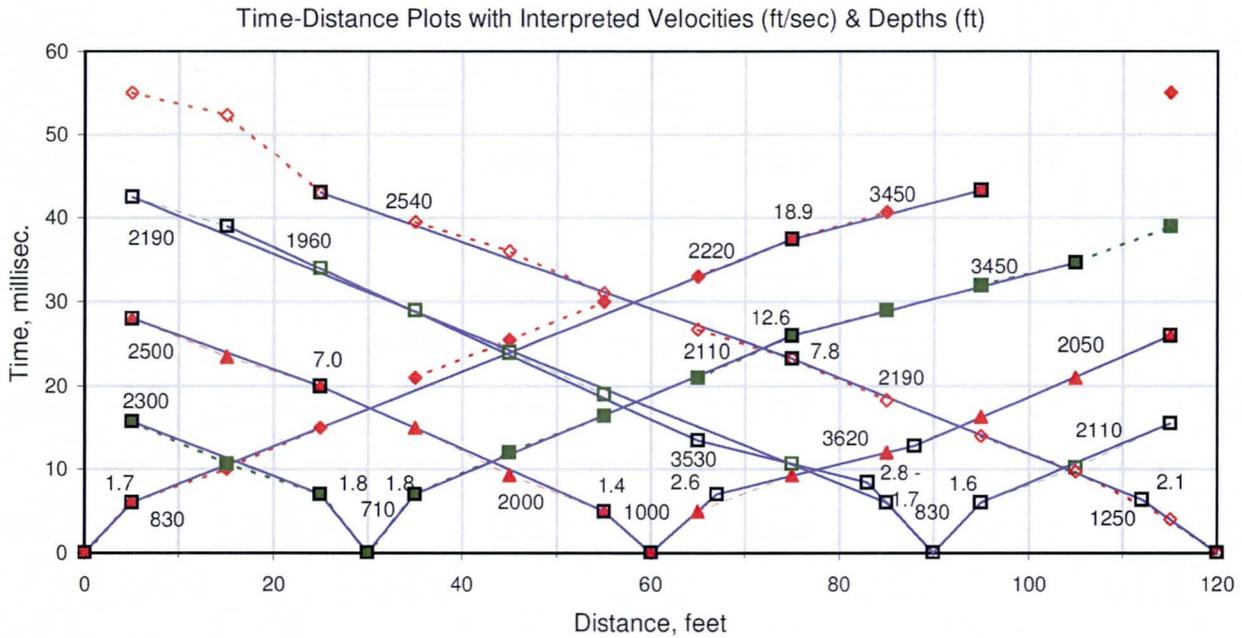
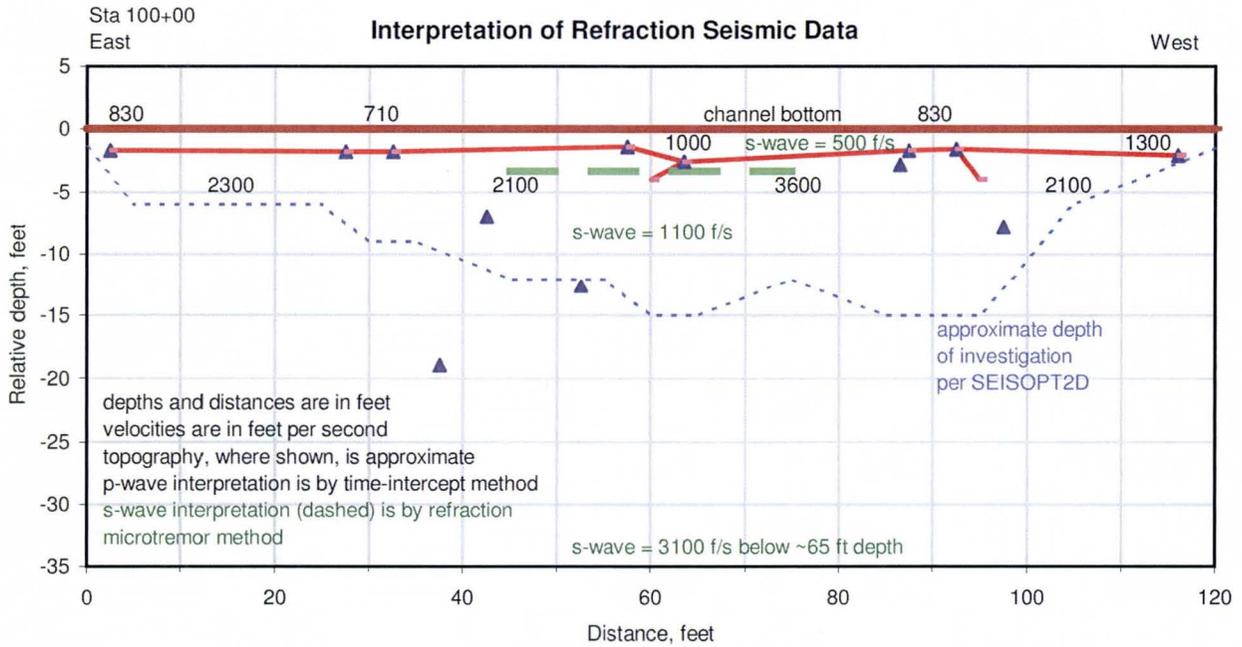


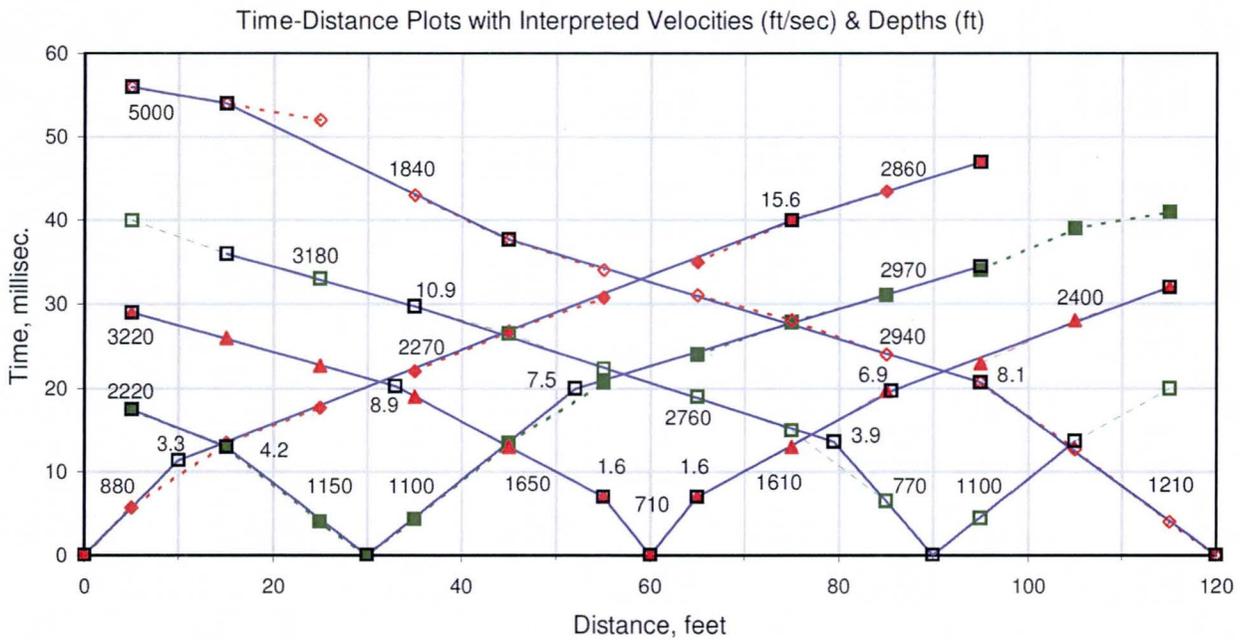
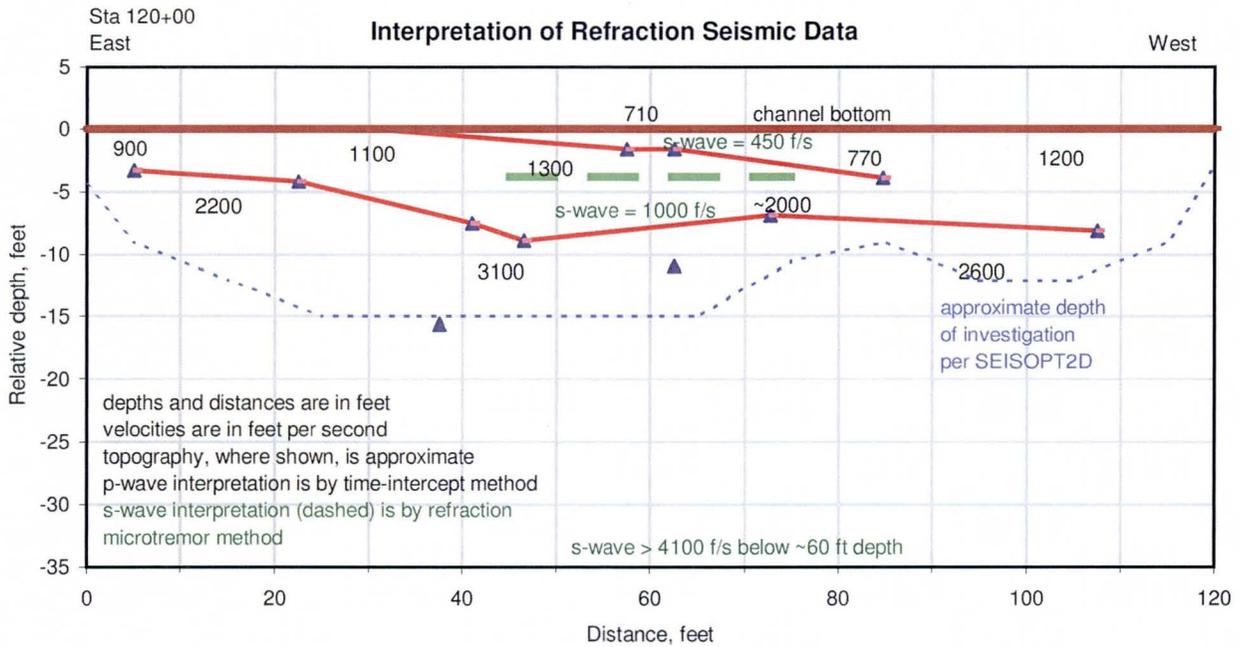


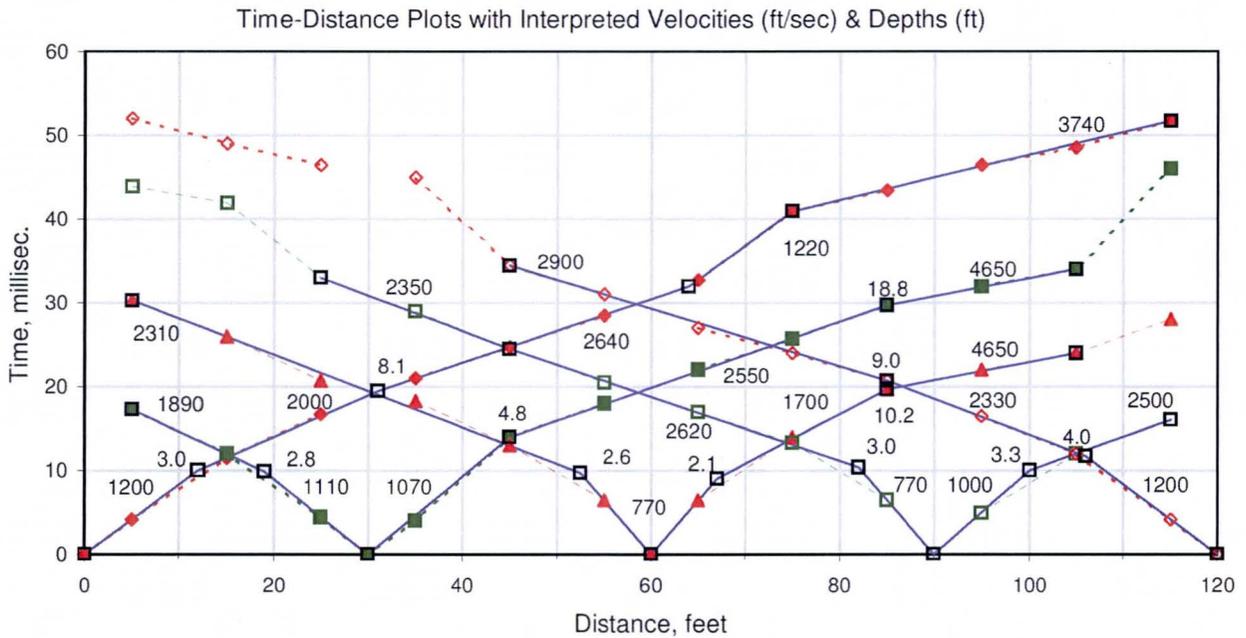
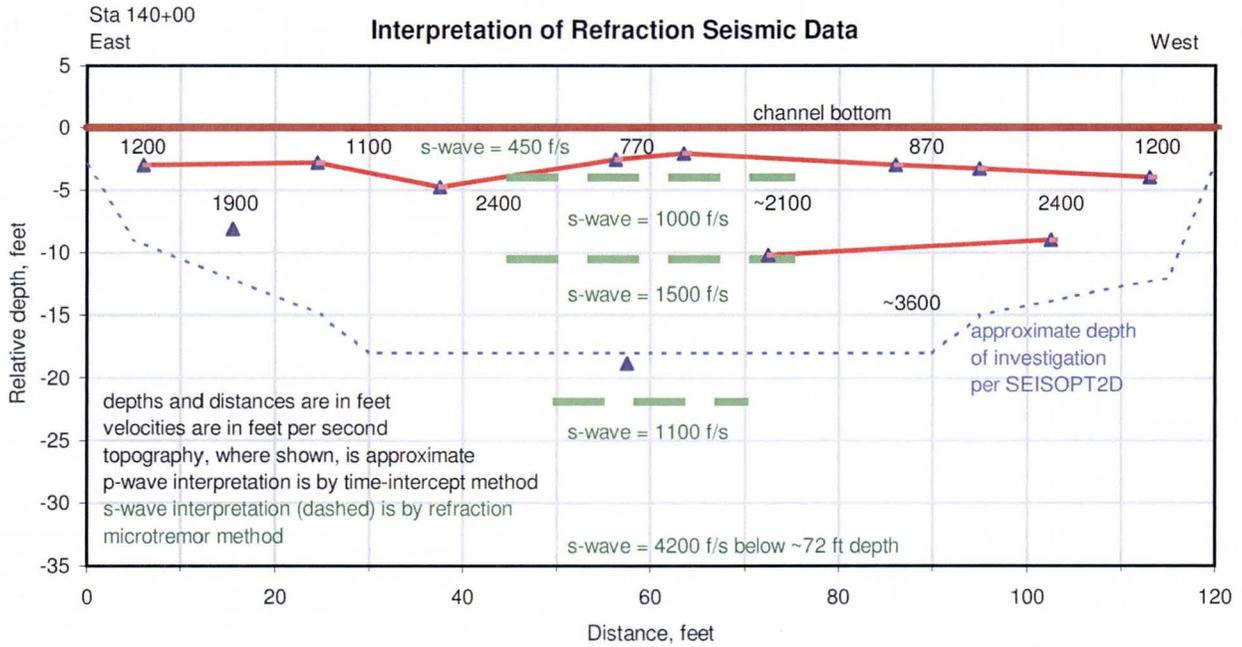


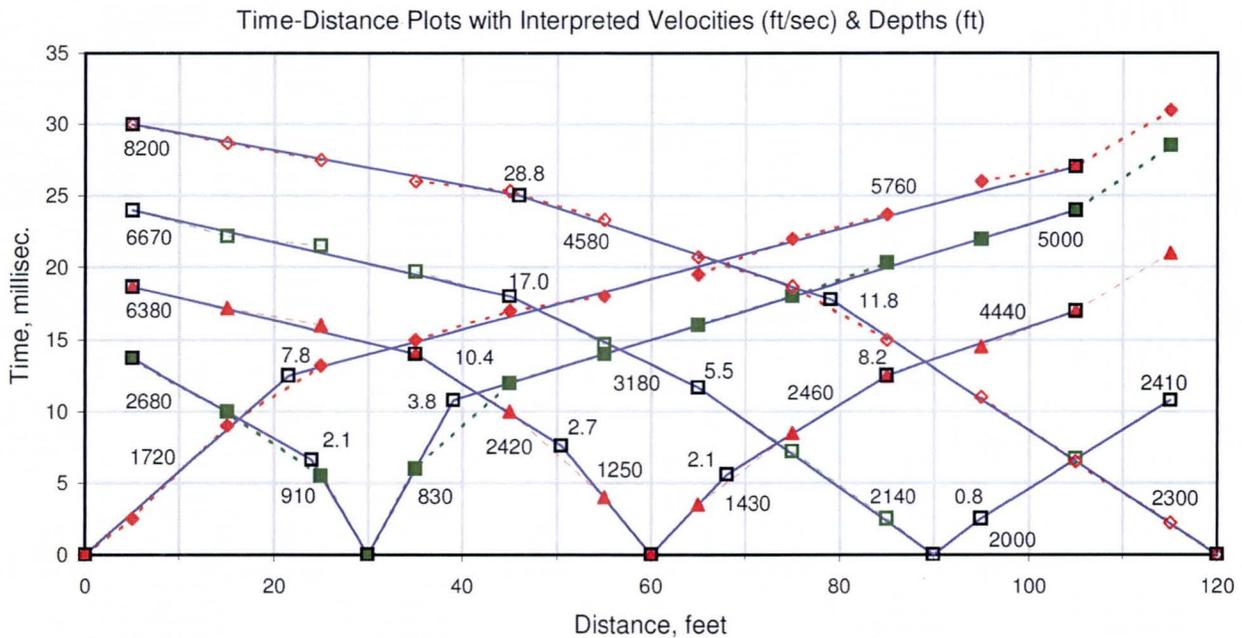
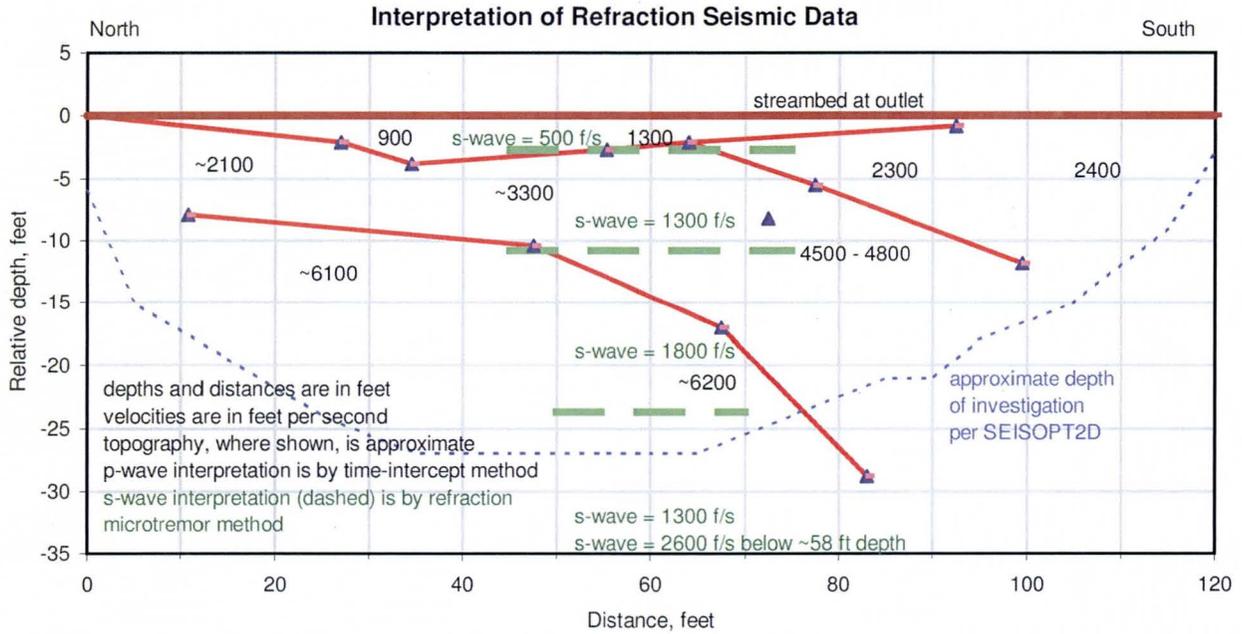


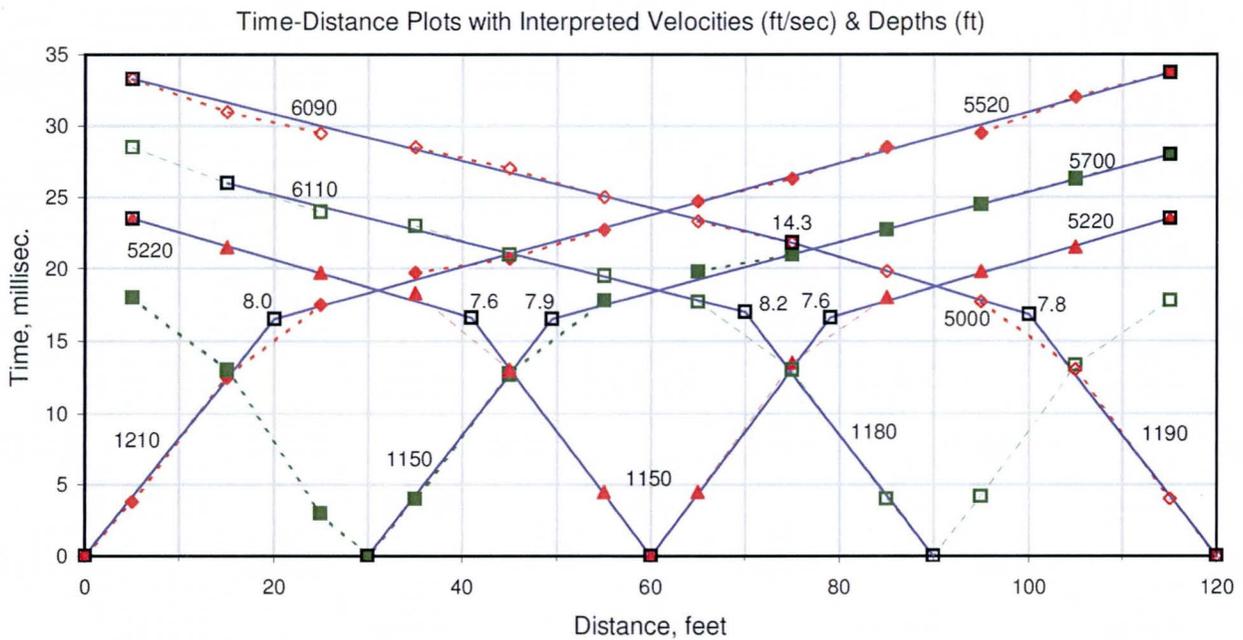
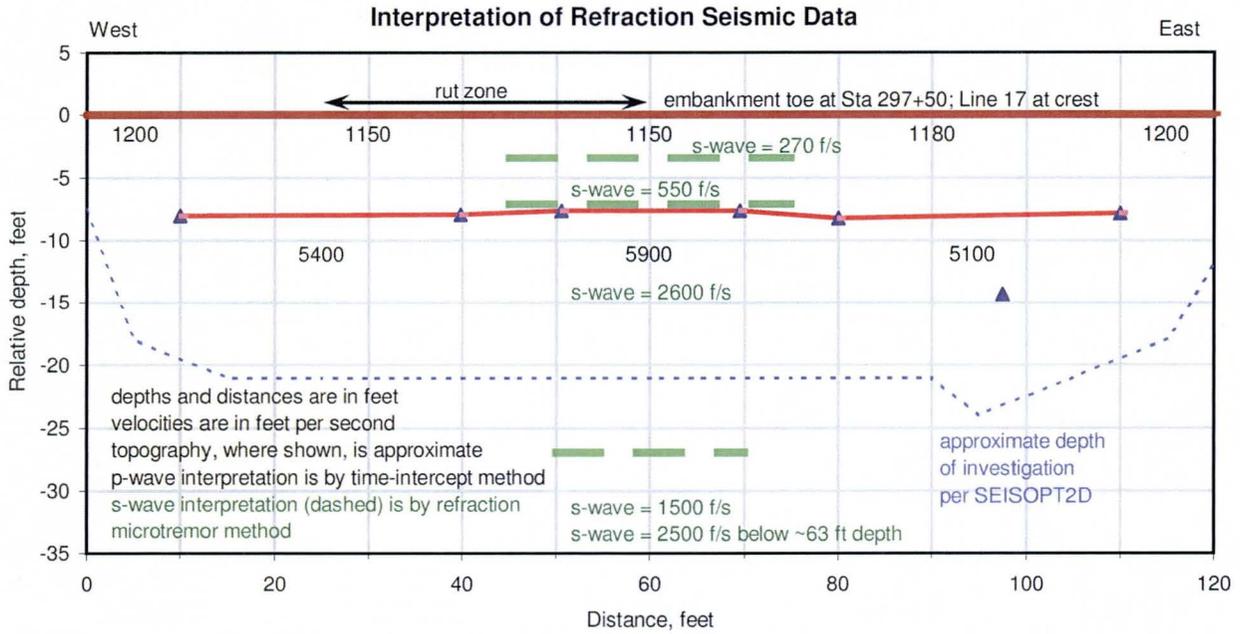


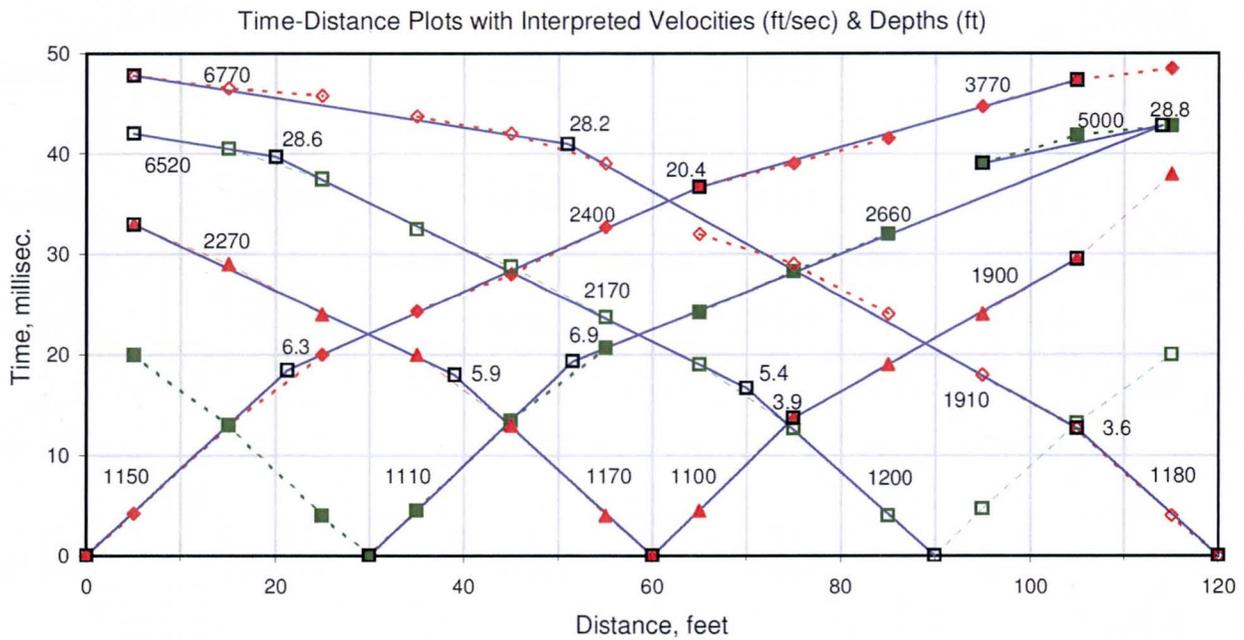
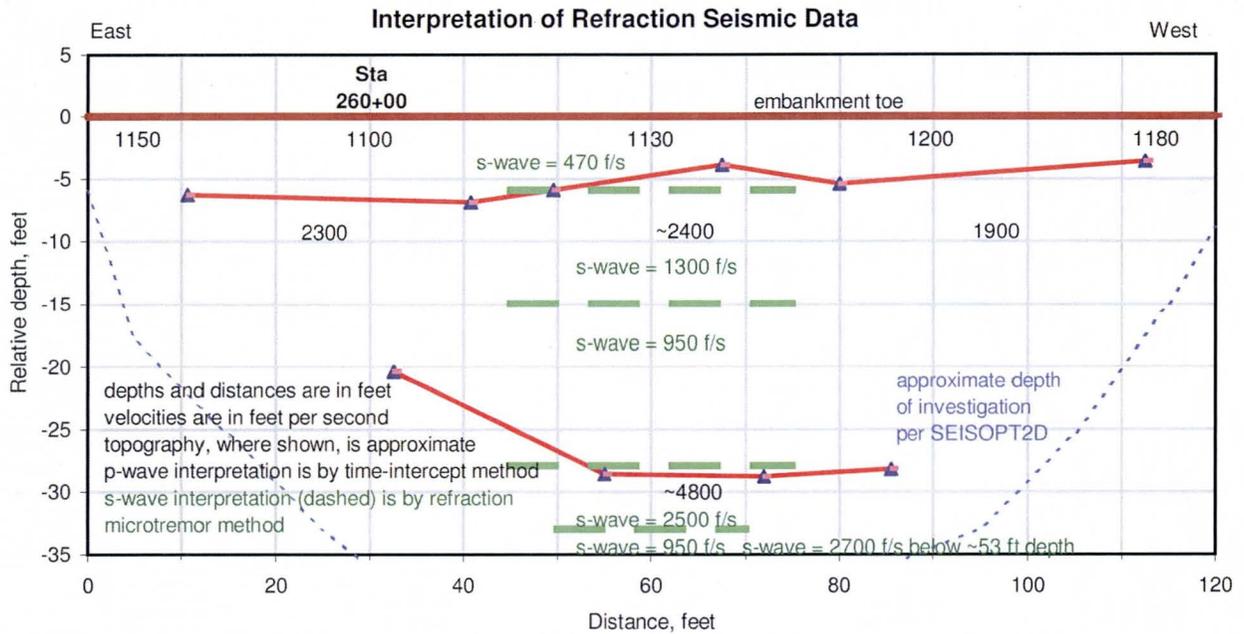


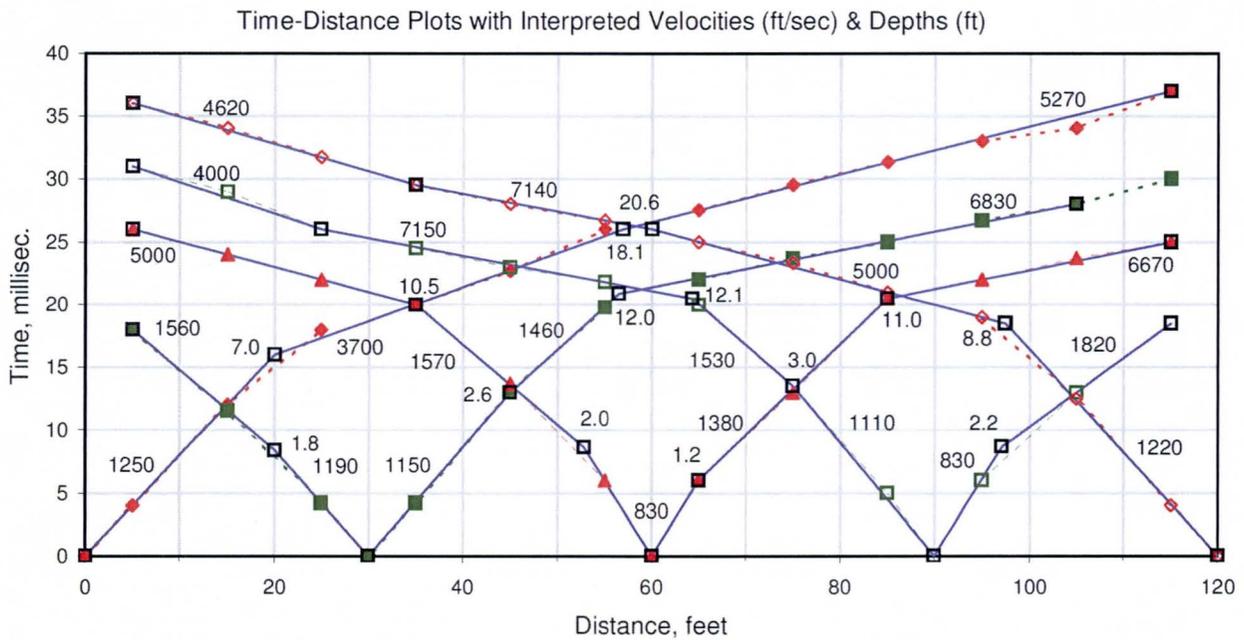
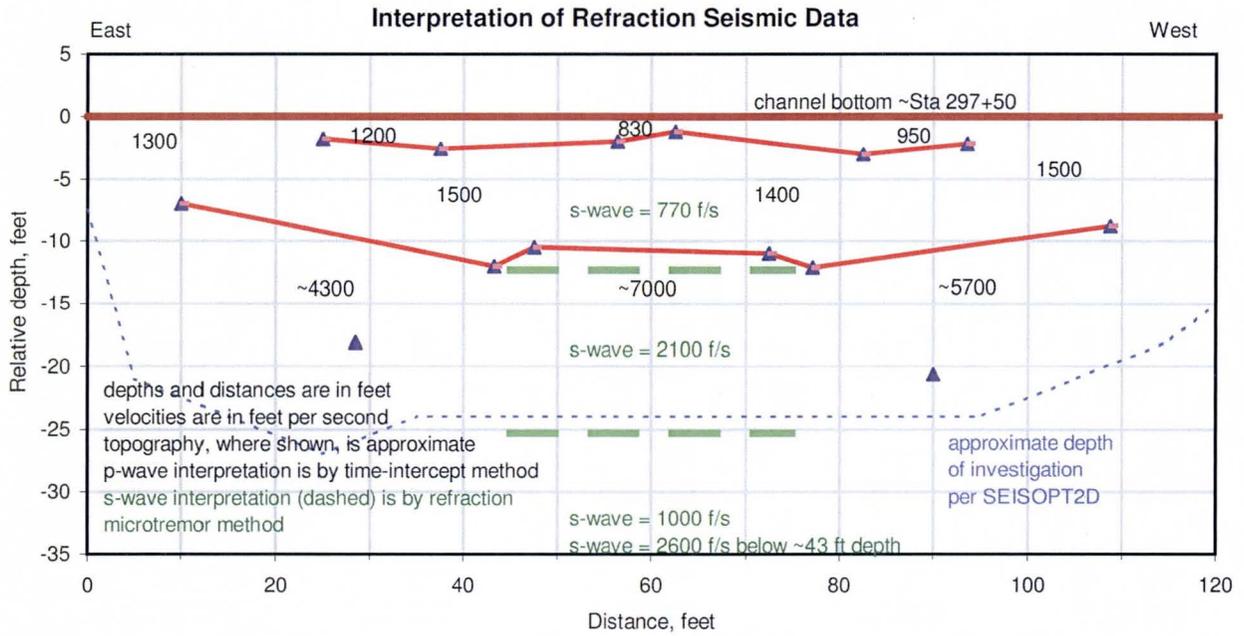


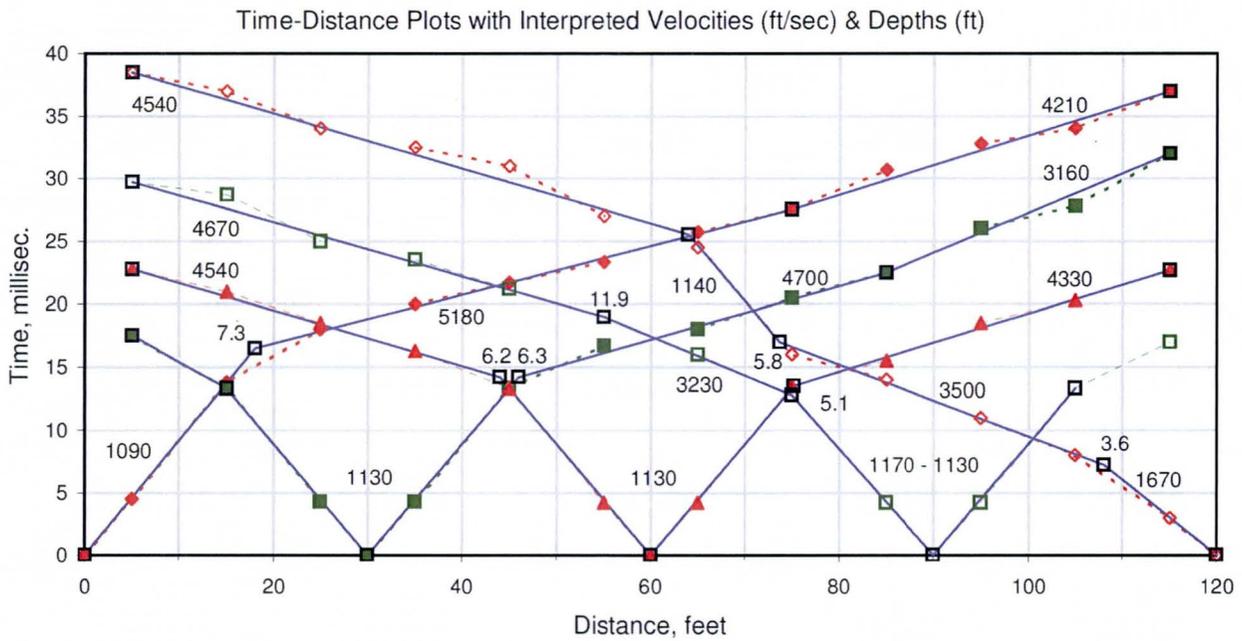
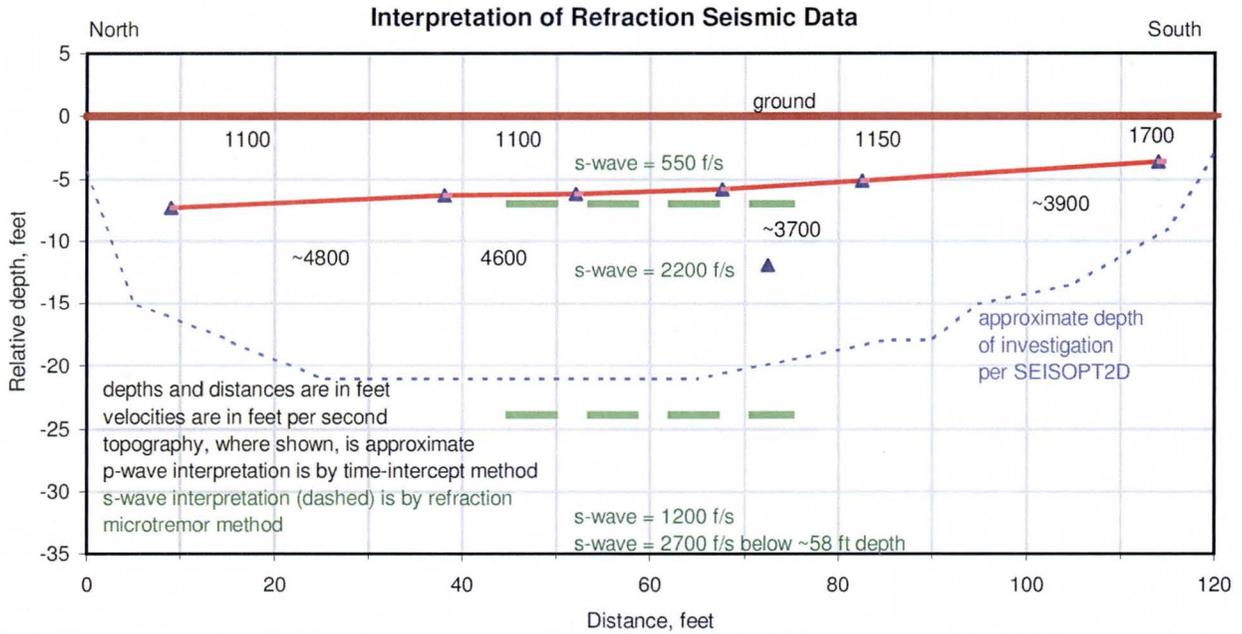


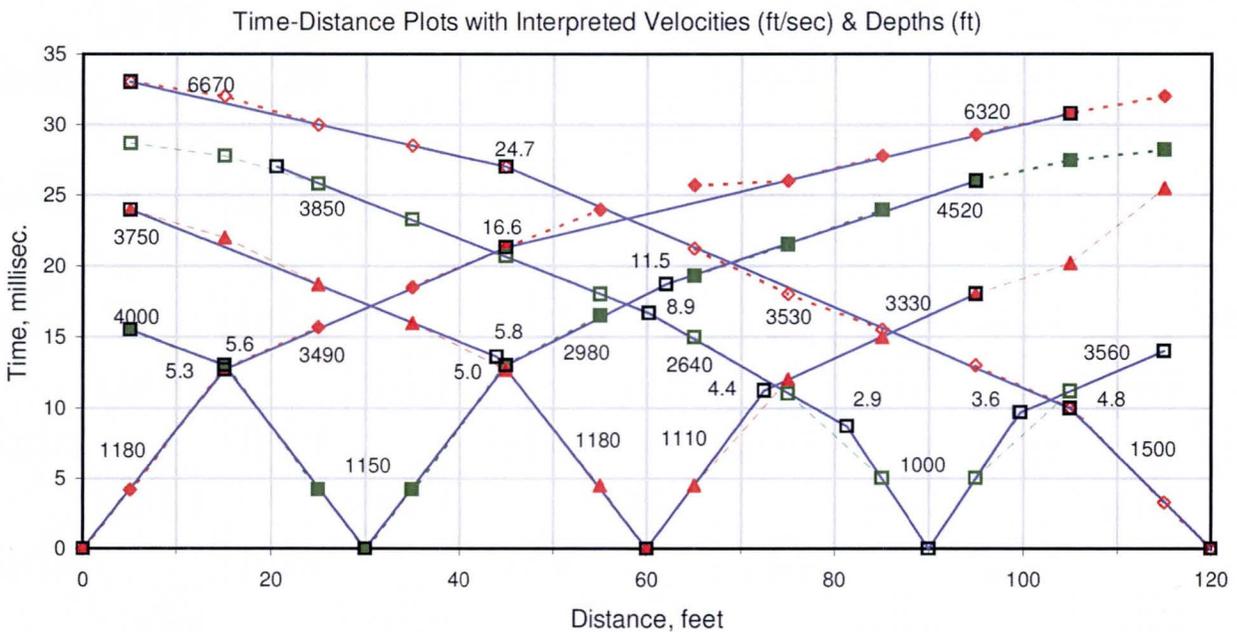
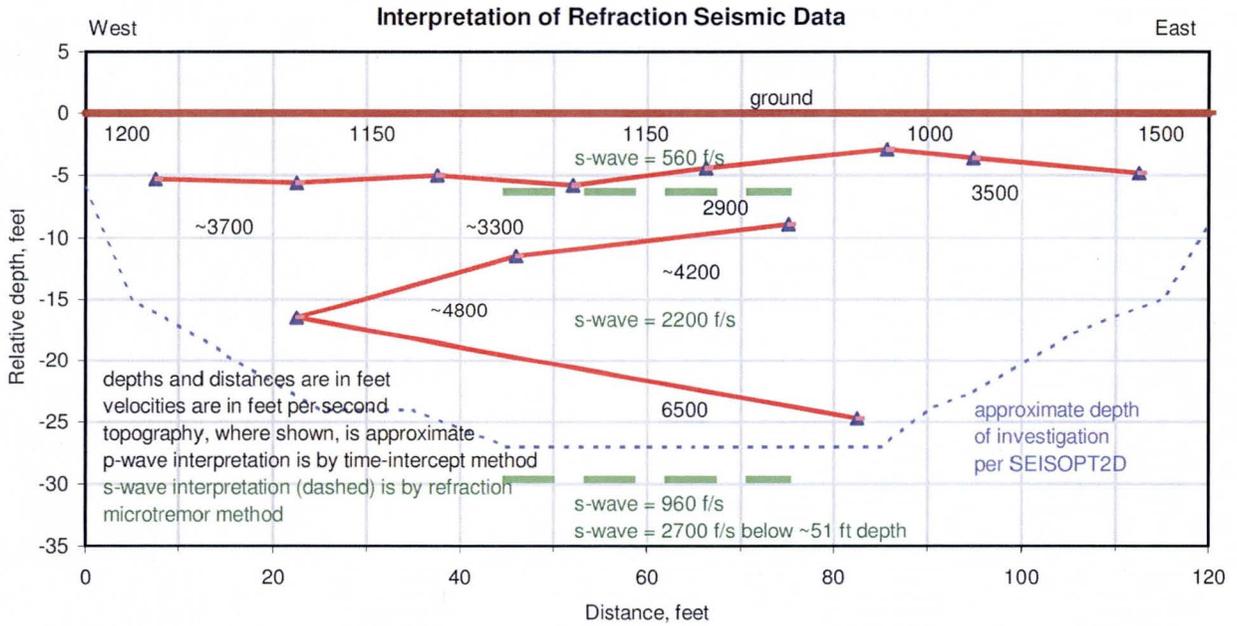














APPENDIX E
TEST PIT PHOTOGRAPHS



Test Pit TP-601 at 5.0'.



Test Pit TP-601 at 7.5'.



Test Pit TP-601. Excavator lifting off ground when digging.



Test Pit TP-601. Sidewall.



Test Pit TP-602 at 6.0'.



Test Pit TP-603 at 5.0'.



Test Pit TP-603 at 7.0'.



Test Pit TP-603 at 9.0'.



Test Pit TP-604 at 8.5'.



Test Pit TP-604 at 9.5'.





APPENDIX F
BACKFILL COMPACTION TEST RESULTS



DAILY PROGRESS REPORT

| | | | |
|-------------------|--------------|-----------------|-----------------|
| Project Name: | McMicken FRS | Date: | 4/28/2014 |
| Project Number: | 17-2013-4059 | Client: | Gannett Fleming |
| Project Location: | Surprise, AZ | Sub Contractor: | |

| | | | | | | | | | | |
|-------|------|--------|------|-------|------|-----|------------|------|--------------|---|
| S | M | T | W | T | F | S | Arrival: | 700 | Reg. Hours | 7 |
| Sunny | | Cloudy | | Rainy | | | Departure: | 1200 | OT Hours: | |
| <32 | 30s | 40s | 50s | 60s | 70s | 80s | Mileage: | 93 | Total Hours: | 7 |
| 90s | 100s | | 110s | | 120s | | | | | |

| | |
|-----------------------------|--------|
| Report No. | JV-001 |
| Corrective Action Required: | |

SERVICES REQUESTED: Compaction Testing

Arrived at site and met with Bill Roman of Gannett Fleming, and the excavation crew, subcontracted by Gannett Fleming. We discussed the scope of work and projected schedule. Mr. Roman and the excavation crew drove to the test pit locations to determine the easiest access points.

The contractor used a CAT 320C excavator to dig the first test pit, TP-601. The side walls and spoils were logged and sampled by Gannett Fleming. A laborer sprayed the spoils with water as they were being excavated to reduce dust.

During excavation, a sample of the spoils was taken and a one point proctor (AZ 232) was completed to determine the approximate maximum dry density for TP-601. The results indicate that the maximum uncorrected density is 102.4 pcf and the uncorrected optimum moisture is 20.3%. There was 36% rock in the sample; the corrected values are 119.2 pcf and 13.4%, respectively.

Upon completion of the excavation, the excavator used the test pit spoils to back fill the hole. The spoils were sprayed by the water truck and processed with the bucket of the excavator. The soil was placed by the excavator in lifts and compacted using a compaction wheel attachment. When the backfill was within about three feet from the top AMEC performed a series of nuclear moisture density tests to determine if the amount of effort applied was sufficient to compact the soil. The results are attached. The contractor and Gannett Fleming intend to use the results of these tests as a guide for compacting the rest of the test pits.

2 hours travel, round trip
5 hours onsite

The information contained herein should be considered preliminary and is subject to review prior to inclusion in our project reports. The information provided does not constitute an engineering evaluation or opinion regarding the suitability of the subject work or materials. Please feel free to contact us at (602) 437-0250 for additional clarification or questions.

AMEC Representative: Juan Valenciano Client Representative: _____



DAILY PROGRESS REPORT

| | | | |
|-------------------|--------------|-----------------|-----------------|
| Project Name: | McMicken FRS | Date: | 4/30/2014 |
| Project Number: | 17-2013-4059 | Client: | Gannett Fleming |
| Project Location: | Surprise, AZ | Sub Contractor: | |

| | | | | | | | | | | |
|-------|------|--------|------|-------|------|-----|------------|-----|--------------|-----|
| S | M | T | W | T | F | S | Arrival: | 700 | Reg. Hours | 4.5 |
| Sunny | | Cloudy | | Rainy | | | Departure: | 930 | OT Hours: | |
| <32 | 30s | 40s | 50s | 60s | 70s | 80s | Mileage: | 102 | Total Hours: | 4.5 |
| 90s | 100s | | 110s | | 120s | | | | | |

Very windy conditions.

| | | | |
|---------------------|--------------------|-----------------------------|--------|
| SERVICES REQUESTED: | Compaction Testing | Report No. | JV-002 |
| | | Corrective Action Required: | |

AMEC arrived at the site and met with Bill Roman of Gannett Fleming to perform nuclear moisture and density tests on the soil backfill of the test pits logged by Gannett Flemming.

Over the course of two days, a total of four test pits were excavated and backfilled. The scope of our work included only testing the top lift of the completed test pits (TP-601 through TP-604). The excavation and backfill of test pits TP-602 through TP-604 were completed while AMEC was away from the site.

Beginning at TP-604, AMEC performed nuclear density testing and shared the results with Mr. Roman, of Gannett Flemming. The one point proctor value obtained on 4/28 was used as a reference, as complete testing of the backfill material was beyond the scope of this project. One additional sample was obtained from TP-603 as the tested dry density was much lower than the other locations, and the soil appeared to have much less rock in the material. The sample was returned to the lab for One Point testing as the windy conditions made it impossible to complete the one point test at the site.

2 hours travel, round trip
2.5 hours onsite

The information contained herein should be considered preliminary and is subject to review prior to inclusion in our project reports. The information provided does not constitute an engineering evaluation or opinion regarding the suitability of the subject work or materials. Please feel free to contact us at (602) 437-0250 for additional clarification or questions.

AMEC Representative: Juan Valenciano Client Representative:

