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:

Gannett Fleming

Excellence Delivered As Promised

In Association with:

URS CORPORATION

GF Project No. 056312

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MCMICKEN DAM GEOTECHNICAL INVESTIGATION AND DATA REPORT
OUTLET CHANNEL ALTERNATIVE 4
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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.

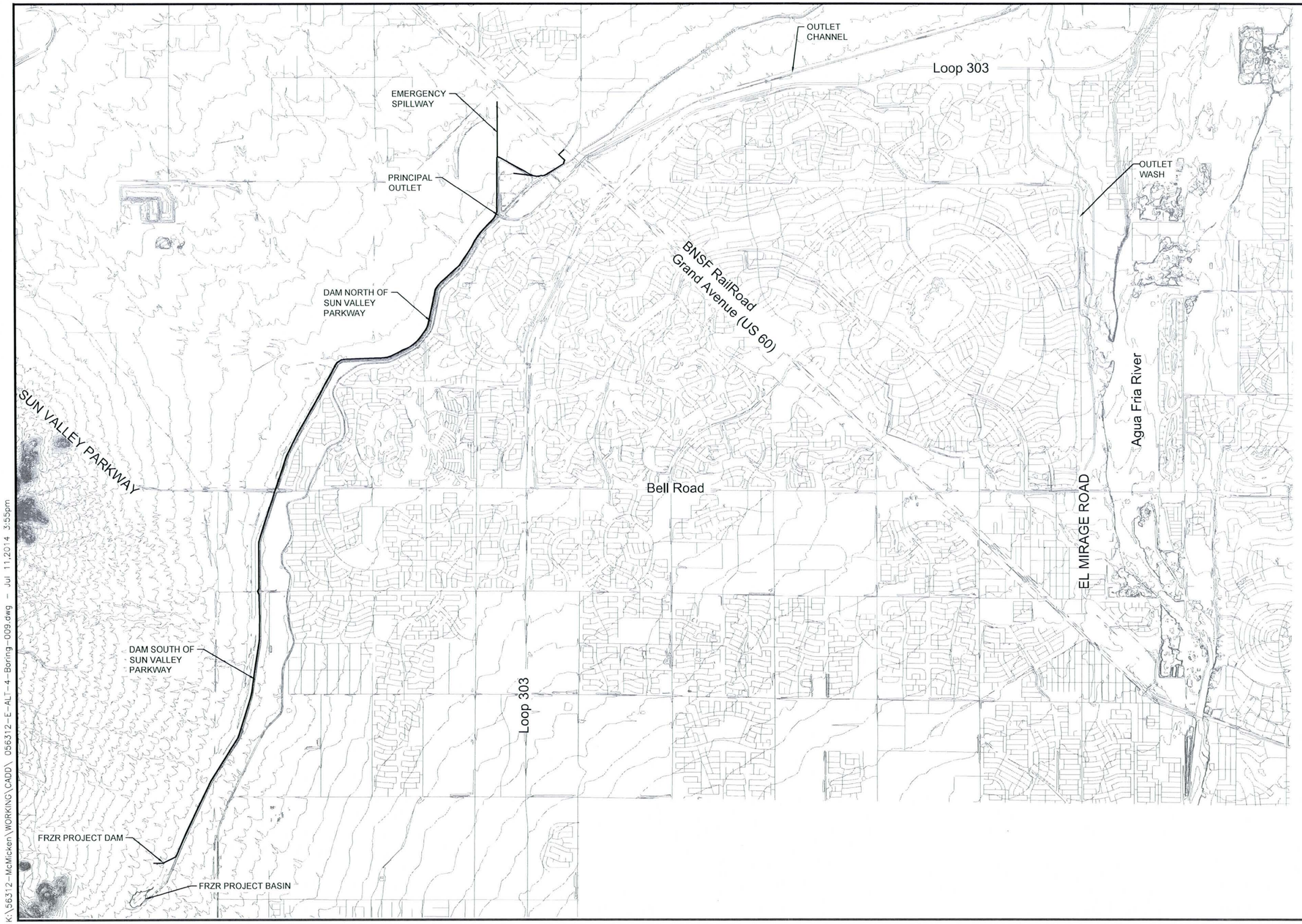
The geotechnical field investigation consisted of the following specific activities:

- 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



0 1 2 3
SCALE IN MILES

Topography Source:

Topography provided by Flood Control District of Maricopa Couonty, 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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MCMICKEN DAM REHABILITATION PROJECT
PROJECT SITE
FIGURE 1

0 600 1200 1800
SCALE IN FEET

LEGEND

- 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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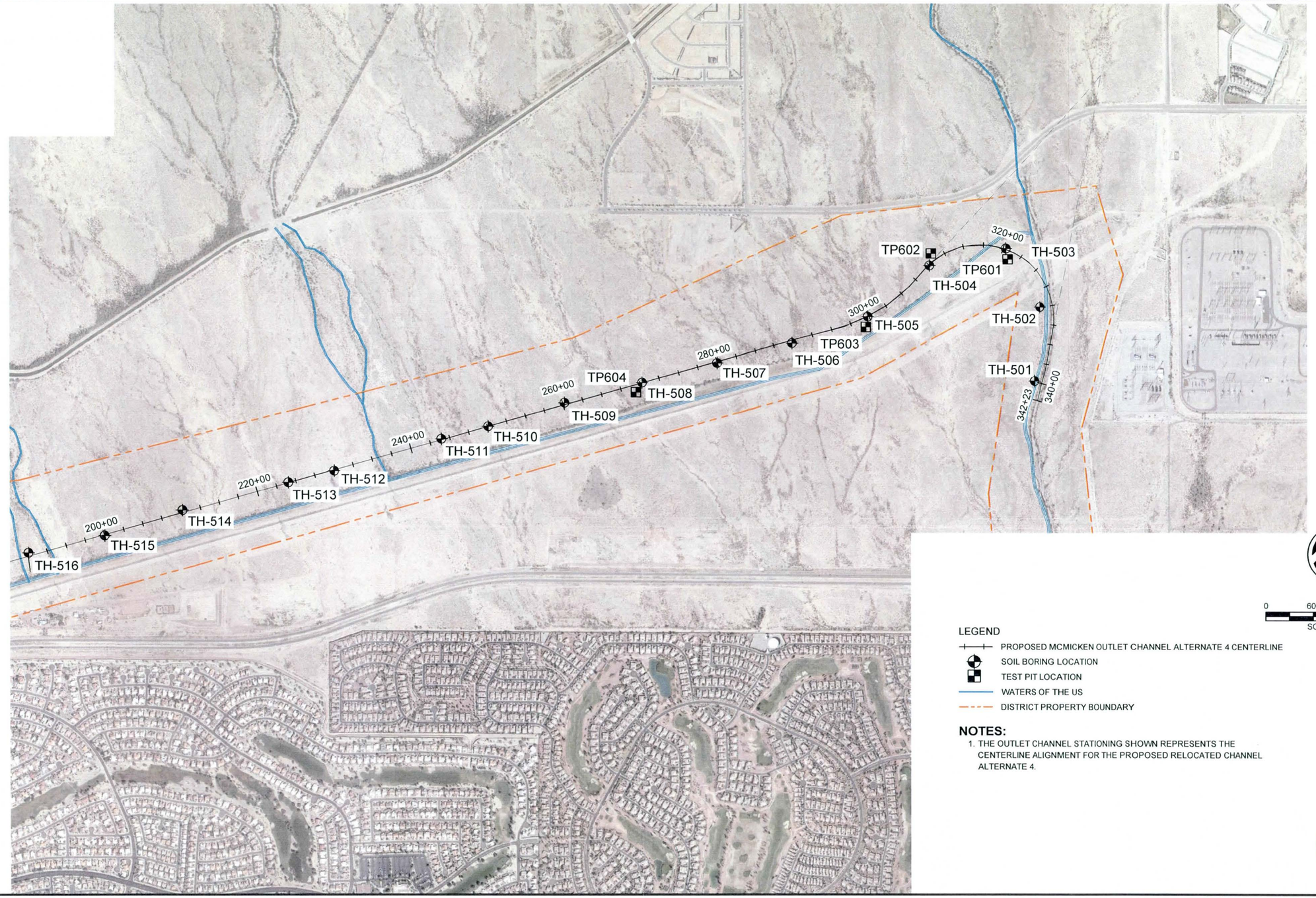
MCMICKEN DAM REHABILITATION PROJECT
OUTLET CHANNEL ALTERNATIVE 4 ALIGNMENT
STATION 10+47 TO STATION 180+75
FIGURE 2



0 600 1200 1800

SCALE IN FEET

LEGEND

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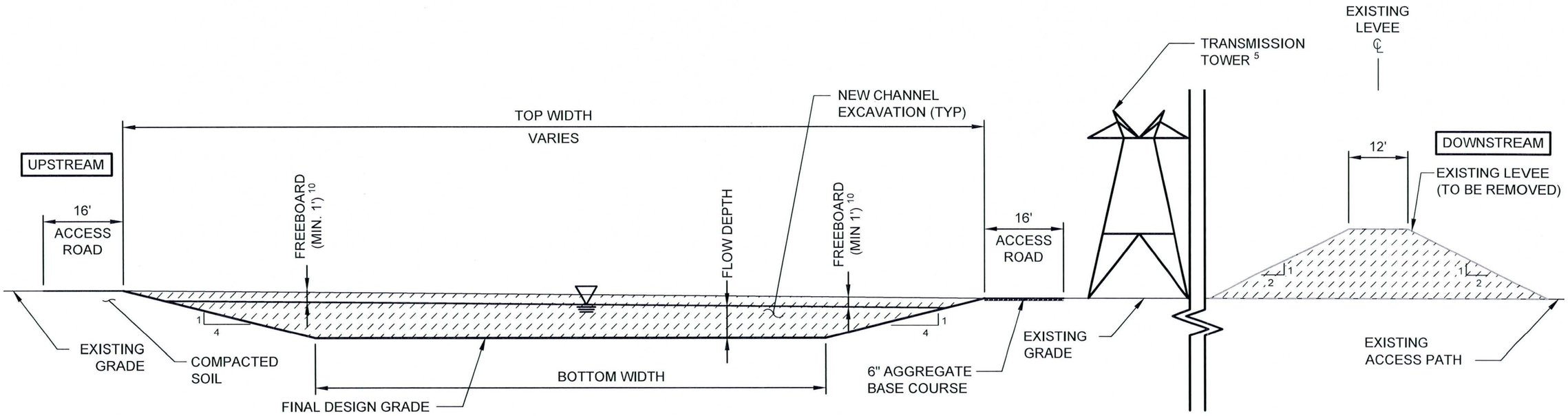
MCMICKEN DAM REHABILITATION PROJECT
OUTLET CHANNEL ALTERNATIVE 4 ALIGNMENT
STATION 180+75 TO STATION 342+23
FIGURE 3



HYDRAULICS TABLE

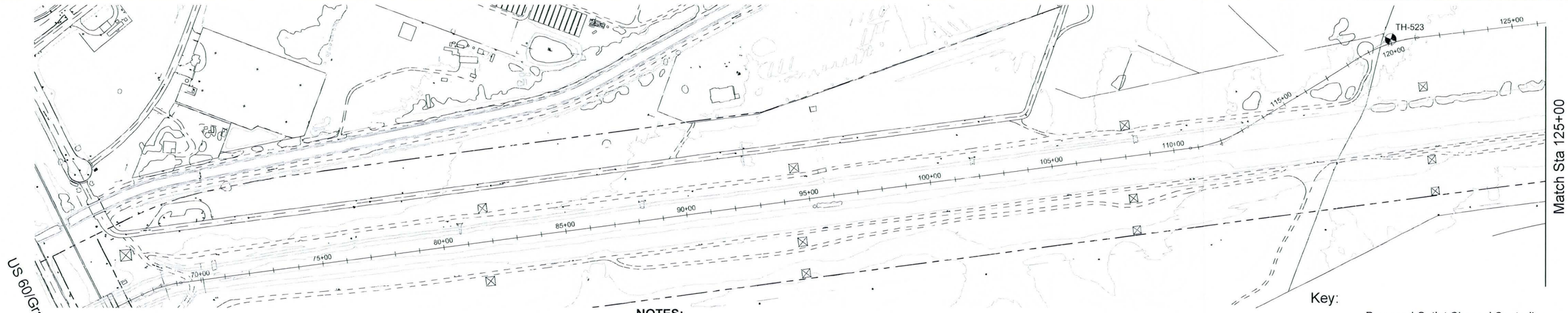
STATION	100-YEAR DISCHARGE (CFS)	200-YEAR DISCHARGE (CFS)	100-YEAR VELOCITY (FPS)	200-YEAR VELOCITY (FPS)	BOTTOM WIDTH (FT)	100-YEAR FLOW DEPTH (FT)	200-YEAR FLOW DEPTH (FT)	LONGITUDINAL SLOPE (FT/FT)
111+50 TO 129+20 A4 [6, 8]	4,450 [1]	4,450	5.2	5.2	50	9.7	9.7	0.0012
131+00 A4 TO 158+85 A4 [8]	4,450 [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:
1. 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).
2. 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.
3. 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.
4. Manning's Roughness Coefficients are based on the FCDMC Hydraulic Manual in conjunction with discussions with the District project team staff.
5. Refer to the plans for location of transmission towers.
6. Channel sections between stations 111+50 and 129+20 retains the existing channel side slopes.
7. Channel bottom widths vary linearly where there are gaps between stations in the table above.
8. A4 refers to Alternative 4 Alignment Stationing.
9. Figure 2-5 "Modify Existing Levee with Recessed Upstream Filter for Alternatives 1 - 4" will be common to all four alternatives.
10. 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

MCMICKEN DAM REHABILITATION PROJECT
REALIGN OUTLET CHANNEL NORTH AND REMOVE EXISTING LEVEE TYPICAL SECTION: ALTERNATIVE 4
FIGURE 4



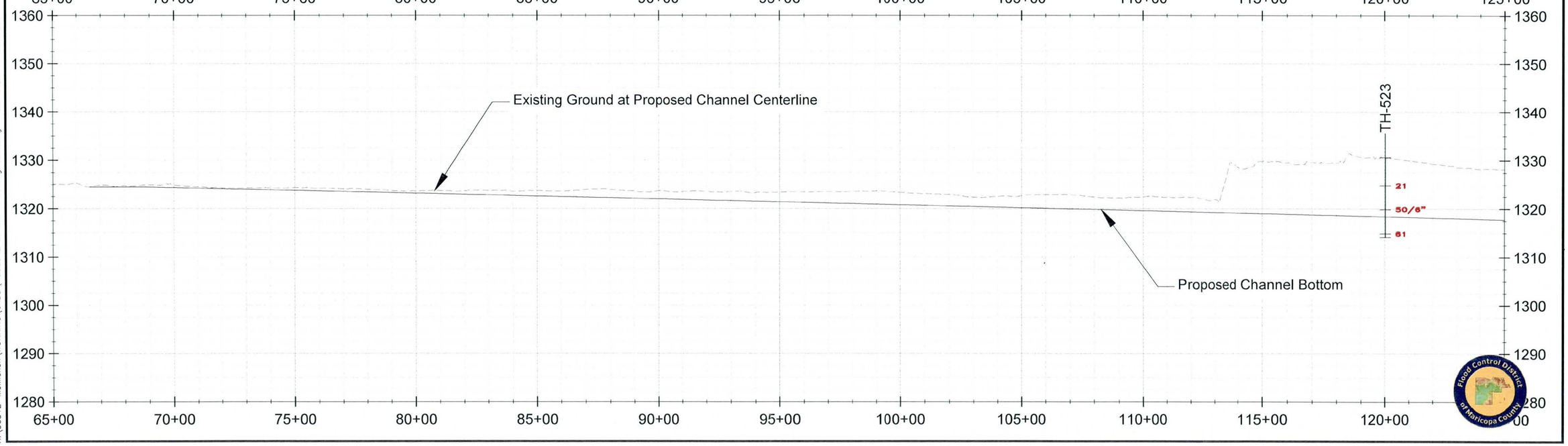
NOTES:

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 0.999869 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)

400 0 200 400 Feet



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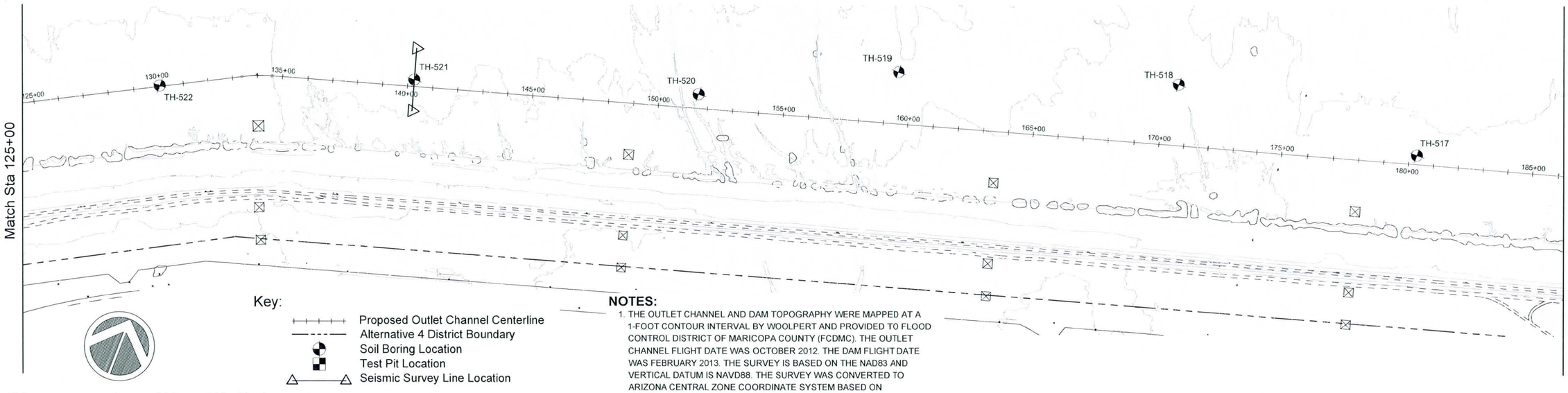
MCMICKEN DAM REHABILITATION PROJECT
PLAN AND PROFILE OUTLET CHANNEL: ALTERNATIVE 4
STATION 65+00 TO STATION 125+00
FIGURE 5



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400 0 200 400 Feet

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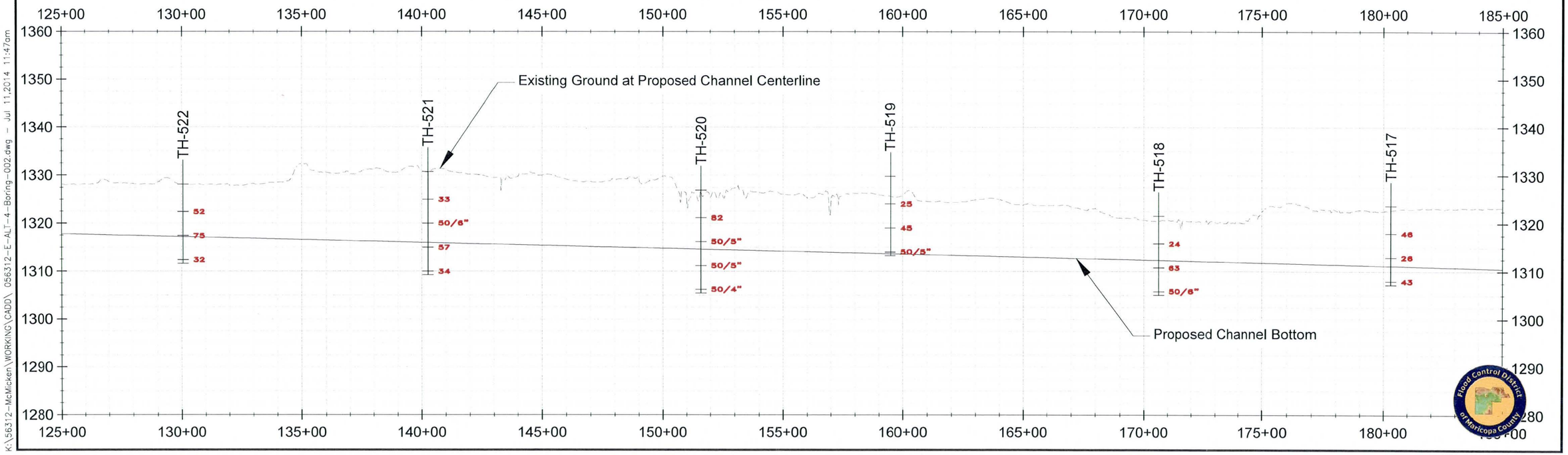

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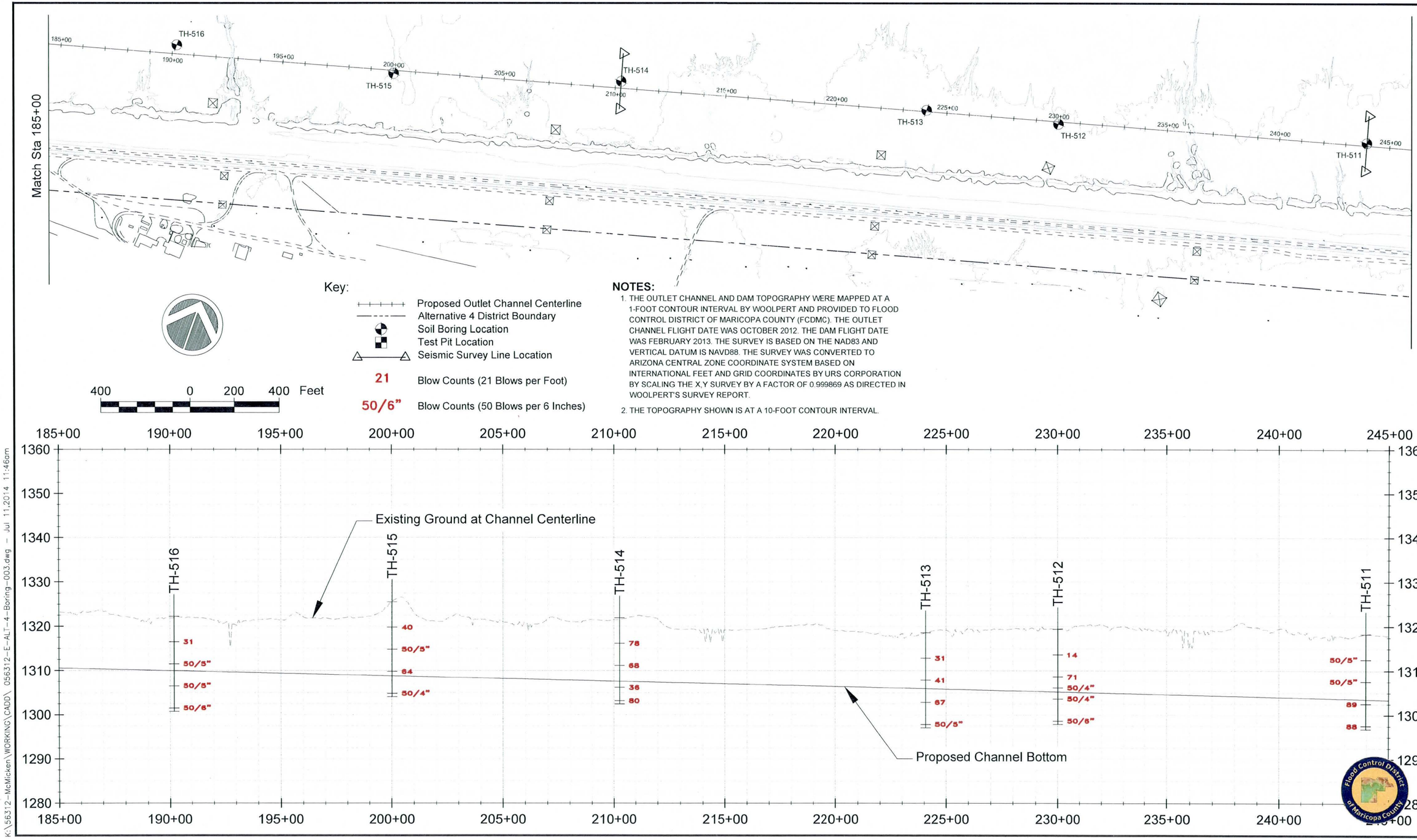
MCMICKEN DAM REHABILITATION PROJECT
PLAN AND PROFILE OUTLET CHANNEL: ALTERNATIVE 4
STATION 125+00 TO STATION 185+00
FIGURE 6



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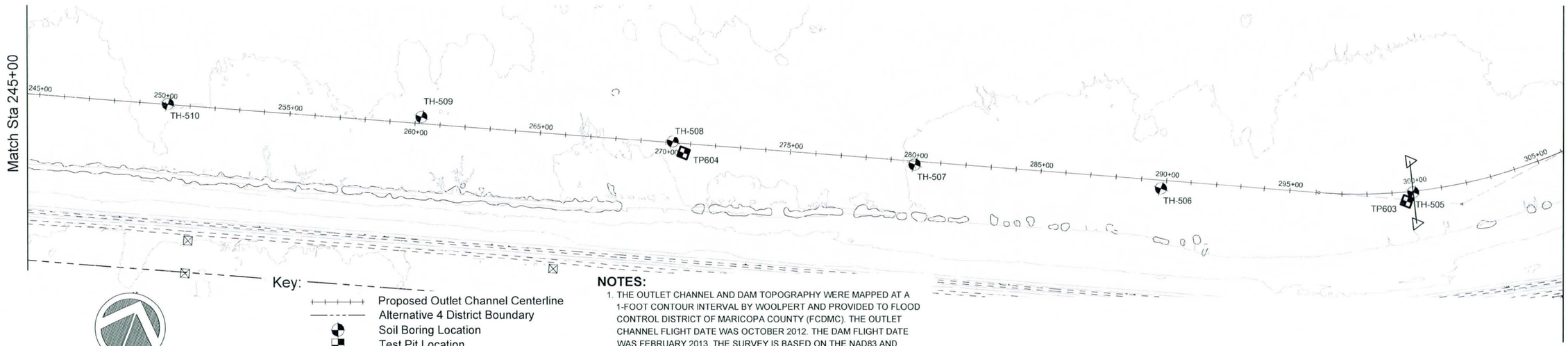
MCMICKEN DAM REHABILITATION PROJECT
PLAN AND PROFILE OUTLET CHANNEL: ALTERNATIVE 4
STATION 185+00 TO STATION 245+00
FIGURE 7



Key:

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- Alternative 4 District Boundary
- Soil Boring Location
- Test Pit Location
- Seismic Survey Line Location

400 0 200 400 Feet

21 Blow Counts (21 Blows per Foot)

50/6" Blow Counts (50 Blows per 6 Inches)

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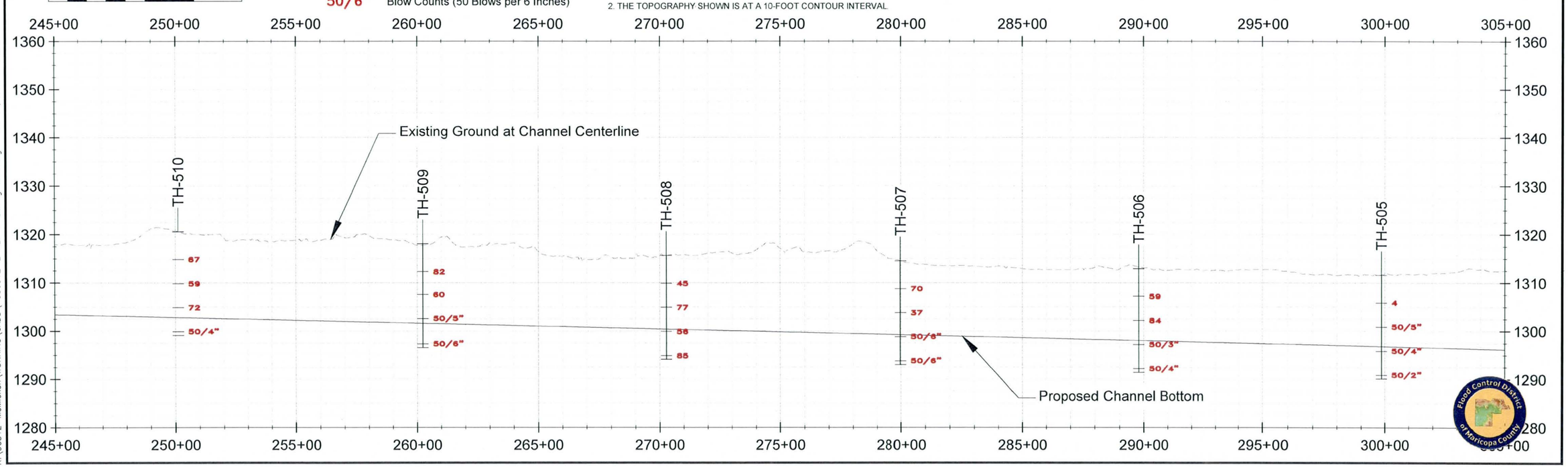

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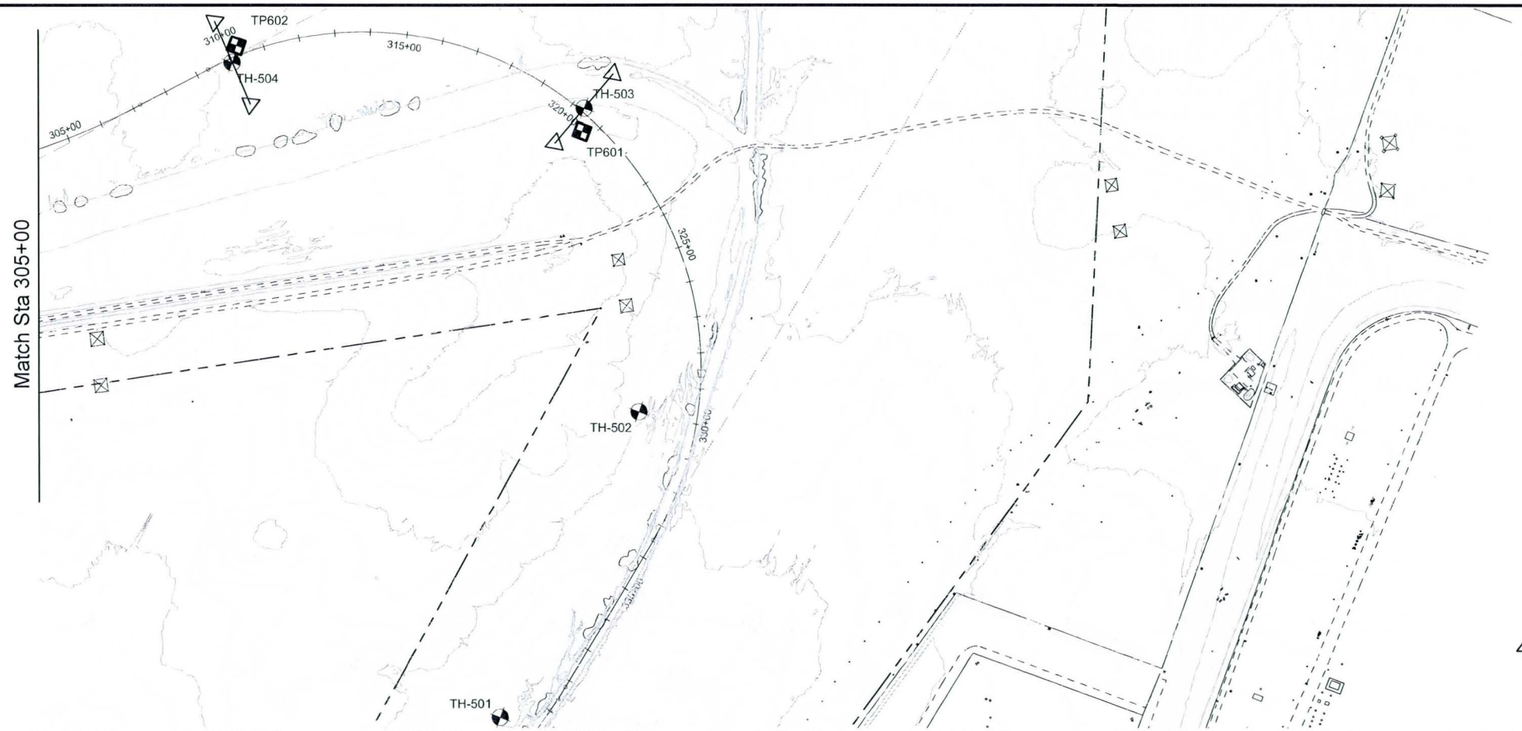
MCMICKEN DAM REHABILITATION PROJECT
PLAN AND PROFILE OUTLET CHANNEL: ALTERNATIVE 4
STATION 245+00 TO STATION 305+00
FIGURE 8



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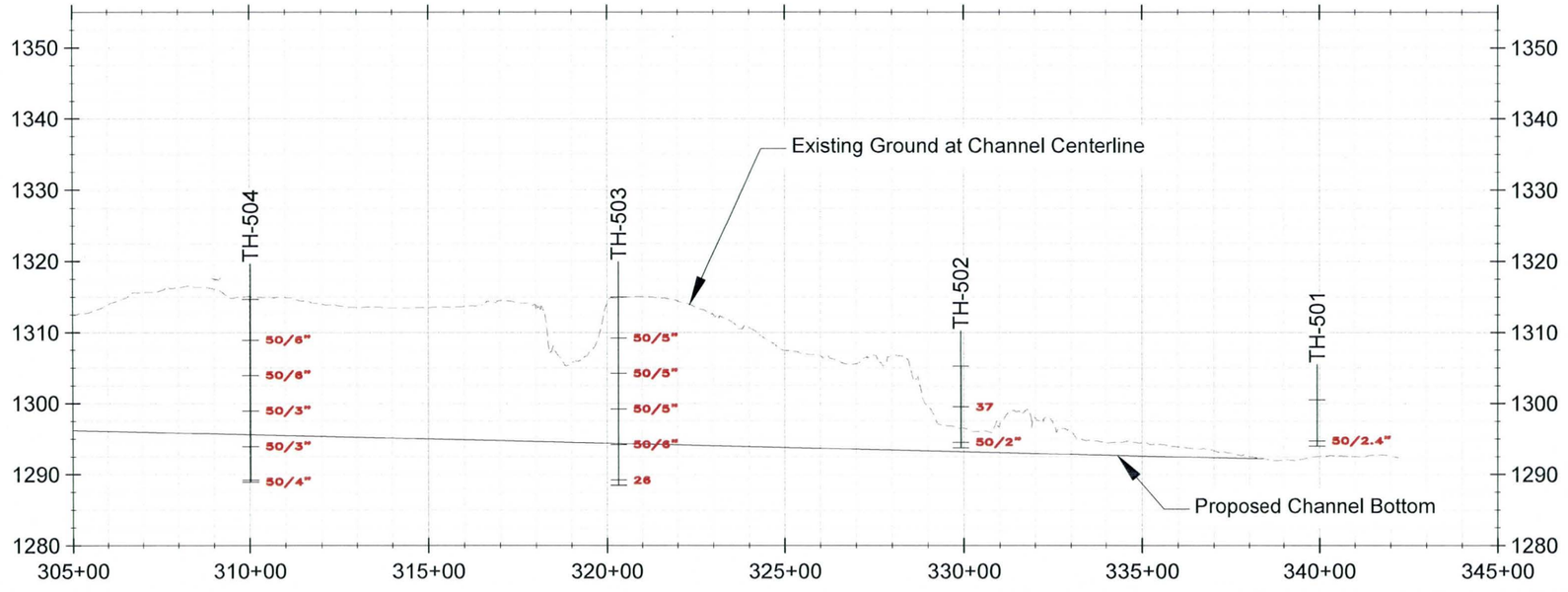
- 50/6" — Blow Counts (50 Blows per 6 Inches)

400 0 200 400 Feet



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PLAN AND PROFILE OUTLET CHANNEL: ALTERNATIVE 4

STATION 305+00 TO STATION 345+00

FIGURE 9

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 1500,000 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 Caperpillar 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 forth 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)			Gradation					Atterberg Limits				Standard Proctor Compaction		Corrosivity	
Test Hole / Test Pit	Sample No.	From	To	USCS Class.	Gravel (%)	Sand (%)	Fines (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plasticity Index (%)	Moisture Content (%)	Calcium Carbonate (%)	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 Alluvuim, 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 indication 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 Fergason, 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 bachhoe). 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 Fergason, 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.

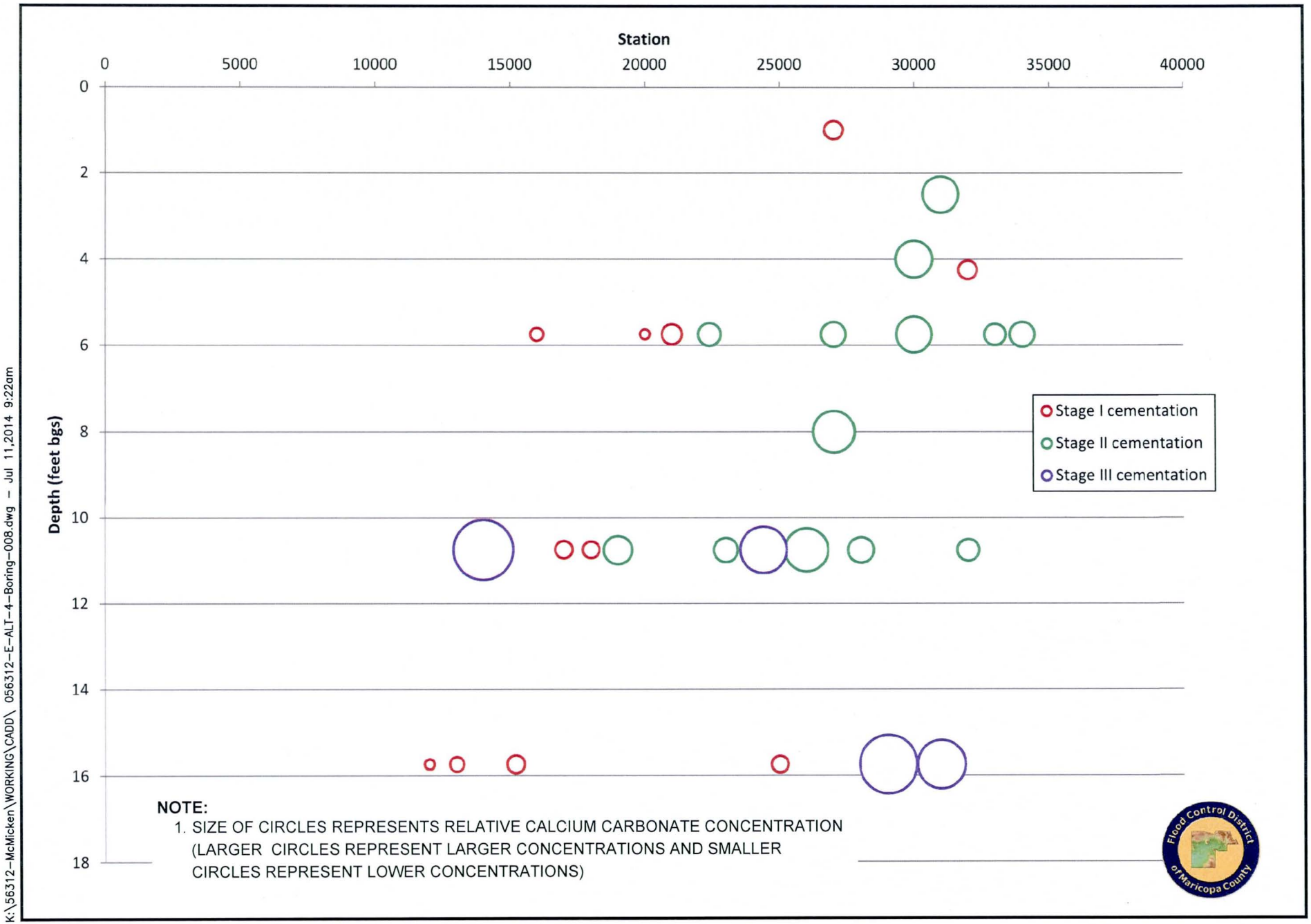
The weakly to moderately cemented soils that are generally present throughout the vertical extent of the proposed channel excavation, beginning at the point where the proposed channel alignment deviates from the existing channel (about Station 120+00) and extending to about Station 240+00, are assumed 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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MCMICKEN DAM REHABILITATION PROJECT

Relative Calcium Carbonate Concentrations as a Function of Location and Depth: Alternative 4

FIGURE 10

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	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>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

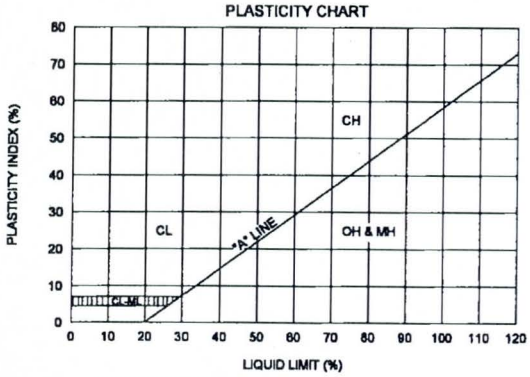
ASTM D 2488 NOTE 15 - CRITERIA FOR DESCRIBING PERCENTAGES OF GRAVEL, SAND AND FINES

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

PLASTICITY CHART



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 (TSF)	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-1586 STANDARD PENETRATION TEST).

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

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TERMS & SYMBOLS USED ON BORING LOGS FOR SOIL

McMicken Dam Rehabilitation Project

McMicken Dam, Surprise, AZ

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602-553-8817
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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
E: 574,053.809
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 339+99
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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
E: 574,124.306
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 330+00
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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), sugangular to subrounded gavel, pinkish white (2.5 YR 8/2), dry, strong reaction with HCL, weak cementation, thin non-continuos 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.

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BORING LOG: TH-503

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:** 986,085.792
E: 573,692.843
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 320+03
OFFSET: 5 ft R

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

COMMENTS:

SURFACE ELEV.: 1314.8
TOTAL DEPTH: 26.5 FT

START DATE: 04/16/2014 **TIME:**
FINISH DATE: 04/16/2014 **TIME:**

Type/Symbol	Augers	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	gm														Sandy SILT (ml).
5	sp-sc		SPT	S-1		5.0	6.5			50/5"				0.4 (27)	Poorly Graded SAND with Clay and Gravel (sp-sc), pinkish white (7.5 YR 8/2), dry, strong reaction with HCL, weak cementation, refused on coarse black gravel clast.
10	ml		SPT	S-2		10.0	11.5			50/5"				0.4 (27)	Gravelly SILT with Sand (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl, moderate cementation.

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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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	gm		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.
															Some cobbles on auger flights.
20			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
E: 572,739.241
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 309+90
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Clayey SAND (sc), white to pinkish white (2.5 YR 8/1 to 2.5 YR 8/2), dry.
5			SPT	S-1		5.0	6.5			16	50/6"			1.0 (67)	sc as above, strong reaction with HCl, weak to moderate cementation.
	SC														
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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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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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
E: 571,958.799
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 299+95
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Sandy Lean CLAY (cl), pinkish white (2.5 YR 8/2), dry, strong reaction with HCl, weak cementation.
5	cl		R	S-1		5.0	6.5			20	20			1.0 (67)	cl as above, strong reaction with HCl, weak cementation.
															Harder drilling and gravel cuttings at 8'.
10			SPT	S-2		10.0	11.5			22	29	50/5"		1.4 (93)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Sandy Fat CLAY (CH), strong reaction with HCl, weak to moderate cementation.
15	CH		SPT	S-3		15.0	16.5	6.0		50/4"				0.3 (20)	Very hard drilling 15' to 20', per driller.
20			SPT	S-4		20.0	21.5			50/2"				0.3 (20)	CH as above, srong 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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Clayey SAND (SC), pinkish white (7.5 YR 8/2), dry.
5	SC		R	S-1		5.0	6.5	4.5		26	33			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Silty SAND (SM), pinkish white (7.5 YR 8/2), dry strong reaction with HCl.
15	SM		SPT	S-3		15.0	16.5	4.7		32	50/3"			0.9 (60)	Gravel layer from 16' to 17', per driller.
20			SPT	S-4		20.0	21.5			50/4"				0.3 (20)	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
E: 570,058.654
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 279+95
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	cl														Gravelly CLAY with Sand (cl).
	ml														Gravelly SILT with Sand (ml).
5			R	S-1		5.0	6.5			39	31			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	ml		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	sm		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.
															End of boring at 21.5 feet below ground surface. No groundwater encountered.

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BORING LOG: TH-508

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:** 984,397.207
E: 569,120.144
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 270+05
OFFSET: 6 ft R

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

COMMENTS:

SURFACE ELEV.: 1315.5
TOTAL DEPTH: 21.5 FT

START DATE: 04/17/2014 **TIME:**
FINISH DATE: 04/17/2014 **TIME:**

Type/Symbol	Augers	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	SM														Silty SAND (SM).
5	CL		SPT	S-1		5.0	6.5	3.7		15	20	25	45	1.5 (100)	Sandy Lean CLAY (CL), light brown (7.5 YR 6/4), mottled white (7.5 YR 8/1), dry, strong reaction with HCl. Gravel contect increading from 3' to 5', per driller.
10			R	S-2		10.0	11.5			25	55			1.0 (67)	Gravelly SILT with Sand (ml), pink (5 YR 8/3), dry, strong reaction with HCl. Hard drilling, gravelly zone from 11' to 12', per driller.

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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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	ml		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.
	sm														Silty SAND with Gravel (sm), pink (7.5 YR 7/3), dry, none to strong reaction with HCl, moderate cementation.
20			SPT	S-4		20.0	21.5			25	35	50	85	1.2 (80)	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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															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.
5	ml		R	S-1		5.0	6.5			37	45			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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
E: 567,180.736
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 250+00
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	gm														Silty GRAVEL with Sand (gm).
5			SPT	S-1		5.0	6.5			40	25	42	67	1.5 (100)	Silty GRAVEL with Sand (gm), pinkish white (5 YR 8/2), dry, strong reaction with HCl, weak cementation.
															Sandy SILT (ml), pinkish white (7.5 YR 8/2), dry, strong reaction with HCl.
10	ml		R	S-2		10.0	11.5			25	34			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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
E: 566,586.507
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 244+03
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Silty GRAVEL with Sand (gm).
5	gm		SPT	S-1		5.0	6.5			38	50/5"			0.9 (60)	Silty GRAVEL with Sand (gm), pinkish white (7.5YR 8/2), dry, strong reaction with HCl, weak to strong cementation.
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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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
E: 565,250.548
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 230+00
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	ml														SILT (ml), little gravel. Lense of fine gravel from 2' to 3', per driller.
5	gm		SPT	S-1		5.0	6.5			5	9			0.0 (0)	Silty GRAVEL with Sand (gm), pinkish gray (7.5 YR 7/2), dry, strong reaction to HCl, weak cementation.
10			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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
			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.
15	CL														ml as above, strong reaction with HCl.
			SPT	S-4		15.0	16.5			39	50/4"			0.8 (53)	
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 (R)	Split Spoon (S)	D&M Lined (DM)	Shelby Tube (U)	Cuttings (CU)
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Gravelly SILT with Sand (ml).
5	CL		R	S-1		5.0	6.5	4.7		15	16			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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
E: 563,338.267
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 210+06
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Silty GRAVEL with Sand (gm).
5															Difficult drilling, cobble or boulder from 4.0' to 4.5', per driller.
	SM		SPT	S-1		5.0	6.5	1.4		36	38	40	78	1.5 (100)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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														Sandy SILT (ml), pink (7.5 YR 7/3), dry, none to strong reaction to HCl.
			SPT	S-4		18.0	19.5			19	30	50	80	1.3 (87)	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
E: 562,365.368
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 199+99
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	ml														Gravelly SILT with Sand (ml).
5	SC		R	S-1		5.0	6.5	8.5		19	21			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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 lilght 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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA					
Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT with Gravel (ml).
5	gm		R	S-1		5.0	6.5			10	21			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15			SPT	S-3		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
E: 559,466.803
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 169+99
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															Sandy SILT (ml), trace to little gravel.
5	ml		SPT	S-1		5.0	6.5			7	12	12	24	1.5 (100)	Sandy SILT (ml), light brown (7.5 YR 6/4), dry, strong reaction with HCl, crumbles with moderate pressure. Sand rich from 5.0' to 5.7'. Some gravel on auger flights.
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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	ml		SPT	S-3		15.0	16.5			26	50/6"			1.0 (67)	Sandy SILT (ml), pink (7.5 YR 7/3), strong reaction with HCl, weak to strong cementation, blocky with continuous white calcite matrix.

End of boring at 16.5 feet below ground surface. No groundwater encountered.

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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
E: 558,404.086
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 160+00
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	NUMBER	SYMBOL	DEPTH (FT) FROM	TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT with fine Gravel (ml).
5	CL		SPT	S-1		5.0	6.5	6.4		8	11	14	25	1.5 (100)	Sandy Lean CLAY (CL), reddish yellow (5 YR 6/6), dry strong reaction with HCl, discountinuous 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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	ml		SPT	S-3		15.0	16.5			50/5'				0.4 (27)	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
E: 557,687.551
LOCATION: McMicken Dam, Surprise, AZ

REF. ALIGNMENT:
STATION: 152+00
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
	ml														Silt (ml).
															Silty SAND with Gravel (sm), pinkish white (7.5 YR 8/2), dry.
5			SPT	S-1		5.0	6.5			28	40	42	82	1.5 (100)	sm as above, strong reaction with HCl, weak cementation.
	sm														
10			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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT trace to little fine Gravel (ml).
5	ml		SPT	S-1		5.0	6.5			12	21			1.0 (67)	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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT trace to little fine Gravel (ml).
5	ml		SPT	S-1		5.0	6.5			12	21			1.0 (67)	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 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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15	SM		SPT	S-3		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		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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT with fine gravel (ml).
5	ml		SPT	S-1		5.0	6.5			23	29			1.0 (67)	SILT (ml), light brown (7.5 YR 6/4), dry, none to strong reaction with HCl, trace to little fine gravel.
10			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.

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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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
15			SPT	S-3		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.

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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 R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
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")	

GROUNDWATER DATA					
Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

DEPTH BELOW SURFACE (FT)	USCS	GRAPHIC	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
															SILT with fine Gravel (ml).
5	gm		R	S-1		5.0	6.5			5	16			1.0 (67)	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 TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	DEPTH (FT) FROM	DEPTH (FT) TO	MOISTURE, %	DRY DENSITY (PCF)	SOIL (Blows/6 in.) 0/6	6/12	12/18	N	REC (FT) (%REC)	VISUAL MATERIAL CLASSIFICATION AND REMARKS
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 wth 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	Page 1 of 1	Test Pit No.: **TP-601**
	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: 15.5 ft	
Coordinates: N 986,068.372	Equipment Used: Caterpillar 320L	Station: 320+03	
E 573,692.526	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: Sample ID	Field: Sample Type	Lab: LL (%)	Lab: PI (%)	Lab: Moisture (%)	Lab: % Passing #4	Lab: % Passing #200	Remarks
1			Sandy SILT (ml), dry, strong reaction with HCl, weak cementation.									
2	ml											
3				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			White band (top of caliche) at 5', moderate cementation.									
6												
7												
8												At 8', digging became hard, ripping teeth used (strong cementation).
9												
10	sp-sc											
11												At 11', operator indicated digging became harder, scraping noises.
12												Less material in each bucket, slower excavation from 12' to 15'.
13			Very strong cementation at 12', per operator. Coarser texture, more cobbles, but no boulders from 12' to 15'.									
14												At 14', sidewalls holding. No collapse.
15			Increased number of cobbles (coarsens downward) at 14'.	1299.3								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	Equipment Used: Caterpillar 320L	Station: 309+90	
E 572,731.724	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: Sample ID	Field: Sample Type	Lab: LL (%)	Lab: PI (%)	Lab: Moisture (%)	Lab: % Passing #4	Lab: % Passing #200	Remarks
1	SM		Silty SAND (SM), trace gravel, dry, strong reaction with HCl.									Walls collapse in upper 2'.
2												Cross-bedded (faintly) in side wall from 2' to 5'.
3			SM as above, dry, strong reaction with HCl, weak to moderate cementation, amount of white (calcite) increases with depth.				NV	NP	4.7	86	39	Bucket sample from 0' to 5'.
4												
5												Harder excavation from 5' to 6'.
6			sm as above, stronger cementation, more white material (calcite).									
7												
8												
9												Harder excavation from 9' to 10'.
10			sm as above, strong cementation, strong reaction with HCl, clods cannot be completely broken by hand.									
11												
12												
13												
14				1301.3								
15	gm		Silty GRAVEL with Sand and Cobbles (gm), dry, strong reaction with HCl, strong cementation.	1300.3								Excavator lifting off ground when digging.
			Bottom of excavation at 15.0 feet.									

Test Pit Log

Gannett Fleming	Project: McMicken Dam Rehabilitation Project	Page 1 of 1	Test Pit No.: **TP-603**
	Location: McMicken Dam, Surprise, AZ		
Date Started: 4/29/14	Operator/Contractor: J. Osborn/Southern Plains Construction		
Date Finished: 4/29/14	Excavation Method: Hydraulic Excavator	Depth: 13.5 ft	
Coordinates: N 985,209.027	Equipment Used: Caterpillar 320L	Station: 299+95	
E 571,958.592	Field Observation / Logging: W. Roman	Offset from CL:	
Surface Elevation: 1311.1 ft	Checked By: Date:	Depth to Groundwater: N/A	

Depth (ft)	USCS	Legend	Material Description	Elevation (ft)	Field: Sample ID	Field: Sample Type	Lab: LL (%)	Lab: PI (%)	Lab: Moisture (%)	Lab: % Passing #4	Lab: % Passing #200	Remarks
1	CL		Sandy Lean CLAY (CL), dry, strong reaction with HCl.									Upper 1 foot is dry and powdery, doesn't stand well in sidewall, sidewall vertical from 1' to 13.5'.
2												
3												
4			CL as above, strong reaction with HCl, small clods from 3' to 5'.				38	17	7.1	99	70	Bucket sample from 3' to 5'.
5												
6												
7												
8			cl as above, strong reaction with HCl, clods still breakable by hand from 7' to 9'.				33	21	3.8	87	38	Bucket sample from 7' - 9'. Harder excavating at 7', per operator.
9												
10												
11			Sandy Lean CLAYI with Gravel (cl) from 10' to 11'.									
12												Bucket sample from 12' to 13.5'.
13			Clods still breakable by hand, strong reaction to HCl, moderate to strong cementation from 12' to 13.5'.	1297.6								
			Bottom of excavation at 13.5 feet.									Excavator standing from 12' to 13.5'.

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-604**
	Location: McMicken Dam, Surprise, AZ		
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	Equipment Used: Caterpillar 320L	Station: 270+05	
E 569,128.150	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: Sample ID	Field: Sample Type	Lab: LL (%)	Lab: PI (%)	Lab: Moisture (%)	Lab: % Passing #4	Lab: % Passing #200	Remarks
1			Silty SAND (SM), dry, strong reactin with HCl, rapid dilatancy.				NV	NP	2.1	88	31	Bucket sample from 0' to 2'.
2												
3												Harder excavation at 3', per operator. Smoother, whiter sidewalls from 3' to 5'.
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.									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												Excavation becomes progressively harder, less material in buckets from 14' to 15.3'.
15				1300.7								
			Bottom of excavation at 15.3 feet.									

PHOENIX - GF MCMICKEN TEST PIT LOGS (WA7).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 Zalesski, 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

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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 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 Fergason, 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 Fergason (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.

Registered Professional Engineer (Civil) CERTIFICATE NO. 18682 MICHAEL L. RUCKER Date Signed 6-30-14 ARIZONA, U.S.A. Expires 03/31/16

Michael L. Rucker, PE
Senior Geotechnical Engineer

Reviewed by:

Registered Professional Engineer (Civil) CERTIFICATE NO. 41937 MARK HARTIG Date Signed 6-30-14 ARIZONA, U.S.A. Expires 3/31/2017

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	D7G, 200 HP	235
5,500 – 7,700 fps	D8R/T, 305-310 HP	-
6,300 – 8,600 fps	D8L, 335 HP	245
6,300 – 8,600 fps	D9R/T, 405-410 HP	-
6,300 – 8,700 fps	D9N, 370 HP	-
7,200 – 10,300 fps	D9L, 460 HP	RH 40
7,200 – 10,300 fps	D10T, 580 HP	-
7,200 – 10,300 fps	D10N, 520 HP	-
7,400 – 10,600 fps	D10, 700 HP	-
7,500 – 11,000 fps	D11T, 850 HP	-
7,600 – 11,000 fps	D11N, 770 HP	
Conglomerate		
4,600 – 5,700 fps	D7G, 200 HP	235
6,200 – 8,200 fps	D8R/T, 305-310 HP	-
7,600 – 9,300 fps	D8L, 335 HP	245
7,700 – 9,300 fps	D9R/T, 405-410 HP	-
7,600 – 9,300 fps	D9N, 370 HP	-
8,400 – 10,600 fps	D9L, 460 HP	RH 40
8,500 – 10,600 fps	D10T, 580 HP	-
8,400 – 10,600 fps	D10N, 520 HP	-
9,000 – 11,000 fps	D10, 700 HP	-
9,300 – 11,500 fps	D11T, 850 HP	
9,300 – 11,500 fps	D11N, 770 HP	
Granite		
4,300 – 4,800 fps	D7G, 200 HP	235
5,800 – 8,000 fps	D8R/T, 305-310 HP	-
6,800 – 8,000 fps	D8L, 335 HP	245
6,800 – 8,000 fps	D9R/T, 405-410 HP	-
6,800 – 8,000 fps	D9N, 370 HP	-
7,300 – 8,400 fps	D9L, 460 HP	RH 40
7,300 – 8,400 fps	D10N, 520 HP	-
7,300 – 8,500 fps	D10T, 580 HP	-
7,800 – 9,000 fps	D10, 700 HP	-
8,100 – 9,600 fps	D11T, 850 HP	
8,100 – 9,500 fps	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.

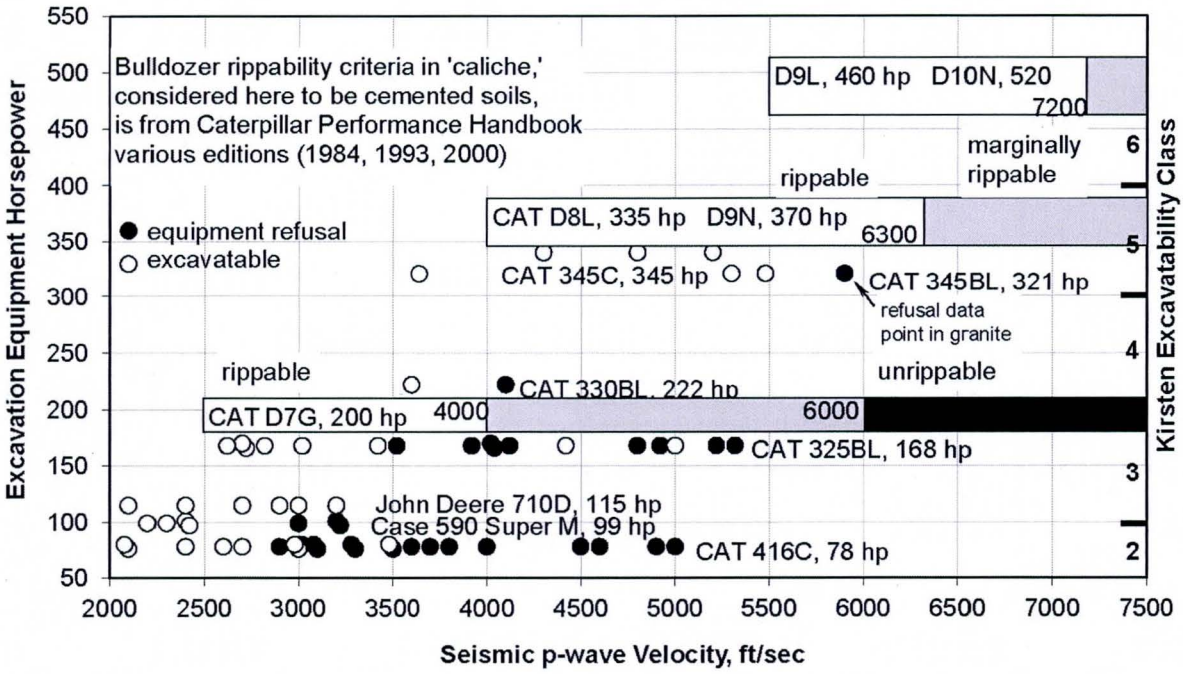
TABLE 2
Approximate Erodability & Excavatability of Materials
Limestone & Cemented Soils (caliche)

Seismic Velocity f/s (m/s) (Rucker and Fergason, 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 Fergason (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.

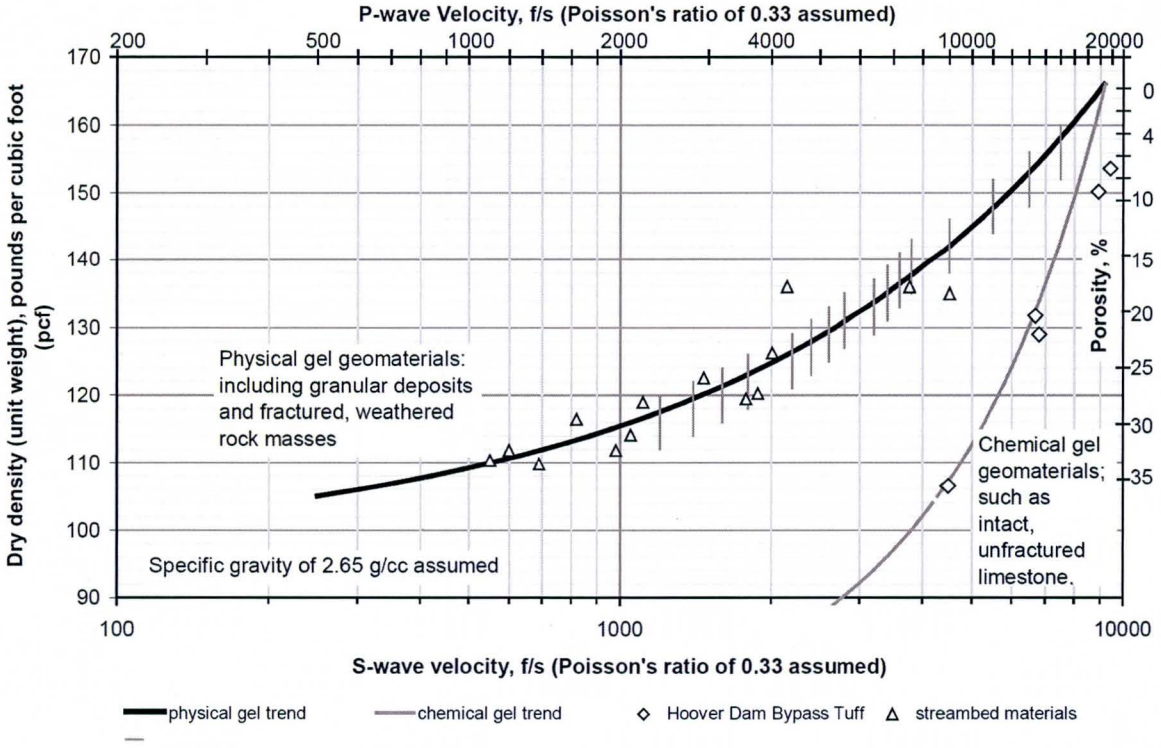
FIGURE 1

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

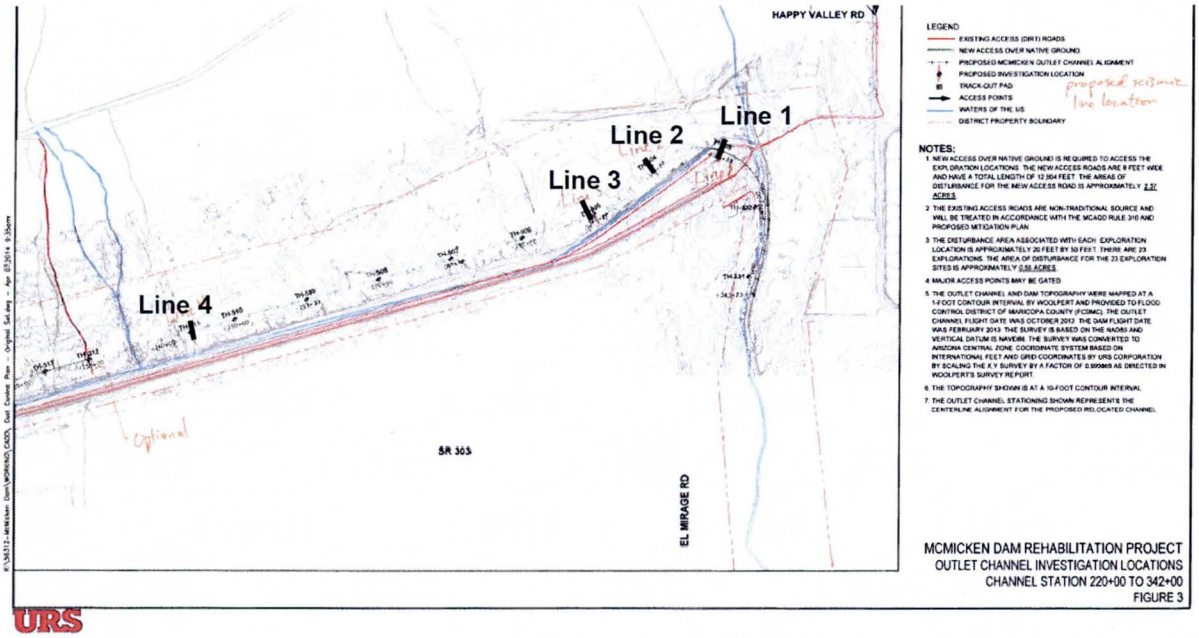


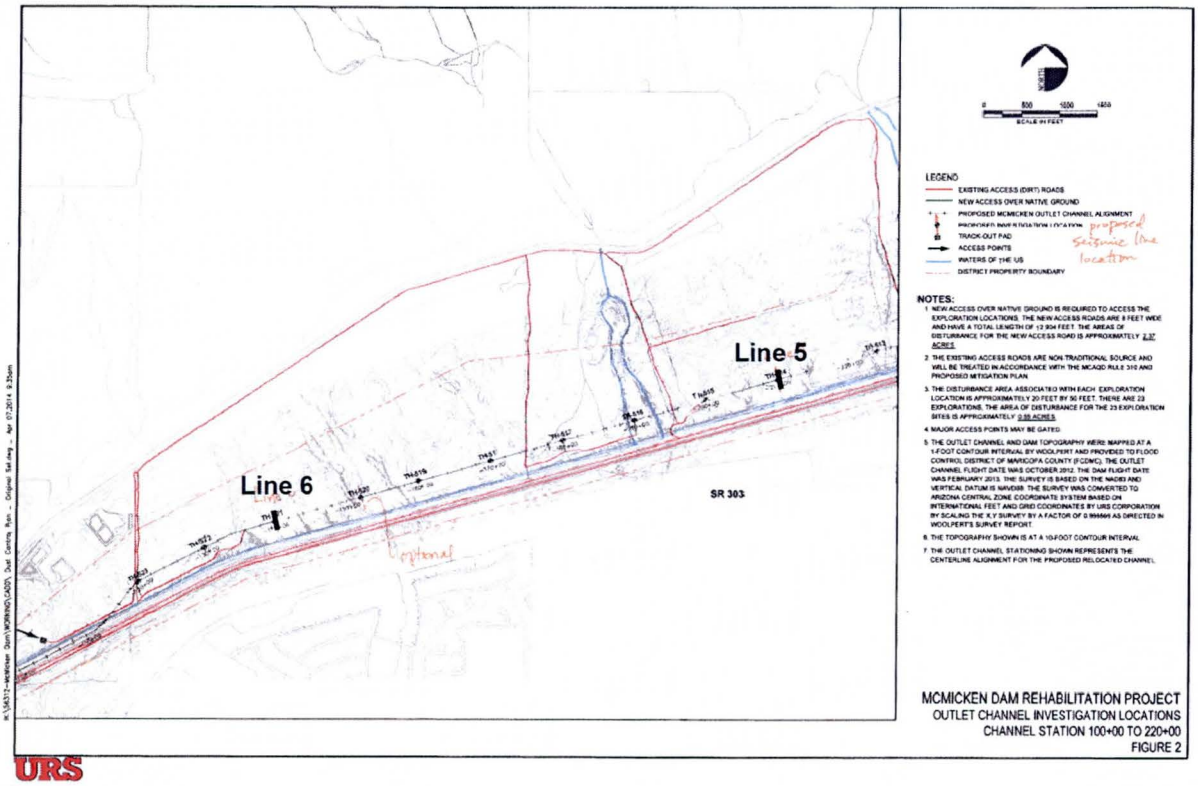
Note: From Rucker and Fergason, (2006; 2009). This chart documents typical backhoe and trackhoe excavation performance at lower seismic p-wave velocities than are presented in the Caterpillar Rippability Charts (CAT 1981, 1993, 2000). These correlations were developed in cemented materials as a function 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)



SITE PLAN


HAPPY VALLEY RD
Line 1
Line 2
Line 3
Line 4
SR 303
EL MIRAGE RD
LEGEND
EXISTING ACCESS (DIRT) ROADS
NEW ACCESS OVER NATIVE GROUND
PROPOSED MCMICKEN OUTLET CHANNEL ALIGNMENT
PROPOSED INVESTIGATION LOCATION
TRACK-OUT PAD
ACCESS POINTS
WATERS OF THE US
DISTRICT PROPERTY BOUNDARY
proposed seismic line location
NOTES:
1. NEW ACCESS OVER NATIVE GROUND IS REQUIRED TO ACCESS THE EXPLORATION LOCATIONS. THE NEW ACCESS ROADS ARE 8 FEET WIDE AND HAVE A TOTAL LENGTH OF 12,864 FEET. THE AREAS OF DISTURBANCE FOR THE NEW ACCESS ROAD IS APPROXIMATELY 2.37 ACRES
2. THE EXISTING ACCESS ROADS ARE NON-TRADITIONAL SOURCE AND WILL BE TREATED IN ACCORDANCE WITH THE MCAQD RULE 310 AND PROPOSED MITIGATION PLAN
3. THE DISTURBANCE AREA ASSOCIATED WITH EACH EXPLORATION LOCATION IS APPROXIMATELY 20 FEET BY 50 FEET. THERE ARE 23 EXPLORATIONS. THE AREA OF DISTURBANCE FOR THE 23 EXPLORATION SITES IS APPROXIMATELY 0.55 ACRES
4. MAJOR ACCESS POINTS MAY BE GATED
5. 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 0.999965 AS DIRECTED IN WOOLPERT'S SURVEY REPORT.
6. THE TOPOGRAPHY SHOWN IS AT A 10-FOOT CONTOUR INTERVAL
7. THE OUTLET CHANNEL STATIONING SHOWN REPRESENTS THE CENTERLINE ALIGNMENT FOR THE PROPOSED RELOCATED CHANNEL
MCMICKEN DAM REHABILITATION PROJECT
OUTLET CHANNEL INVESTIGATION LOCATIONS
CHANNEL STATION 220+00 TO 342+00
FIGURE 3
URS


Line 5
Line 6
SR 303
0
800
1600
1600
SCALE IN FEET
LEGEND
EXISTING ACCESS (DIRT) ROADS
NEW ACCESS OVER NATIVE GROUND
PROPOSED MCMICKEN OUTLET CHANNEL ALIGNMENT
TRACK-OUT PAD
ACCESS POINTS
WATERS OF THE US
DISTRICT PROPERTY BOUNDARY
proposed seismic line location
NOTES:
1. NEW ACCESS OVER NATIVE GROUND IS REQUIRED TO ACCESS THE EXPLORATION LOCATIONS. THE NEW ACCESS ROADS ARE 8 FEET WIDE AND HAVE A TOTAL LENGTH OF 13,904 FEET. THE AREAS OF DISTURBANCE FOR THE NEW ACCESS ROAD IS APPROXIMATELY 2.57 ACRES
2. THE EXISTING ACCESS ROADS ARE NON-TRADITIONAL SOURCE AND WILL BE TREATED IN ACCORDANCE WITH THE MCAQD RULE 310 AND PROPOSED MITIGATION PLAN
3. THE DISTURBANCE AREA ASSOCIATED WITH EACH EXPLORATION LOCATION IS APPROXIMATELY 20 FEET BY 50 FEET. THERE ARE 23 EXPLORATIONS. THE AREA OF DISTURBANCE FOR THE 23 EXPLORATION SITES IS APPROXIMATELY 0.55 ACRES
4. MAJOR ACCESS POINTS MAY BE GATED
5. 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 0.999965 AS DIRECTED IN WOOLPERT'S SURVEY REPORT.
6. THE TOPOGRAPHY SHOWN IS AT A 10-FOOT CONTOUR INTERVAL
7. THE OUTLET CHANNEL STATIONING SHOWN REPRESENTS THE CENTERLINE ALIGNMENT FOR THE PROPOSED RELOCATED CHANNEL
MCMICKEN DAM REHABILITATION PROJECT
OUTLET CHANNEL INVESTIGATION LOCATIONS
CHANNEL STATION 100+00 TO 220+00
FIGURE 2
URS

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 microtemor 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.

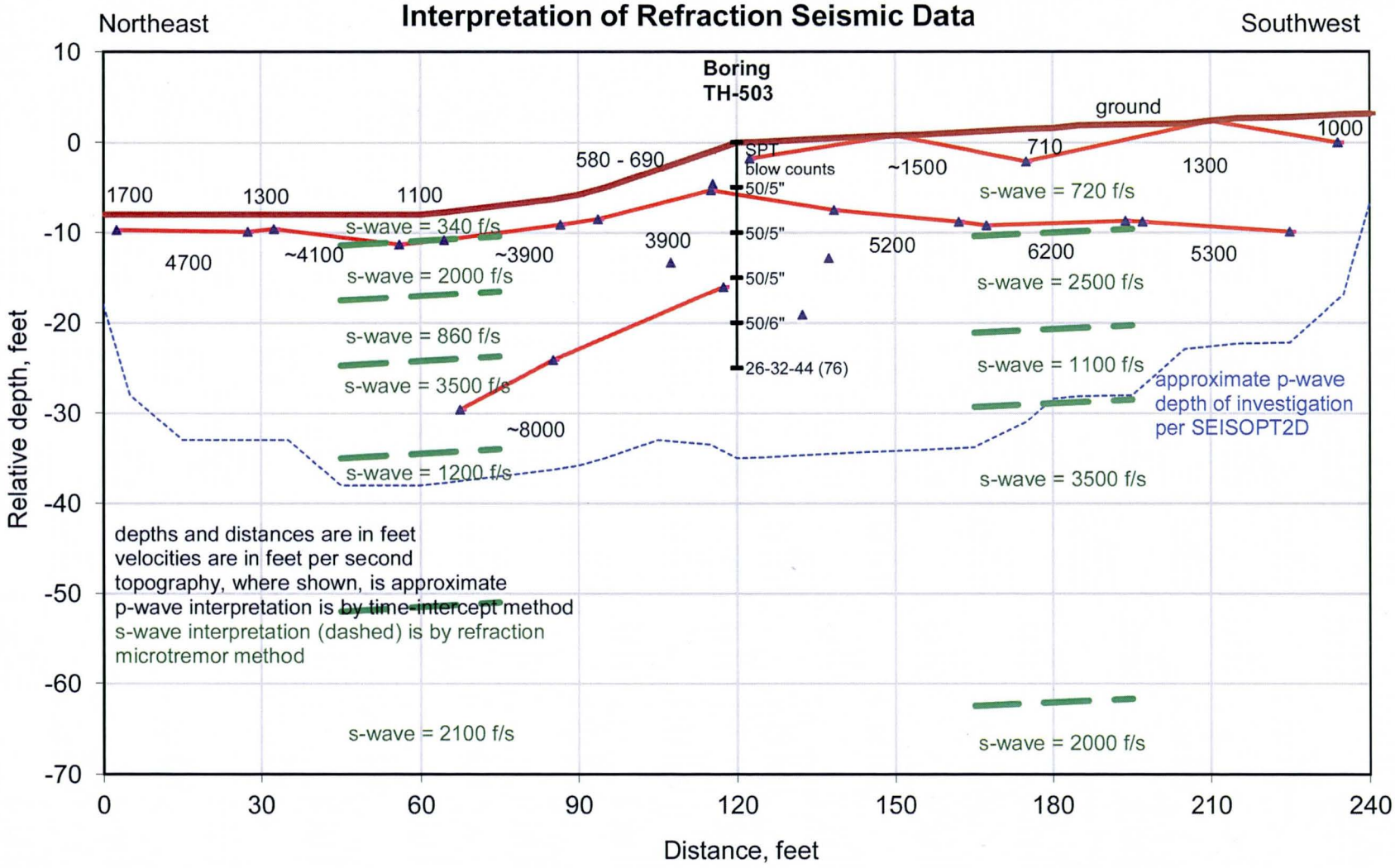
Interpretation - Although preliminary or quality control initial ReMi seismic data interpretations may sometimes be performed in the field, full interpretations are completed in the office. Data files, typically about 1,160kb each in size, are transferred from the seismograph to the laptop computer using 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.

Seismic Refraction and Refraction
Microtremor Interpretation

Line 1

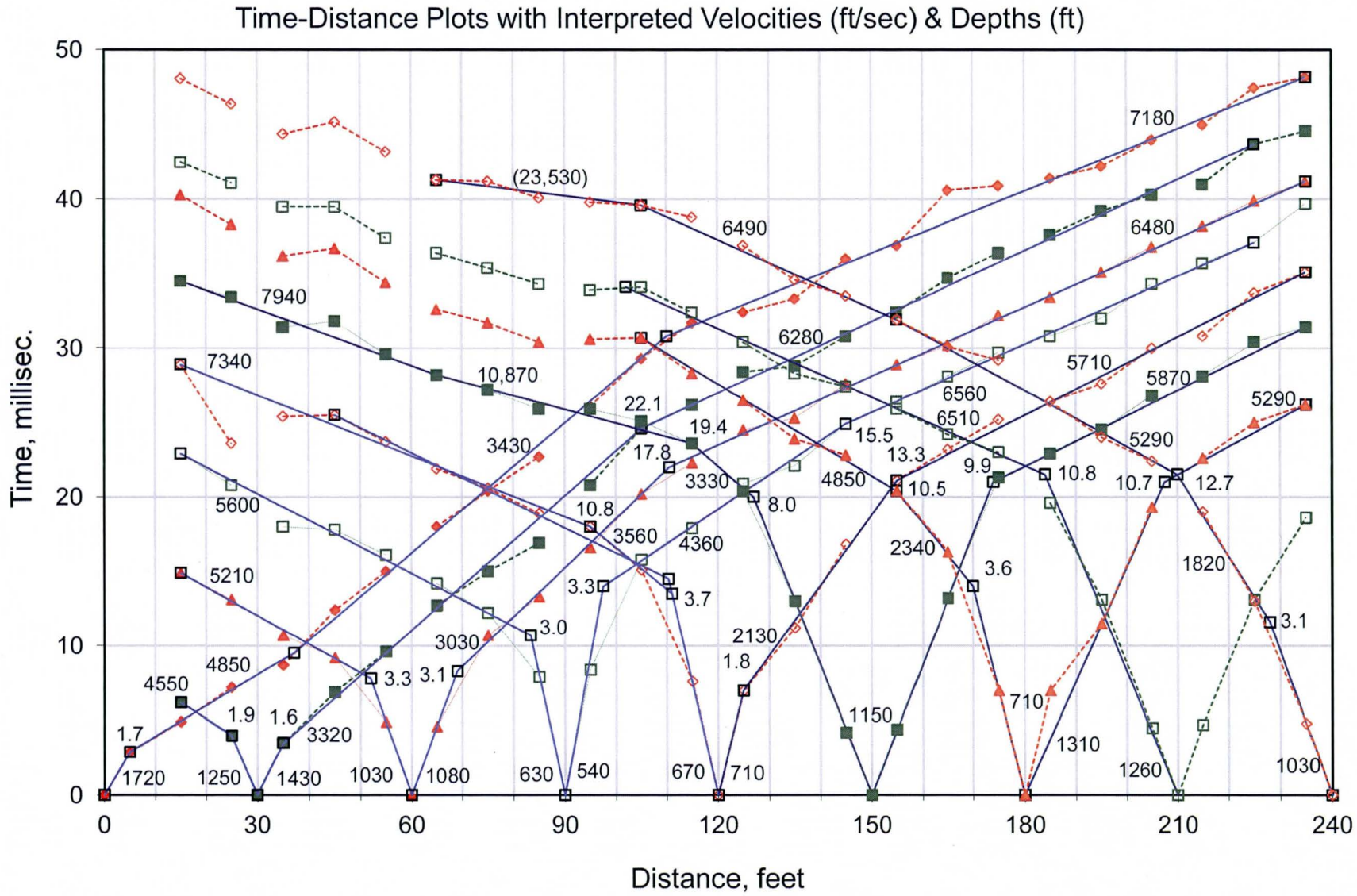
AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

Line 1

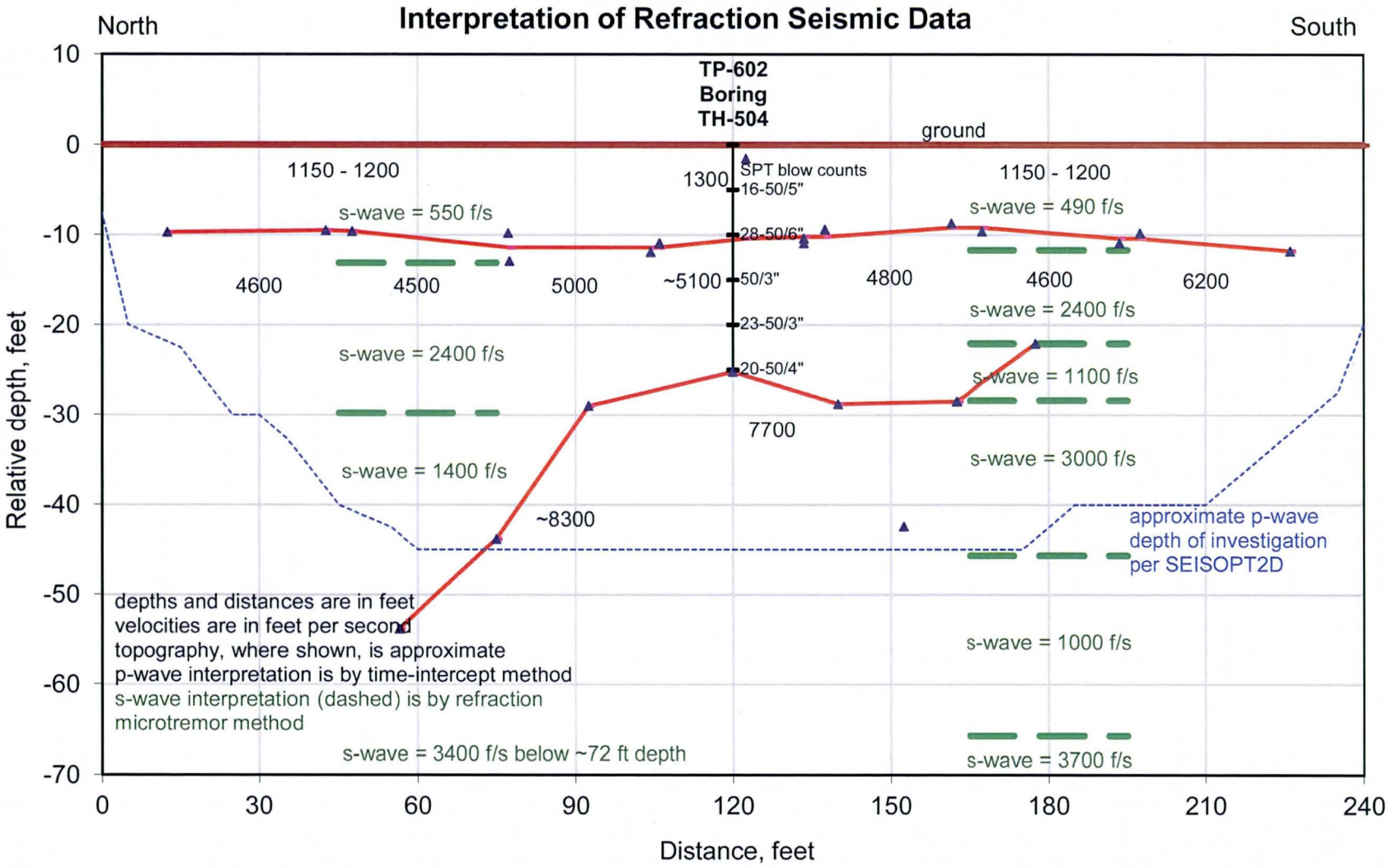
AMEC Job No. 17-2013-4059



Seismic Refraction and Refraction
Microtremor Interpretation

Line 2

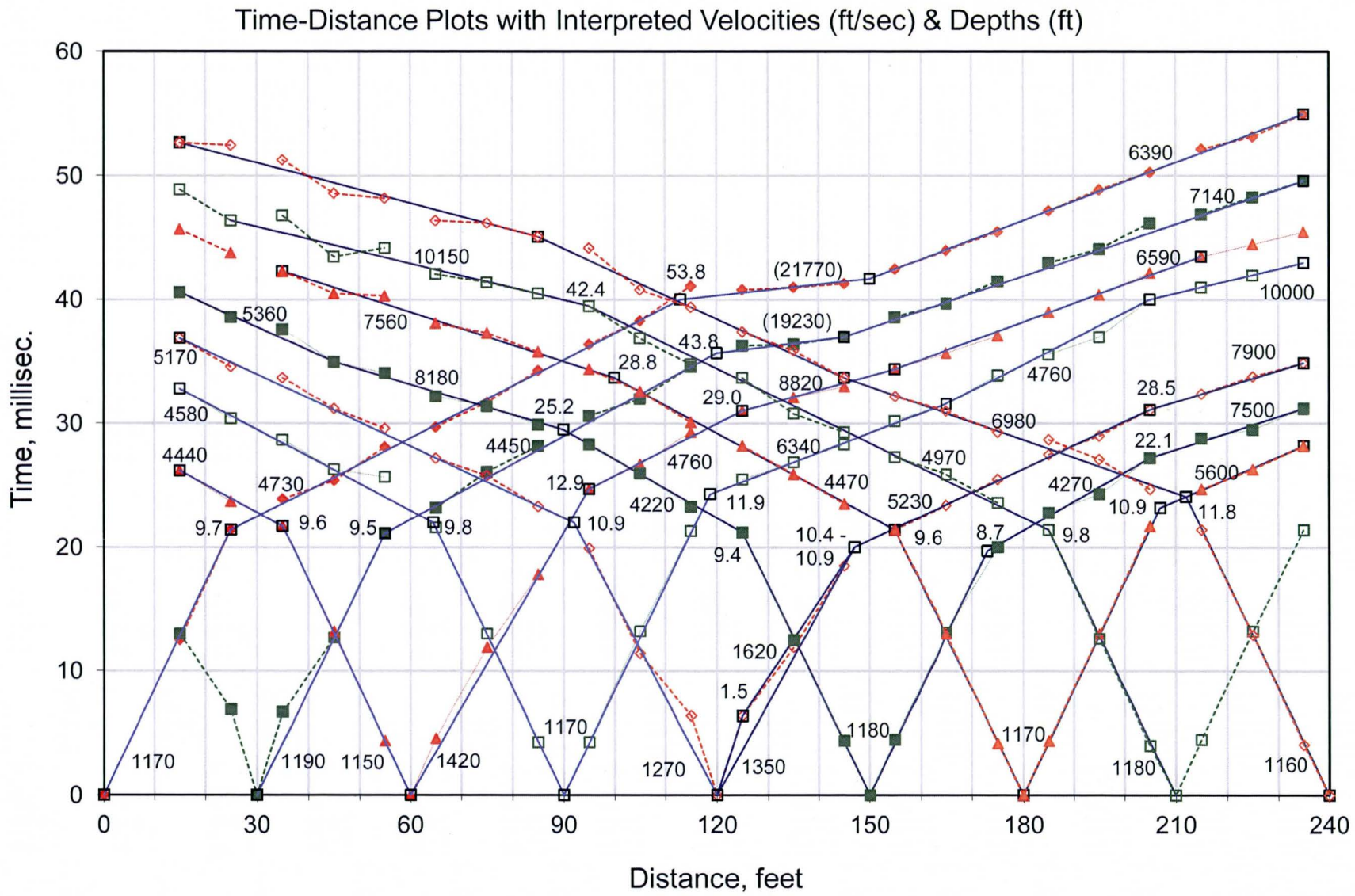
AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

Line 2

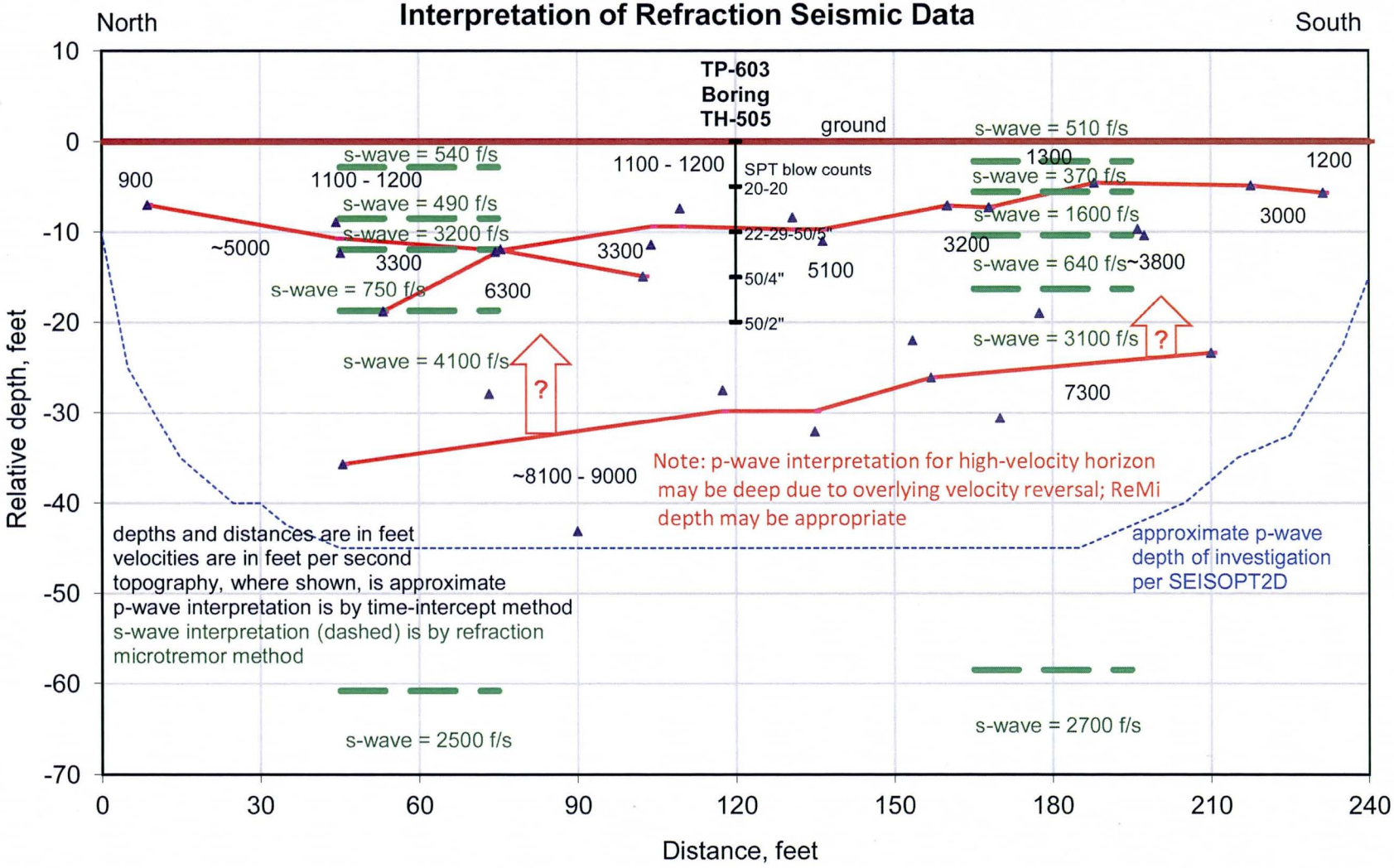
AMEC Job No. 17-2013-4059



Seismic Refraction and Refraction
Microtremor Interpretation

Line 3

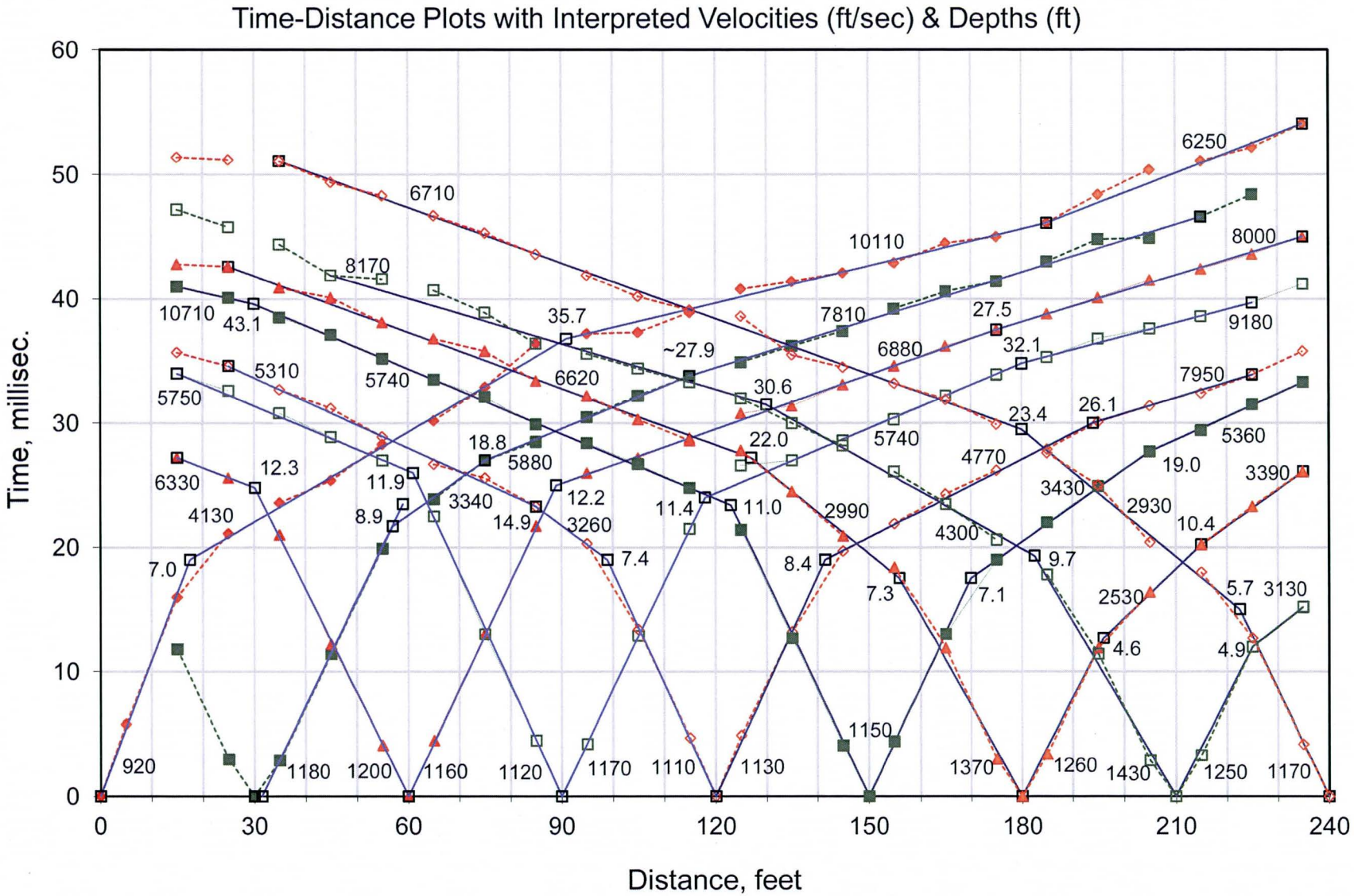
AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

Line 3

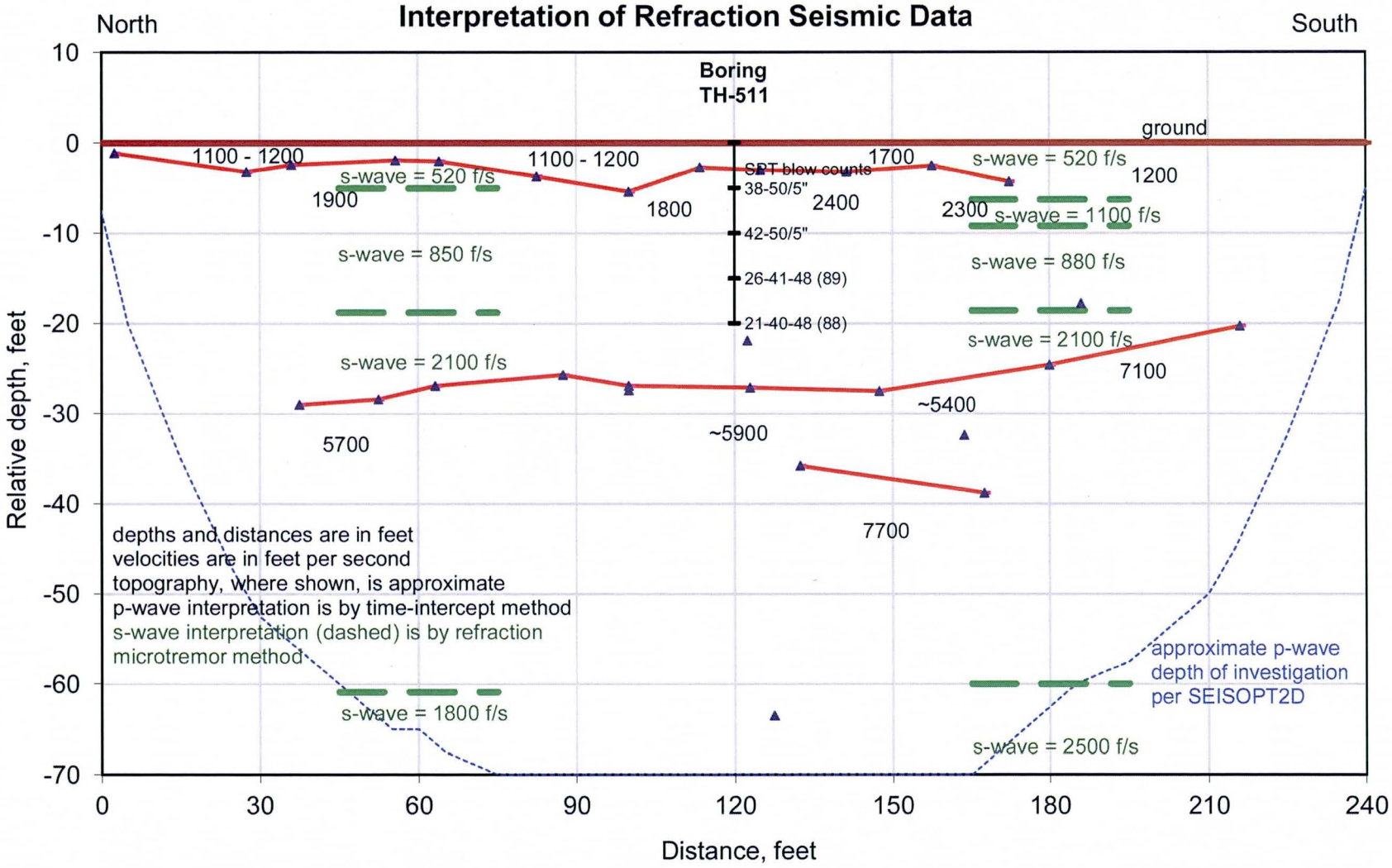
AMEC Job No. 17-2013-4059



Seismic Refraction and Refraction
Microtremor Interpretation

Line 4

AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

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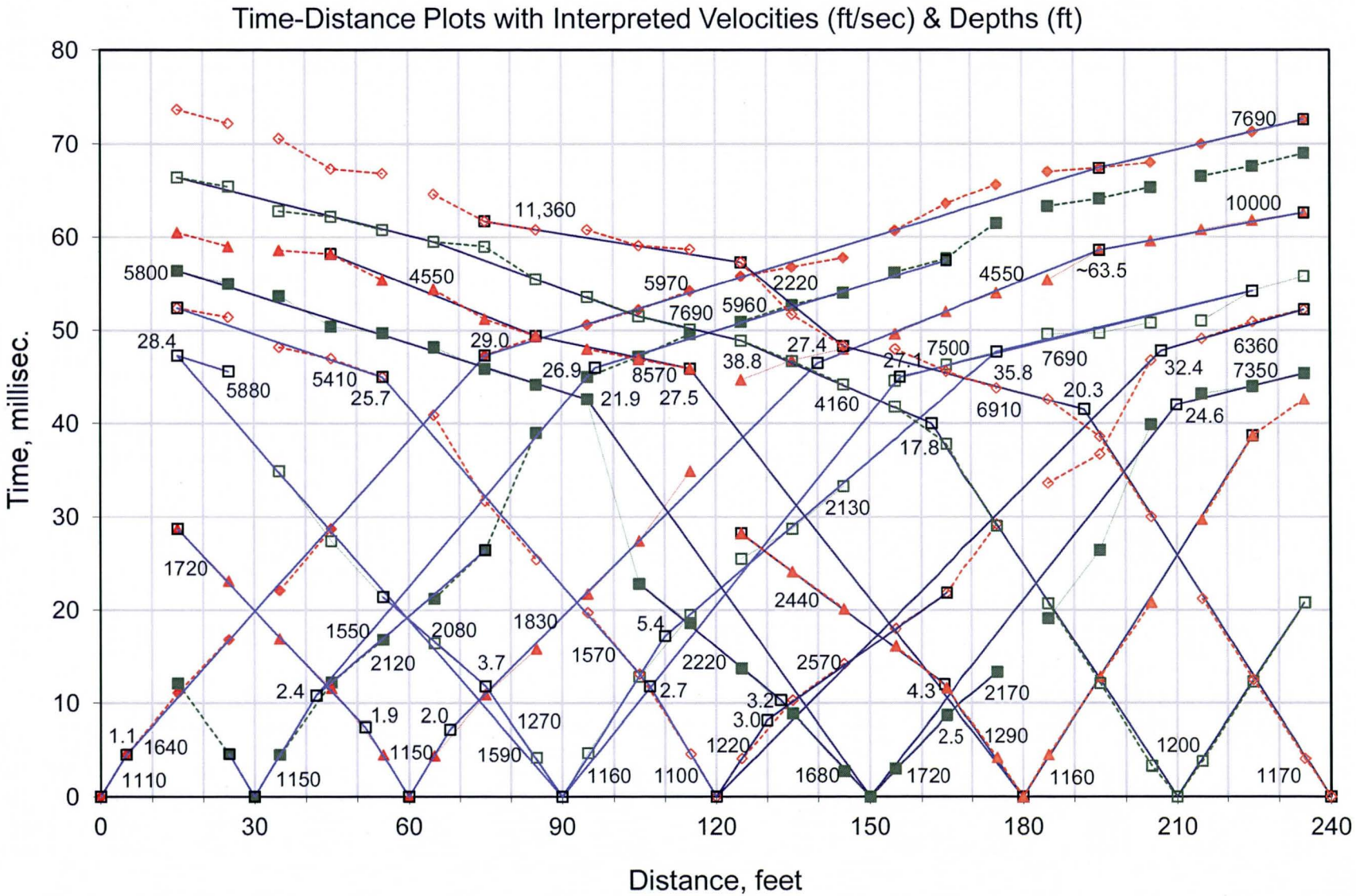
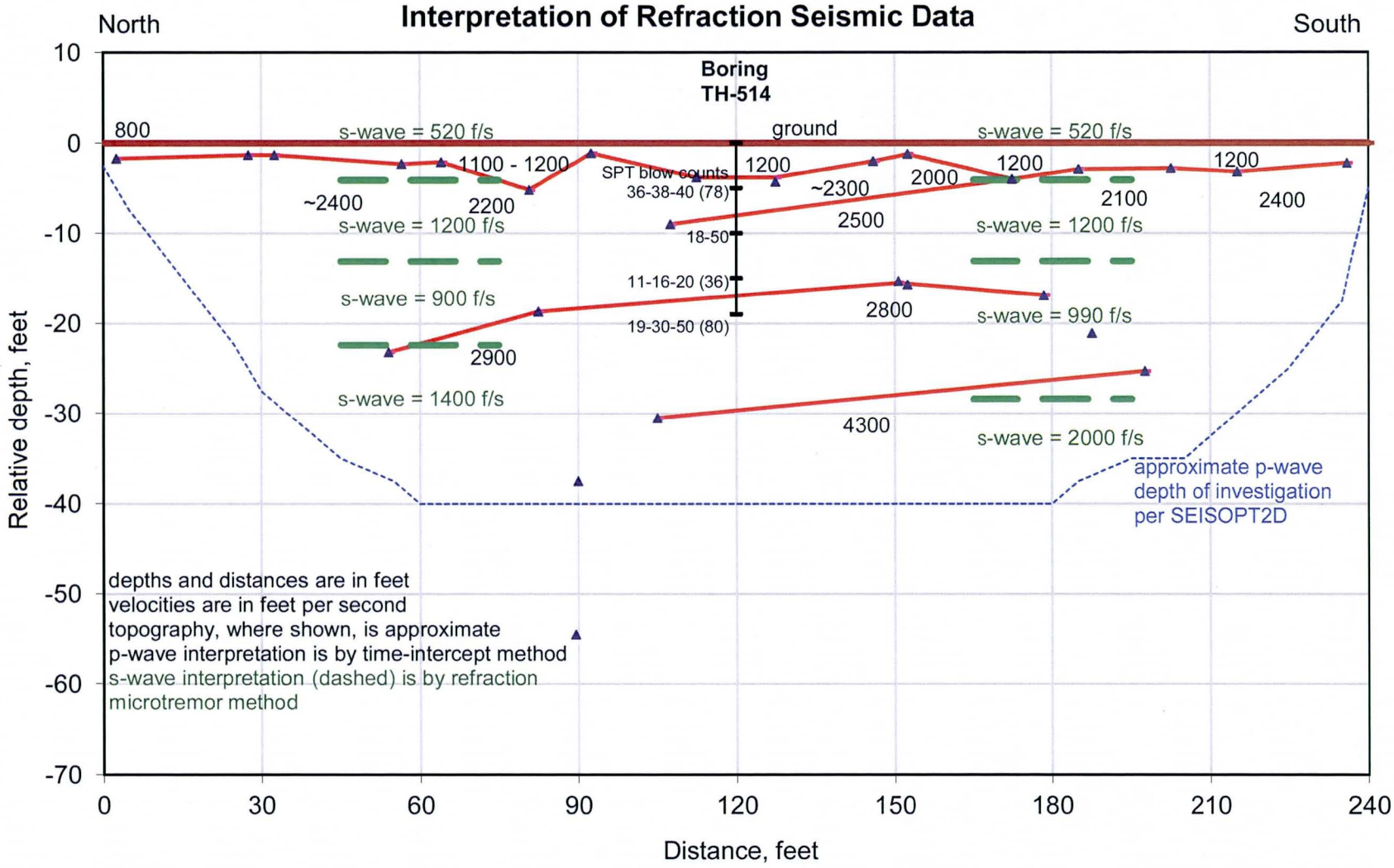
AMEC Job No. 17-2013-4059



Seismic Refraction and Refraction
Microtremor Interpretation

Line 5

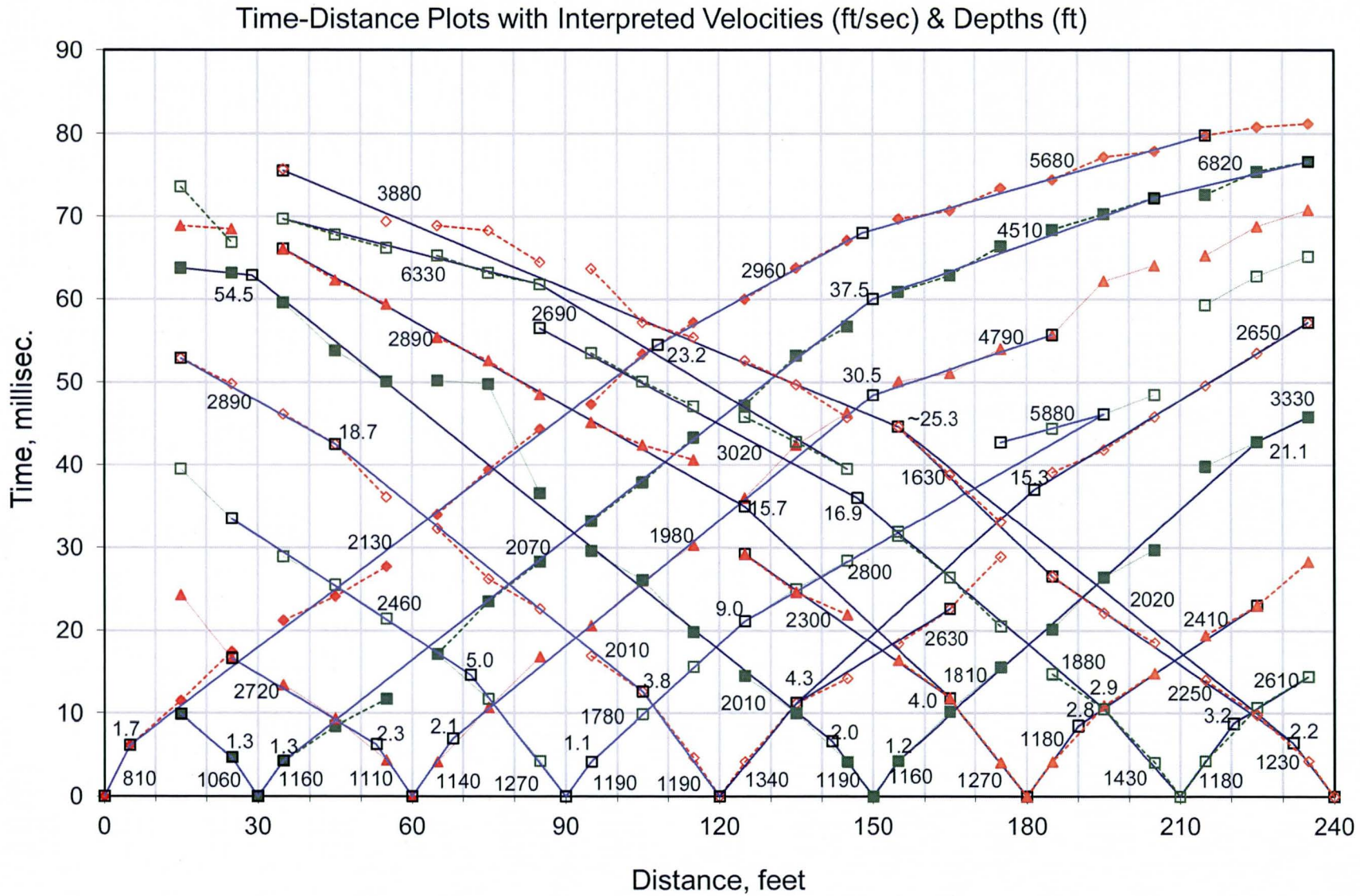
AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

Line 5

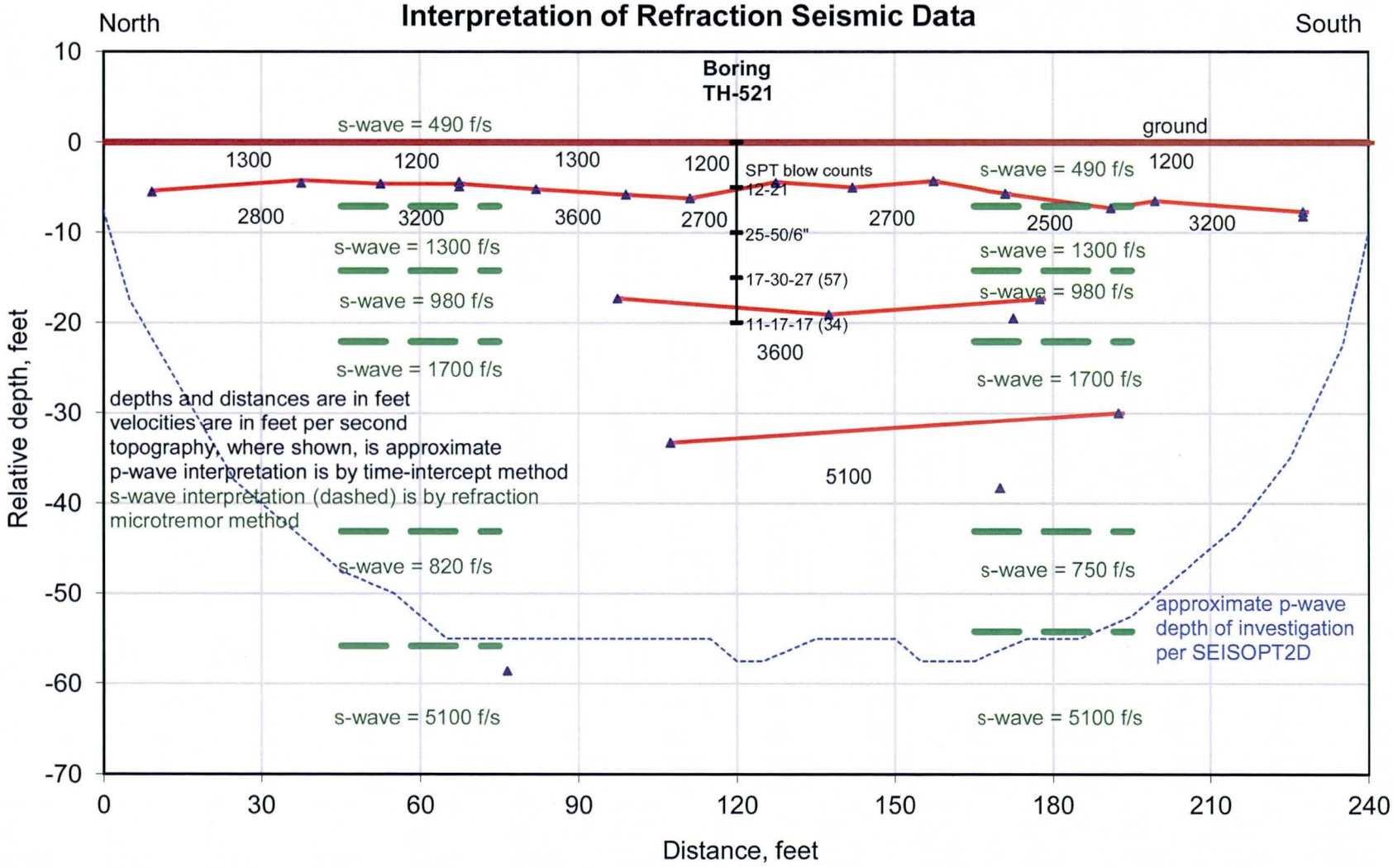
AMEC Job No. 17-2013-4059



Seismic Refraction and Refraction
Microtremor Interpretation

Line 6

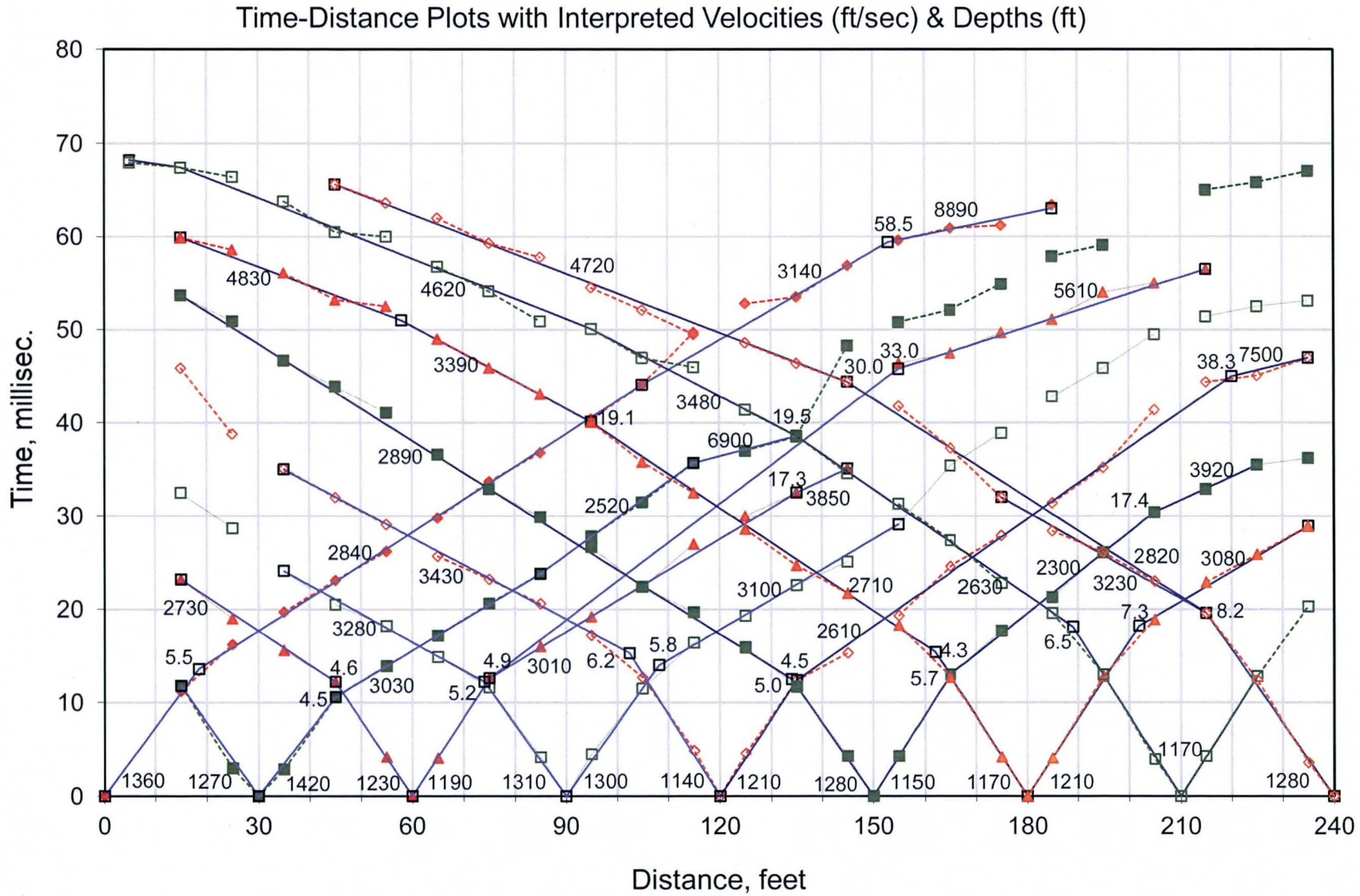
AMEC Job No. 17-2013-4059



Seismic Refraction Interpretation
Time-Distance Plots

Line 6

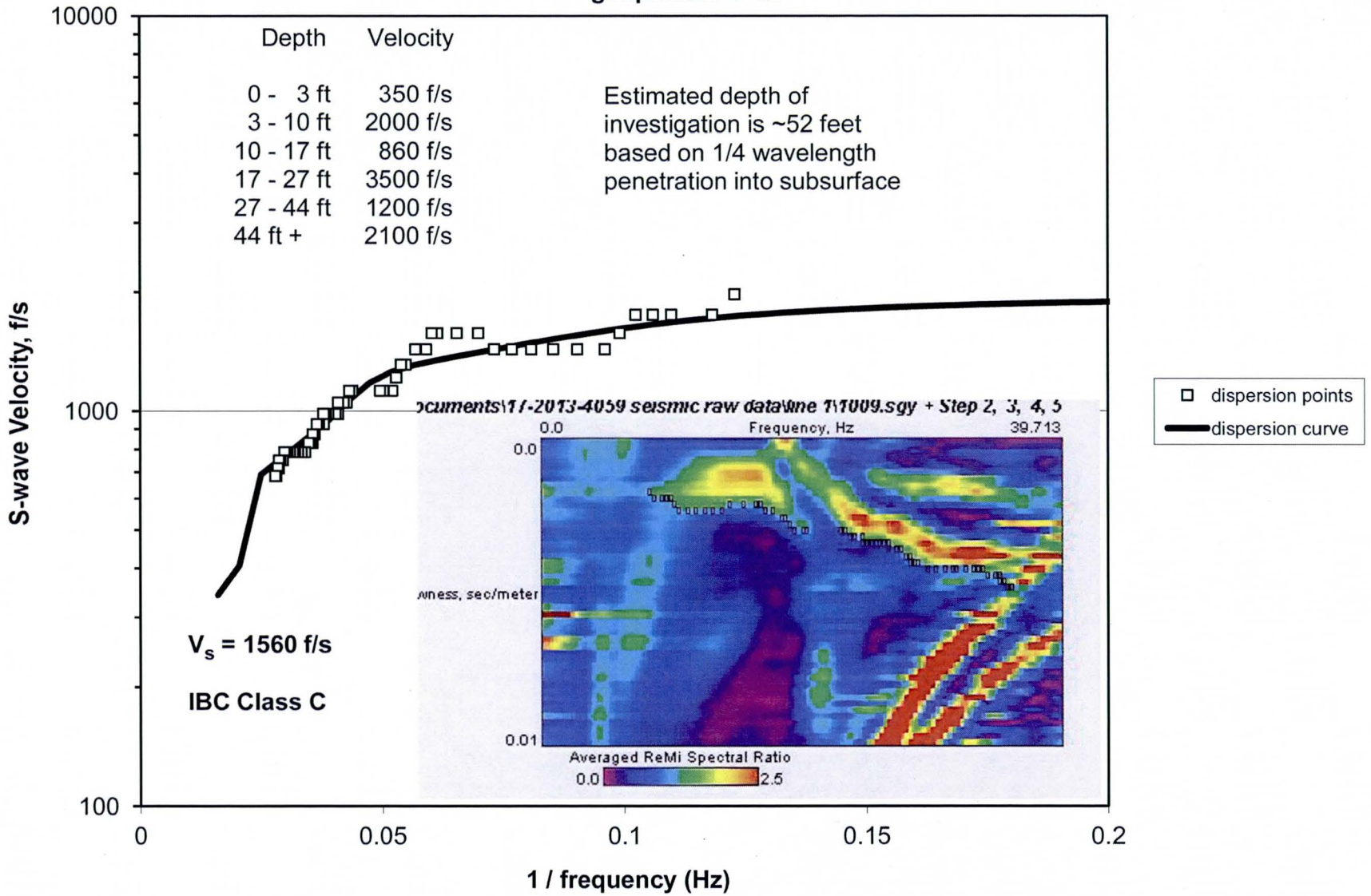
AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

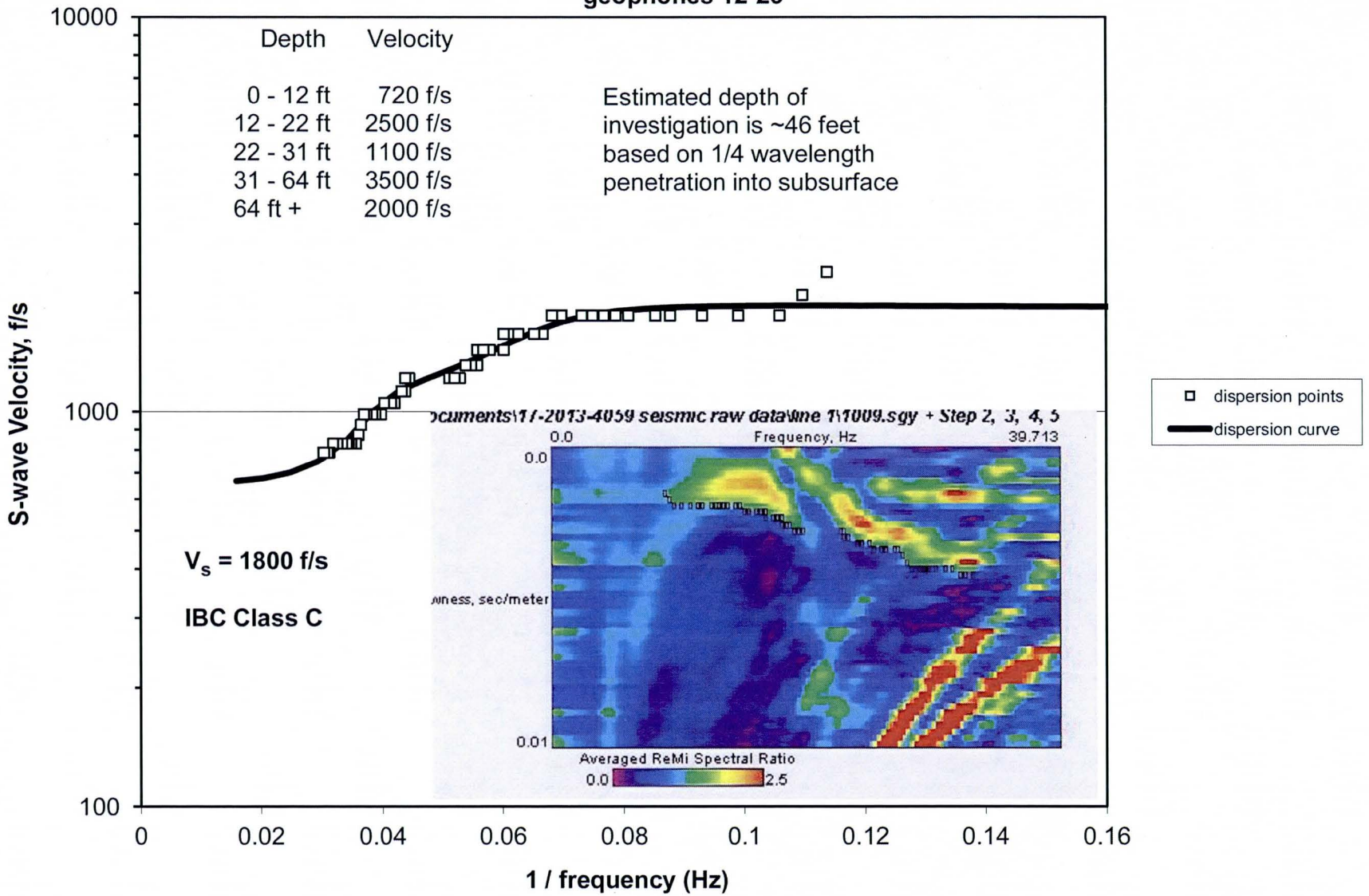
Line 1A
geophones 1-12

AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation **Line 1B** AMEC Job No. 17-2013-4059

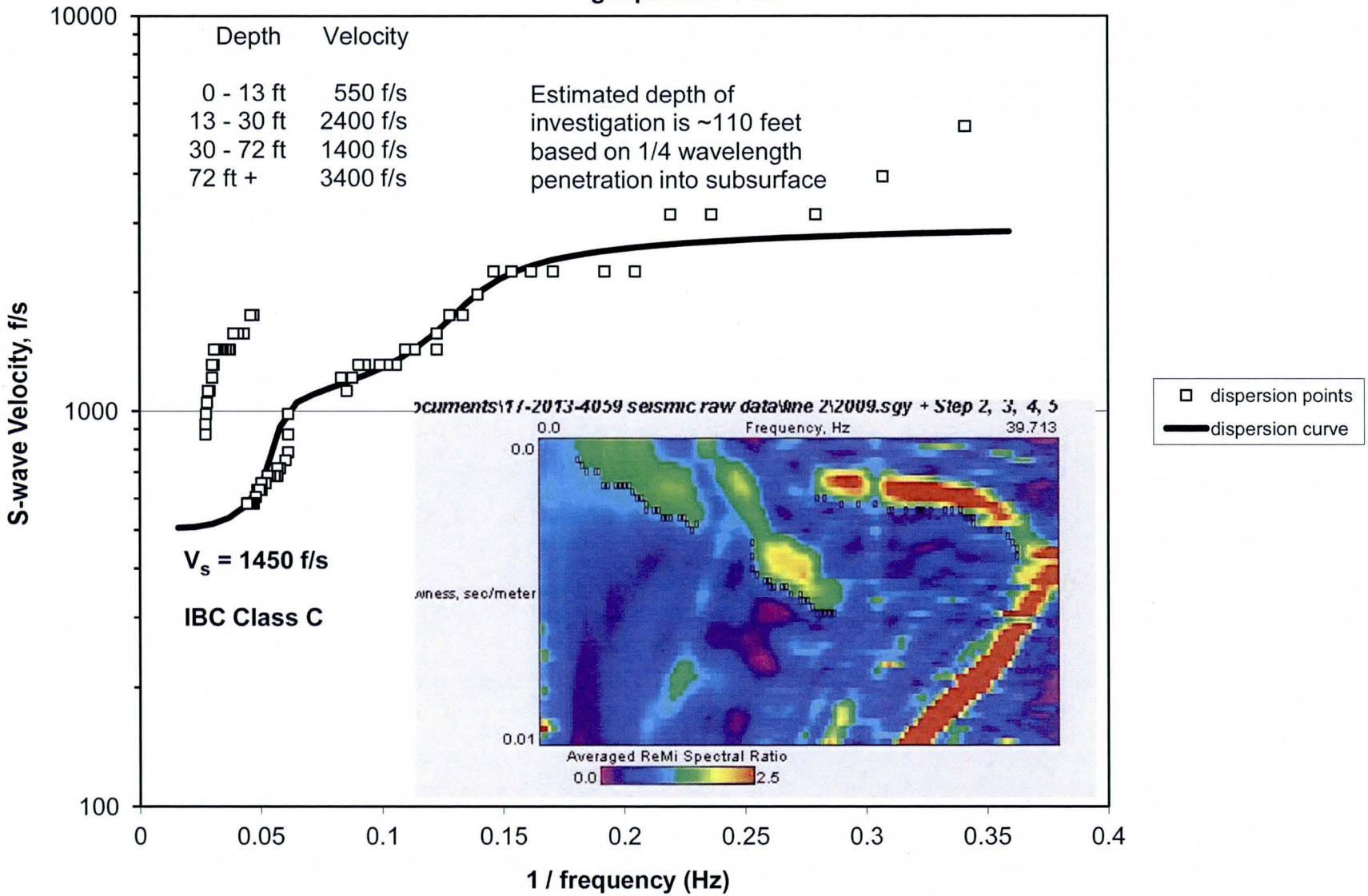
geophones 12-23



Refraction Microtremor S-wave Interpretation

Line 2A
geophones 1-12

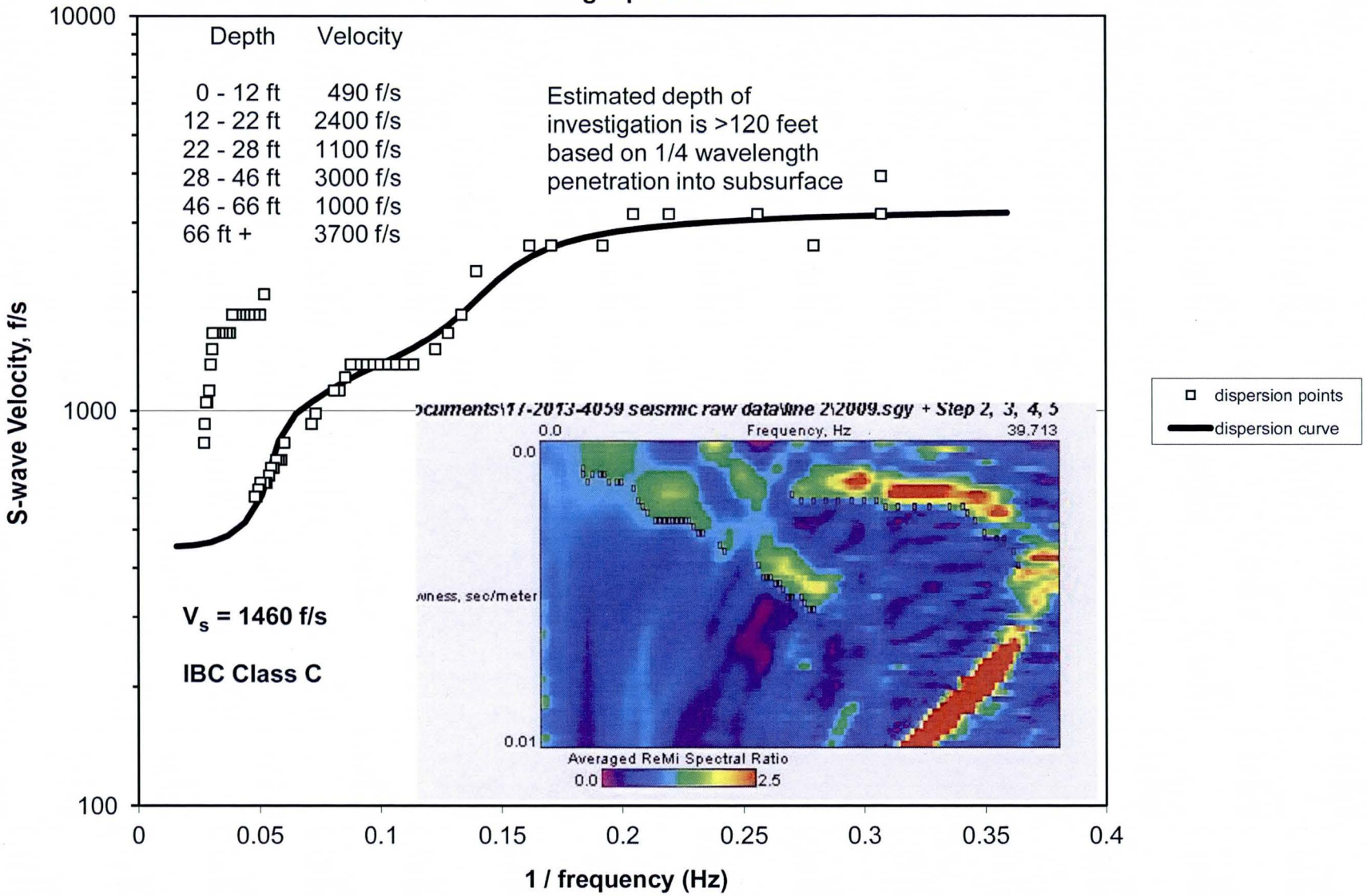
AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

Line 2B
geophones 12-23

AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

Line 3A
geophones 12-23

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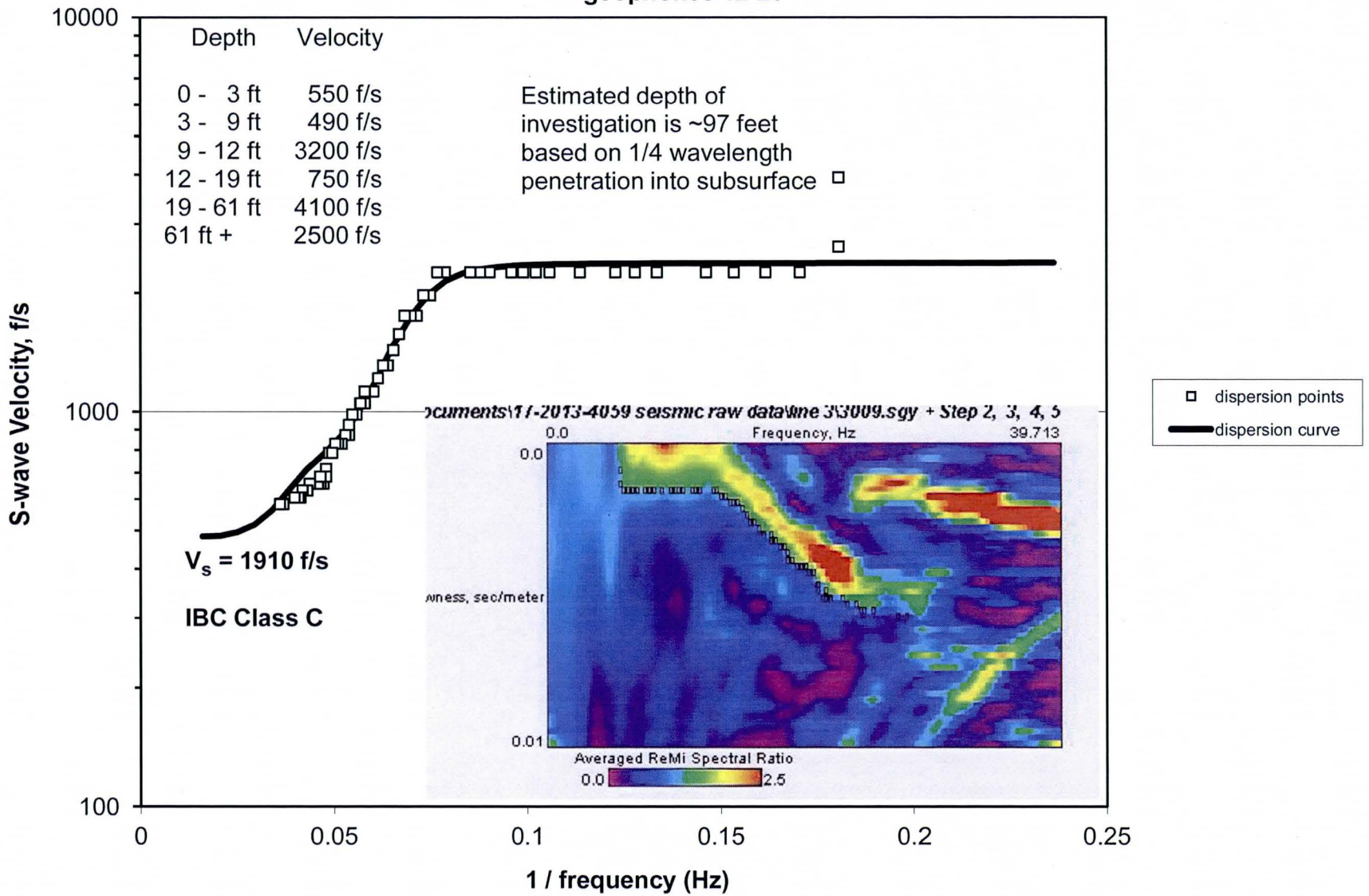

Refraction Microtremor S-wave Interpretation

Line 3B
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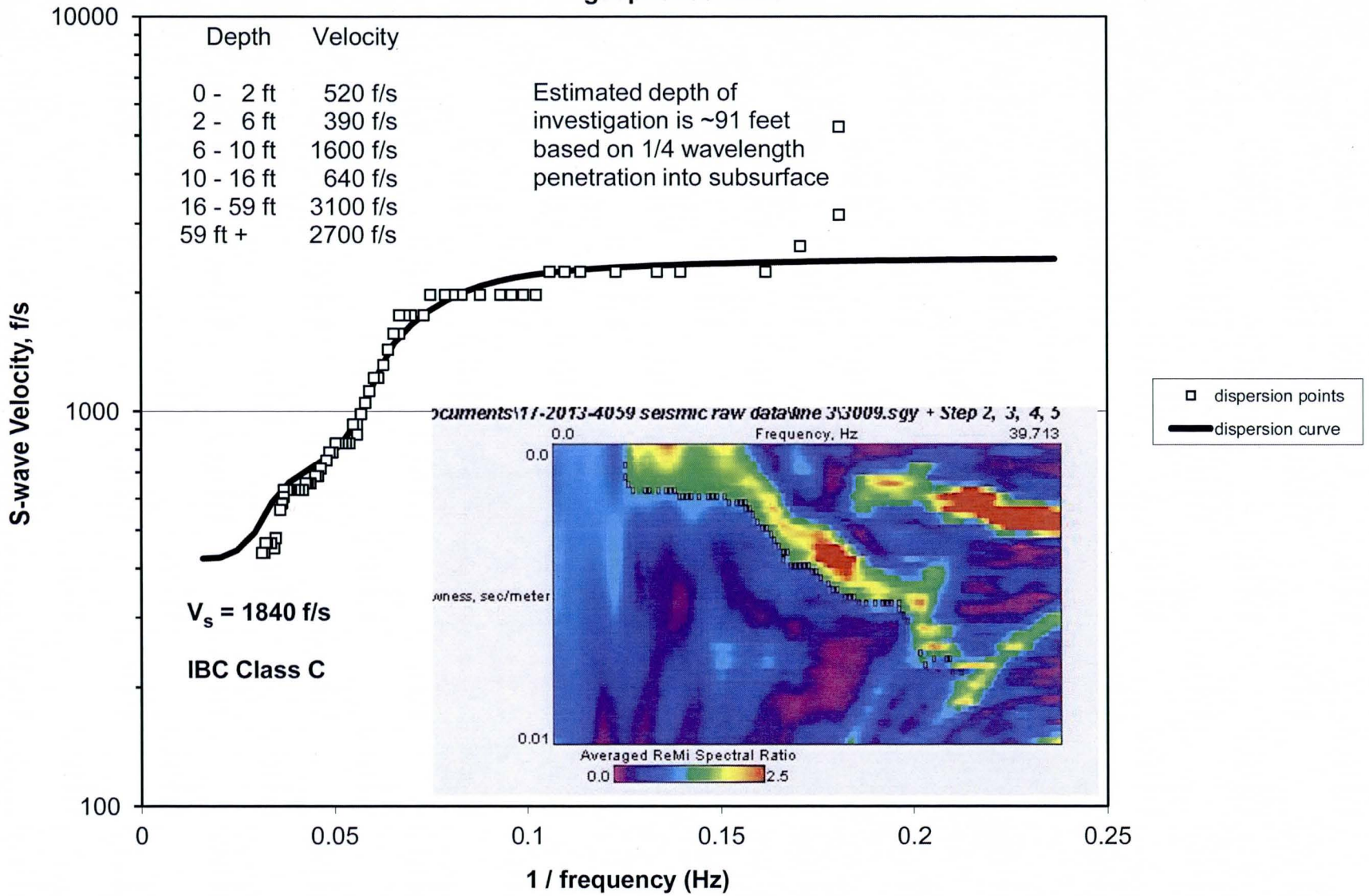

Refraction Microtremor S-wave Interpretation

Line 4A
geophones 1-12

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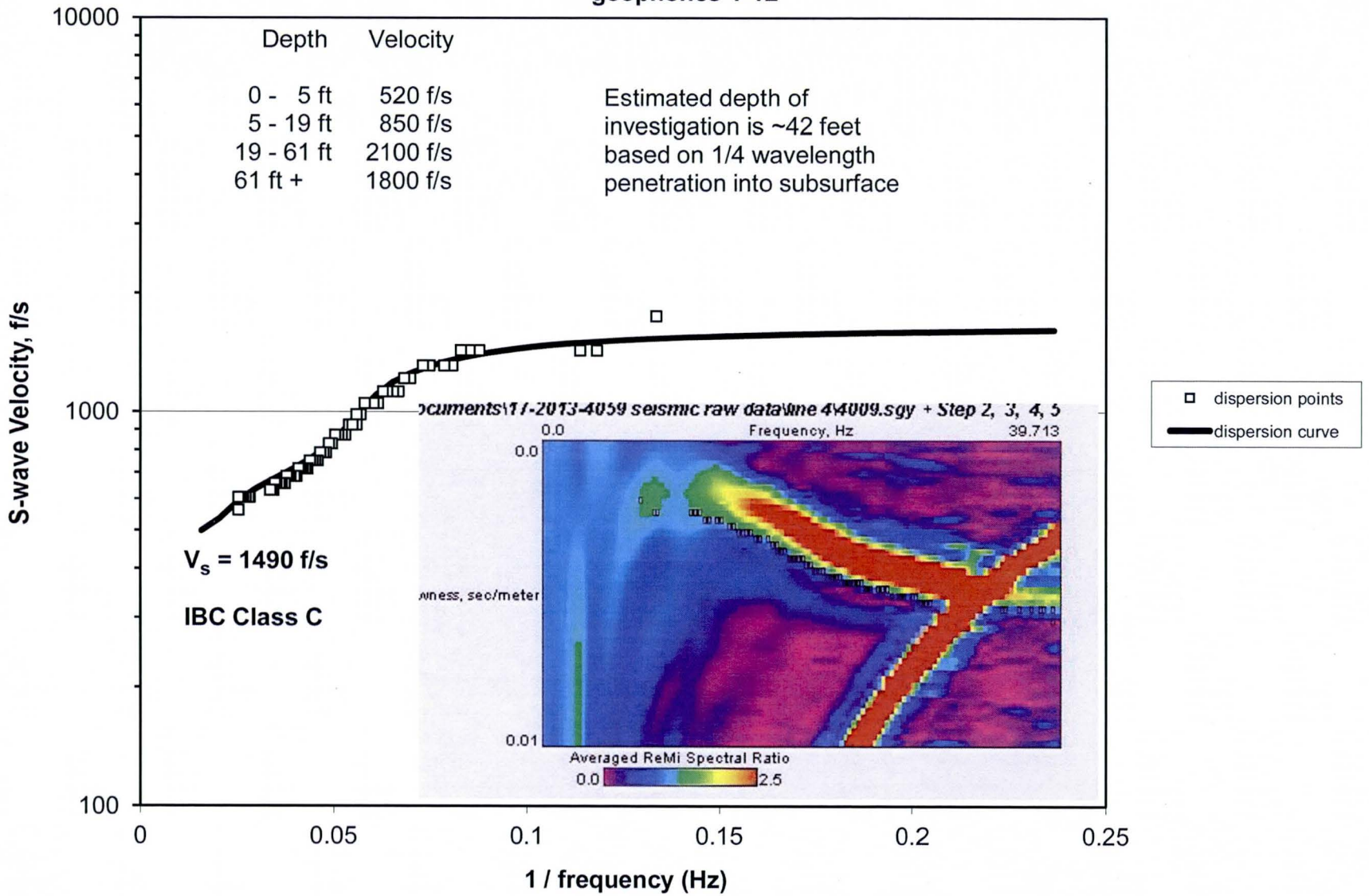
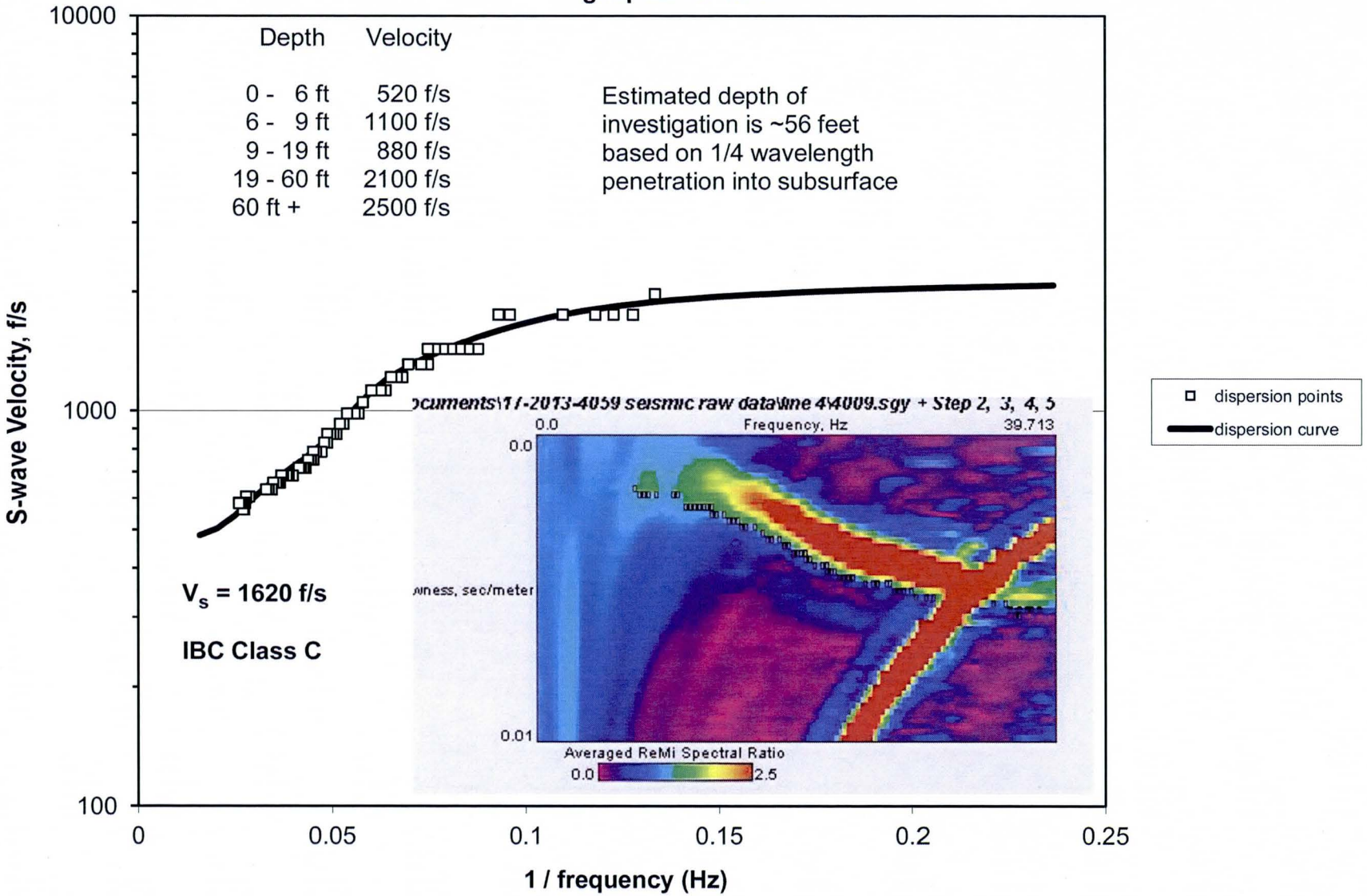


Refraction Microtremor S-wave Interpretation

Line 4B
geophones 12-23

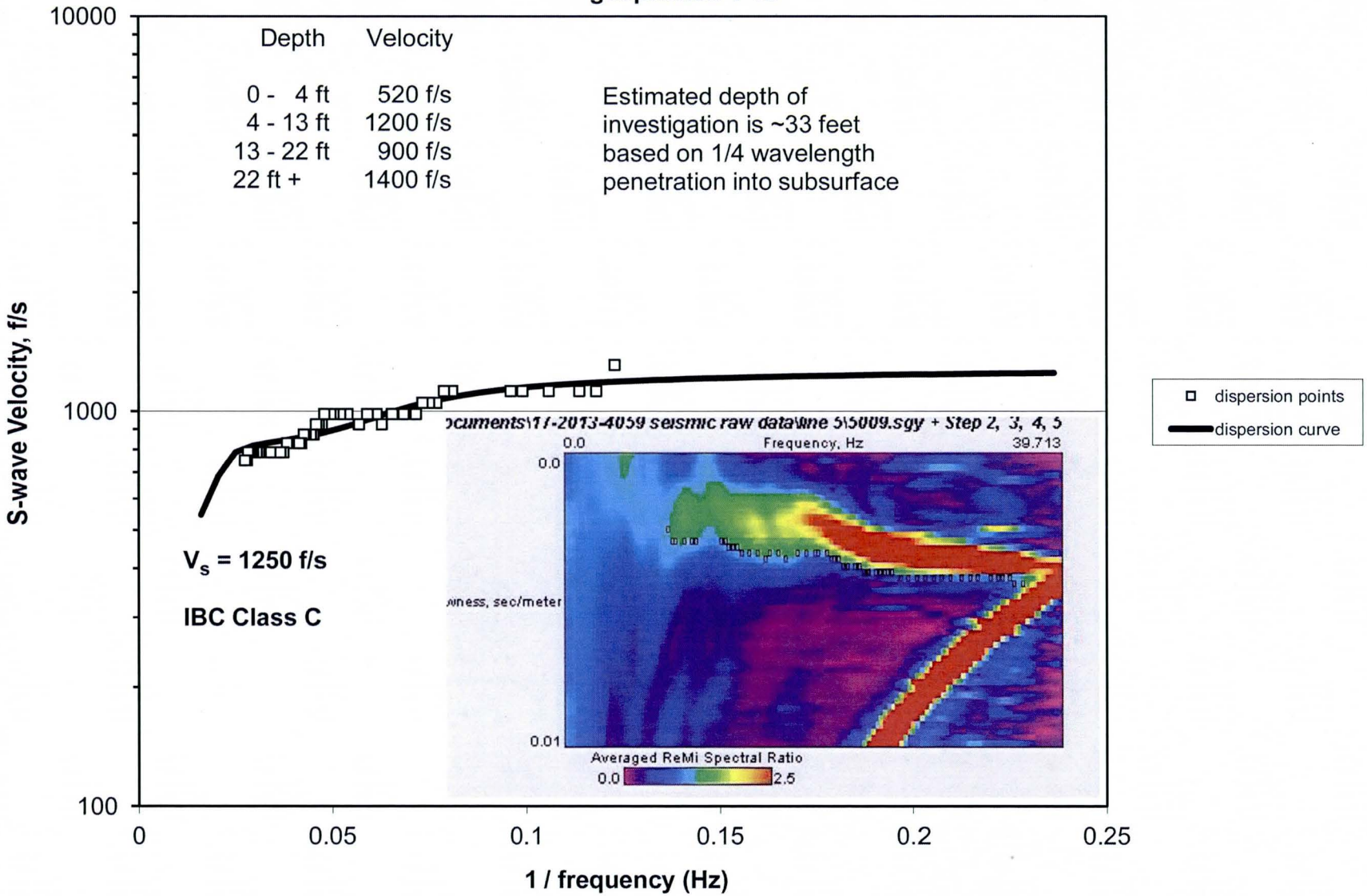
AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

Line 5A
geophones 1-12

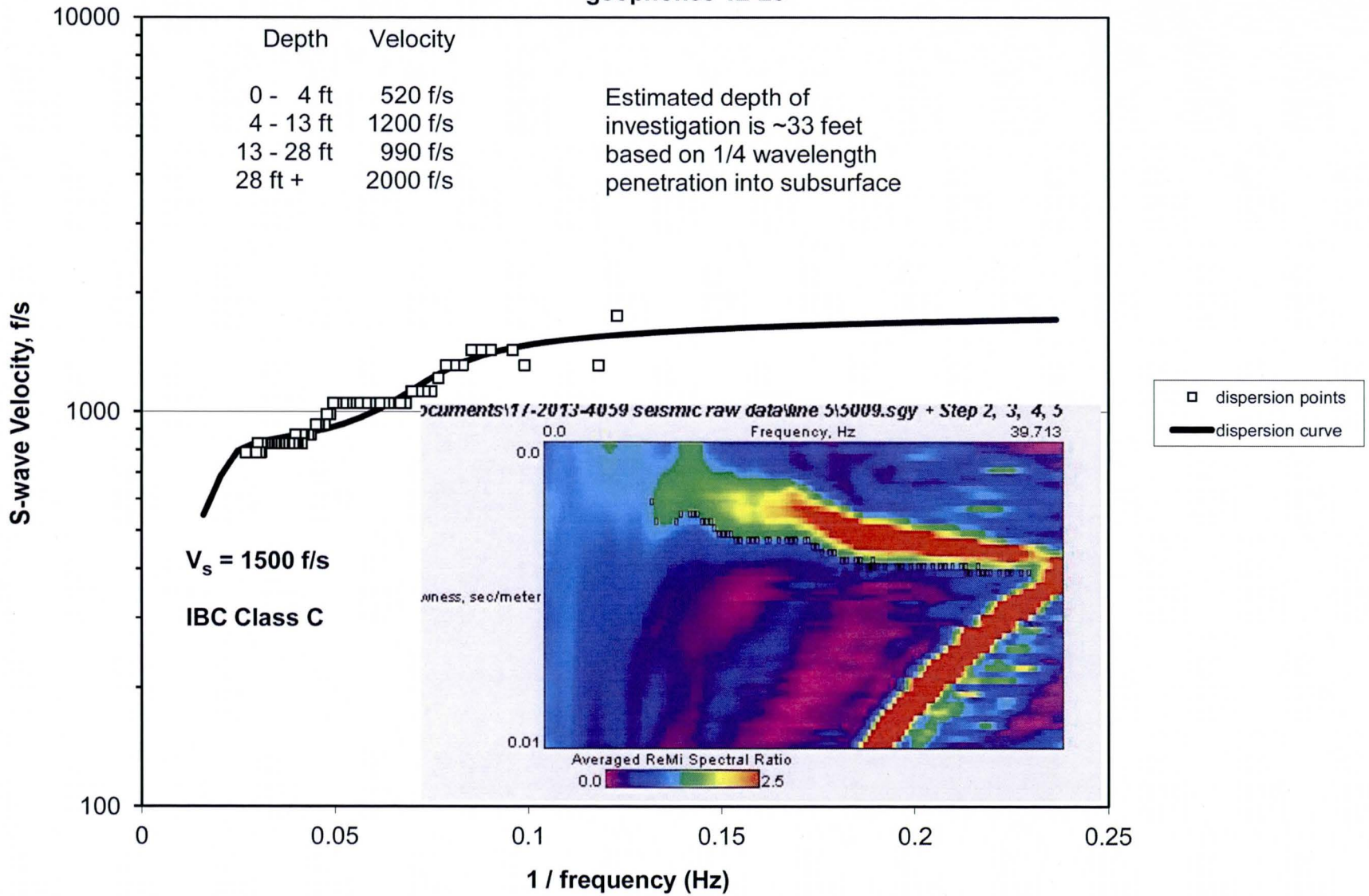
AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

Line 5B
geophones 12-23

AMEC Job No. 17-2013-4059



Refraction Microtremor S-wave Interpretation

Line 6A
geophones 1-12

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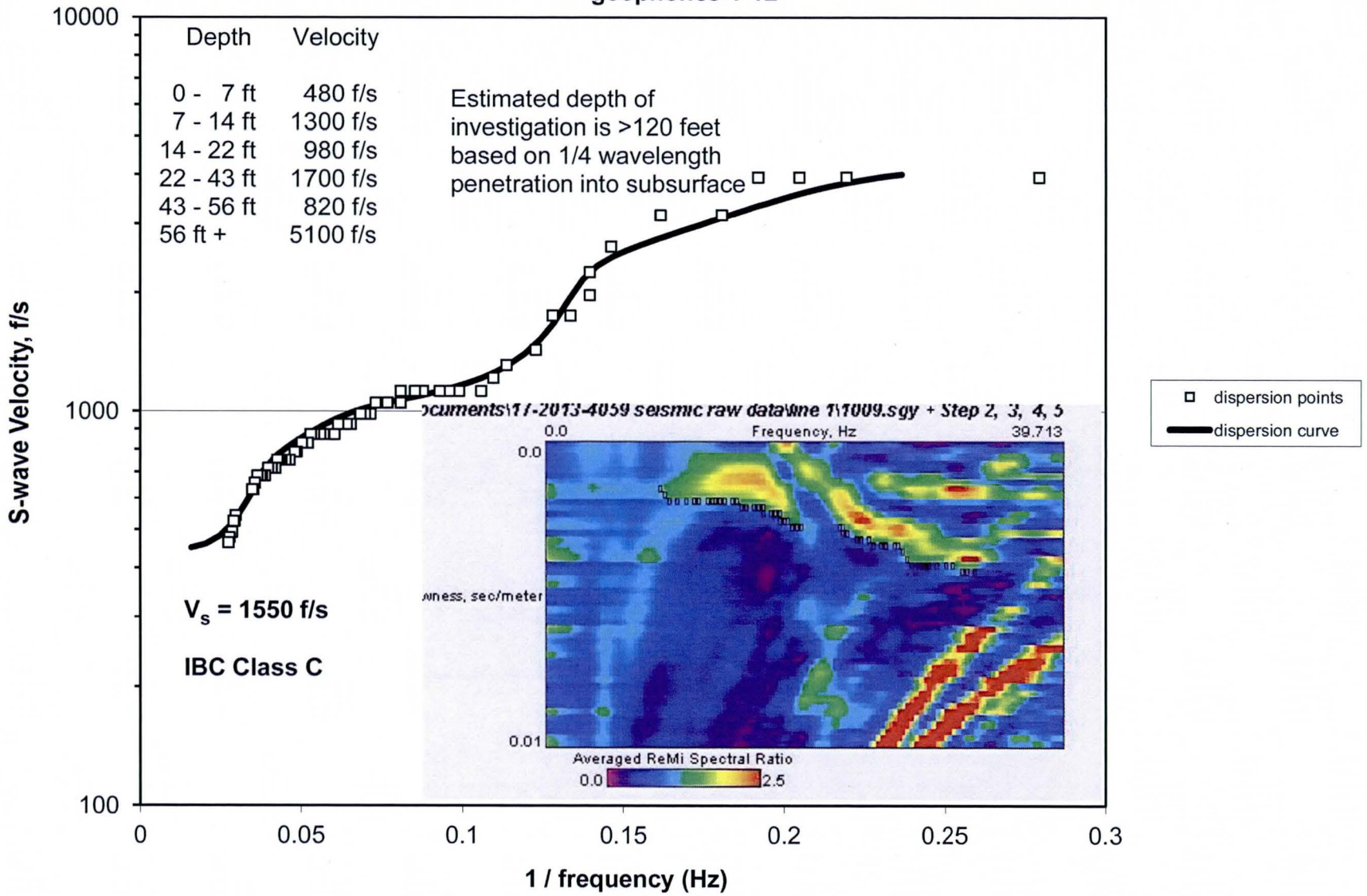

Refraction Microtremor S-wave Interpretation

Line 6B
geophones 12-23

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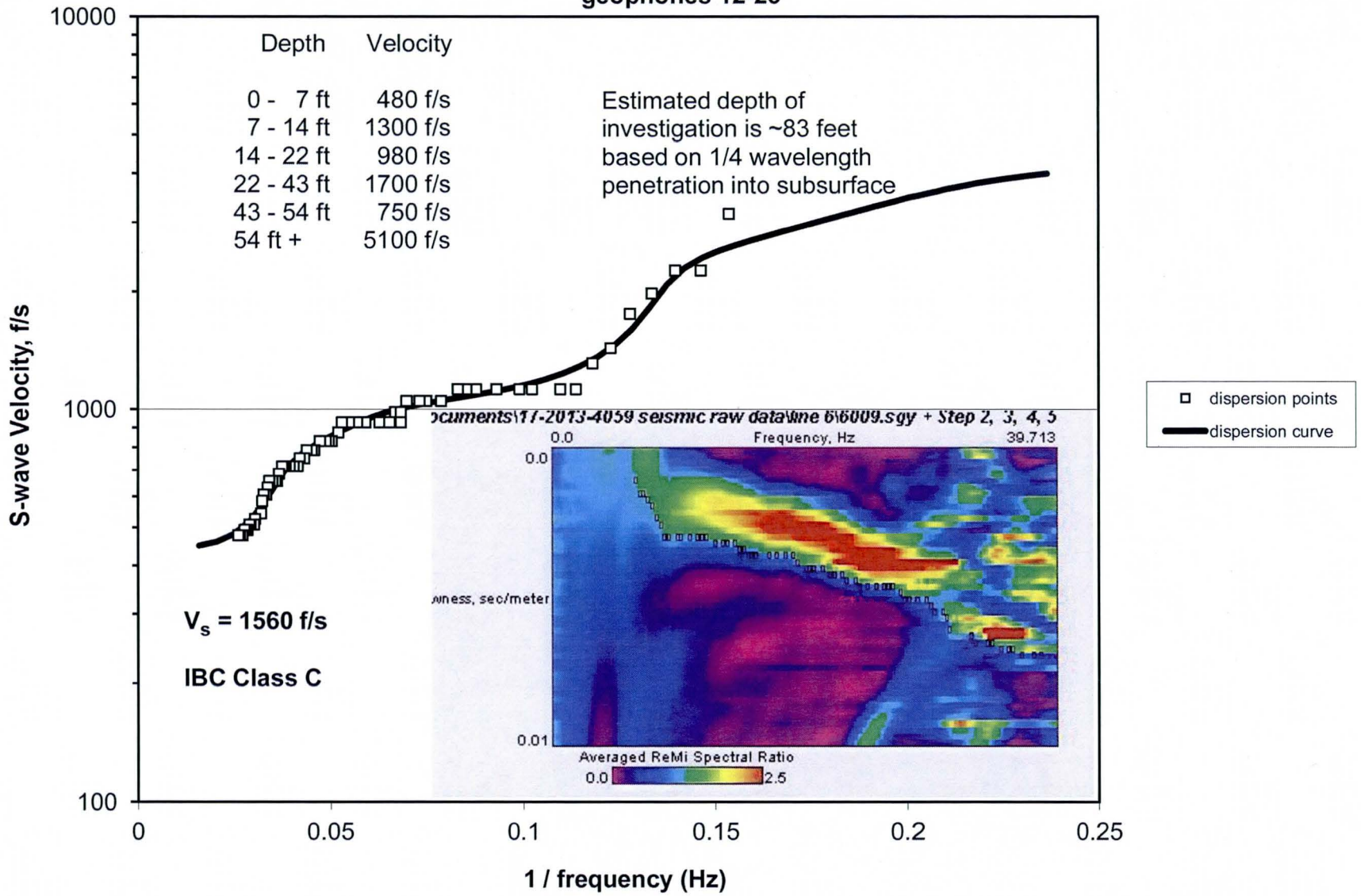


APPENDIX C

SOILS LABORATORY RESULTS

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
MATERIAL:	Soil	**DATE ASSIGNED:**	5/13/14
SAMPLE SOURCE:	SEE BELOW		

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

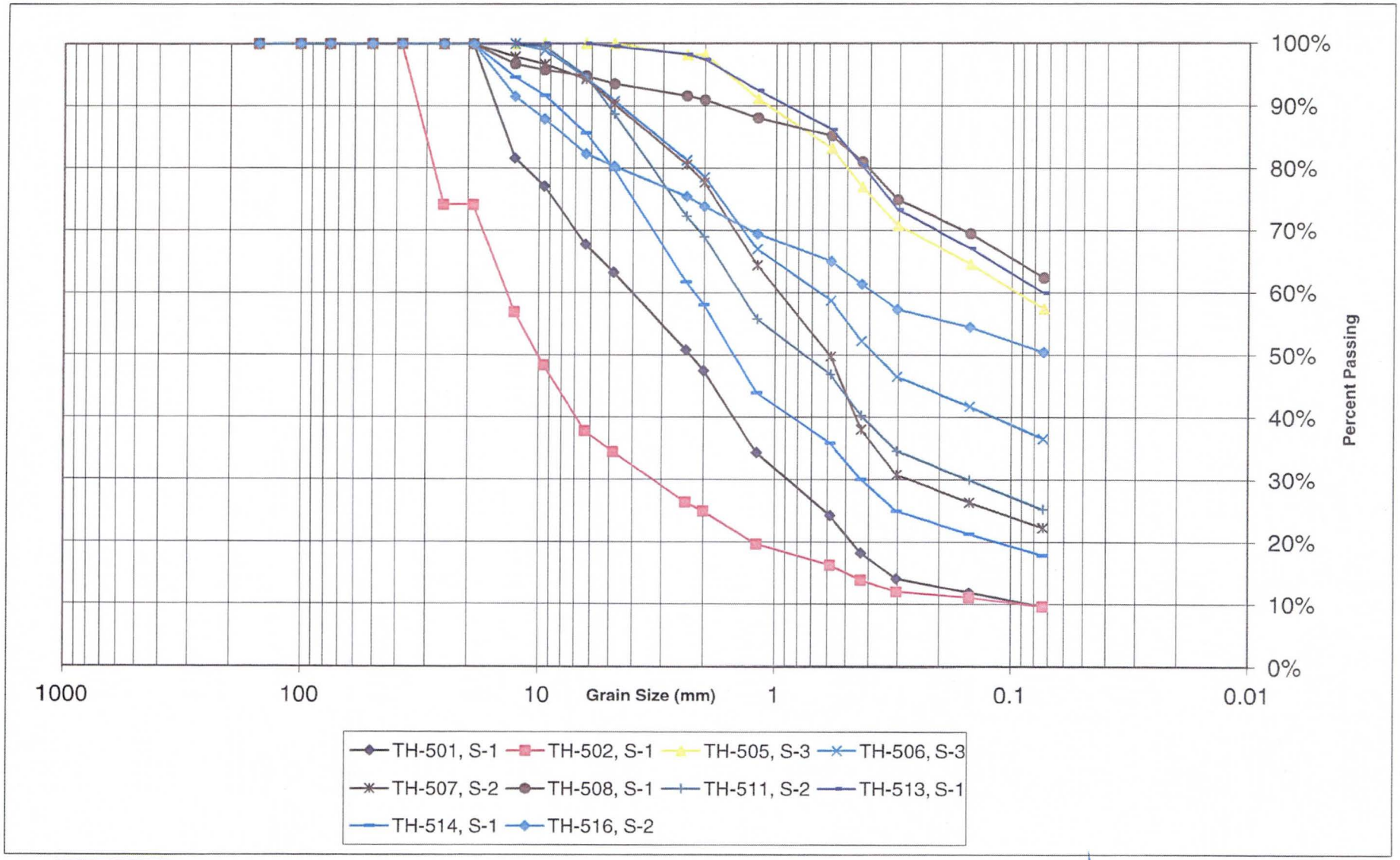
				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	**USCS**	**LL**	**PI**	**#200**	**#140**	**#100**	**#60**	**#40**	**#20**	**#10**	**#8**	**#4**	**1/4"**	**3/8"**	**1/2"**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**3"**	**6"**	**Lab #**
													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

AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
SAMPLE SOURCE:	SEE BELOW	**DATE ASSIGNED:**	5/13/14

MECHANICAL SIEVE ANALYSIS



AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project		**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az		**WORK ORDER NO:**	4
MATERIAL:	Soil		**DATE ASSIGNED:**	5/13/14
SAMPLE SOURCE:	SEE BELOW			

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

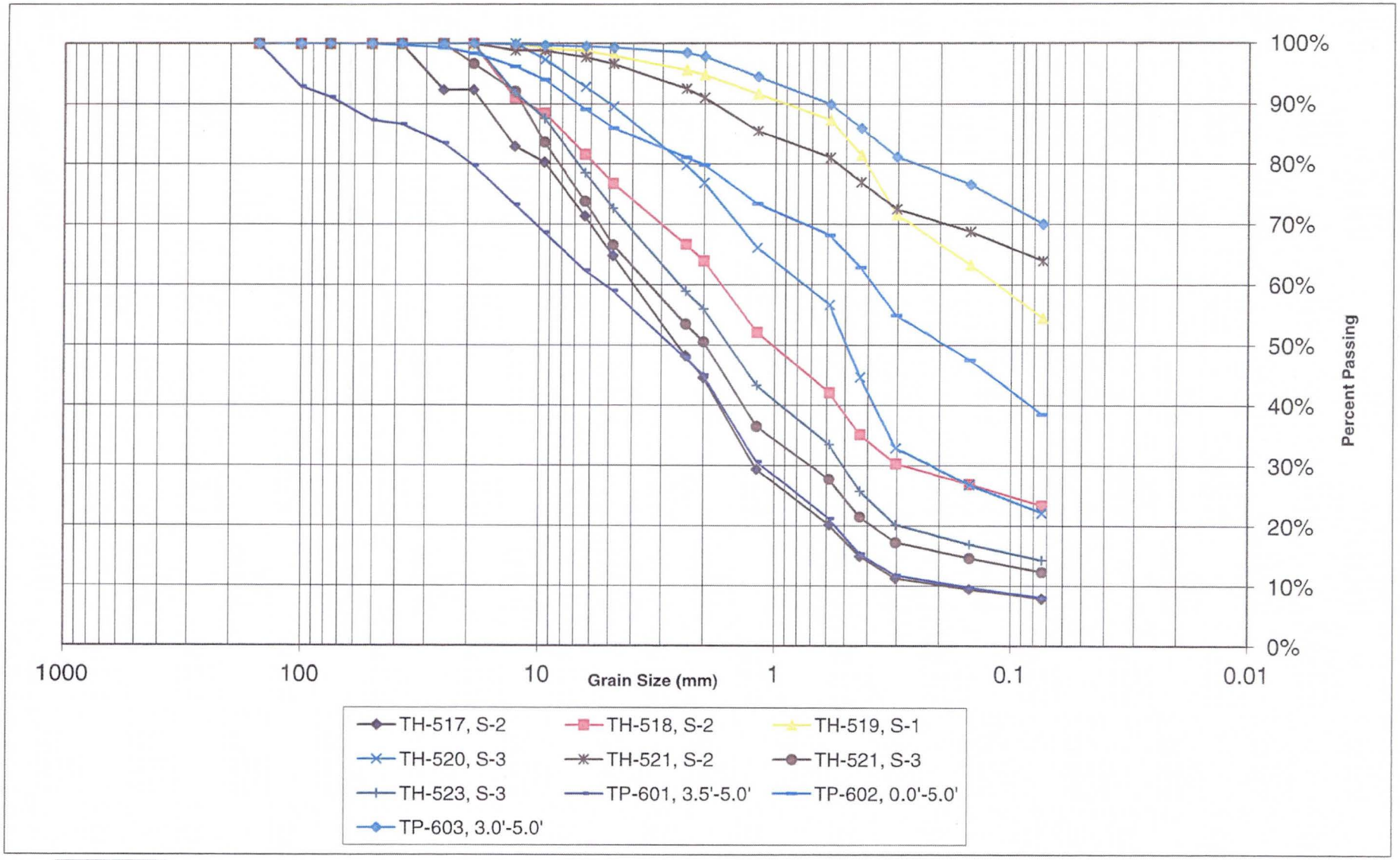
				Silt or	SAND							GRAVEL								COBBLES	
				Clay	Fine			Medium			Coarse	Fine				Coarse						
Location & Depth	**USCS**	**LL**	**PI**	**#200**	**#140**	**#100**	**#60**	**#40**	**#20**	**#10**	**#8**	**#4**	**1/4"**	**3/8"**	**1/2"**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**3"**	**6"**	**Lab #**
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

AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
SAMPLE SOURCE:	SEE BELOW	**DATE ASSIGNED:**	5/13/14

MECHANICAL SIEVE ANALYSIS



AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
MATERIAL:	Soil	**DATE ASSIGNED:**	5/13/14
SAMPLE SOURCE:	SEE BELOW		

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

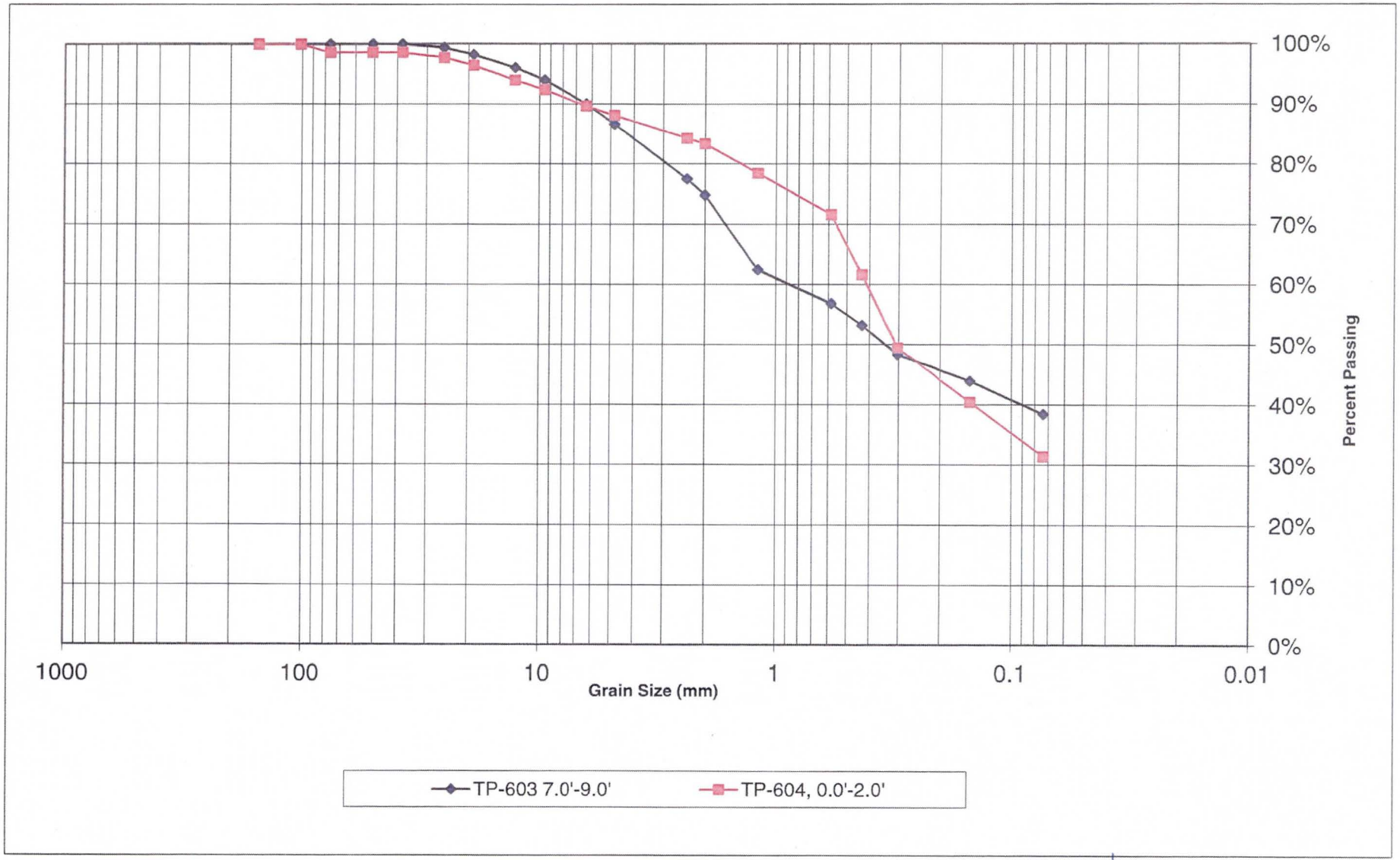
				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	**USCS**	**LL**	**PI**	**#200**	**#140**	**#100**	**#60**	**#40**	**#20**	**#10**	**#8**	**#4**	**1/4"**	**3/8"**	**1/2"**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**3"**	**6"**	**Lab #**
PERCENT PASSING BY WEIGHT																							
TP-603 7.0'-9.0'	SC	33	12	38	44	48	53	57	62	75	78	87	90	94	96	98	99	100	100	100	100	100	112
TP-604, 0.0'-2.0'	SM	NV	NP	31	40	49	62	72	78	83	84	88	90	92	94	97	98	99	99	99	100	100	114

AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
SAMPLE SOURCE:	SEE BELOW	**DATE ASSIGNED:**	5/13/14

MECHANICAL SIEVE ANALYSIS



AASHTO R18

REVIEWED BY

PROJECT:	McMicken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise, Az	**WORK ORDER NO:**	4
MATERIAL:	Native Soil	**LAB NO:**	See Below
SAMPLE SOURCE:	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%

AASHTO R18

REVIEWED BY

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
MATERIAL:	Soil	**DATE ASSIGNED:**	5/13/14
SAMPLE SOURCE:	SEE BELOW		

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

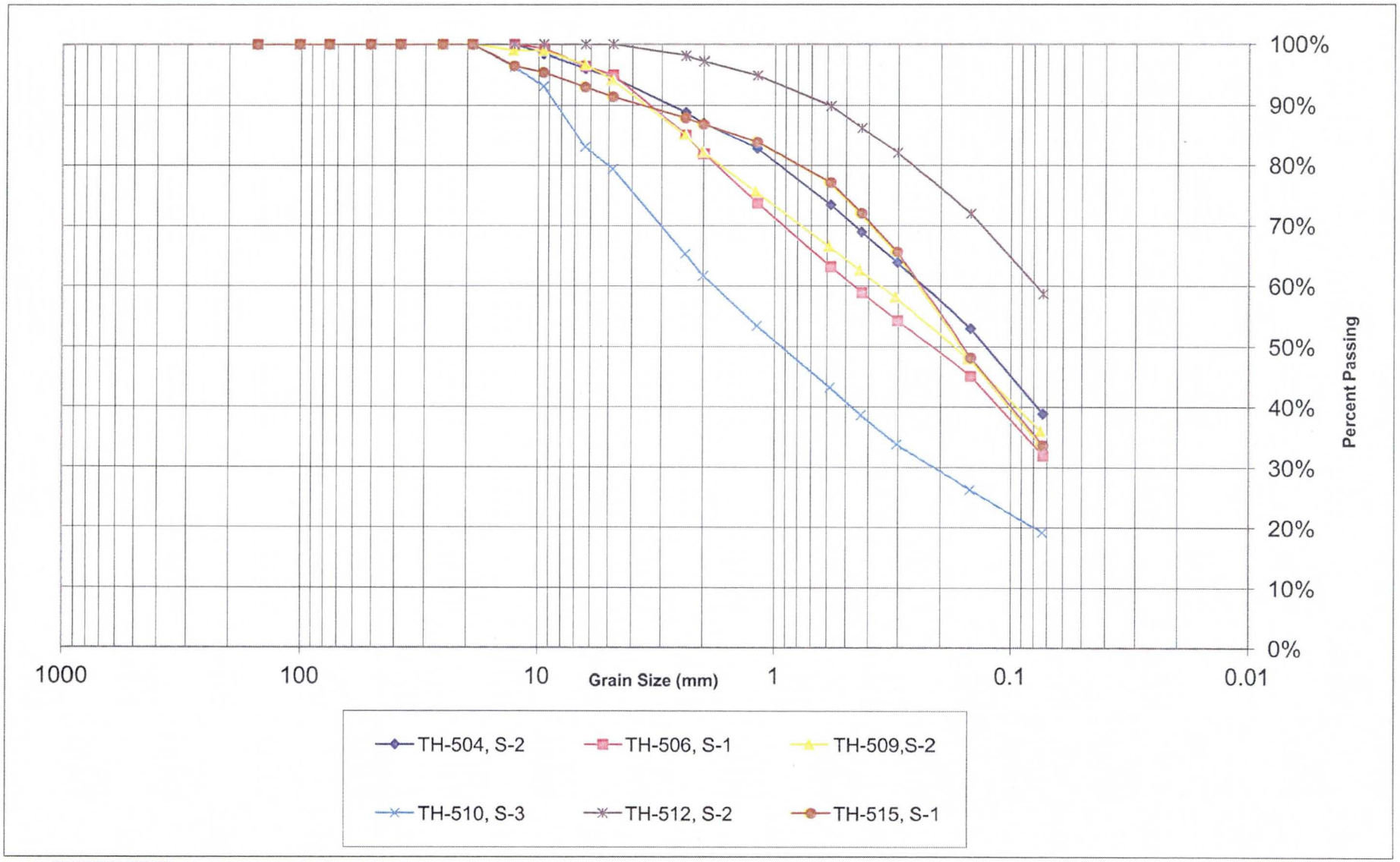
				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	**USCS**	**LL**	**PI**	**#200**	**#100**	**#50**	**#40**	**#30**	**#16**	**#10**	**#8**	**#4**	**1/4"**	**3/8"**	**1/2"**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**	**3"**	**6"**	**Lab #**
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	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	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	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	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	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	99

AASHTO R18

REVIEWED BY _____

PROJECT:	McMiken Dam Rehabilitation Project	**JOB NO:**	17-2013-4059
LOCATION:	Surprise Az	**WORK ORDER NO:**	4
SAMPLE SOURCE:	SEE BELOW	**DATE ASSIGNED:**	5/13/14

MECHANICAL SIEVE ANALYSIS



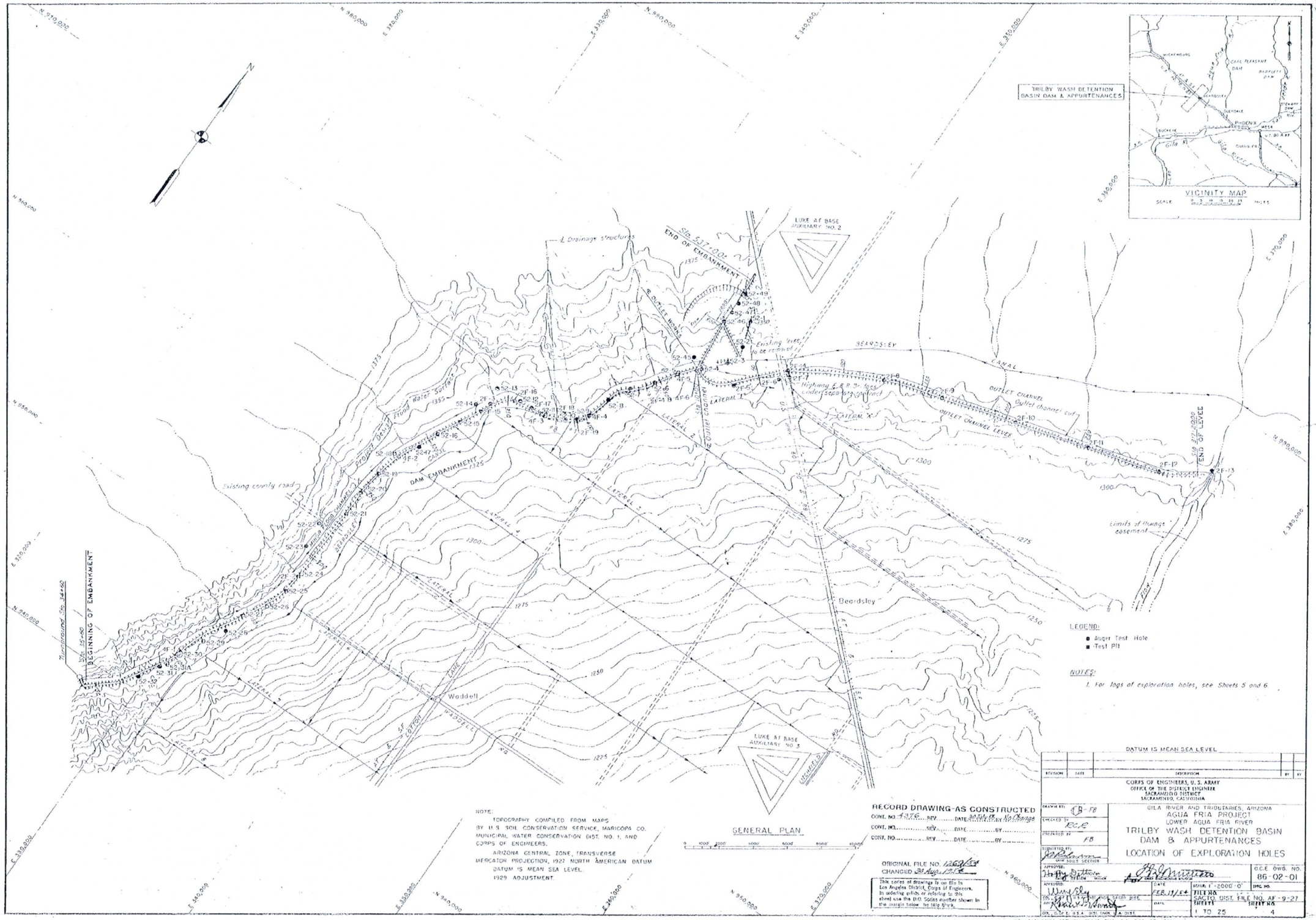
AASHTO R18

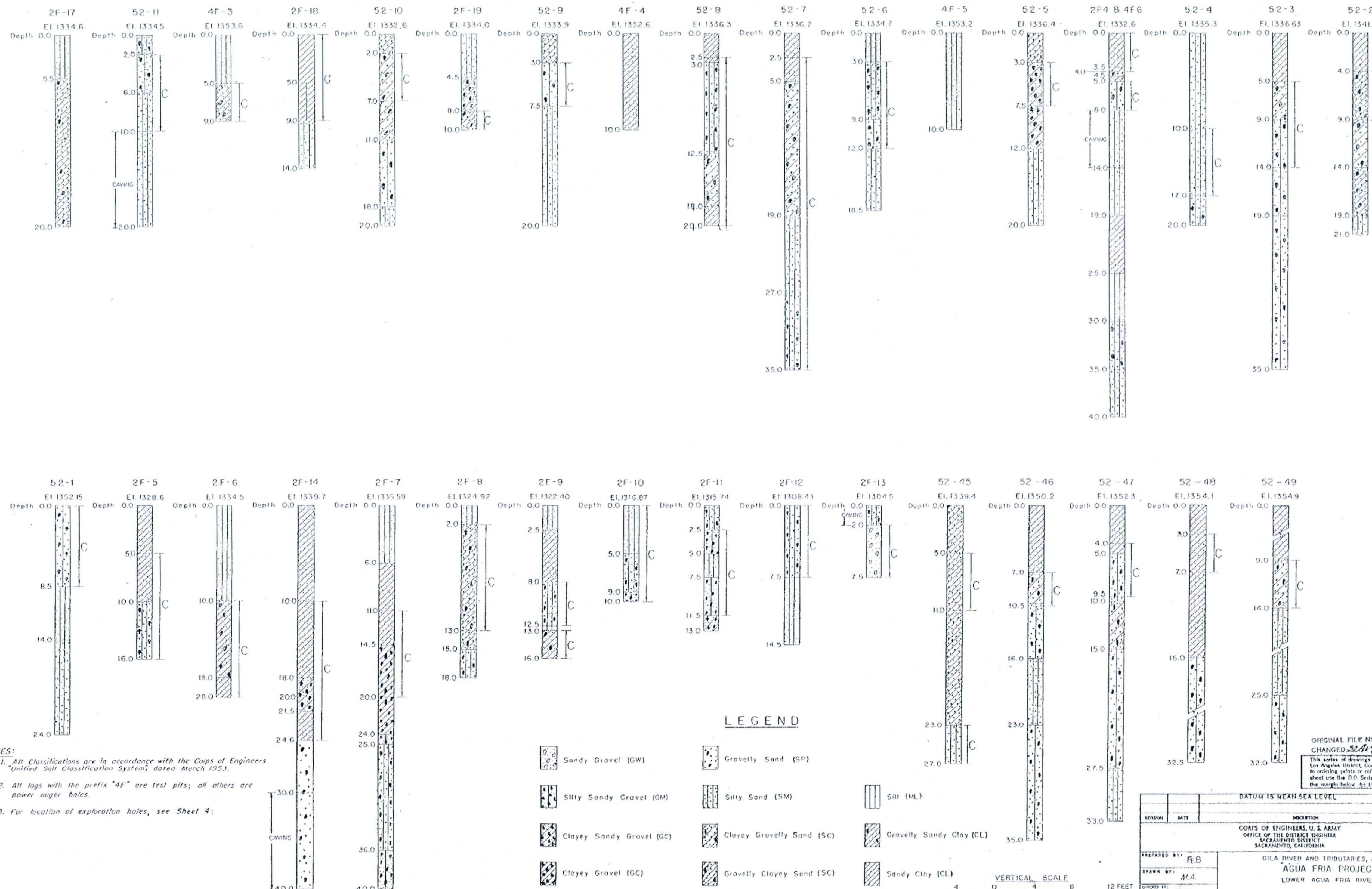
REVIEWED BY

APPENDIX D

HISTORIC GEOTECHNICAL DATA

CORPS OF ENGINEERS — U. S. ARMY





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

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

VERTICAL SCALE
4 0 4 8 12 FEET

RECORD DRAWING-AS CONSTRUCTED
CONT. NO. 4376 REV. DATE 30 July 58 BY No Change
CONT. NO. REV. DATE BY
CONT. NO. REV. DATE BY

ORIGINAL FILE NO. 126384
CHANGED 30 Aug. 1958

This series of drawings is on file in Los Angeles District, Corps of Engineers. In ordering prints or refering to this sheet use the D.O. Series number shown in the margin below the title block.

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA

PREPARED BY: FEB
DRAWN BY: M.A.
CHECKED BY: RCR
SUBMITTED BY: [signature] CHIEF SOILS SECTION
APPROVED: [signature] CHIEF DESIGN BRANCH
[signature] CHIEF ENGINEERING DIVISION
APPROVED: [signature] COL., C. OF E., U.S.A., DIST. ENGR., SACTO. DIST.
APPROVED: [signature] COL., C. OF E., U.S.A., DIST. ENGR., L.A. DIST.

GILA RIVER AND TRIBUTARIES, ARIZONA
AGUA FRIA PROJECT
LOWER AGUA FRIA RIVER

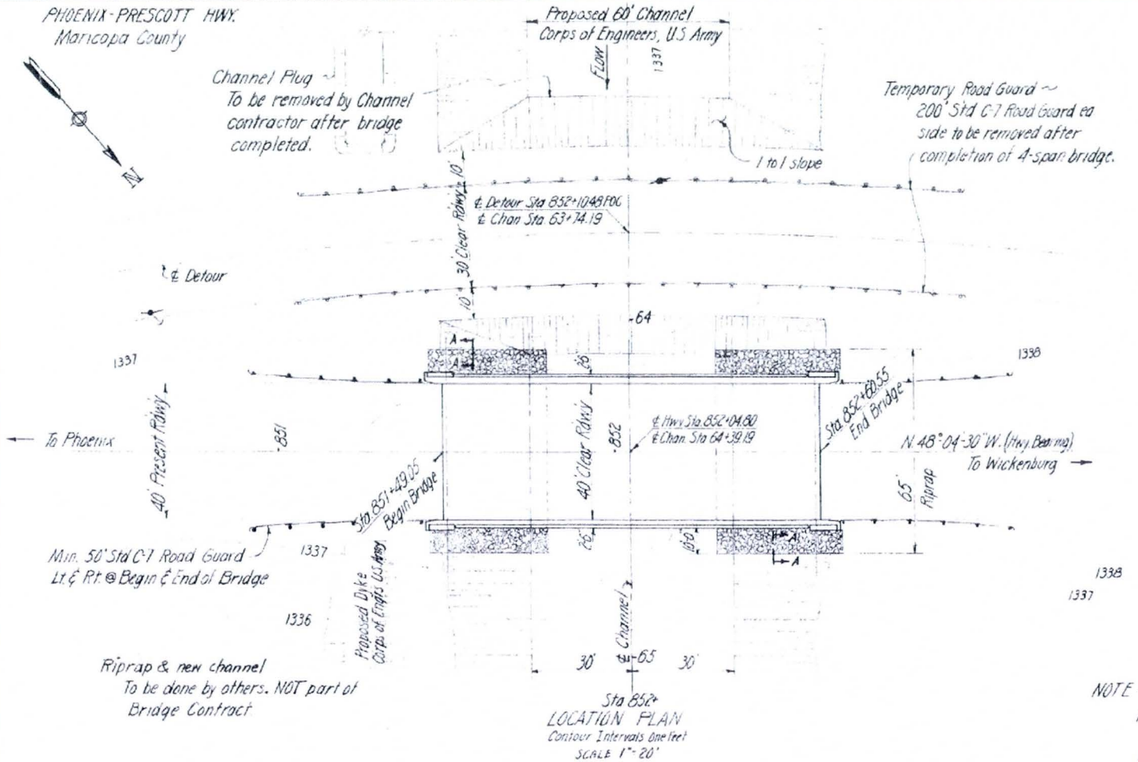
TRILBY WASH DETENTION BASIN DAM AND APPURTENANCES LOGS OF EXPLORATION HOLES

O.C.E. DWG. NO. 86-02-01
DATE: FEB. 19/54
SCALE: 1" = 4' Vert.
SPEC NO.
FILE NO. SACTO. DIST. FILE NO. AF-9-27
SHEETS 1 to 25
SHEET NO. 6

TO ACCOMPANY SPECIFICATIONS ENG-04-353-58-141

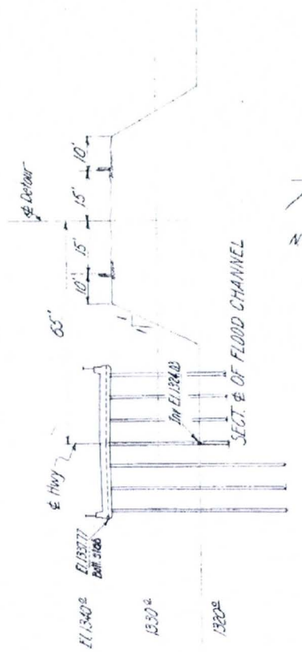
FILE NO. (D.O. SERIES) 151/6

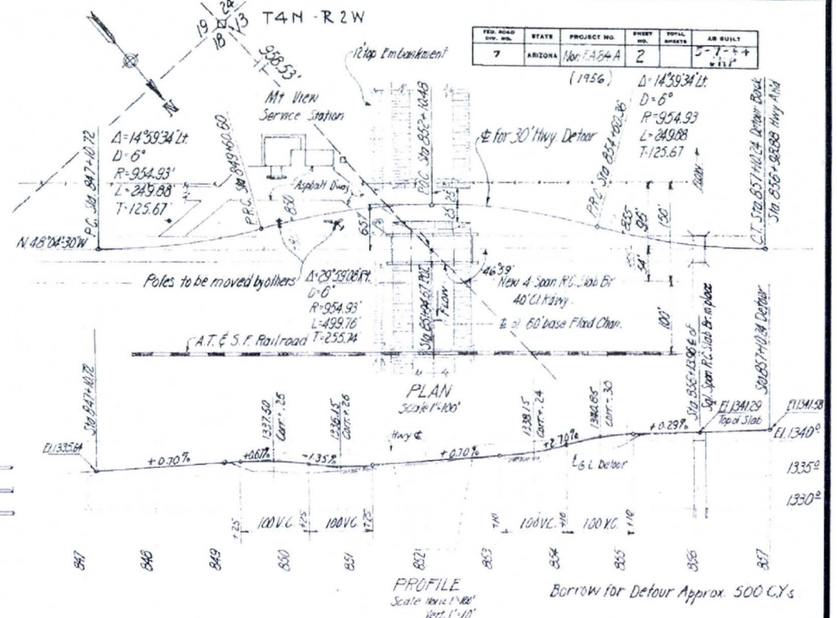
PHOENIX - PRESCOTT HWY.
Maricopa County



LOCATION PLAN
Contour Intervals one foot
SCALE 1" = 20'

Riprap & new channel
To be done by others. NOT part of Bridge Contract





FED. ROAD DIV. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZONA	Ver. FA 84-A	2		5-7-54 W.E.H.

NOTE ~ Contract shall include —
New 4 Span Cont. R.C. Slab Bridge constructed to grade of present Hwy.
Construction, maintenance and obliteration of detour
Furnishing & maintenance of all necessary barricades, signs, lights, etc.
All necessary fill widening, pavement patching and placing of roadguard @ ends of new bridge.

GENERAL NOTES ~

Construction - Standard Specifications Arizona Highway Dept. Edition of 1948.

Design: A.A.S.H.O. Specifications 1953 revised to date Loading Class H20-S16-1944.

Stresses — f_s = 20,000 #/in² f_c = 1,200 #/in² n = 10 Class D Concrete
f_s = 20,000 #/in² f_c = 1,000 #/in² n = 12 Class A Concrete

No wearing surface allowance in deck slab design.

Reinforcing steel shall be intermediate grade and shall conform to A.A.S.H.O. Designation M 31-47-48.

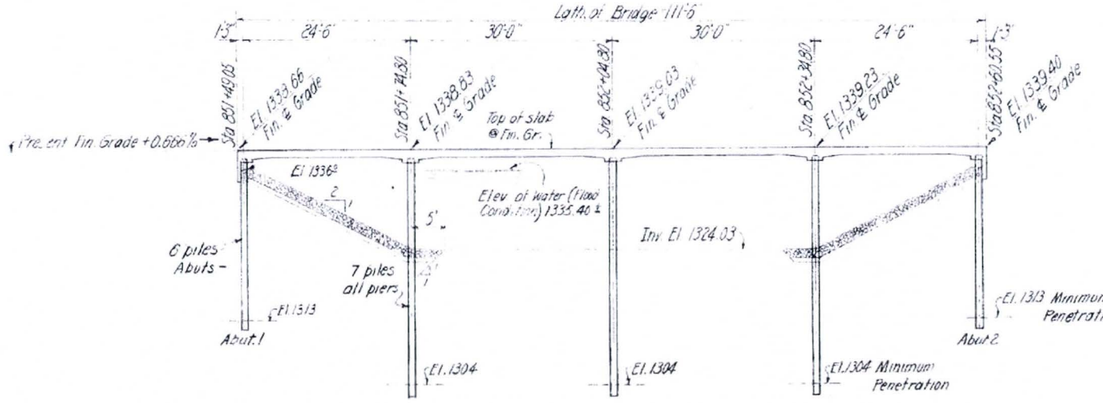
Steel H piling shall conform to A.S.T.M. Spec. A-7. f_s 18000 #/in².

All welding shall conform to American Welding Society Specifications for Welded Highway & Railway Bridges.

Forms shall be cambered as per Std Specs. page #135.

Curbs shall be poured to grade without camber after falsework has been struck.

Paint & painting shall conform to Standard Specs.
Piling - See page 184
Field: 1st coat paint #1A or #1B
2nd coat paint #3
3rd coat paint #10



SECTION OF ℄ ROADWAY
SCALE 1"=10'

SECTION A-A
Scale ¾"=1'0"

PILE NOTE ~

All piles shall be 10BP42" Estimated Length of piles 25' for Abutments 35' for Piers.

Excavation for Abutment concrete shall be made after piles are in place.

APPROXIMATE QUANTITIES

ITEM	Std No	Sheet No	Struct. Excav. C.Y.	Conc. Class A	C.I. Class D	Reinf. Steel Lbs.	Alum. Hdrl Lin. Ft.	Steel H Piling No	Steel H Piling Lin. Ft.
Abuts 1 & 2	Spec	3	60	10.52				12	300.00
Piers 1, 2 & 3	Spec	3						21	735.00
Deck	Spec CS-2-20	3 & 5			239.06	55615			
Handrail	HA-3	4					213.00		
TOTALS			60	10.52	239.06	55615	213.00	33	1035.00

See Std HA-3 Sheet 3 of 4 for Handrail Details.
See Std CS-2-20 Sheet 4 of 4 for Deck Details.

ALL CONCRETE CLASS D EXCEPT AS NOTED

		DAYS
LAYOUT	R.A.H	3/54
DESIGN	W.E.H	9/54
ARCHITECTURE		
DRAWN	W.E.H	3/15/54
TRACED		
CHECKED	R.A.L.	4-10-54
	W.E.H	4-12-54
SHEET NO.	1 OF 4	

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA 852+
BEARDSLEY FLOOD CHANNEL BRIDGE
LOCATION DETAILS

BRIDGE NUMBER 473 | U60-138.09

REGISTERED CIVIL ENGINEER — CERTIFICATE EXPIRES DEC. 31, 19 54 — ARIZONA, U.S.A. — BRIDGE ENGINEER

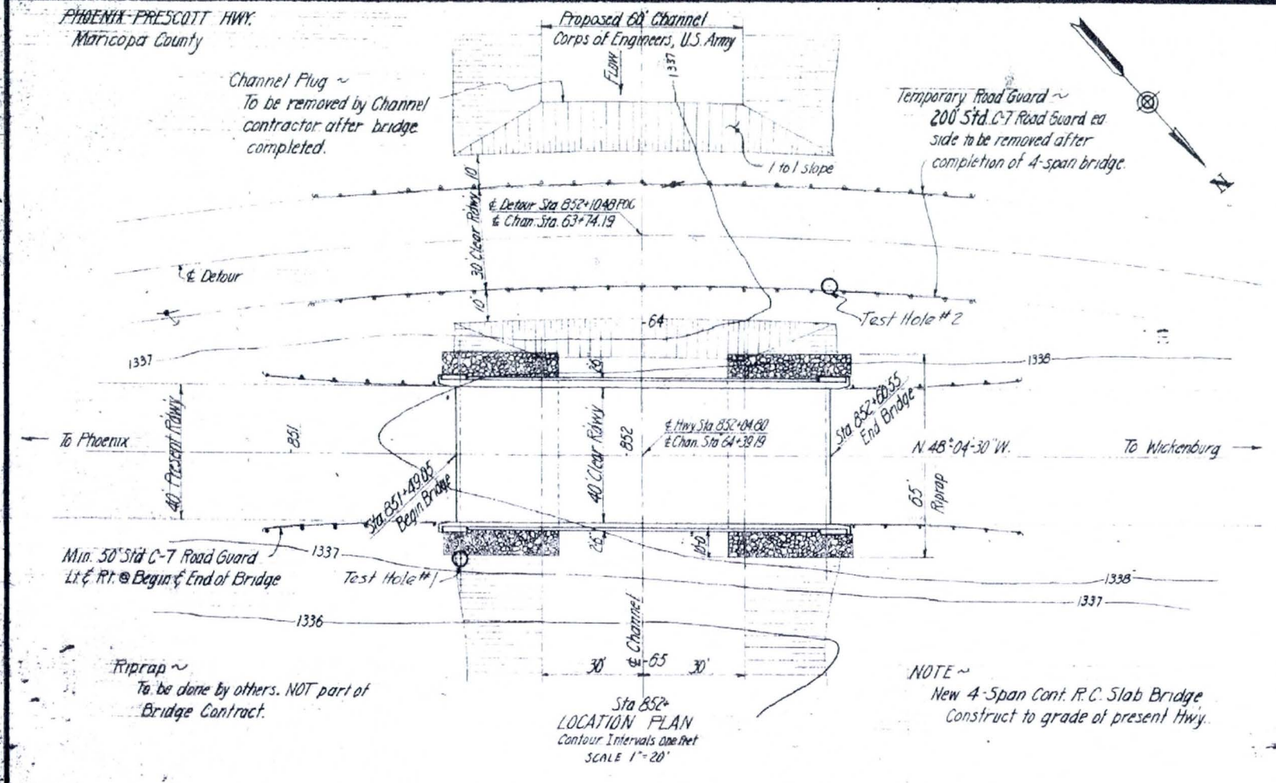
Refer Arizona Dam files - M.C.W.C.D. #1

(Ver. FA 84-A (1956))

FED. ROAD DIV. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZONA	Non FA 84-A	2A		

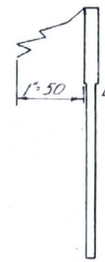
(1956)

PHOENIX-PRESCOTT HWY.
Maricopa County

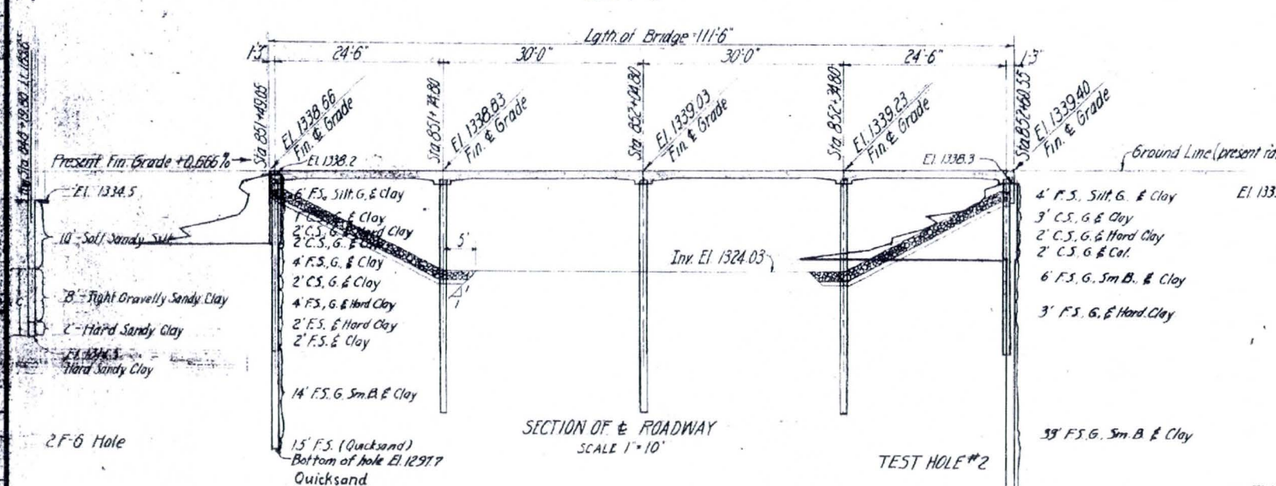


LEGEND

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



Blows per foot required to drive casing.



2F-6 Hole

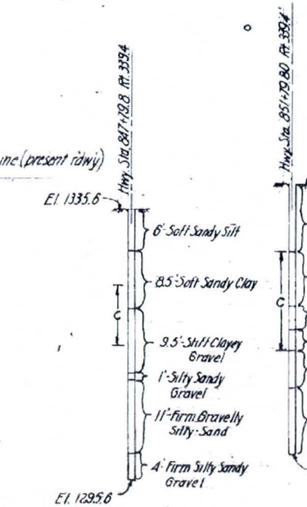
TEST HOLE #1

SECTION OF ℄ ROADWAY
SCALE 1" = 10'

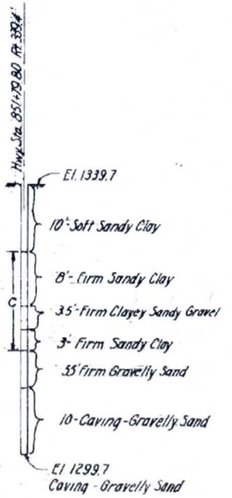
TEST HOLE #2

Note: Holes #1 & #2 made by State Concrete Rotary Drill Oct, 1954

Note: Test hole data for holes 2F-6, 2F-7, & 2F-14 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.



2F-7 Hole



2F-14 Hole

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

		DATE
LAYOUT	R.A.H.	3/54
DESIGN	W.T.H.	3/54
ARCHITECTURE		
DRAWN	W.T.H.	3/31/54
TRACED	W.R.J.	4-8-54
CHECKED	R.J.	4-8-54
SHEET NO.	1A OF 4	

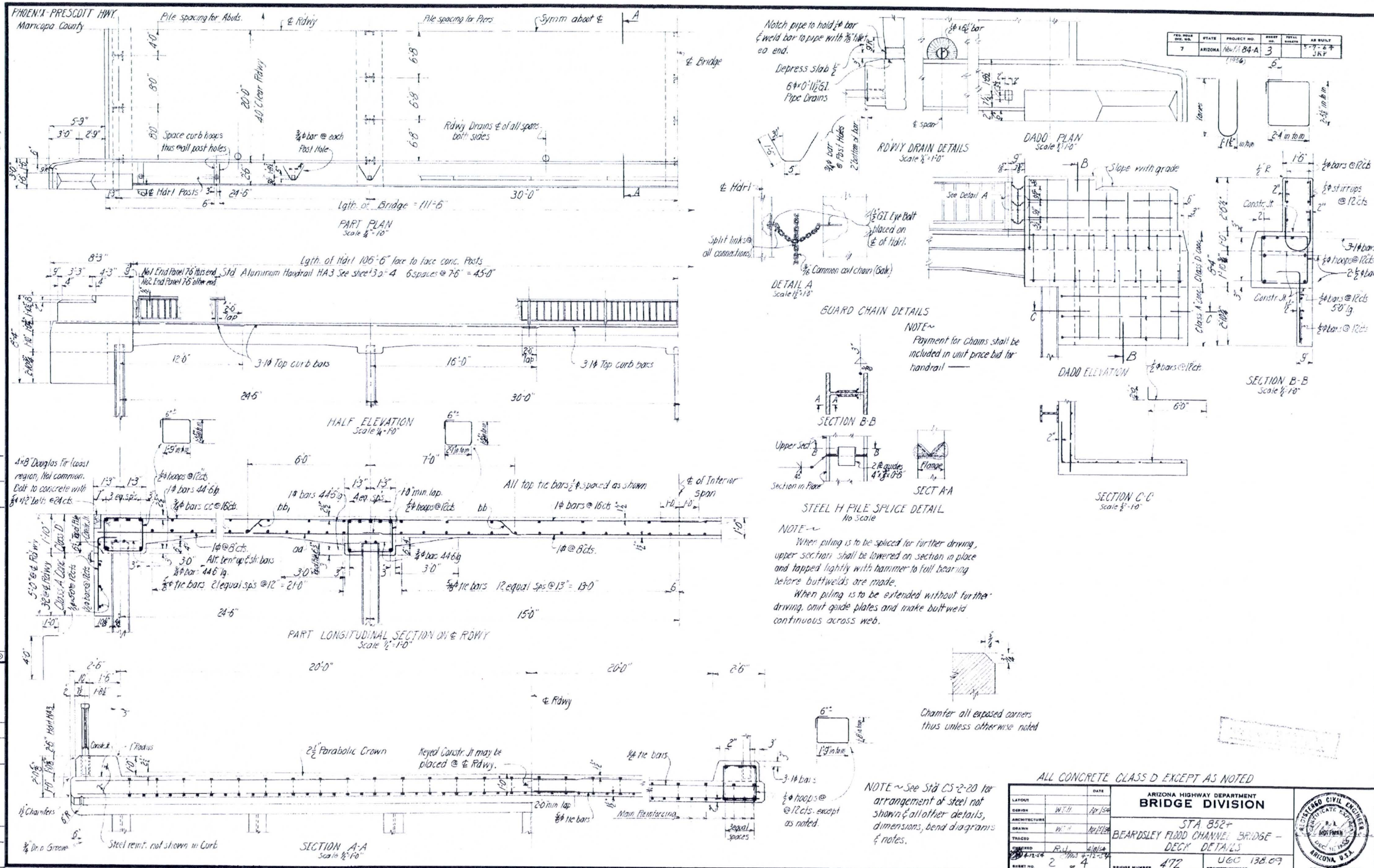
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA 852+
BEARDSLEY FLOOD CHANNEL BRIDGE
TEST HOLE DATA

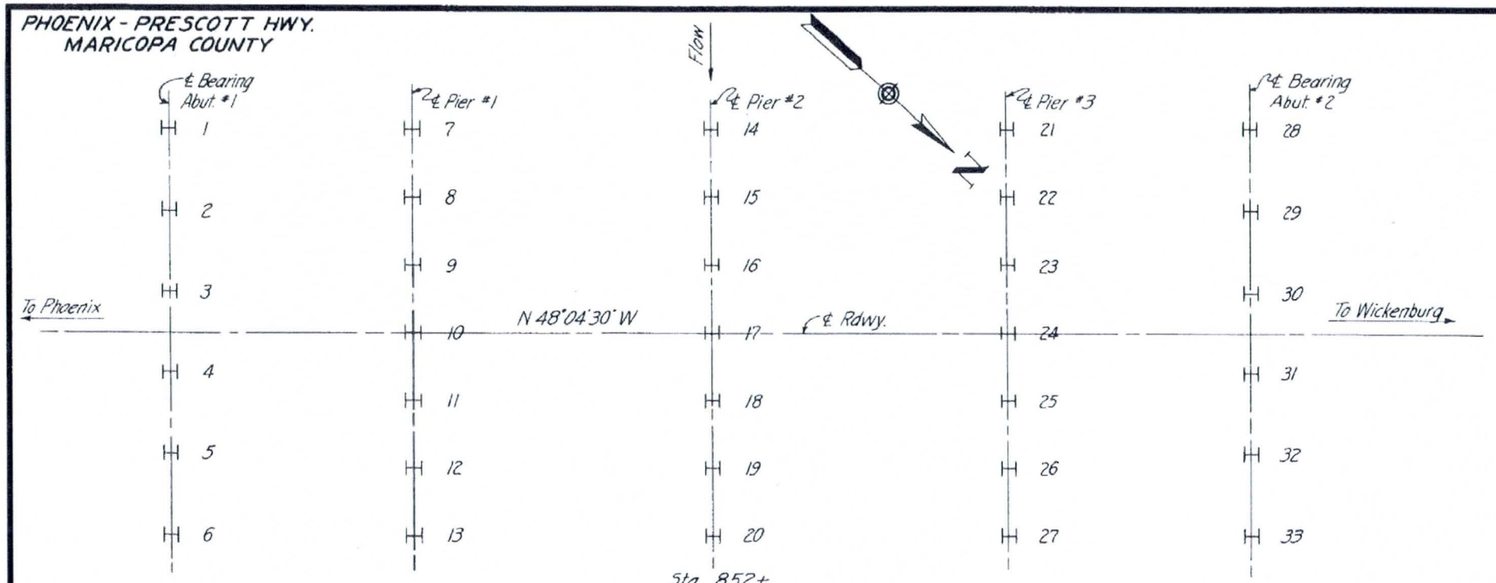
BRIDGE NUMBER 472 | U60 138.09

BRIDGE ENGINEER

Non FA 84-A (1956)


PHOENIX-PRESCOTT HWY
Maricopa County
PART PLAN
Lgth. of Bridge = 111'-6"
HALF ELEVATION
Lgth. of Hdrl 106'-6" face to face conc. Posts
PART LONGITUDINAL SECTION ON ¢ RDWY
SECTION A-A
RDWY DRAIN DETAILS
DADO PLAN
DADO ELEVATION
SECTION B-B
SECTION C-C
GUARD CHAIN DETAILS
DETAIL A
NOTE ~ Payment for chains shall be included in unit price bid for handrail
STEEL H PILE SPLICE DETAIL
No Scale
NOTE ~ When piling is to be spliced for further driving, upper section shall be lowered on section in place and tapped lightly with hammer to full bearing before buttwelds are made.
When piling is to be extended without further driving, omit guide plates and make buttweld continuous across web.
Chamfer all exposed corners thus unless otherwise noted
NOTE ~ See Std CS-2-20 for arrangement of steel not shown & all other details, dimensions, bend diagrams & notes.
ALL CONCRETE CLASS D EXCEPT AS NOTED
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
STA 852+
BEARDSLEY FLOOD CHANNEL BRIDGE - DECK DETAILS
472
2 of 4
ARIZONA
84-A
(1956)
BRIDGE ENGINEER

PHOENIX - PRESCOTT HWY.
MARICOPA COUNTY



Sta. 852+
BEARDSLEY FLOOD CHANNEL BRIDGE

H Vertical Pile
All piles 10BP42

FED. ROAD DIV. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZONA	Non FA84A	3A		5-1-57 JKP

(1956)

HAMMER DATA :

Type	Single Acting
Make	Vulcan No. 1
Weight of Ram	5,000 Lbs.
Stroke	3.0 feet
Area of Piston	
Effective Cylinder Pressure	

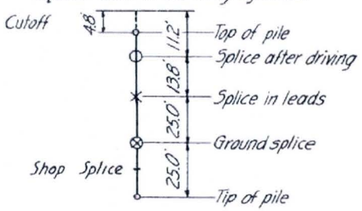
For single acting hammer

$$P = \frac{2WH}{s+0.1}$$

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



PILE LEGEND

CUTOFF LEGEND

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

PAY QUANTITIES

Item	Description	Unit	As per plans 10BP42	As built 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

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.

Pile number	Abutment #1 1 s	2 s	3 30 s	4 s	5 s	6 s	Pier #1 7 32 s	8 28 s	9 s	10 s	11 23 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-5 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	33.00	33.00
Elevation tip of pile	1312.51	1313.02	1308.96	1312.38	1312.75	1312.62	1300.42	1300.11	1300.01	1303.57	1303.68

Pile number	Pier #1 (cont.) 12 9 s	13 s	Pier #2 14 s	15 s	16 s	17 s	18 3 s	19 7 s	20 8 s	Pier #3 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-5 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	1303.05

Pile number	Pier #3 (cont.) 23 s	24 s	25 s	26 s	27 s	Abutment #2 28 s	29 s	30 s	31 s	32 s	33
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-5 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 3.25
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

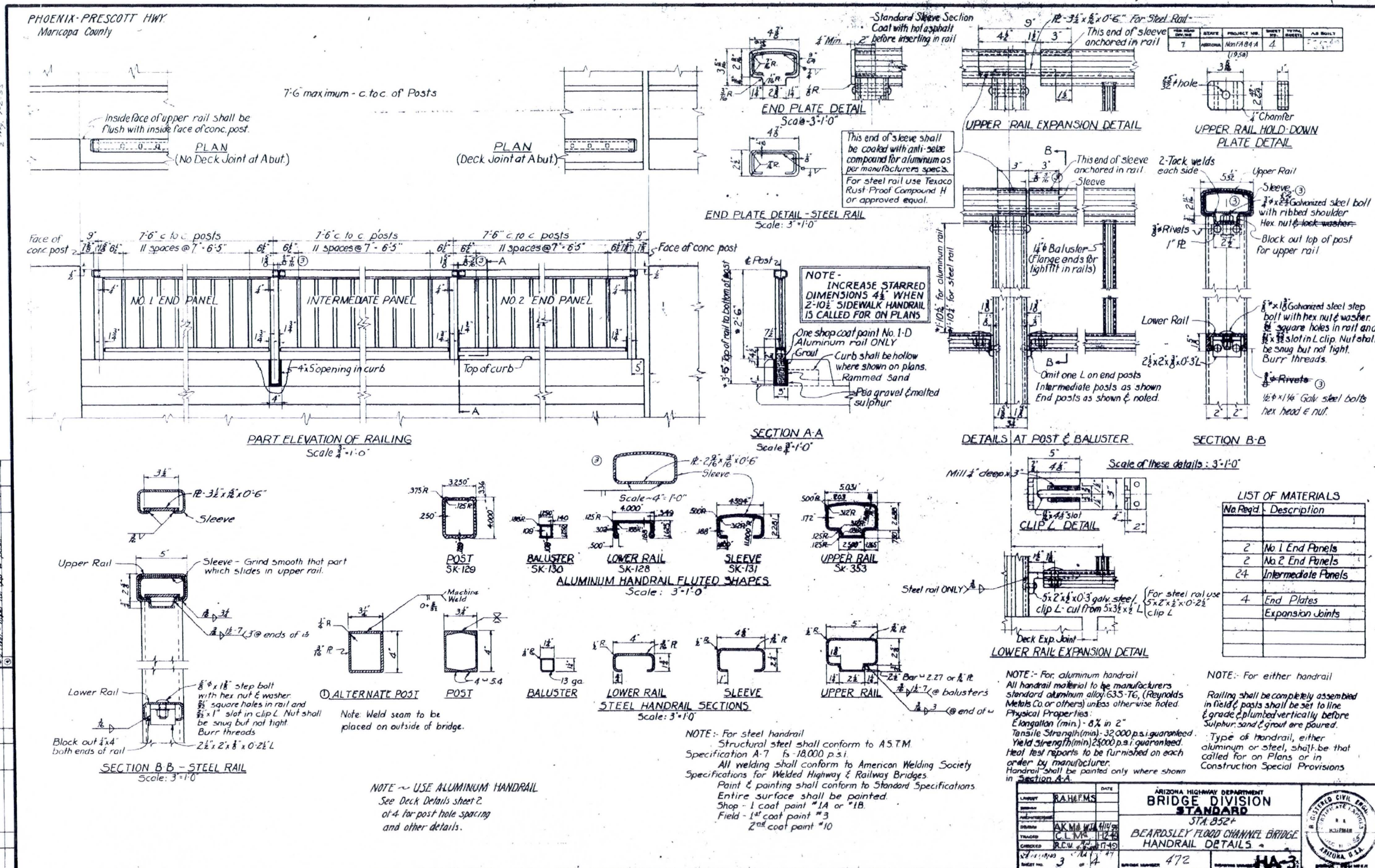
		DATE
LAYOUT		
DESIGN		
ARCHITECTURE		
DRAWN	JP	10-25-55
TRACED		
CHECKED	J.A.W	10-26-55

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

Sta. 852+
BEARDSLEY FLOOD CHANNEL BRIDGE
BEARING PILE RECORD

SHEET NO. 2A OF 4 | BRIDGE NUMBER 472 | DRAWING NUMBER U60 138.09 | BRIDGE ENGINEER

Non FA84-A(1956)



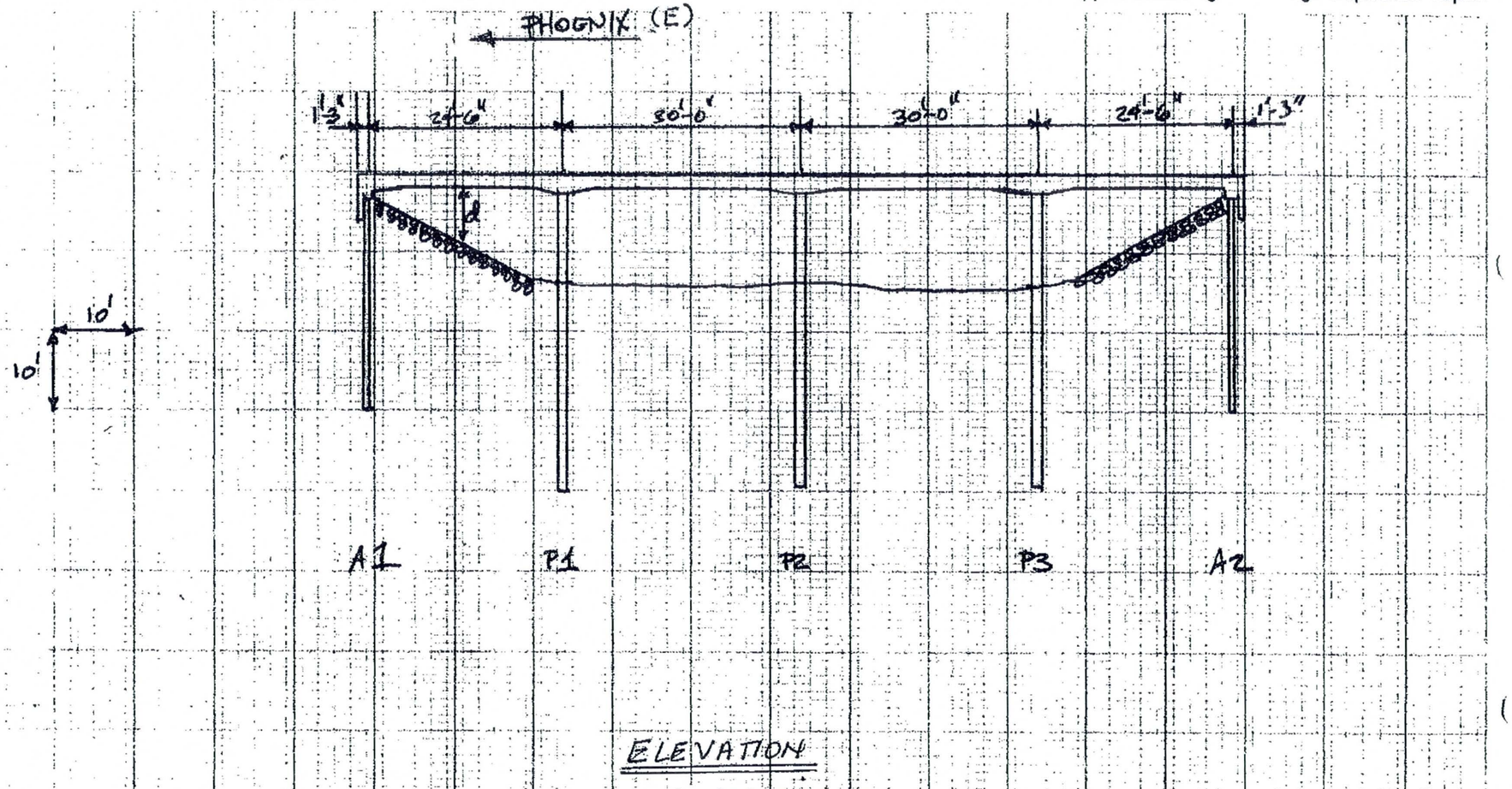
PHOENIX-PRESCOTT HWY.
Maricopa County
7'-6" maximum - c. to c. of Posts
Inside face of upper rail shall be flush with inside face of conc. post.
PLAN (No Deck Joint at Abut.)
PLAN (Deck Joint at Abut.)
END PLATE DETAIL Scale 3"=1'-0"
Standard Sleeve Section Coat with hot asphalt before inserting in rail
END PLATE DETAIL - STEEL RAIL Scale: 3"=1'-0"
This end of sleeve shall be coated with anti-seize compound for aluminum as per manufacturers specs.
For steel rail use Texaco Rust-Proof Compound H or approved equal.
UPPER RAIL EXPANSION DETAIL
This end of sleeve anchored in rail
UPPER RAIL HOLD-DOWN PLATE DETAIL
Face of conc post
7'-6" c. to c. posts 11 spaces @ 7" - 6.5"
NO. 1 END PANEL
INTERMEDIATE PANEL
NO. 2 END PANEL
4"x5" opening in curb
Top of curb
PART ELEVATION OF RAILING Scale 3/4"=1'-0"
NOTE - INCREASE STARRED DIMENSIONS 4½" WHEN 2'-10½" SIDEWALK HANDRAIL IS CALLED FOR ON PLANS
One shop coat paint No. 1-D Aluminum rail ONLY
Grout
Curb shall be hollow where shown on plans.
Rammed sand
Pea gravel & melted sulphur
SECTION A-A Scale 3/4"=1'-0"
This end of sleeve anchored in rail
Sleeve
1¼" ϕ Baluster (Flange ends for light fit in rails)
Omit one L on end posts. Intermediate posts as shown. End posts as shown & noted.
DETAILS AT POST & BALUSTER
2-Tack welds each side
Upper Rail
Sleeve
Galvanized steel bolt with ribbed shoulder Hex. nut & lock washer
Block out top of post for upper rail
Lower Rail
Galvanized steel step bolt with hex nut & washer. square holes in rail and slot in L clip. Nut shall be snug but not tight. Burr threads.
Galv. steel bolts hex head & nut.
SECTION B-B
Scale of these details: 3"=1'-0"
CLIP L DETAIL
LOWER RAIL EXPANSION DETAIL
Deck Exp. Joint
Steel rail ONLY
5x2"x½"x0'-3" galv. steel clip L- cut from 5x3½x½ L
For steel rail use 5x2"x½"x0'-2½" clip L
POST SK-129
BALUSTER SK-130
LOWER RAIL SK-128
SLEEVE SK-131
UPPER RAIL SK-353
ALUMINUM HANDRAIL FLUTED SHAPES Scale: 3"=1'-0"
① ALTERNATE POST
POST
BALUSTER
LOWER RAIL
SLEEVE
UPPER RAIL
STEEL HANDRAIL SECTIONS Scale: 3"=1'-0"
Note: Weld seam to be placed on outside of bridge.
Upper Rail
Sleeve - Grind smooth that part which slides in upper rail.
Lower Rail
Block out 4"x4" both ends of rail
SECTION B-B - STEEL RAIL Scale: 3"=1'-0"
NOTE ~ USE ALUMINUM HANDRAIL See Deck Details sheet 2 of 4 for post hole spacing and other details.
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 - 1 coat paint #1A or #1B. Field - 1st coat paint #3, 2nd coat paint #10
NOTE:- For aluminum handrail All handrail material to be manufacturers standard aluminum alloy 63S-T6, (Reynolds Metals Co. or others) unless otherwise noted. Physical Properties: Elongation (min.) - 8% in 2" Tensile Strength (min) - 32,000 p.s.i. guaranteed. Yield Strength (min) 25,000 p.s.i. guaranteed. Heat test reports to be furnished on each order by manufacturer. Handrail shall be painted only where shown in Section A-A.
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.
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
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
STANDARD
STA. 852+
BEARDSLEY FLOOD CHANNEL BRIDGE
HANDRAIL DETAILS
472
HA-3
Sheet 3 of 4
MASTER SHEET 11-12-53
REVISION OF 4/11/52 - A.K.M.
N FA 84-A (1956)

Name of Structure: McMicken Dam Floodway Br. WB
Structure No.: 00472
Location Route: US 60 WB MP: 138.09

Appendix C
Channel Profile

1/1

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



ELEVATION

LOOKING UP STREAM

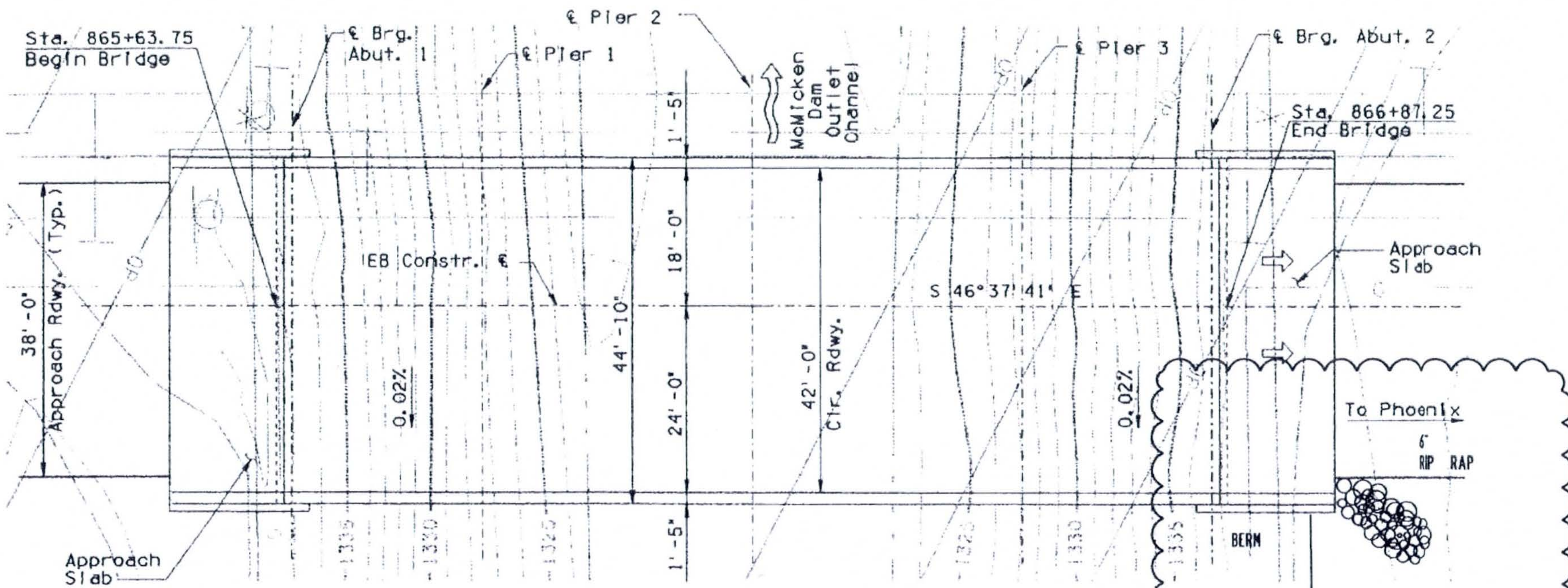
Insp. No.	Insp. date	Insp. Initials	Location / d	A1	½ span toe	P1	midspan	P2	midspan	P3	½ span toe	A2						
18	12/3/03	GG/TB		0.8'	11.3'	11.8'	12.6'	11.4'	12.9'	11.4'	11.5'	0.9'						
20	2/11/08	SK/ED	d/s	0.53'	7.68'	11.29'	12.98	11.95'	12.71	10.51	6.63	0.5'						
NSC 21	12/5/07	DB/CT	o/s	2.10	7.85	11.65	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'	n.2 / 12.1'	13.4'	11.7' / 11.4'	11.1'	2.1'						

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

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

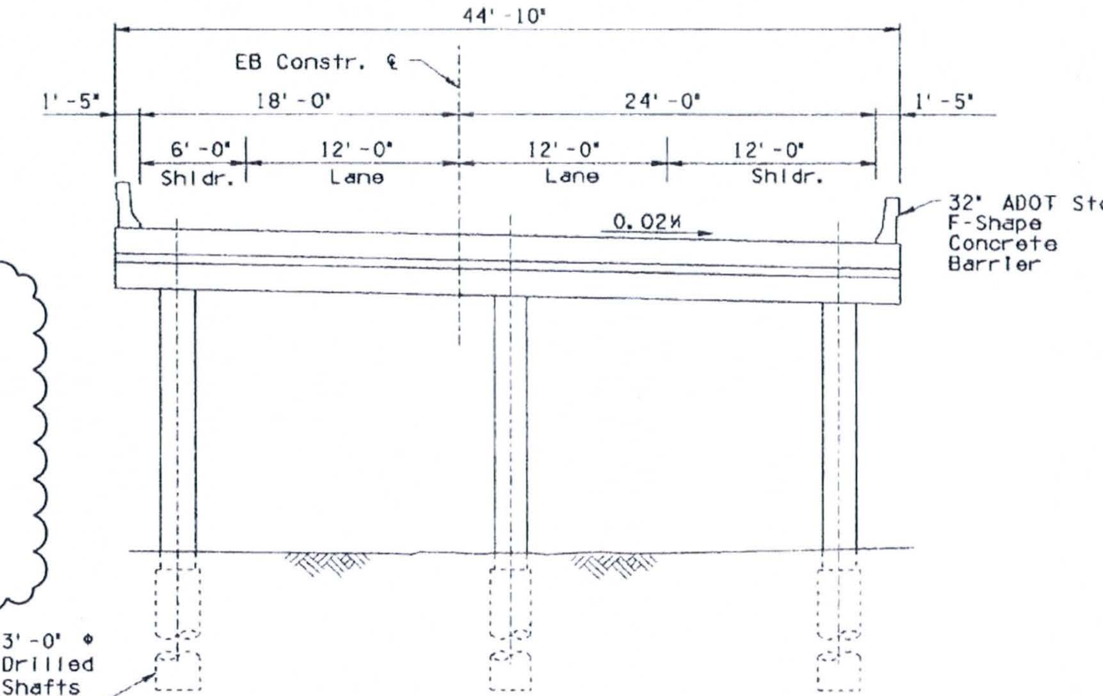
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	127	161	DD 5/04/07

060 MA 136



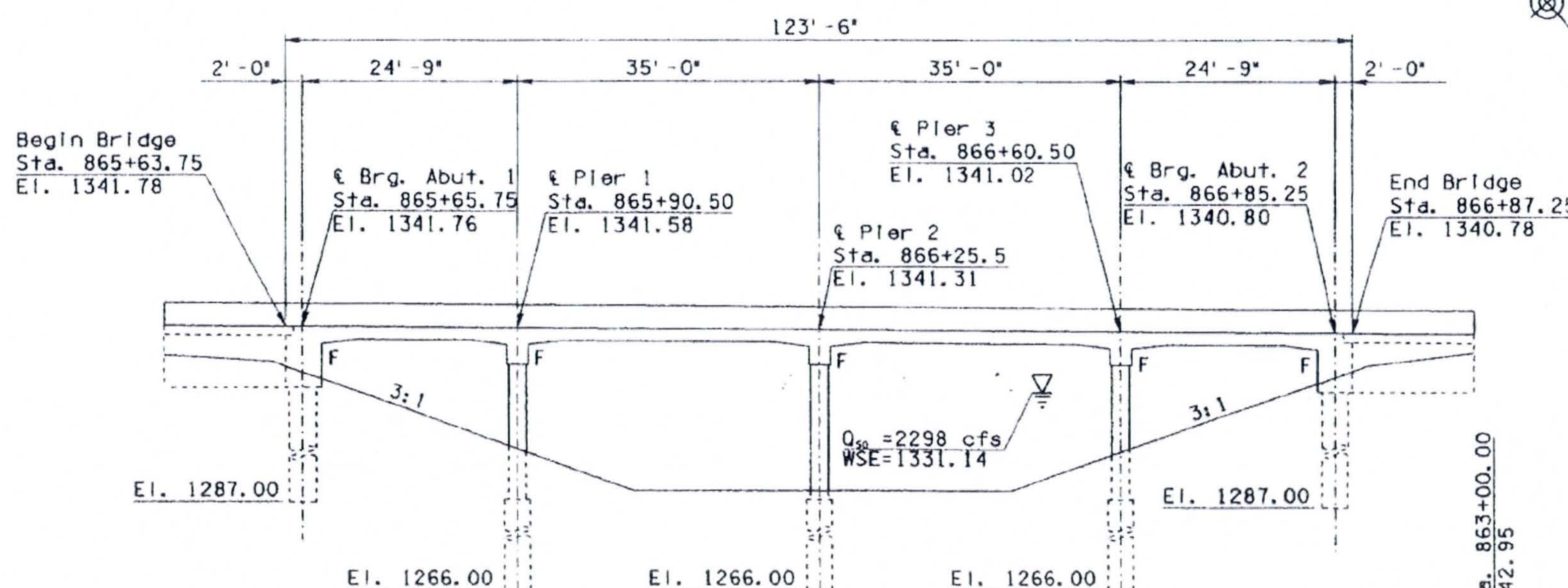
LOCATION PLAN

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



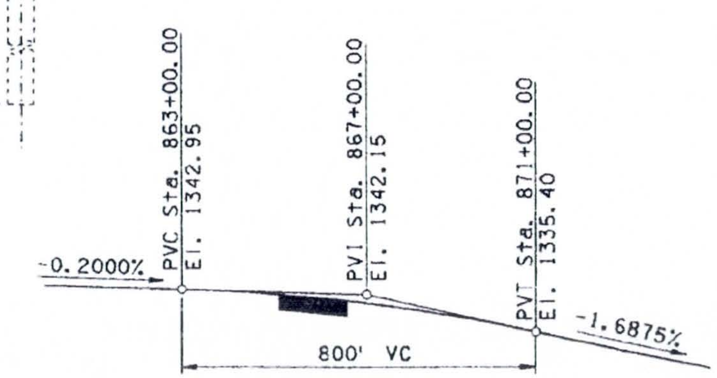
TYPICAL SECTION AT PIER

Scale: 1" = 5'-0"



ELEVATION

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



PROFILE GRADE

N.T.S.

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

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	C. RODRIGUEZ	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

Sverdrup CIVIL INC

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

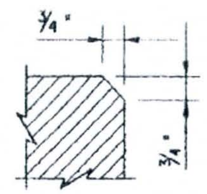
STA. 865+
McMICKEN DAM OUTLET CHL BR EB
GENERAL PLAN

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 1 OF 17

TRACS NO. H 4573 01C | 022-2(56) | 127 OF 161

PLOTTED BY: eggerse DATE PLOTTED: 31-JAN-2001 15:16



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	f'c =	4500 psi
(Deck	fc =	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

APPROXIMATE QUANTITIES

	Str. Excav. C. Y.	Str. Backfill C. Y.	Class 'S' Concrete fc' =3500 C. Y.	Class 'S' Concrete fc' =4500 C. Y.	Reinf. Steel lbs.	30" Drilled Shafts Ln. Ft.
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 247 ft
Approach Slab 1345 ft²
Thrie Beam 3 ea.

DESIGN	C. RODRIGUEZ	8/99	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP
DESIGN CHECKED	D. KIRKPATRICK	8/99	
DRAWN	H. BROWN	8/99	
DRAWING CHECKED	D. KIRKPATRICK	8/99	

Sverdrup
CIVIL INC

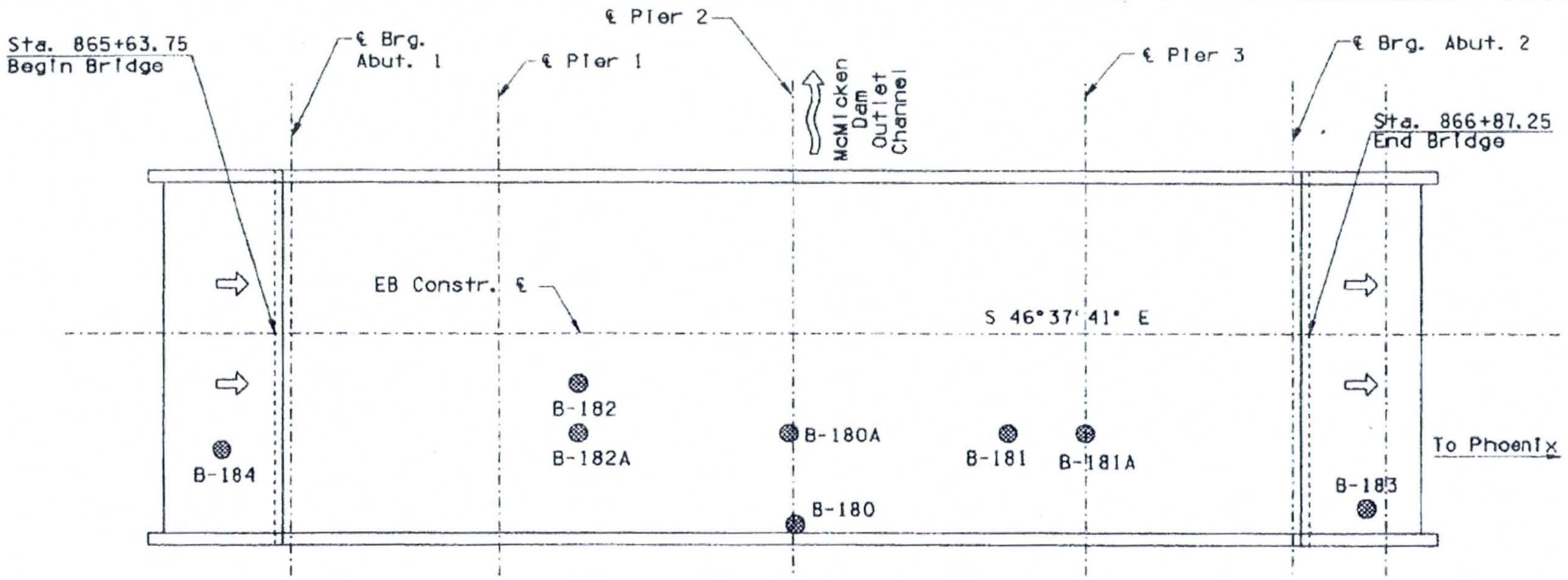
STA. 865+
McMICKEN DAM OUTLET CHL BR EB
GENERAL NOTES AND QUANTITIES

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

34856 DOUGLAS A. KIRKPATRICK ARIZONA, USA

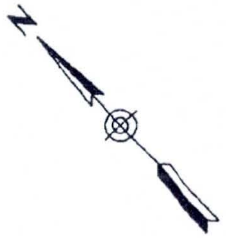
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	129	161	DD 5/04/07

060 MA 136



LOCATION PLAN

Scale: 1" = 10'-0"



GENERAL NOTES:

1. 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.

2. 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.

3. 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, in dependent interpretations or judgement of the contractor.

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 final 12 inches of penetration is the Standard Penetration Resistance (N).
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 "Bullnose 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		

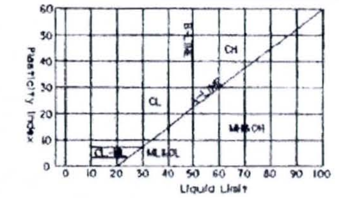
* Number of blows of a 140 lb hammer free falling 30 inches to drive a 2 inch O.D. split spoon sampler (ASTM D-1588)

† Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer.

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

MATERIAL SIZE	PARTICLE SIZE			
	Lower Limit		Upper Limit	
	mm	Sieve Size †	mm	Sieve Size †
Sands				
Fine	.075	#200	0.42	#40
Medium	0.42	#40	2.00	#10
Coarse	2.00	#10	4.76	#4
Gravels				
Fine	4.76	#4	19.1	3/4" ◦
Coarse	19.1	3/4" ◦	76.2	3" ◦
Cobbles	76.2	3" ◦	304.8	12" ◦
Boulders	304.8	12" ◦	914.4	36" ◦

† U.S. Standard ◦ Clear Square Openings



DESIGN	M. SPEEDIE	8/99
DESIGN CHECKED	G. CREASER	8/99
DRAWN	B. BROWN	8/99
DRAWING CHECKED	M. SPEEDIE	8/99

SPEEDIE AND ASSOCIATES

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION DATA SHEET

US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.
ROUTE	MILEPOST	STRUCTURE NO.	LOCATION

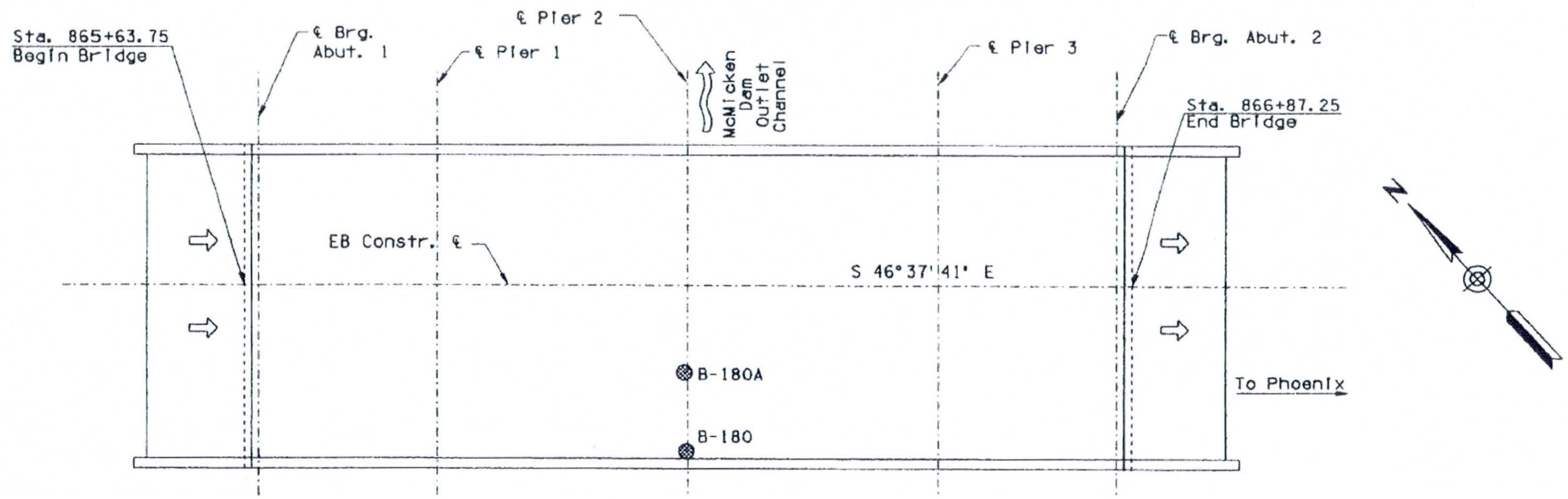
Registered Professional Engineer (Civil) Certificate No. 14388 GREGG ALAN CREASER Arizona, U.S.A.

SHEET 3 OF 17

TRACS NO. H 4573 01C | 022-2(56) | 129 OF 161

F.H.W.A. 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.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-180
RIG TYPE: CME-55
DATE: 3-15-99
CONTRACTOR: Heber Mining Co.
STATION: 866+25; 23'Rt.
ELEVATION: 1323.5
GEOL/TECH: K. Graval
DRILLER: R. Wood

DEPTH IN FEET	SPT BLOWS/6"
5	12-22-27
10	12-17-18
15	12-10-14
20	18-15-14
25	50/4"
30	25-50/3"
35	18-31-26/6"
40	22-20-35
45	50/12"
50	11-13-27
55	36-30-30
60	27-45-48

Depth to (ft)	VISUAL CLASSIFICATION & REMARKS
2.0	Brown SANDY SILT/SANDY CLAY (ML/CL-Dry)
8.0	Dense Brown CLAYEY SAND/SILTY SAND (SC/SM-Dry)
14.0	Dense Greyish Brown SILTY SAND (SM-Dry to Moist) with Trace Gravel
20.0	14 Feet: Cobbles Begin Medium Dense Greyish Brown WELL GRADED SAND (SW-Dry) with Trace Gravel and Trace Cobbles
22.0	Medium Dense Brown CLAYEY SAND (SC-Moist)
38.0	Very Dense Greyish Brown WELL GRADED SAND (SW-Dry to Moist) with Some Gravel and Cobbles
42.0	Very Dense Brown CLAYEY SAND/SILTY SAND (SC/SM-Moist) with Trace Gravel
48.0	Very Dense Orangish Brown WELL GRADED SAND (SW-Dry to Moist) with Little Gravel
53.0	Dense Brown CLAYEY SAND (SC-Moist) with Trace Gravel
58.0	Very Dense Greyish Brown WELL GRADED SAND (SW-Moist) with Trace Gravel
61.0	Very Dense Brown CLAYEY SAND (SC-Moist)
	End of Boring

Printed 5-20-99

	Depth	Hour	Date
∇	Dry		
▼			

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-180A
RIG TYPE: CME-75
DATE: 1-4-01
CONTRACTOR: Heber Mining
STATION: 866+25 , 12'Rt
ELEVATION: 1323.5
GEOL/TECH: T. Rheinschmidt
DRILLER: M. Stroud

DEPTH IN FEET	SPT BLOWS/6"
10	12-18-17
20	3-45-50/3"
30	50/6"
40	17-16-29

Depth to (ft)	VISUAL CLASSIFICATION & REMARKS
8.0	CLAYEY SAND/SANDY CLAY (SC/CL Dry); Brown; Dense
15.0	SANDY SILT/SILTY SAND (ML/SM-Moist); Brown; Dense
25.0	WELL GRADED SAND (SW Moist); Grayish Brown; Very Dense; with Trace Gravel
37.5	GRAVELLY SAND (SW-Moist); Grayish Brown; Very Dense; with Possible Cobbles
40.5	SILTY SAND/CLAYEY SAND (SM/SC-Moist); Brown; Dense
48.0	WELL GRADED SAND (SW-Moist); Grayish Brown; Dense; with Little Gravel
	CLAYEY SAND (SC-Moist); Brown; Dense

	Depth	Hour	Date
∇	Dry		
▼			

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-180A
RIG TYPE: CME-75
DATE: 1-4-01
CONTRACTOR: Heber Mining
STATION: 866+25 , 12'Rt
ELEVATION: 1323.5
GEOL/TECH: T. Rheinschmidt
DRILLER: M. Stroud

DEPTH IN FEET	SPT BLOWS/6"
50	10-15-19
60	28-38-35
65	13-16-18
70	12-18-21
75	15-26-30
80	50/4"

Depth to (ft)	VISUAL CLASSIFICATION & REMARKS
53.0	CLAYEY SAND (SC-Moist); Brown; Dense
62.0	WELL GRADED SAND (SW-Moist); Brown; Very Dense; with Trace Gravel
79.5	CLAYEY SAND (SC-Moist); Brown; Dense; with Some Clayey Layering
80.5	WELL GRADED SAND (SW-Moist); Grayish Brown; Very Dense; with Gravel
	End of Boring

	Depth	Hour	Date
∇	Dry		
▼			

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

PLOTTED BY: edgerse DATE PLOTTED: 30-JAN-2001 06:21
FILE: pl\01401?\702ceda\789str\729adgn\mcmicken\017smb12.dgn

DESIGN	M. SPEEDIE	8/99
DESIGN CHECKED	G. CREASER	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	M. SPEEDIE	8/99

SPEEDIE AND ASSOCIATES

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION DATA SHEET

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

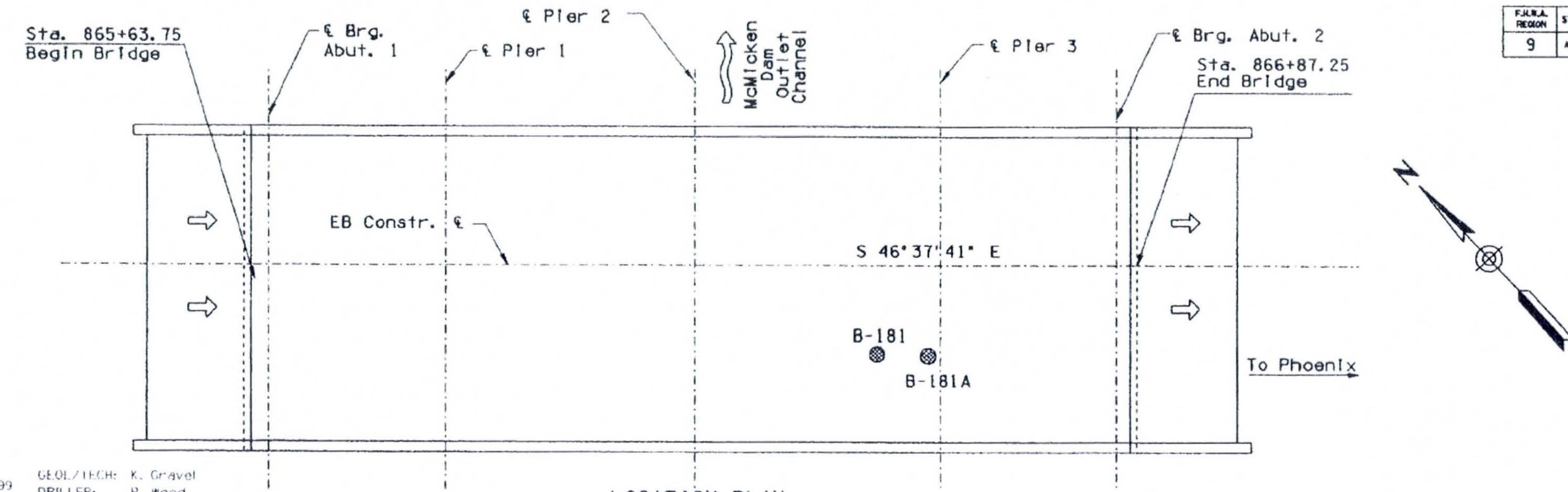
Registered Professional Engineer (Civil) Certificate No. 14388 GREGG ALAN CREASER ARIZONA

SHEET 4 OF 17

TRACS NO. H 4573 01C | 022-2(56) | 130 OF 161

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	131	161	DD 5/04/07

060 MA 136



LOCATION PLAN

Scale: 1" = 10'-0"

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
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; 7'Rt.
ELEVATION: 1325.6

DEPTH IN FEET	SPT BLOWS/6"	VISUAL CLASSIFICATION & REMARKS	Depth
		Hard Brown SANDY CLAY (CL-Dry)	
5	12-17-22		8.5
10	38/12"	Dense Greyish Brown SILTY FINE SAND (SM-Dry)	
15	18-20-22		20.0
20	12-12-14	Very Stiff Brown SANDY SILT/SANDY CLAY (CL/ML-Moist)	22.0
25	37-50/6"	Very Dense Brown WELL GRADED SAND (SW-Dry to Moist) with Trace to Little Gravel	
30	26-50/4"		32.0
35	20-38-50	33 Feet: Cobbles Begin Very Dense Greyish Brown WELL GRADED SAND (SW Dry to Moist) with Sand Gravel and Cobbles	38.5
40	44/12"	Dense Brown CLAYEY SAND (SC-Moist) with Some Gravel and Cobbles	41.0
		Very Dense Orangish Brown WELL GRADED SAND (SW-Dry to Moist) with Little Gravel	
45	23-28-28		48.0
50	13-16-19	Hard Brown SANDY SILT (ML-Moist)	52.0
55	35-40-48	Very Dense Greyish Brown WELL GRADED SAND (SW-Moist) with Little Gravel	58.5
60	24-33-34	Very Dense CLAYEY SAND/SILTY SAND (SC/SM-Moist)	61.0

End of Boring

	Depth	Hour	Date
▽	Dry		
▼			

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-181A
RIG TYPE: CME 75
DATE: 1-4-01
GEOL/TECH: T. Rheinschmidt
DRILLER: M. Stroud
CONTRACTOR: Heber Mining
STATION: 866+55, 12'Rt
ELEVATION: 1325.6

DEPTH IN FEET	SPT BLOWS/6"	VISUAL CLASSIFICATION & REMARKS	Depth
		SANDY CLAY (CL-Dry); Brown; Stiff	8.5
10	9-9-11	SILTY SAND (SM-Dry to Moist); Brown; Medium Dense	19.0
20	9-10-14	SILTY SAND Dense; with Some Clay	23.0
30	30-50/4"	SAND/GRAVELLY SAND (SW-Moist); Brown; Very Dense	
40	38-26-24		42.0
		WELL GRADED SAND (SW Moist); Brown; Dense; with Trace Gravel	47.0
50	15-20-21	SILTY SAND (SM-Moist); Brown; Dense	

	Depth	Hour	Date
▽	Dry		
▼			

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-181A
RIG TYPE: CME-75
DATE: 1-4-01
GEOL/TECH: T. Rheinschmidt
DRILLER: M. Stroud
CONTRACTOR: Heber Mining
STATION: 866+55, 12'Rt
ELEVATION: 1325.6

DEPTH IN FEET	SPT BLOWS/6"	VISUAL CLASSIFICATION & REMARKS	Depth
	20-26-43	SILTY SAND (SM-Moist); Brown; Dense	
65	30-41-26		
70	13-18-24		
75	19-24-24		77.5
80	30-50/6"	WELL GRADED SAND (SM-Moist); Brown; Very Dense	81.0

End of Boring

	Depth	Hour	Date
▽	Dry		
▼			

DESIGN	M. SPEEDIE	8/99
DESIGN CHECKED	G. CREASER	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	M. SPEEDIE	8/99

SPEEDIE AND ASSOCIATES

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

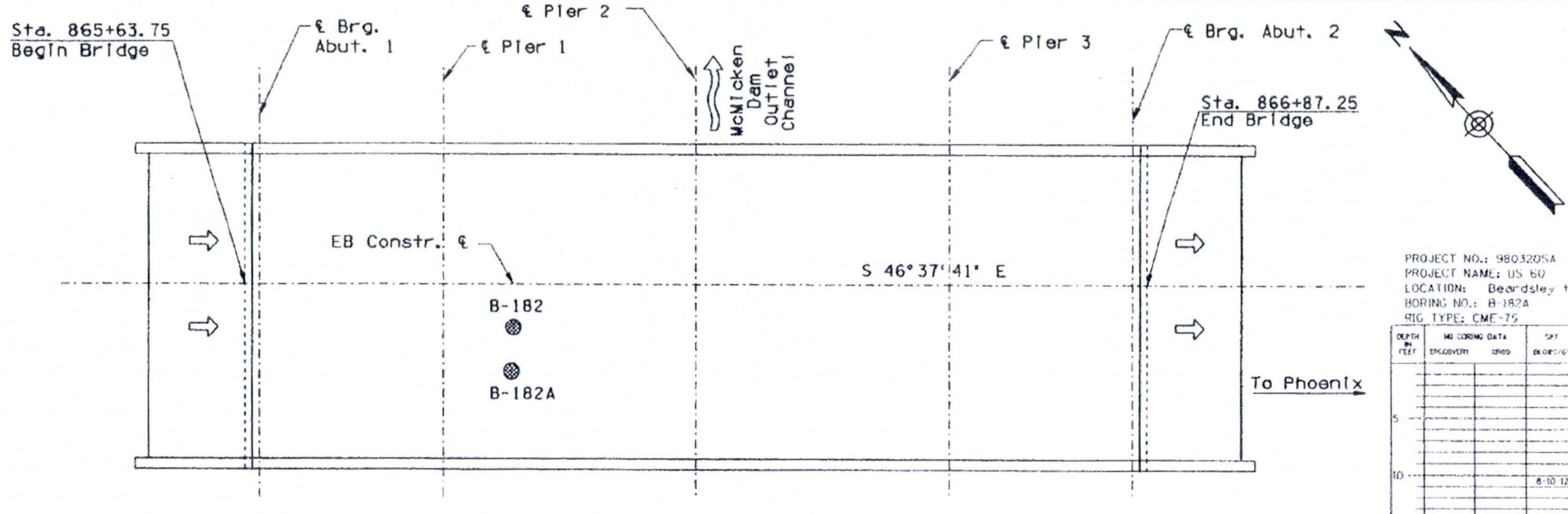
STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION DATA SHEET

ROUTE	MILEPOST	STRUCTURE NO.
US 60	138.09	2561

LOCATION: DEER VALLEY RD. TO BEARDSLEY RD.

Registered Professional Engineer (Civil) Certificate No. 14388 GREGG ALAN CREASER Arizona

SHEET 5 OF 17



LOCATION PLAN

Scale: 1" = 10'-0"

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	132	161	DD 5/04/07

060 MA 136

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 Morristown CONTRACTOR: Heber Mining Co.
BORING NO.: B-182 STATION: 866+00; 6'Rt.
RIG TYPE: CME-55 ELEVATION: 1324.0

DEPTH IN FEET	NO CORING DATA RECOVERY	RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS
0–8.0							Dense to Very Dense Brown SANDY CLAY (CL-Dry)
5			50/10"				
8.0–13.0							Dense Brown SILTY SAND (SM-Dry)
10			45/12"				
13.0–18.0							Dense Greyish Brown POORLY GRADED FINE SAND (SP-Dry)
15			16-36-19				
18.0–43.0							Very Dense Brown SILTY SAND (SM-Dry to Moist) with Little Gravel
20			19-26-28/6"				
24.5							24.5 Feet: Some Gravel
25			36-26-25/6"				
30			32-50/4"				
35			21-50/6"				
40			23-50/4"				
43.0–48.0							Dense Brown POORLY GRADED FINE SAND (SP-Moist) with Trace Gravel
45			16-18-22				
48.0–52.5							Dense Brown SILTY SAND (SM-Moist)
50			16-16-21				
52.5–61.0							Very Dense to Dense Greyish Brown WELL GRADED SAND (SW-Moist) with Trace Gravel
55			28-35-39/6"				
60			11-18-22				
61.0							End of Boring

	Depth	Hour	Date
▽	Dry		
▼			

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 Morristown CONTRACTOR: Heber Mining
BORING NO.: B-182A STATION: 866+00, 12'Rt
RIG TYPE: CME-75 ELEVATION: 1324.0

DEPTH IN FEET	NO CORING DATA RECOVERY	RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS
0–8.0							SANDY CLAY (CL-Dry); Brown; Dense
8.0–12.0							SILTY SAND (SM-Dry); Brown; Medium Dense
10			8-10-12				
12.0–24.0							WELL GRADED SAND (SW-Dry); Brown; Medium Dense; with Trace Gravel and 0% to 10% Cobbles
20			8-10-18				
24.0–38.0							GRAVELLY SAND/SANDY GRAVEL (SW/GW-Dry); Brown; Very Dense; with 5% to 10% Cobbles
30			30-46-34				
38.0–47.0							WELL GRADED SAND (SW-Moist); Brown; Very Dense; with Trace Silt and Trace Gravel
40			17-20-24				
47.0–68.0							SILTY SAND (SM-Moist); Brown; Medium Dense
50			13-10-16				
60			27-37-48				
65			11-19-19				
68.0–81.0							WELL GRADED SAND (SW-Moist); Grayish Brown; Dense; with Trace Gravel
70			15-19-20				
75			16-18-21				
80			31-50/6"				
81.0							End of Boring

	Depth	Hour	Date
▽	Dry		
▼			

DESIGN	M. SPEEDIE	8/99
DESIGN CHECKED	G. CREASER	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	M. SPEEDIE	8/99

SPEEDIE AND ASSOCIATES

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION DATA SHEET

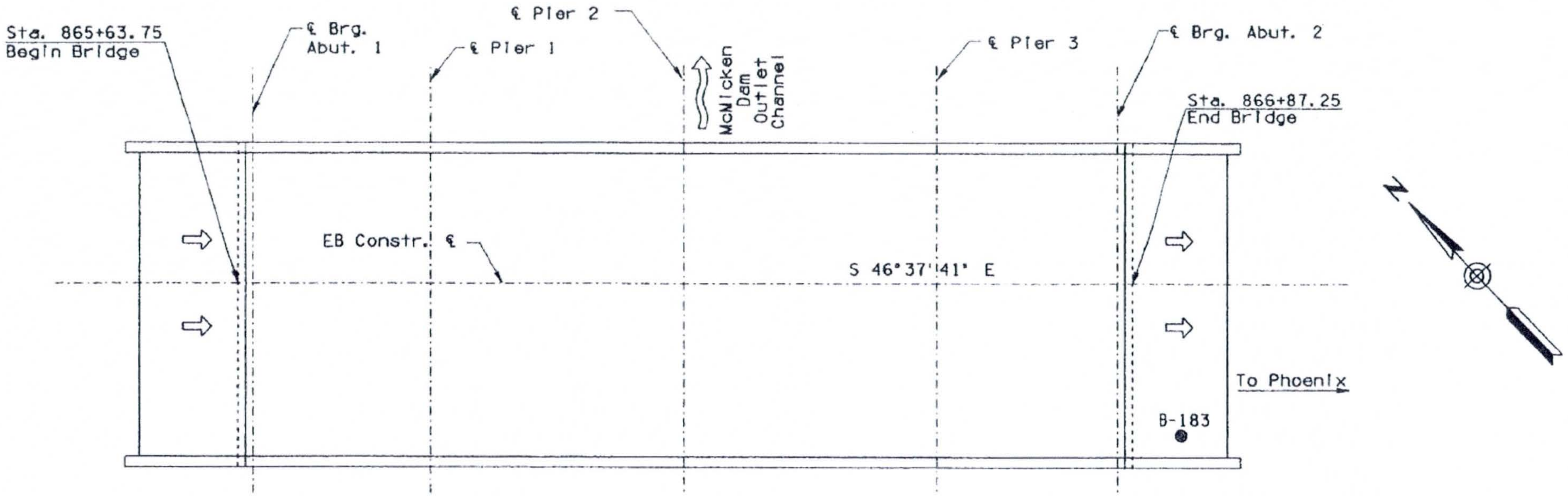
ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

Registered Professional Engineer (Civil) Certificate No. 14388 GREGG ALAN CREASER Arizona

SHEET 6 OF 17

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	133	161	DD 5/04/07

060 MA 136



LOCATION PLAN

Scale: 1" = 10'-0"

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA   DATE: 3-19-99   GEOL/TECH: K. Gravel
PROJECT NAME: US 60   DRILLER: B. Freeman
LOCATION: Beardsley to Morristown   CONTRACTOR: Hebor Mining Co.
BORING NO.: B-183   STATION: 866+94; 21'Rt.
RIG TYPE: LC 60   ELEVATION: 1337.0

DEPTH IN FEET	NQ CORING DATA %RECOVERY	%RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS	
5			6-5-5				Stiff Brown SANDY CLAY (CL-Dry)	8.0
10			50/10"				Very Dense Brown CLAYEY SAND (SC-Dry) with Trace Gravel and Weak to Moderate Calcareous Cementation	13.0
15			15-12-14				Medium Dense Brown CLAYEY SAND (SC-Dry) with Little Gravel	18.0
20			14-16-24				Hard Brown SANDY CLAY (CL-Dry) with Trace Gravel and Trace Weak Calcarenous Cementation	22.0
25			14-10-12				Medium Dense Brown SILTY SAND (SM-Dry) with Little Gravel	
30			9-13-13					33.0
35			11-11-13				Very Stiff Brown SANDY SILT (ML-Moist)	38.0
40			25-50/6"				Very Dense Grayish Brown WELL GRADED SAND (SW-Dry) with Trace Gravel	42.0
45			15-18-24				Dense Reddish Brown WELL GRADED SAND (SW-Moist) with Little Clay and Little Gravel	47.5
							Very Dense Brown WELL GRADED	

	Depth	Hour	Date
▽	Dry		
▼			

GEOTECHNICAL SERVICES BORING LOG

PROJECT NO.: 980320SA   DATE: 3-19-99   GEOL/TECH: K. Gravel
PROJECT NAME: US 60   DRILLER: B. Freeman
LOCATION: Beardsley to Morristown   CONTRACTOR: Hebor Mining Co.
BORING NO.: B-183   STATION: 866+94; 21'Rt.
RIG TYPE: LC 60   ELEVATION: 1337.0

DEPTH IN FEET	NQ CORING DATA %RECOVERY	%RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS	
			20-50/5"				SAND (SW-Moist) with Some Gravel	
55			75/12"					
60			31-42-26/12"					61.0
							Dense Brown SILTY FINE SAND (SP/SM-Moist)	
65			16-18-25					67.5
							Very Dense Greyish Brown WELL GRADED SAND (SW-Moist) with Some Gravel and Trace Silt	71.0
70			23-36-36/12"				End of Boring	
75								
80								
85								
90								
95								

	Depth	Hour	Date
▽	Dry		
▼			

DESIGN	M. SPEEDIE	8/99
DESIGN CHECKED	G. CREASER	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	M. SPEEDIE	8/99

SPEEDIE AND ASSOCIATES

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION DATA SHEET

US 60	138.09	2561
ROUTE	MILEPOST	STRUCTURE NO.

LOCATION: DEER VALLEY RD. TO BEARDSLEY RD.

Registered Professional Engineer, Certificate No. 14388, GREGG ALAN CREASER, Arizona

SHEET 7 OF 17

TRACS NO. H 4573 01C   022-2(56)   133 OF 161

SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE

PLOTTED BY: edgerbe DATE PLOTTED: 30-JUL-2001 13:44
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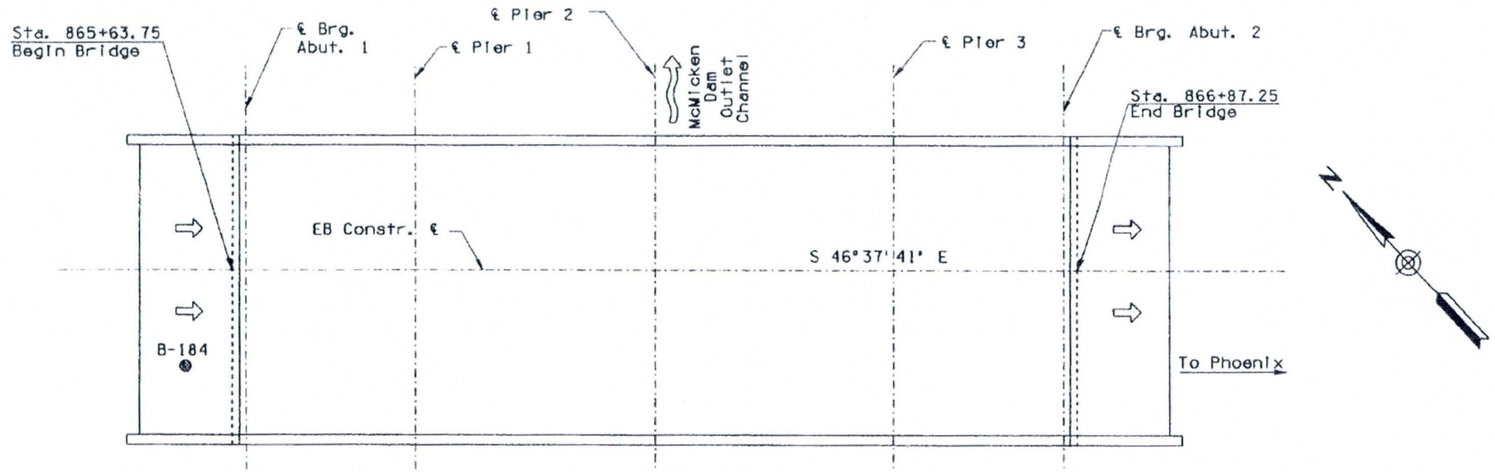
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(156)	134	161	DO 5/01/01
		060 MA 136			



LOCATION PLAN

Scale: 1" = 10'-0"

GEOTECHNICAL SERVICES
BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-184
RIG TYPE: LC 60

DATE: 2-23-99
CONTRACTOR: Heber Mining Co.
STATION: 865+57; 14'Rt.
ELEVATION: 1339.0
GEOL./TECH: K. Gravel
DRILLER: B. Freeman

DEPTH IN FEET	NO CORING DATA RECOVERY	RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS
							Medium Dense Brown CLAYEY SAND (SC-Dry) with Little Gravel
5			5-9-9				8.0
10			9-16-22				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				38.0
40			50/6"				Very Dense Greyish Brown WELL GRADED SAND (SW-Dry) with Some Gravel
45			30/5"				48.0
							Dense Brown SILTY SAND

Printed 5-30-99

Depth	Hour	Date
Dry		

GEOTECHNICAL SERVICES
BORING LOG

PROJECT NO.: 980320SA
PROJECT NAME: US 60
LOCATION: Beardsley to Morristown
BORING NO.: B-184
RIG TYPE: LC 60

DATE: 2-23-99
CONTRACTOR: Heber Mining Co.
STATION: 865+57; 14'Rt.
ELEVATION: 1339.0
GEOL./TECH: K. Gravel
DRILLER: B. Freeman

DEPTH IN FEET	NO CORING DATA RECOVERY	RQD	SPT BLOWS/6"	DRILLING DATA NOTES	AVERAGE RATE (MIN/FT)	GRAPH	VISUAL CLASSIFICATION & REMARKS
			14-16-19				(SM-Dry)
55			16-23-25				57.0
60			48/12"				Dense Greyish Brown WELL GRADED SAND (SW-Dry to Moist) with Some Gravel
							60.5
							Stiff to Very Stiff Brown SANDY CLAY (CL-Dry)
65			38-27-18				61.2
							Dense Grey WELL GRADED SAND (SW-Dry) with Some Gravel
							68.0
70			4-8-12				Medium Dense Greyish Brown POORLY GRADED SAND (SP-Moist) with Trace Gravel
							71.0
							End of Boring
75							
80							
85							
90							
95							

Printed 5-30-99

Depth	Hour	Date
Dry		

PLOTTED BY: eagerbe DATE PLOTTED: 04-JAN-2001 13:22
FILE: e:\81401\7822\add_76\sht\709eggmcmicken\217end15.dgn

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

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

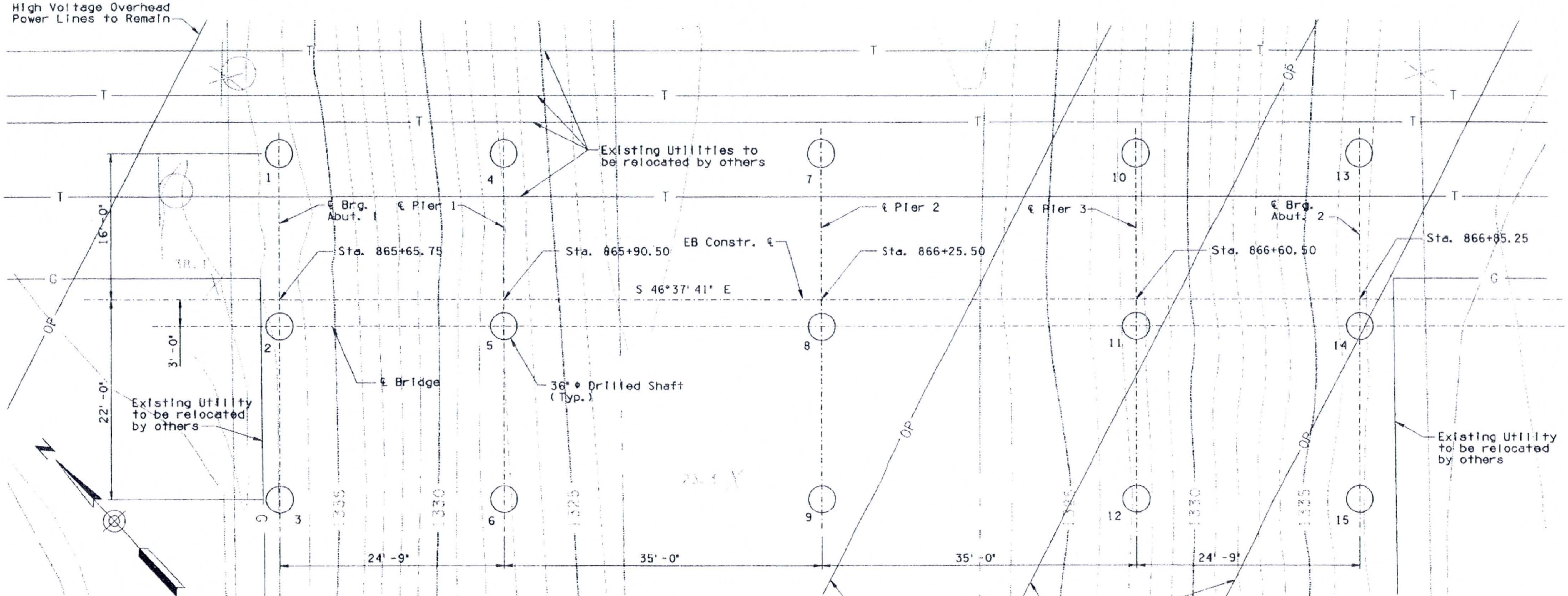
14388 GREGG ALAN CREASER — REGISTERED PROFESSIONAL ENGINEER — CERTIFICATE — ARIZONA

SHEET 8 OF 17

TRACS NO. H 4573 01C | 022-2(156) | 134 OF 161

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	135	161	DD 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: 3/16" = 1'-0"

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

Sverdrup CIVIL INC

ROUTE	MILEPOST	STRUCTURE NO.
US 60	138.09	2561

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
FOUNDATION LAYOUT

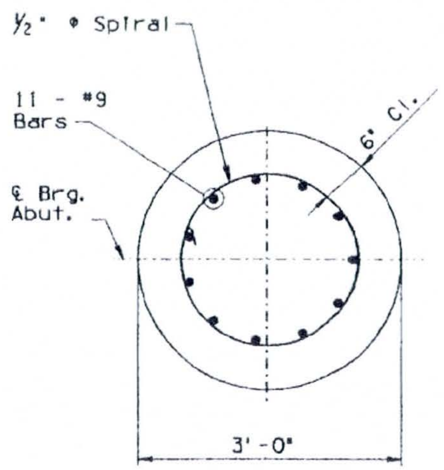
LOCATION
DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 9 OF 17

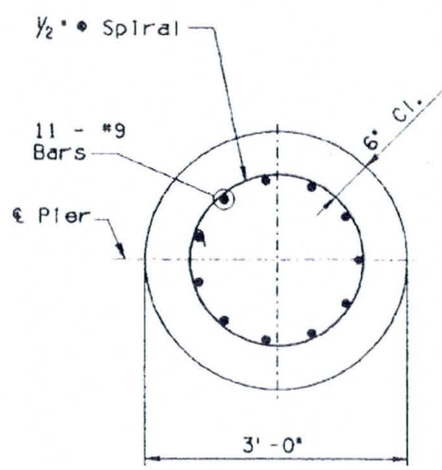
TRACS NO. H 4573 01C | 022-2(56) | 135 OF 161

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	136	161	DD 5/04/07

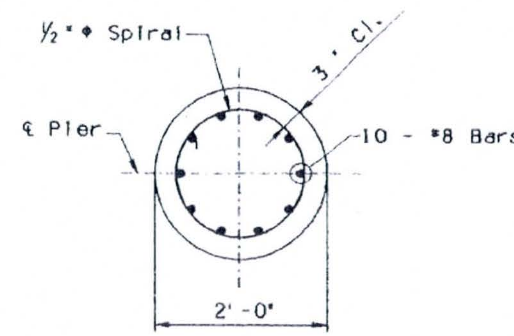
060 MA 136



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



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



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

DRILLED SHAFT NOTES

1. Construction of Drilled Shaft Foundations shall be in accordance with the Special Provisions and as noted below.

2. See the Special Provisions for details on drilling in caving and groundwater conditions. If steel casings are used, the casings must be removed. The geotechnical report by Speedie and Associates indicates that loose sands were encountered during test drilling that may cave during construction of the drilled shafts.

3. Standard hooks may be oriented inward, outward or at intermediate angles. Note that if casing is used, orienting the hooks outward may interfere with removal of the casing.

4. Only those construction joints and vertical reinforcing bar splices shown on the plans will be permitted unless approved by the Engineer.

5. Allowable axial load for 36" dia. drilled shafts is 310 kips at the abutments and 460 kips at the piers.

6. The plan elevations given for the bottoms of the drilled shafts are indicative of depths where satisfactory bearing material may be encountered, based on the geotechnical report. See the Special Provisions for requirements for determination of the actual bottom elevations.

7. ½" ⌀ spiral reinforcing steel shall be cold drawn wire conforming with AASHTO M32 (ASTM A82) Fy = 60 ksi. Use 48 bar or wire diameters minimum lap for splice with 135° end hooks around vertical bars.

8. Anchorage of spiral reinforcement shall be provided by 1½ extra turns of spiral bar or wire at each end of a spiral unit.

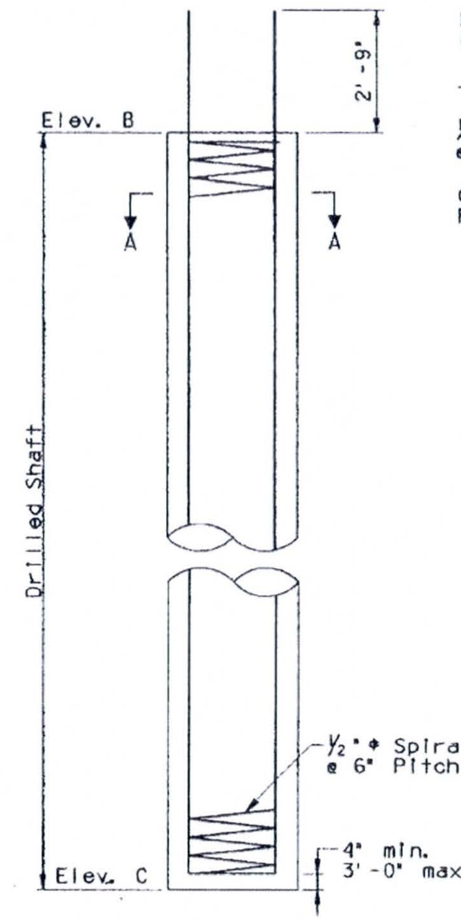
9. Each drilled shaft constructed under slurry conditions shall have 4 - 2½" ⌀ schedule 80 rigid PVC pipes equally spaced within the spiral. See Special Provisions for other requirements.

10. Conformation Shaft shall be Abutment 2, Shaft #14.

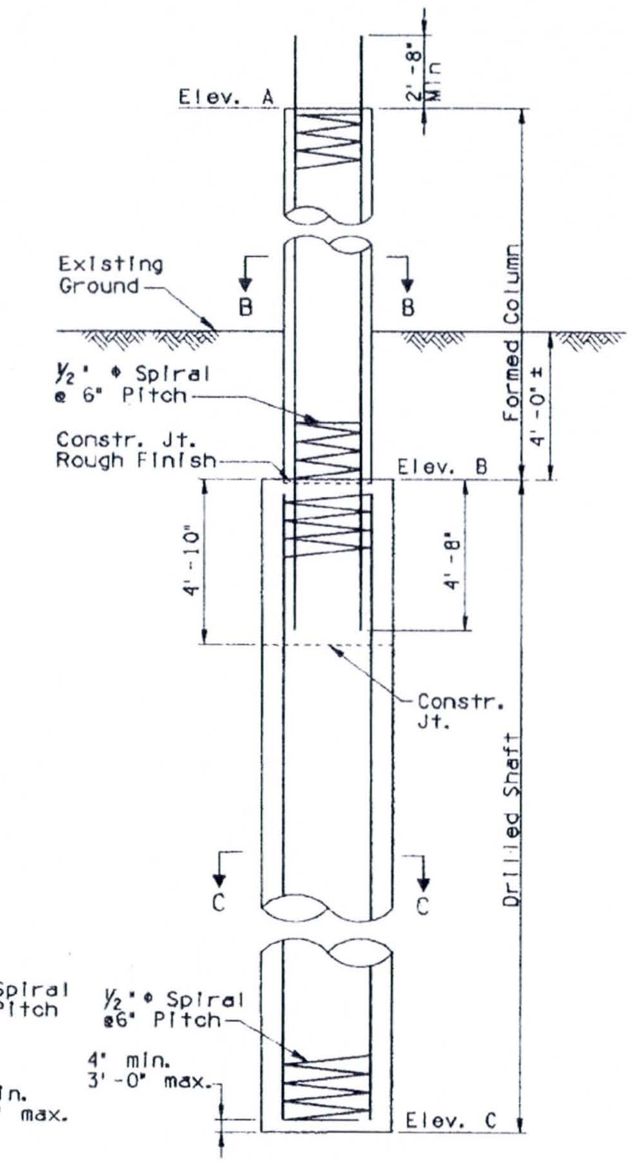
11. High voltage power lines are present at this site. Drilling will be restricted by these power lines.

SHAFT/COLUMN ELEVATIONS

Shaft/Column Number	Elev. A	Elev. B	Elev. C
1	-	1334.84	1287.00
2	-	1334.45	1287.00
3	-	1334.07	1287.00
4	1338.45	1318.00	1266.00
5	1338.06	1318.00	1266.00
6	1337.68	1318.00	1266.00
7	1338.18	1318.00	1266.00
8	1337.79	1318.00	1266.00
9	1337.41	1318.00	1266.00
10	1337.89	1318.00	1266.00
11	1337.50	1318.00	1266.00
12	1337.12	1318.00	1266.00
13	-	1333.87	1287.00
14	-	1333.49	1287.00
15	-	1333.11	1287.00



DETAIL A
Scale: 1" = 2' -0"



DETAIL B
Scale: 1" = 2' -0"

DRILLED SHAFT & COLUMN DETAILS

DESIGN	C. RODRIGUEZ	8/99	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION BRIDGE GROUP
DESIGN CHECKED	D. KIRKPATRICK	8/99	
DRAWN	H. BROWN	8/99	
DRAFTING CHECKED	D. KIRKPATRICK	8/99	

Sverdrup CIVIL INC

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
DRILLED SHAFT & COLUMN DETAILS

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

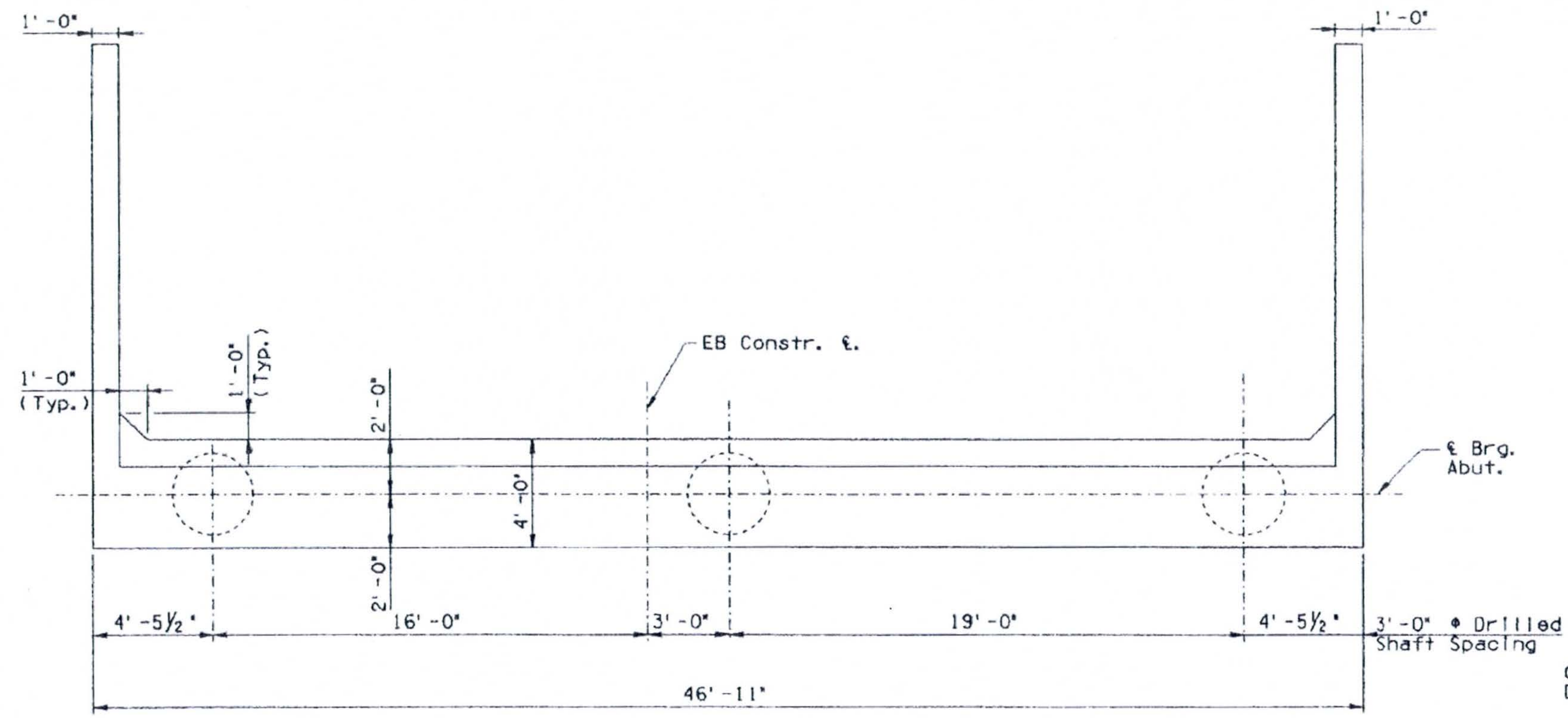
34658 DOUGLAS A. KIRKPATRICK ARIZONA, USA

SHEET 10 OF 17

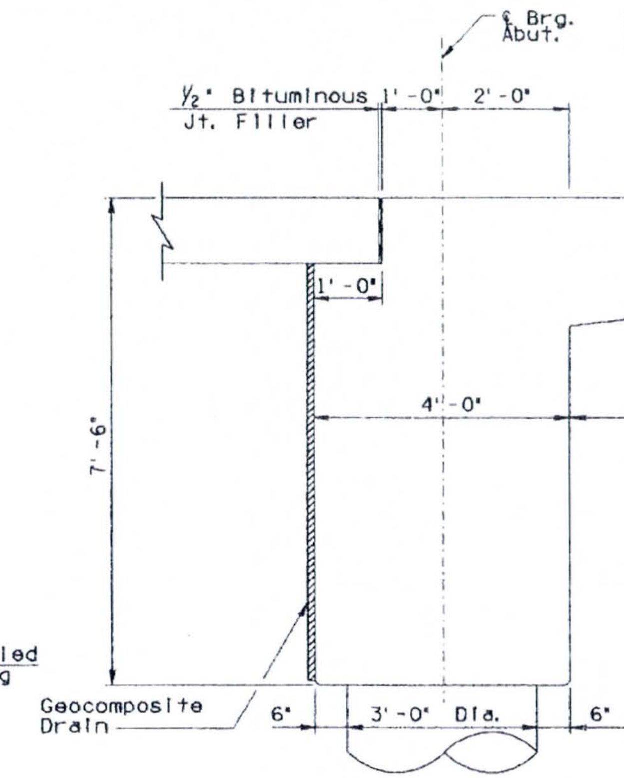
TRACS NO. H 4573 01C | 022-2(56) | 136 OF 161

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	137	161	DD 5/04/07

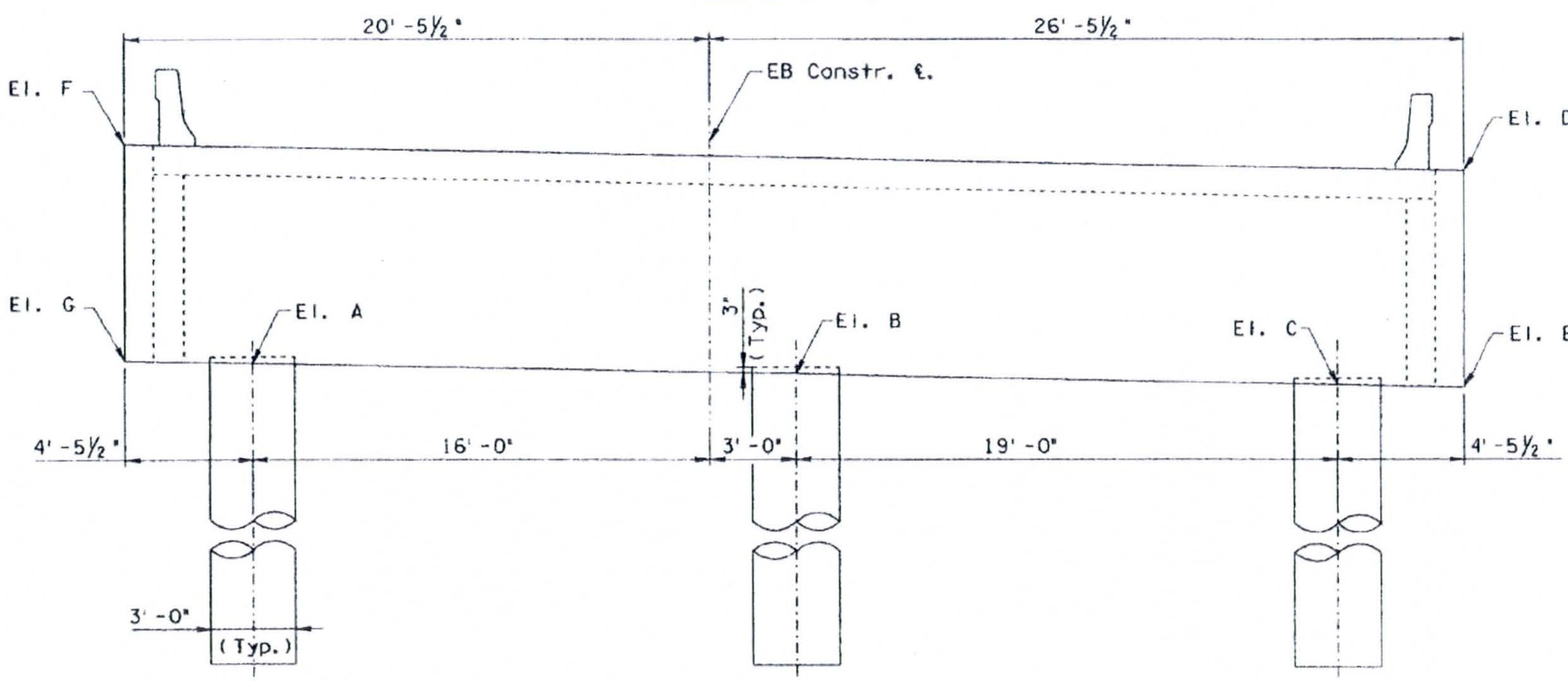
060 MA 136



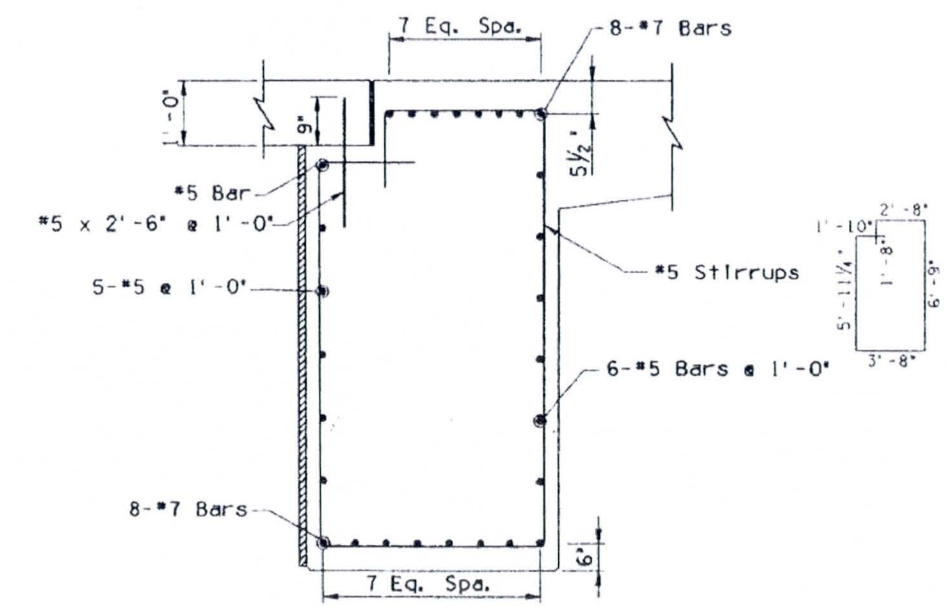
ABUTMENT PLAN
(Abut. 2 shown, Abut. 1 opposite hand)
Scale: 1" = 3'-0"



TYPICAL SECTION
Scale: ¾" = 1'-0"



ABUTMENT ELEVATION
(Abut. 2 shown, Abut. 1 opposite hand)
Scale: 1" = 3'-0"



TYPICAL SECTION
Scale: ¾" = 1'-0"

	El. A	El. B	El. C	El. D	El. E	El. F	El. 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 ℄ of Brg. Abut.

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	C. RODRIGUEZ	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

Sverdrup CIVIL INC

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
ABUTMENT PLAN AND ELEVATION

ROUTE	MILEPOST	STRUCTURE NO.
US 60	138.09	2561

LOCATION: DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 11 OF 17

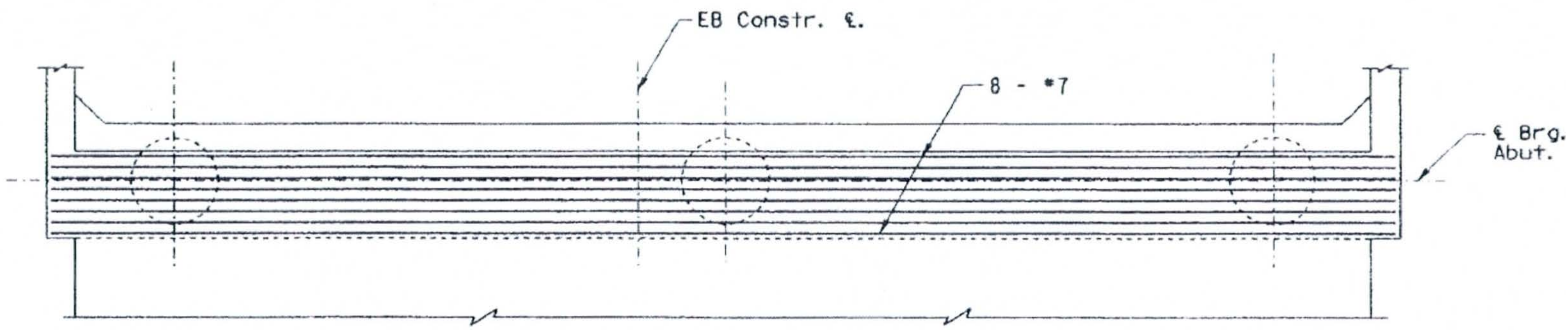
TRACS NO. H 4573 01C | 022-2(56) | 137 OF 161

PLOTTED BY: ecgorbe DATE PLOTTED: 31-JAN-2001 14:24
FILE: p:\014017\720cadd\709str\780dgn\mcmicken\017eeabt.dgn

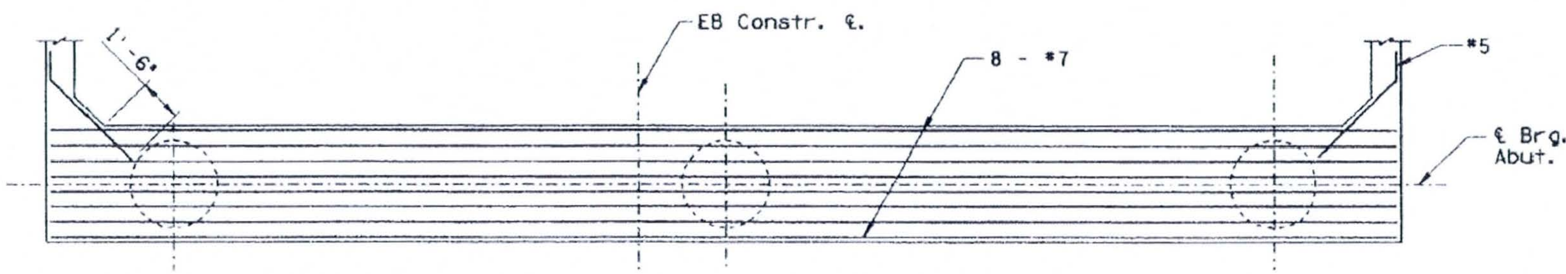
SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	138	161	DD 5/04/07

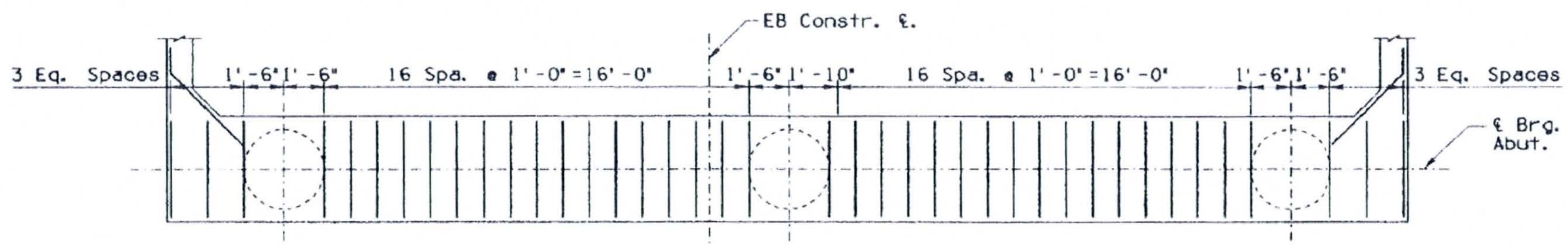
060 MA 136



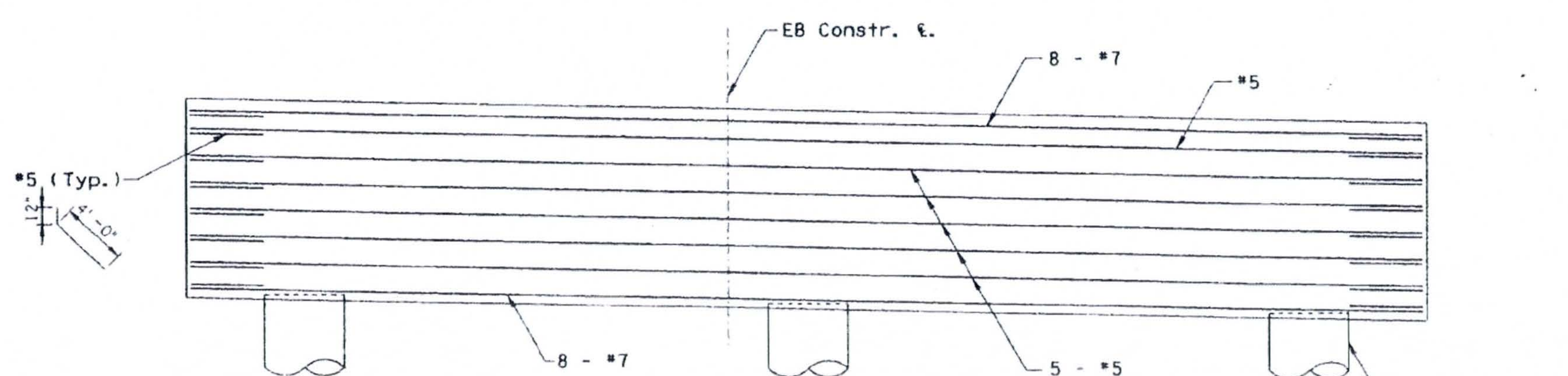
PLAN OF TOP STEEL
Scale: 1" = 3'-0"



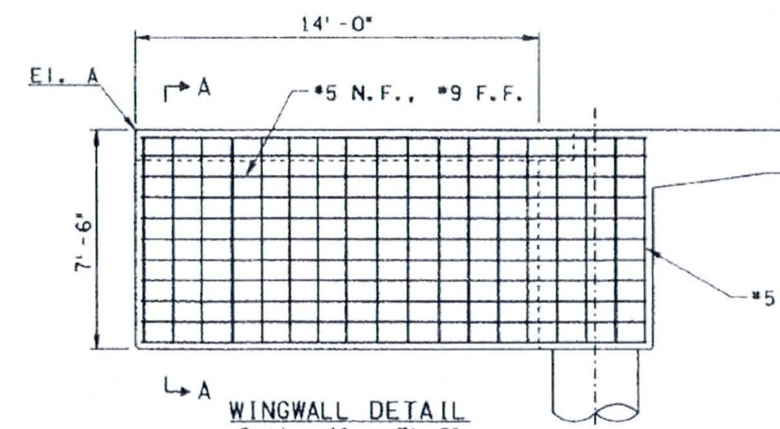
PLAN OF BOTTOM STEEL
Scale: 1" = 3'-0"



PLAN OF STIRRUP SPACING
Scale: 1" = 3'-0"



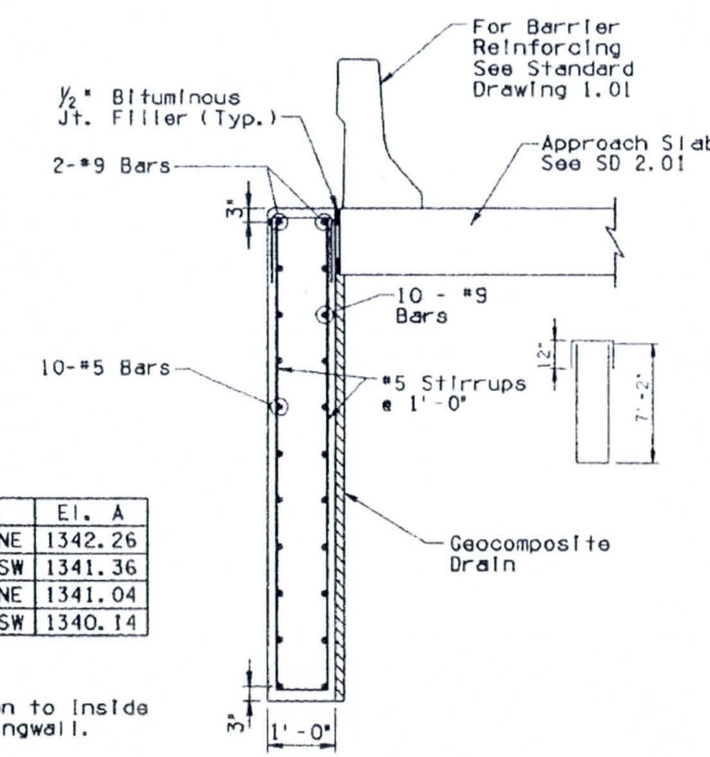
ELEVATION
Scale: 1" = 3'-0"



WINGWALL DETAIL
Scale: 1" = 3'-0"

Wingwall	El. A
Abut. 1 NE	1342.26
Abut. 1 SW	1341.36
Abut. 2 NE	1341.04
Abut. 2 SW	1340.14

NOTE:
El. A Given to Inside Face of Wingwall.



SECTION A-A
Scale: ¾" = 1'-0"

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
ABUTMENT & WINGWALL DETAILS

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

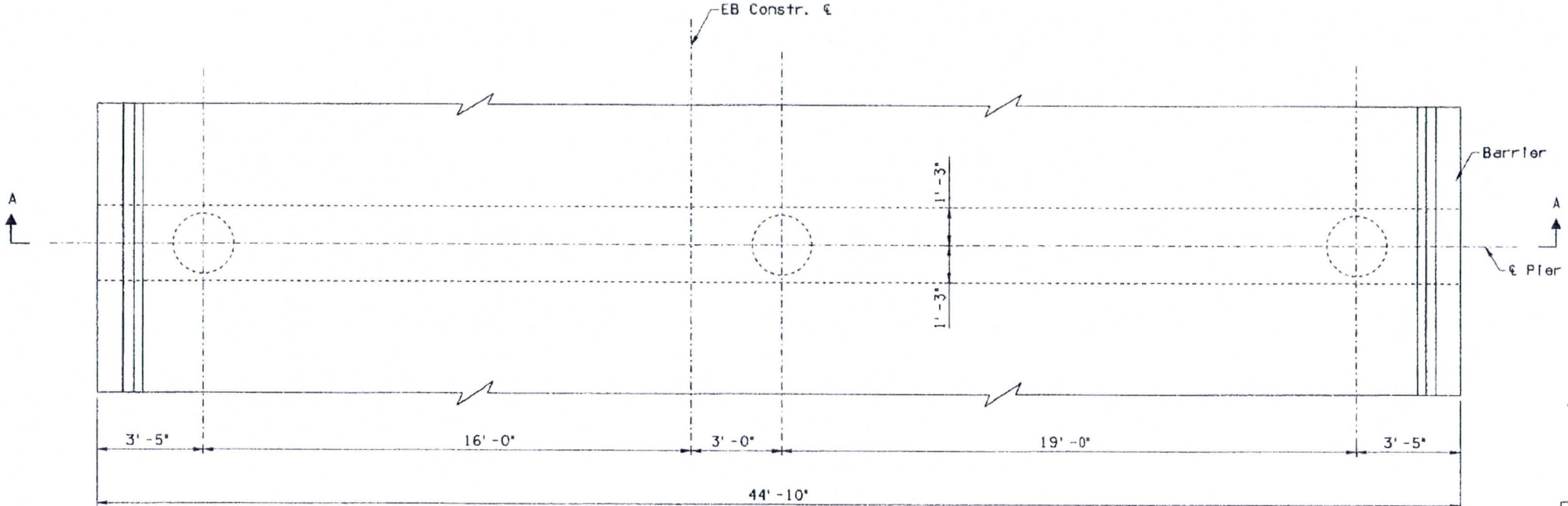
SHEET 12 OF 17

TRACS NO. H 4573 01C

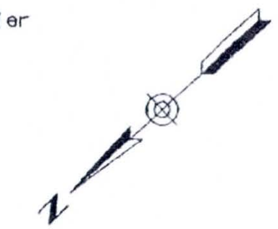
022-2(56)

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	139	161	DD 5/04/07

060 MA 136

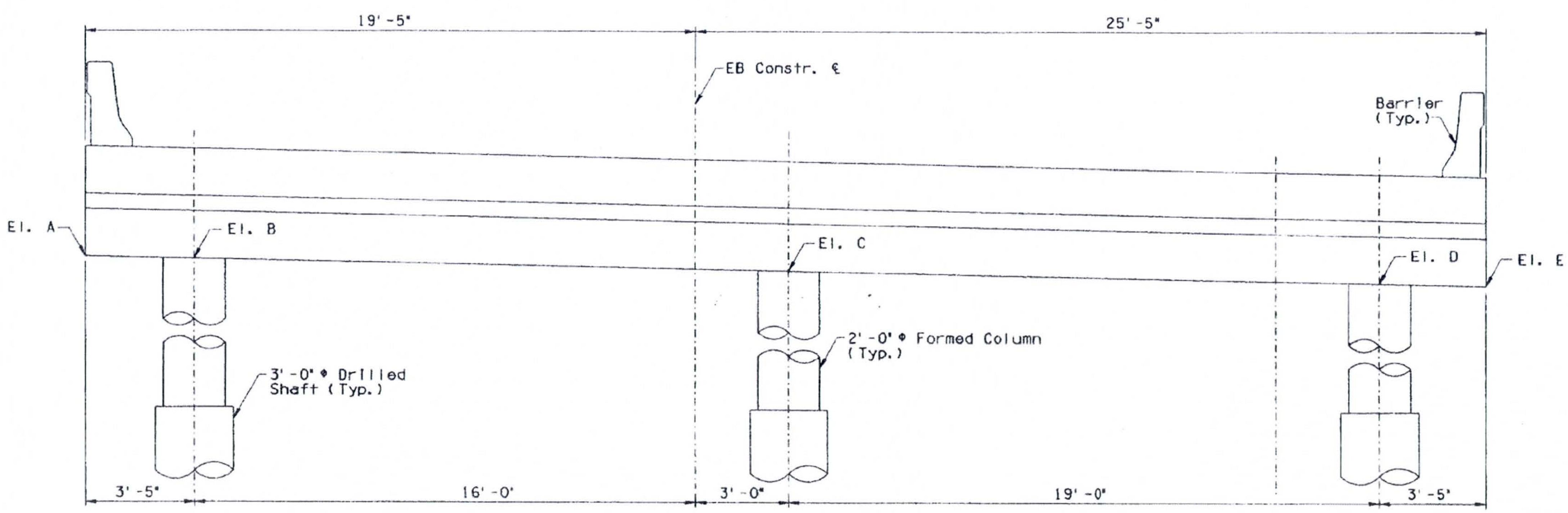


PLAN
Scale: ½" = 1'-0"



PIER ELEVATION TABLE			
	Pier 1	Pier 2	Pier 3
El. A	1338.51	1338.24	1337.95
El. B	1338.45	1338.18	1337.89
El. C	1338.06	1337.79	1337.50
El. D	1337.68	1337.41	1337.12
El. E	1337.61	1337.34	1337.05

NOTE:
Elevations given are at the ℄ of Pier.



SECTION A-A
(Looking Ahead Station)
Scale: ½" = 1'-0"

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SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	K. BROWN	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
PIER PLAN AND ELEVATION

US 60	138.09	2561
ROUTE	MILEPOST	STRUCTURE NO.

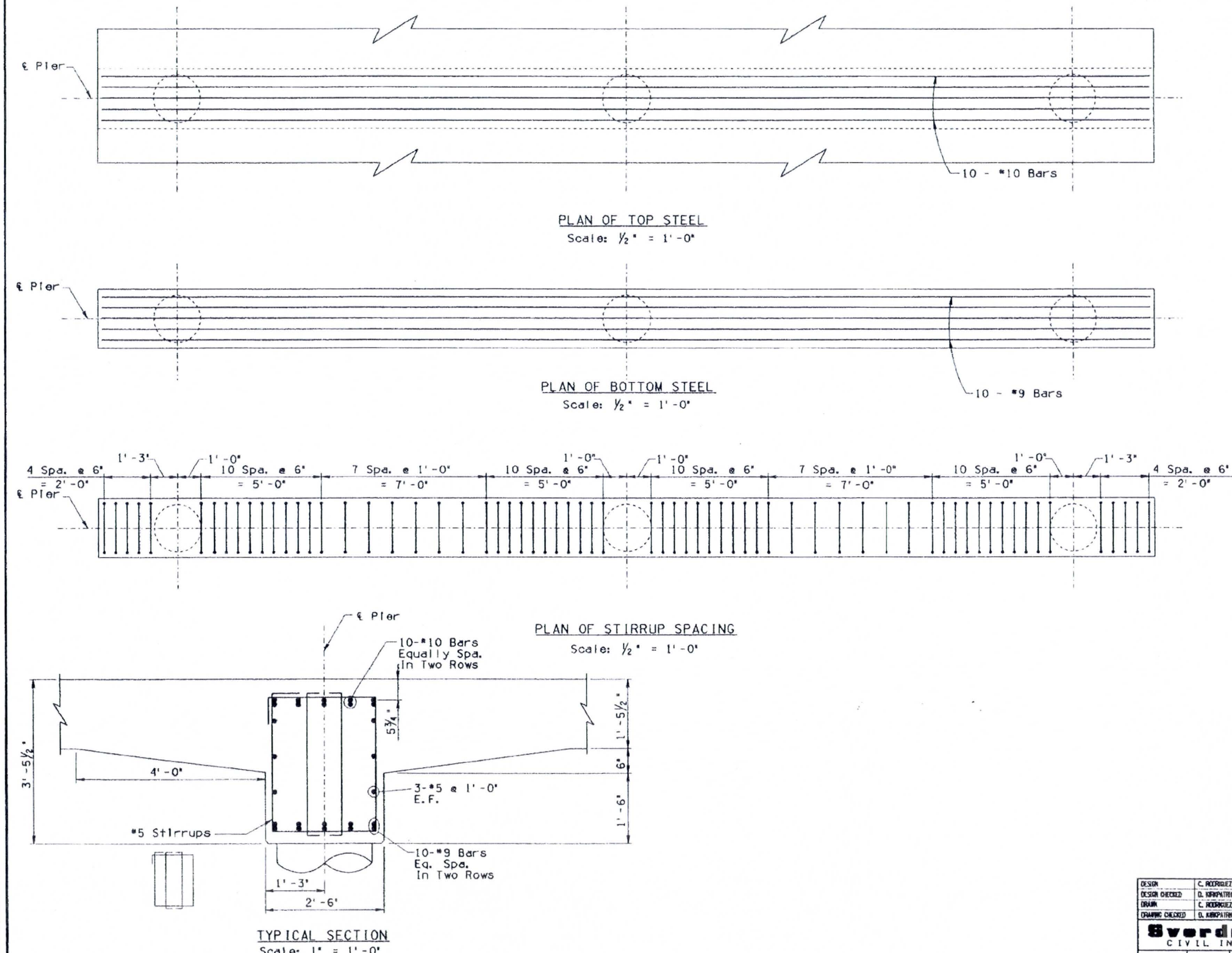
LOCATION: DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 13 OF 17

TRACS NO. H 4573 01C | 022-2(56) | 139 OF 161

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	140	161	DD 5/04/07

060 MA 136



DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	C. RODRIGUEZ	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

Sverdrup CIVIL INC

ROUTE	MILEPOST	STRUCTURE NO.
US 60	138.09	2561

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
PIER DETAILS

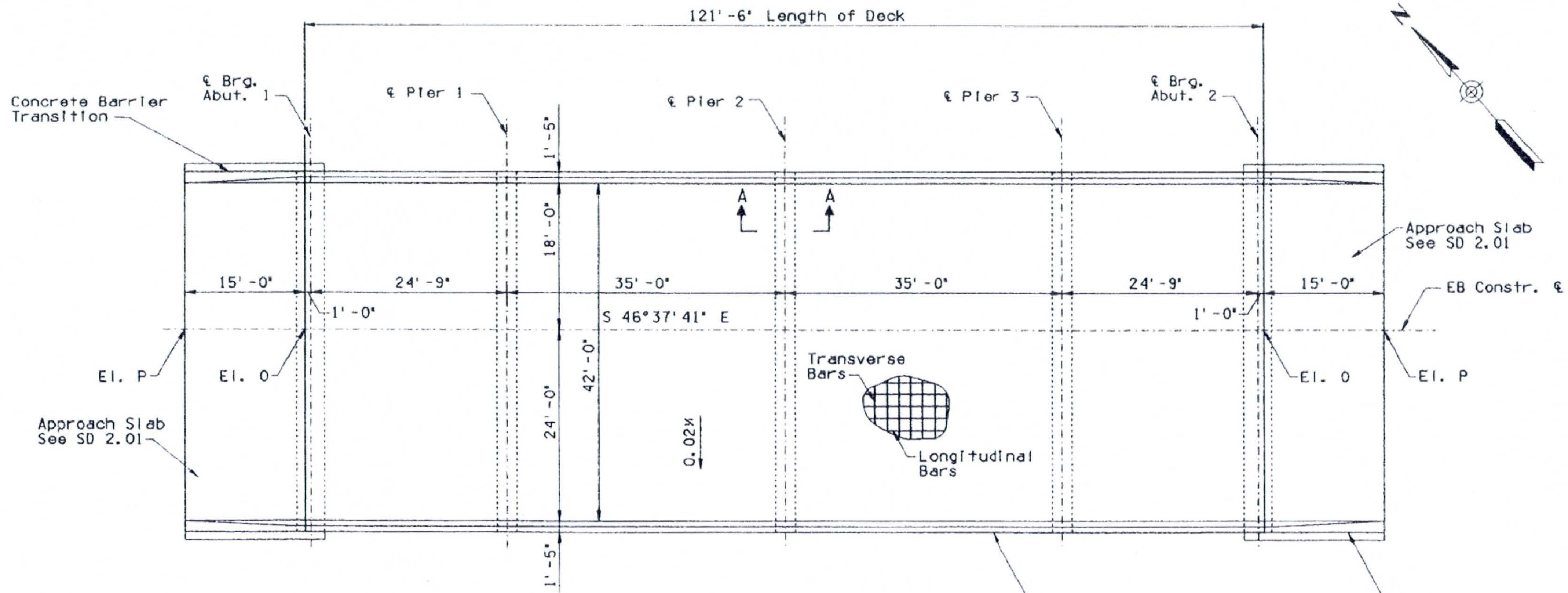
LOCATION DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 14 OF 17

TRACS NO. H 4573 01C | 022-2(56)

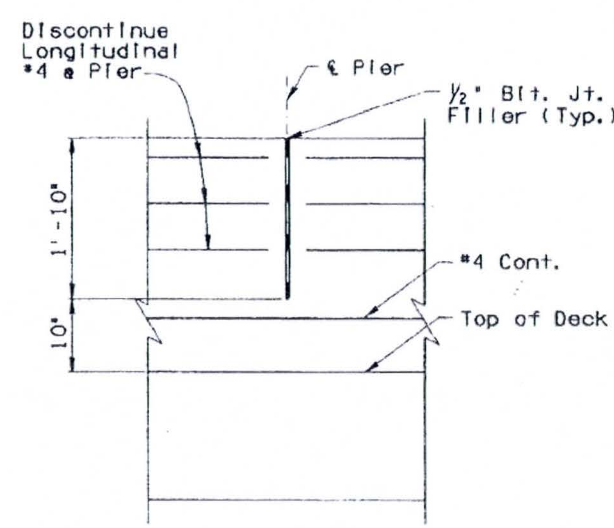
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	141	161	DD 5/04/07

060 MA 136



DECK PLAN

Scale: 1/8" = 1'-0"



SECTION A-A

At Piers Only

Scale: 1" = 1'-0"

APPROACH SLAB TABLE				
TOP OF SLAB ELEVATIONS				
	Abutment 1		Abutment 2	
Location	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
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
DECK PLAN

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 15 OF 17

TRACS NO. H 4573 01C | 022-2(56) | 141 OF 161

PLOTTED BY: edgerbe DATE PLOTTED: 31-JAN-2001 15:54
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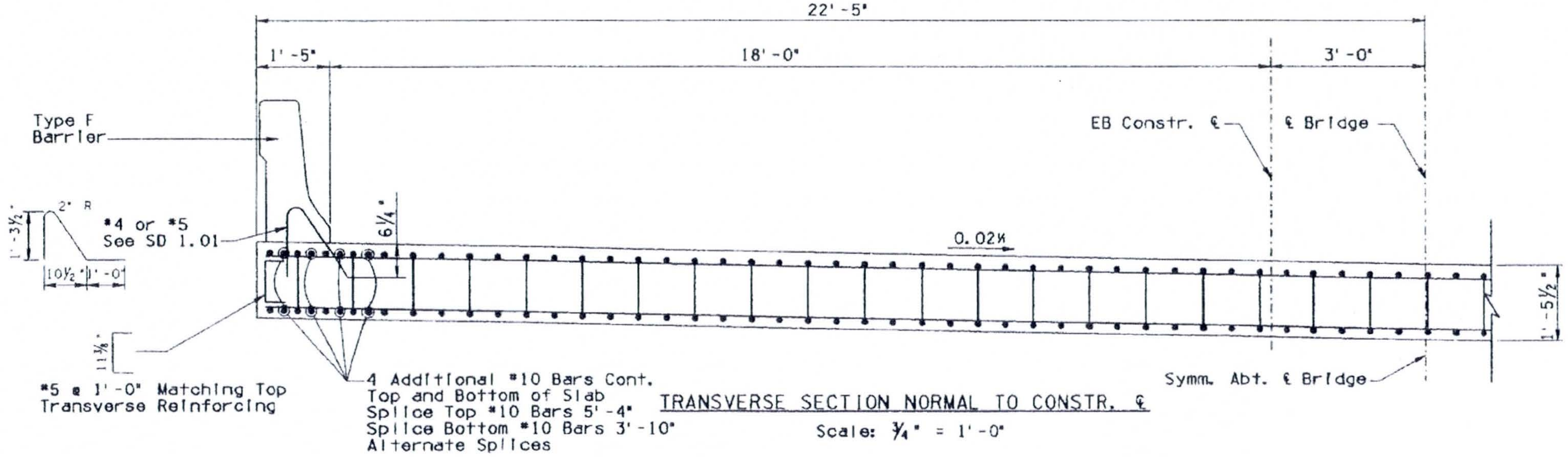
FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	022-2(56)	142	161	00 5/04/01

060 MA 136

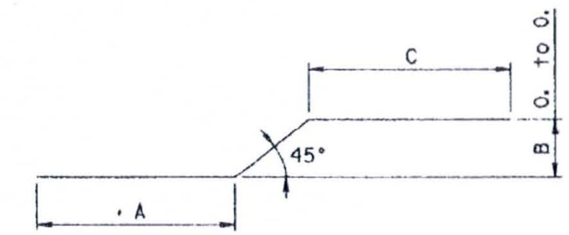


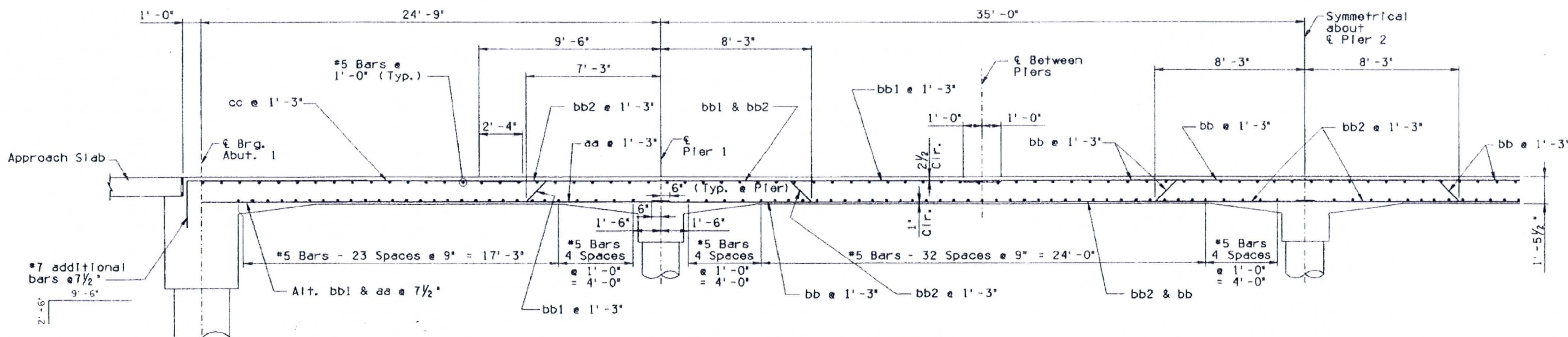
TRANSVERSE SECTION NORMAL TO CONSTR. ℄

Scale: ¾" = 1'-0"

BAR LIST

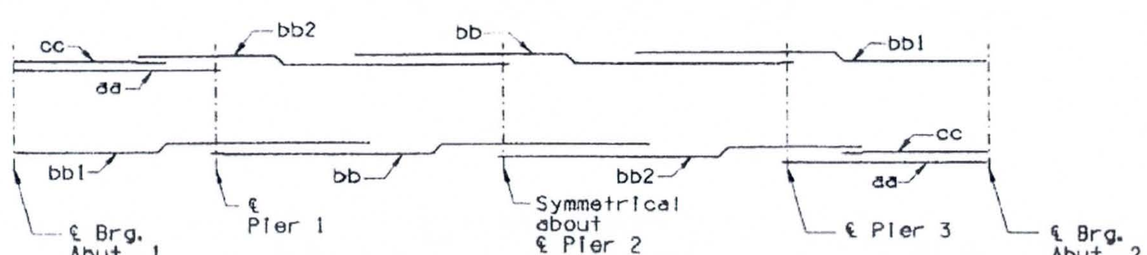
Mark	Size	Bend	Length	A	B	C
aa	7	Str.	25'-3"	-	-	-
bb	10		54'-6"	27'-3"	1'-2"	25'-7"
bb1	10		43'-9"	17'-6"	1'-2"	24'-7"
bb2	10		45'-6"	27'-3"	1'-2"	16'-7"
cc	7	Str.	17'-7"	-	-	-





LONGITUDINAL SECTION ALONG CONSTR. ℄

Scale: ⅜" = 1'-0"



SLAB STEEL PLACING DIAGRAM

N.T.S

PLOTTED BY: Edsersa DATE PLOTTED: 05-MAR-2001 08:27

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	H. BROWN	8/99
DRAWING CHECKED	D. KIRKPATRICK	8/99

Sverdrup CIVIL INC

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
DECK DETAILS

ROUTE	MILEPOST	STRUCTURE NO.
US 60	138.09	2561

LOCATION: DEER VALLEY RD. TO BEARDSLEY RD.

SHEET 16 OF 17

TRACS NO. H 4573 01C — 022-2(56)

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

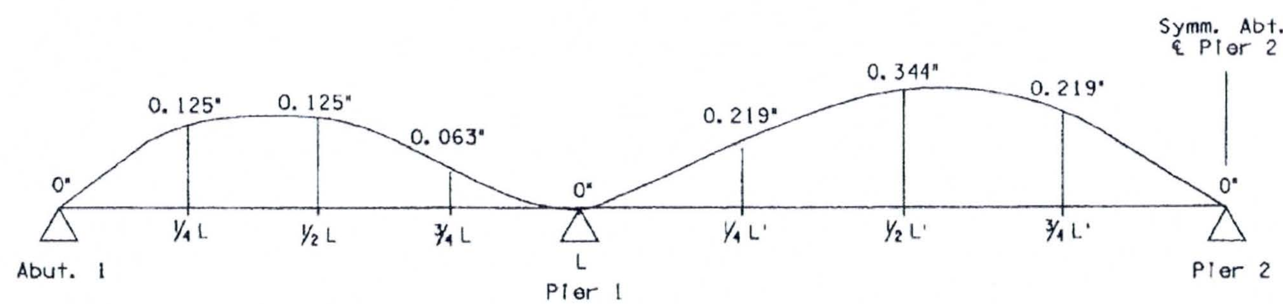
060 MA 136

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.

DESIGN	C. RODRIGUEZ	8/99
DESIGN CHECKED	D. KIRKPATRICK	8/99
DRAWN	K. BROWN	8/99
DRAFTING CHECKED	D. KIRKPATRICK	8/99

Sverdrup
CIVIL INC

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 865+
McMICKEN DAM OUTLET CHL BR EB
SCREED ELEVATIONS

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
US 60	138.09	2561	DEER VALLEY RD. TO BEARDSLEY RD.

Registered Professional Engineer (Civil) 34856 DOUGLAS A. KIRKPATRICK ARIZONA, U.S.A.

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**, Upthrown Side; **D**, Downthrown side; queried where uncertain.[3]
- 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

[1]Depth to Bedrock: AMEC, 2003.

[2]Depth to Lower Alluvial Unit: Driller logs from ADWR. In used records and Kam et al., 1966.

[3] Concealed Fault Line, [4]Depth to Crystalline Rock, and [5]Approximate 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.

[6]Bouger Gravity: Arizona Complete Bouger Gravity Anomaly Map: U.S. Department of the Interior, U.S. Geological Survey Open-File Report 01-0081.

0 3,500 7,000 14,000 Feet

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

N

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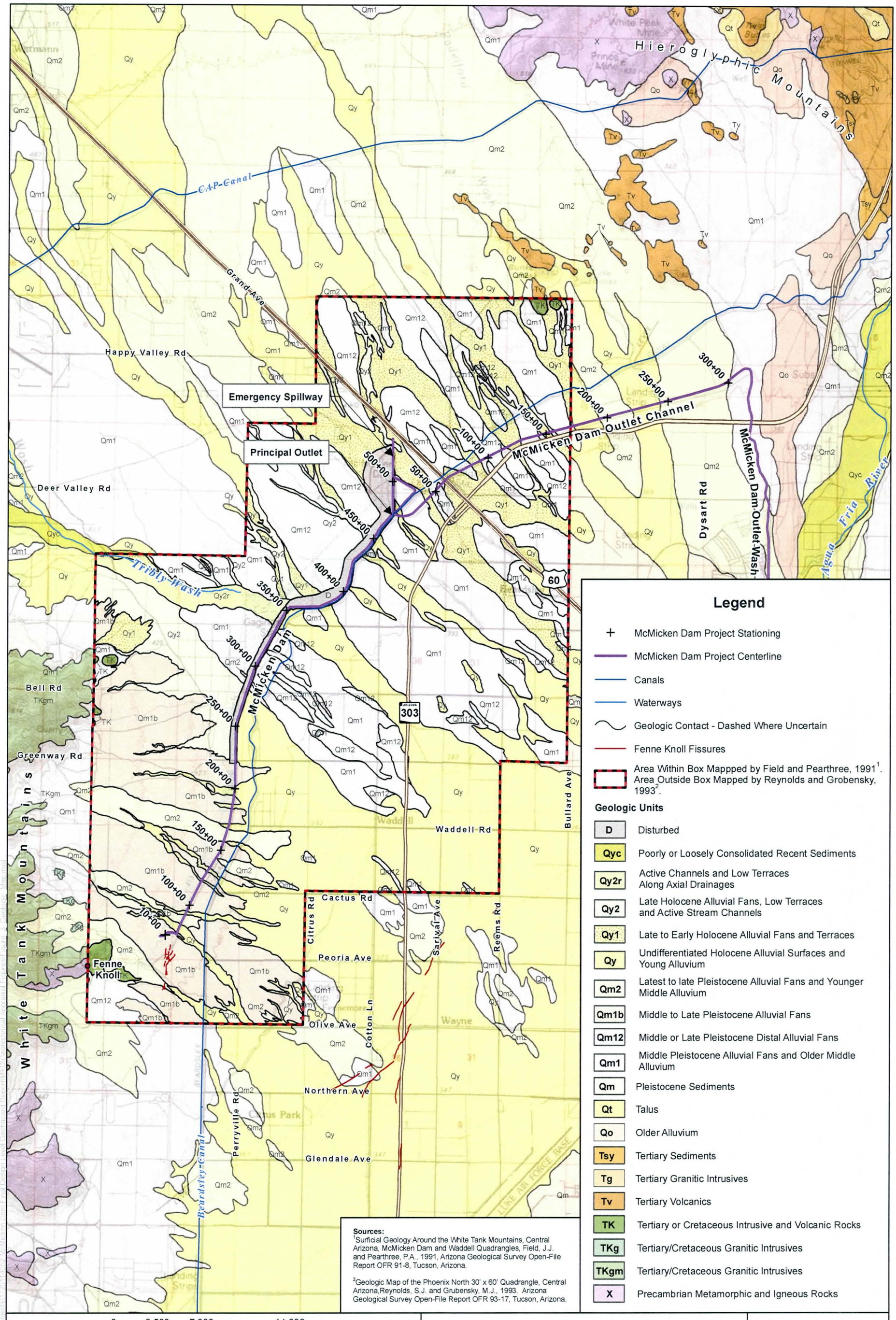
Geotechnical Appraisal Report
McMicken Dam Project
Flood Control District of Maricopa County

Regional Gravity, Depth to Bedrock and Depth to Lower Alluvial Unit

FIGURE 2

amec



Legend

- McMicken Dam Project Stationing
- McMicken Dam Project Centerline
- Canals
- Waterways
- Geologic Contact - Dashed Where Uncertain
- Fenne Knoll Fissures
- Area Within Box Mappped by Field and Pearthree, 1991[1]. Area Outside Box Mapped by Reynolds and Grobensky, 1993[2].

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 Grubensky, M.J., 1993. Arizona Geological Survey Open-File Report OFR 93-17, Tucson, Arizona.

0 3,500 7,000 14,000 Feet

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Job No.	17-2011-4052
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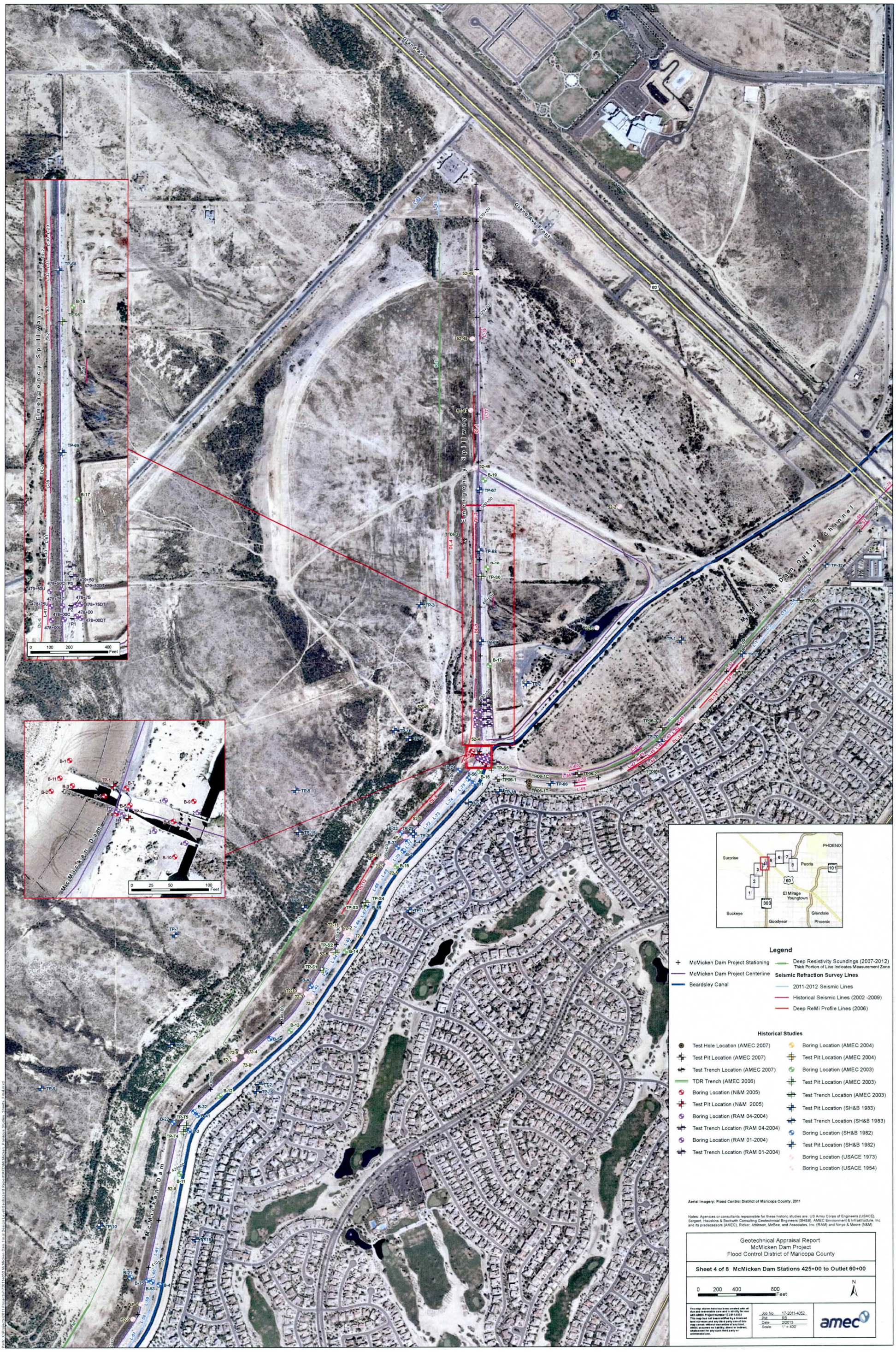
Geotechnical Appraisal Report
McMicken Dam Project
Flood Control District of Maricopa County

Surficial Geologic Map

FIGURE 3

amec



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 repsonsible for these historic studies are: US Army Corps of Engineers (USACE), Sergent, Hauskins & Beckwith Consulting Geotechnical Engineers (SH&B), AMEC Environment & Infrastructure, Inc and its predecessors (AMEC), Ricker, Atkinson, McBee, and Associates, Inc. (RAM) and Ninyo & Moore (N&M).

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

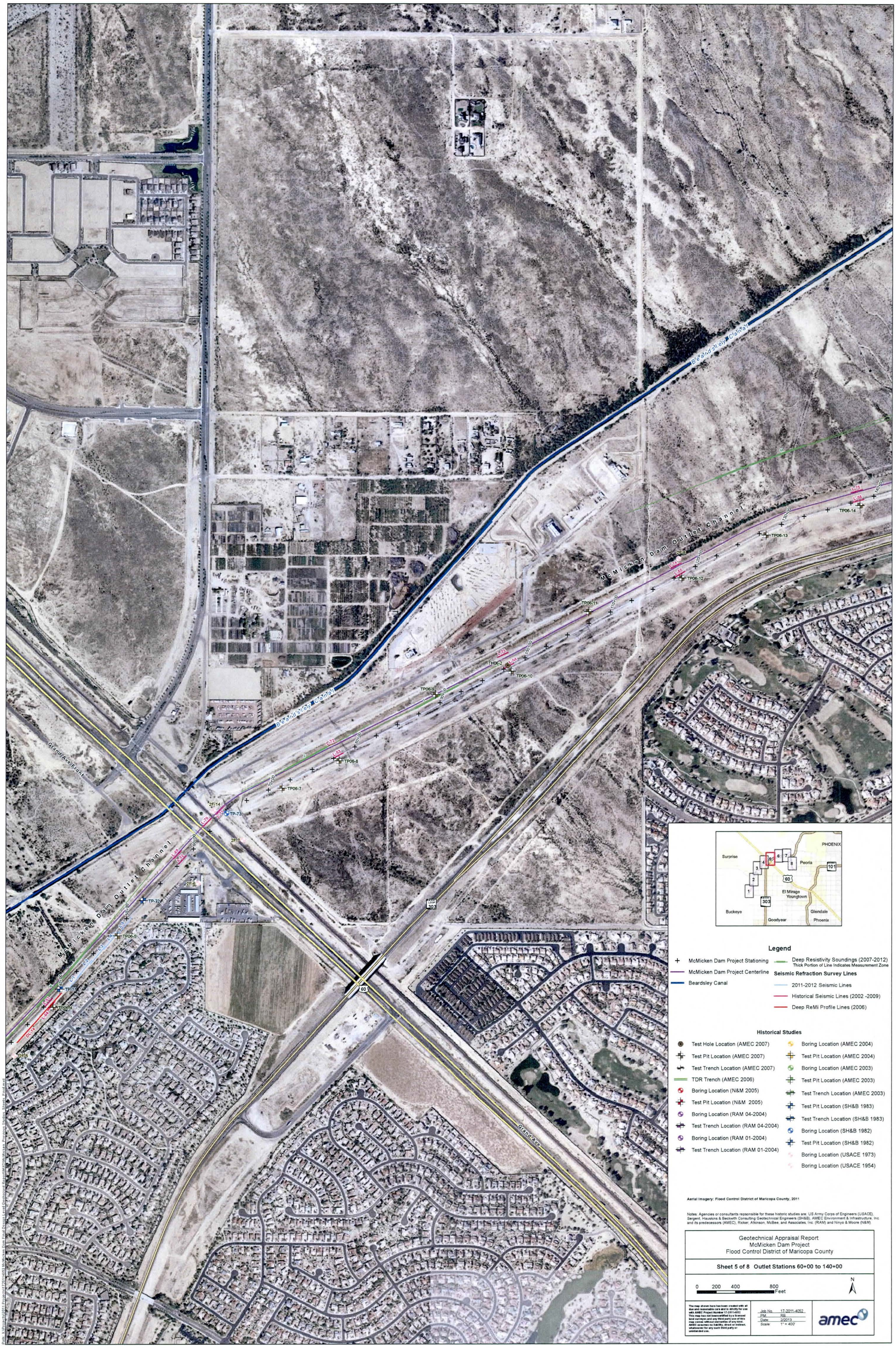
Sheet 4 of 8 McMicken Dam Stations 425+00 to Outlet 60+00

0 200 400 800 Feet

N

Job No.	17-2011-4052
PM	RB
Date	2/2013
Scale	1" = 400'

amec



Aerial Imagery: Flood Control District of Maricopa County, 2011

Notes: Agencies or consultants repsonsible for these historic studies are: US Army Corps of Engineers (USACE), Sergent, Hauskins & Beckwith Consulting Geotechnical Engineers (SH&B), AMEC Environment & Infrastructure, Inc and its predecessors (AMEC), Ricker, Atkinson, McBee, 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

Job No. 17-2011-4052
PM: RB
Date: 2/2013
Scale: 1" = 400'

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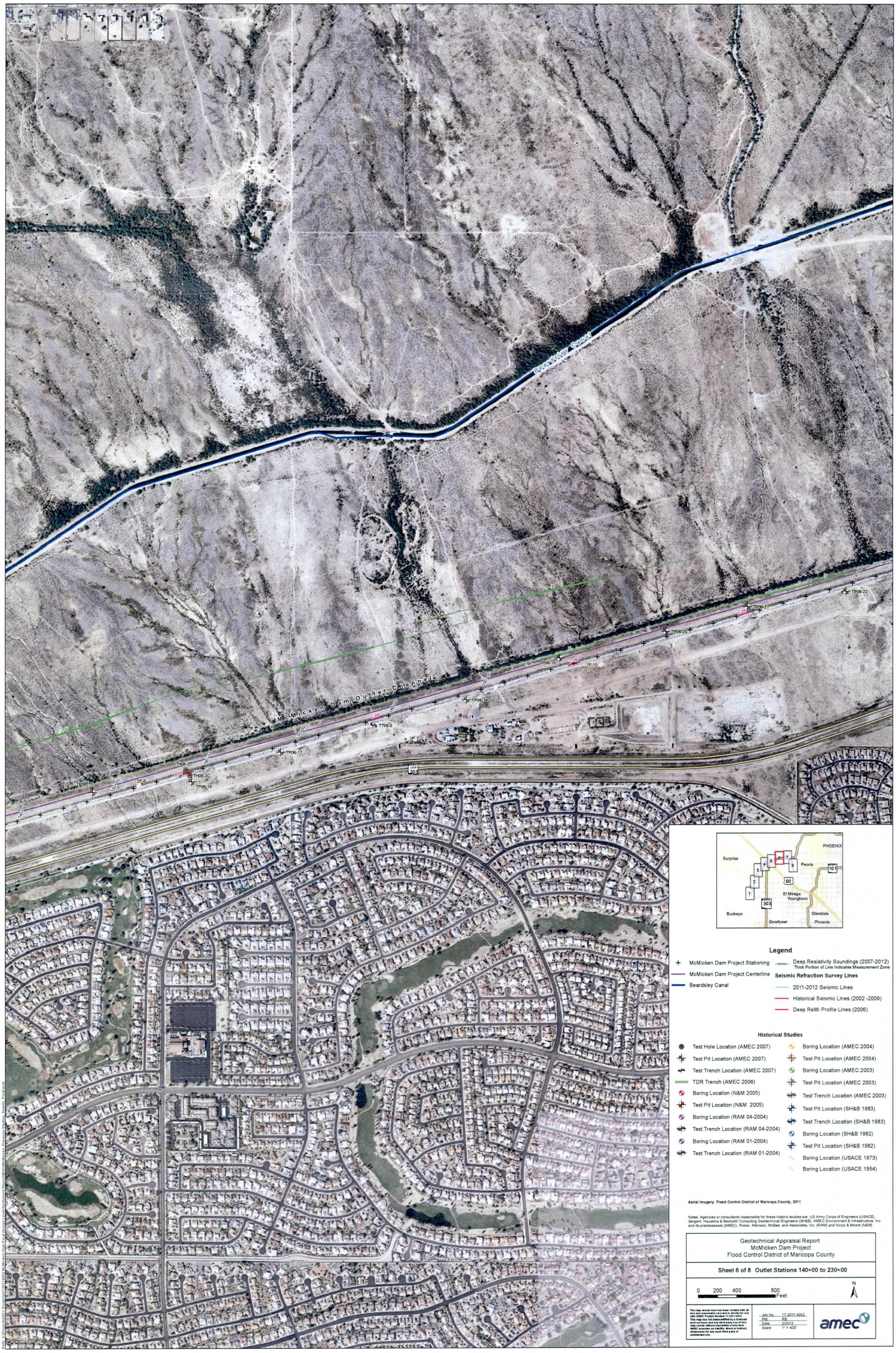
Beardsley Canal
McMicken Dam Outlet Channel
TP06-22
TP06-21
TP06-20
TP06-19
TP06-18
TP06-17
TT06-5
TH06-3T
TH06-3C
TP06-16
TP06-15
2F-10
2F-9
L-25
L-26
L-48
L-57
Loop 303
PHOENIX
Surprise
Peoria
Buckeye
Goodyear
Glendale
Phoenix
El Mirage
Youngtown
Legend
McMicken Dam Project Stationing
McMicken Dam 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), Sergent, Hauskins & Beckwith Consulting Geotechnical Engineers (SH&B), AMEC Environment & Infrastructure, Inc. and its predecessors (AMEC), Ricker, Atkinson, McBee, and Associates, Inc. (RAM) and Ninyo & Moore (N&M).
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
N
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Job No. 17-2011-4052
PM RB
Date 2/2013
Scale 1" = 400'
amec
Path: x:\Project\2011 Projects\17201140\2 McMicken Dam Final Design\Level 0\Dashboard Report\MXD\McMicken Previous Studies_Sheet6_Final.mxd

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 repsonsible for these historic studies are: US Army Corps of Engineers (USACE), Sergent, Hauskins & Beckwith Consulting Geotechnical Engineers (SH&B), AMEC Environment & Infrastructure, Inc. and its predecessors (AMEC), Ricker, Atkinson, McBee, and Associates, Inc. (RAM) and Ninyo & Moore (N&M).

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

N

Job No.	17-2011-4052
PM:	RB
Date:	2/2013
Scale:	1" = 400'

amec

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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		**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
1						ASTM D2292 Nuclear Density at 2.0' Dry Density 96 pcf	
2				6			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. TH06-1C

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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						ASTM D2292 Nuclear Density at 2.0' Dry Density 110 pcf	
2				6			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. TH06-1T

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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		**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
1				6		ASTM D2292 Nuclear Density at 1.5' Dry Density 102 pcf	
							Stopped Digging at 1'6"
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. TH06-2

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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		**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
1						ASTM D2292 Nuclear Density at 2.0' Dry Density 108 pcf	
2				4			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. TH06-3C

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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		**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	
							Stopped Digging at 2'6"
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. TH06-3T

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	REMARKS	SOIL DESCRIPTION
0			D		SC		**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
1						ASTM D2292 Nuclear Density at 2.0' Dry Density 89 pcf	
2				7			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. TH06-4C

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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						ASTM D2292 Nuclear Density at 2.0' Dry Density 78 pcf	
2				13			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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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	
							Stopped Digging at 1'6"
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. TH06-5

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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							note: Stage I cementation & trace of fine grained gravel below 3'6"
4							
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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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
							note: Stage II cementation below 10'
11							note: SC zone, predominantly fine to medium grained sand from 11' to 12'
12			D				note: decrease in fines below 12', possible SP/GP
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. TP06-1

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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			D				note: trace of fine grained gravel below 6'
7							
8							
9					SC	slightly moist	**CLAYEY SAND,** trace of silt, predominantly fine grained sand, trace of cobbles up to 3" in diameter, subangular, uncemented to Stage I, low to medium 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. TP06-2

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
10			D		SC	slightly moist	**CLAYEY SAND,** continued
11							note: predominantly fine to medium grained sand & Stage I cementation below 11'
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. TP06-2

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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-ML		**SANDY CLAY TO SANDY SILT,** predominantly fine grained sand, Stage I to I+ cementation, medium to high plasticity, brown
3			D		SM		**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'
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. TP06-3

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
10					SM		**SILTY SAND,** continued
11					SM		**SILTY SAND,** predominantly fine grained sand, subangular to subrounded, uncemented, low plasticity, dark brown
12			D				
13							
14							
15							Stopped Backhoe at 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. TP06-3

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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
							Backhoe refused at 11'6"
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. TP06-4

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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 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
1							
2							
3							note: well graded sand & increase in fine grained gravel & medium plasticity below 3'
4							
5					SC/GC	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')
6							note: Stage II cementation & reddish-brown to white below 9'
7							
8			D				
9			D				
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. TP06-5

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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	slightly moist	**CLAYEY SAND WITH GRAVEL,** continued
11			D				note: slight decrease in cemenation at 11'
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

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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,** predominantly fine to medium grained sand, some coarse grained gravel, subangular to subrounded, Stage I cementation, medium plasticity, brown
1							
2			D		SC/CL	slightly moist	**SAND & CLAY,** predominantly fine grained sand, uncemented to Stage I cementation, medium to high plasticity, light brown to brown
3							
4							note: increase in fine grained sand & Stage I cementation below 4'
5							
6					SC	slightly moist	**CLAYEY SAND,** trace of fine grained gravel, predominantly fine grained sand, Stage I cementation, medium to high plasticity, dark brown
7			D				
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. TP06-8

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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	slightly moist	**CLAYEY SAND,** continued
							note: Stage I+ cementation below 10'
11			D				
12							note: Stage I+ to II below 12'
							Stopped Backhoe at 12'6"
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. TP06-8

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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
5							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
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. TP06-9

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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				
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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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-GC	slightly moist	**SAND & GRAVEL WITH CLAY,** considerable predominantly coarse grained gravel, predominantly well graded sand, Stage I+ to II cementation, low plasticity, light brown
1							
2			D		CL/SC	slightly moist	**SAND & CLAY,** predominantly fine grained sand, Stage I cementation, medium plasticity, reddish-brown
3							
4							
5							
6			D		SC-GC	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
7							
8							note: CL-SC zones from 8' to 9'
9			D				note: decrease in coarse grained gravel, subangular to subrounded below 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. TP06-11

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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							
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

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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
1			D				
2							
3							
4							note: predominantly well graded gravel, subangular to subrounded, light brown to tan below 4'
5			D				
6							note: Stage I+ cementation below 6'
7							
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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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
							note: Stage I cementation & well graded sand below 10'
11							
12			D				
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. TP06-12

PROJECT Wittmann ADMP

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
0					GC	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
1							
2			D				
3							
4							
5					SC	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
6							
7			D		GC	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)
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. TP06-13

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	REMARKS	SOIL DESCRIPTION
10			D		GC	slightly moist	**CLAYEY GRAVEL,** 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. TP06-13

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	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+ cemenation, 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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
10					GC	slightly moist	**CLAYEY GRAVEL,** continued
11							note: Stage I+ to II cementation & light brown to tan below 11'
12			D				
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. TP06-14

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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	REMARKS	SOIL DESCRIPTION
10					SM	slightly moist	**SILTY SAND WITH GRAVEL,** continued
11							
							Stopped Backhoe at 11'6"
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. TP06-15

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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-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			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	REMARKS	SOIL DESCRIPTION
10					GC	slightly moist	**CLAYEY GRAVEL,** continued
11							
12			D				
							Stopped Backhoe at 12'6"
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. TP06-16

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

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

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

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

GROUNDWATER

DEPTH	HOUR	DATE
	none	

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

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
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	REMARKS	SOIL DESCRIPTION
0			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 to high plasticity, light brown
1							
2			D		SM/GM	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
3					GM	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
4			D				
5							
6							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. TP06-19

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

PROJECT Wittmann ADMP

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 220+00
Channel
SURFACE ELEV. 1316.1'
DATUM NAVD 88

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
1							
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)
3							
4							
5							
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'
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
9			D				
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. TP06-21

PROJECT Wittmann ADMP

JOB NO. 6-117-001025 **DATE** 12/5/06

BACKHOE TYPE Volvo BL70
LOCATION Sta. 230+00
Downstream
SURFACE ELEV. 1319.7'
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	REMARKS	SOIL DESCRIPTION
0					SC-SM	slightly moist	**SILTY TO CLAYEY SAND,** predominantly fine grained sand, uncemented to Stage I, medium plasticity, light brown
2			D		CL	slightly moist	**SANDY CLAY,** predominantly fine grained sand, Stage I cementation, medium to high plasticity, reddish-brown
4					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				
8			D				
							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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 240+00
Downstream
SURFACE ELEV. 1319.6'
DATUM NAVD 88

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

PROJECT Wittmann ADMP

JOB NO. 6-117-001025 **DATE** 12/5/06

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 250+00
Channel
SURFACE ELEV. 1320.0'
DATUM NAVD 88

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
4							
5							
6			D				note: predominantly fine grained sand below 6'
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	REMARKS	SOIL DESCRIPTION
10					SM/GM		**SAND & GRAVEL WITH SILT,** continued
							Backhoe refused at 10'6"
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. TP06-24

PROJECT Wittmann ADMP

JOB NO. 6-117-001025 **DATE** 12/1/06

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 260+00
Downstream
SURFACE ELEV. 1320.0'
DATUM NAVD 88

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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 260+00
Downstream
SURFACE ELEV. 1320.0'
DATUM NAVD 88

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification or Rock Unit	REMARKS	SOIL DESCRIPTION
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

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 272+00
Downstream
SURFACE ELEV. 1311.7'
DATUM NAVD 88

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	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	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					SC	slightly moist	**CLAYEY SAND,** trace of fine grained gravel, predominantly fine grained sand, Stage I to I+ cementation, reddish-brown
2			D		SC-CL	slightly moist	**SAND & CLAY,** predominantly fine grained sand, Stage I+ to II cementation, medium to high plasticity, light brown to tan
6					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			D				
							Backhoe refused at 7'6"
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. TP06-27

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
1							note: uncemented to Stage I cementation & reddish-brown at 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
4			D				
5							note: decrease in cemetation (Stage I) & fine to medium grained sand below 5'
6							
7			D				
8							
9							note: increase in cementation (Stage II) below 9'
							Stopped Backhoe at 9'6"
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. TP06-28

PROJECT Wittmann ADMP

JOB NO. 6-117-001025 **DATE** 12/5/06

GROUNDWATER

	DEPTH	HOUR	DATE
▽		none	
▼			

BACKHOE TYPE Volvo BL70
LOCATION Sta. 300+00
Downstream
SURFACE ELEV. 1311.2'
DATUM NAVD 88

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-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

PROJECT Wittmann ADMP

JOB NO. 6-117-001025 **DATE** 12/5/06

GROUNDWATER

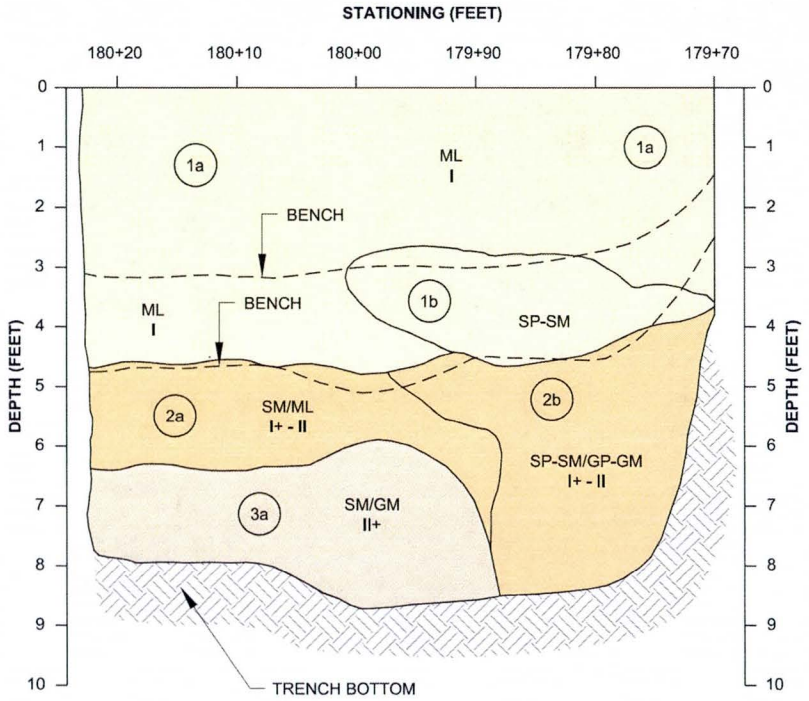
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Volvo BL70
LOCATION Sta. 307+50
Downstream
SURFACE ELEV. 1311.1'
DATUM NAVD 88

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,** 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							note: increase in coarse grained gravel & Stage I+ to II cementation below 8'6"
9							
							Backhoe refused at 9'6"
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. TP06-30



1a - (ML) Sandy silt, trace of clay, predominantly fine grained sand, Stage I, nonplastic to low plasticity, light brown

note: occasional sandy/gravelly lense

1b - (SP-SM) Sand with silt, some gravel, well graded sand, nonplastic, brown

note: occasional lense 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
- ALLUVIAL UNIT - 2 PLEISTOCENE
- ALLUVIAL UNIT - 3 PLEISTOCENE
- SM (I,II) USCS SOIL CLASSIFICATION WITH STAGE OF CARBONATE MORPHOLOGY
- CONTACT
- 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

amec

GsEndineering Department\2006 Projects\6-117-001025 Wittmann ADMP\cad\Trench Figures.dwg

PROJECT:	Wittmann ADMP McMicken Dam	**JOB NO:**	6-117-001025 PH 1
LOCATION:		**WORK ORDER NO:**	1
SAMPLE SOURCE:	SEE BELOW	**DATE ASSIGNED:**	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #
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

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/2006

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

				Silt or	SAND								GRAVEL									COBBLES	
					Fine			Medium			Coarse		Fine				Coarse						
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 #
PERCENT PASSING BY WEIGHT																							
TP06-03 @ 1.0-2.0'	SM	NV	NP	35	48	62	69	76	88	93	94	97	97	98	98	99	99	99	99	100	100	100	9
TP06-03 @ 3.0-4.0'	CL	37	19	71	80	85	88	90	94	96	96	98	98	99	99	100	100	100	100	100	100	100	10
TP06-29 @ 2.0-3.0'	SP-SM	46	13	9.1	13	17	19	22	30	40	44	64	67	75	81	87	91	94	99	100	100	100	11
TP06-29 @ 6.0-7.0'	SM	65	32	18	25	29	32	35	44	53	57	85	89	93	94	96	96	96	97	100	100	100	12
TP06-28 @ 0.0-1.0'	SC	25	9	50	65	77	82	86	92	95	96	98	99	100	100	100	100	100	100	100	100	100	13
TP06-28 @ 4.0-5.0'	GC	37	13	27	31	34	36	38	43	50	52	60	63	67	71	76	86	91	92	100	100	100	14
TP06-28 @ 7.0-8.0'	SM	45	18	47	56	61	64	69	80	88	90	97	98	98	99	100	100	100	100	100	100	100	15
TP06-27 @ 2.0-3.0'	CL	36	16	51	64	74	78	81	87	90	91	95	96	98	99	100	100	100	100	100	100	100	16
TP06-27 @ 7.0-7.5'	SC	35	11	18	25	33	38	43	54	67	72	89	92	96	97	99	100	100	100	100	100	100	17
TP06-26 @ 2.0-3.0'	CL	36	20	51	65	77	81	84	87	88	89	90	92	93	95	96	96	98	100	100	100	100	18

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
					Fine			Medium			Coarse		Fine				Coarse						
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 #
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

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL								COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse					
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 #

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	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	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	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	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	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	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	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	38

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AASHTO R18

REVIEWED BY CMK

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #

PERCENT PASSING BY WEIGHT

TP06-19 @ 4.0-5.0'	GP-GM	37	12	7.3	10	13	15	16	21	26	28	39	44	55	62	77	84	96	96	100	100	100	39
TP06-18 @ 1.0-2.0'	CL	25	8	56	69	81	85	88	93	96	97	99	99	99	99	99	100	100	100	100	100	100	40
TP06-18 @ 6.0-7.0'	CL	38	14	65	75	80	81	82	84	85	85	89	93	97	98	99	100	100	100	100	100	100	41
TP06-17 @ 2.0-3.0'	CL	38	19	61	75	84	87	90	94	96	97	99	100	100	100	100	100	100	100	100	100	100	43
TP06-17 @ 4.0-5.0'	SC	33	12	48	63	71	73	75	78	81	82	87	89	93	95	97	98	100	100	100	100	100	44
TP06-16 @ 6.0-7.0'	CL	36	15	53	64	71	73	76	79	83	84	88	90	94	97	99	100	100	100	100	100	100	47
TP06-15 @ 0.0-1.0'	SP-SM	NV	NP	7.7	13	23	28	33	41	47	50	65	73	83	90	95	97	98	100	100	100	100	49
TP06-15 @ 5.0-6.0'	CL-ML	23	7	57	73	85	88	90	92	93	93	95	96	98	98	99	100	100	100	100	100	100	50
TP06-15 @ 8.0-10.0'	SC	30	12	36	50	62	66	68	73	76	77	83	87	92	94	96	98	98	100	100	100	100	51

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #
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	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	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	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	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	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	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	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	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	62

AASHTO R18

REVIEWED BY CY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #
PERCENT PASSING BY WEIGHT																							
TP06-11 @ 10.0-11.0'	SC	30	10	20	29	38	44	51	62	72	74	86	89	93	95	98	100	100	100	100	100	100	63
TP06-10 @ 0.0-1.0'	SC	29	10	22	29	36	40	43	50	57	60	73	78	87	91	95	97	99	100	100	100	100	64
TP06-10 @ 7.0-8.0'	CL	30	14	64	76	83	85	86	89	91	92	95	97	98	99	100	100	100	100	100	100	100	65
TP06-09 @ 2.0-3.0'	GP-GC	39	22	7.6	10	13	15	18	26	33	36	50	57	69	77	87	92	97	98	100	100	100	67
TP06-09 @ 8.0-9.0'	SC	34	13	20	26	34	41	49	64	72	75	87	90	96	98	100	100	100	100	100	100	100	68
TP06-09 @ 11.0-12.0'	SP-SM	NV	NP	12	17	28	38	49	66	74	76	83	85	90	93	96	98	100	100	100	100	100	69
TP06-08 @ 2.0-3.0'	SM	22	3	47	69	85	89	91	96	95	96	98	98	99	99	99	100	100	100	100	100	100	70
TP06-08 @ 7.0-8.0'	SC	46	24	42	54	65	69	73	79	82	84	90	93	96	98	99	100	100	100	100	100	100	71
TP06-07 @ 0.0-1.0'	SP-SC	31	13	8.2	12	19	22	26	32	40	42	56	62	73	82	93	97	98	98	100	100	100	73
TP06-07 @ 4.0-6.0'	SC	45	25	35	41	51	58	64	73	77	78	82	85	90	93	97	99	100	100	100	100	100	74

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #

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

AASHTO R18

REVIEWED BY

PROJECT:	Wittmann ADMP McMicken Dam	JOB NO:	6-117-001025 PH 1
LOCATION:	Arizona	WORK ORDER NO:	2
SAMPLE SOURCE:	SEE BELOW	DATE ASSIGNED:	11/28/06

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

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
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 #

PERCENT PASSING BY WEIGHT

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	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	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	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	90

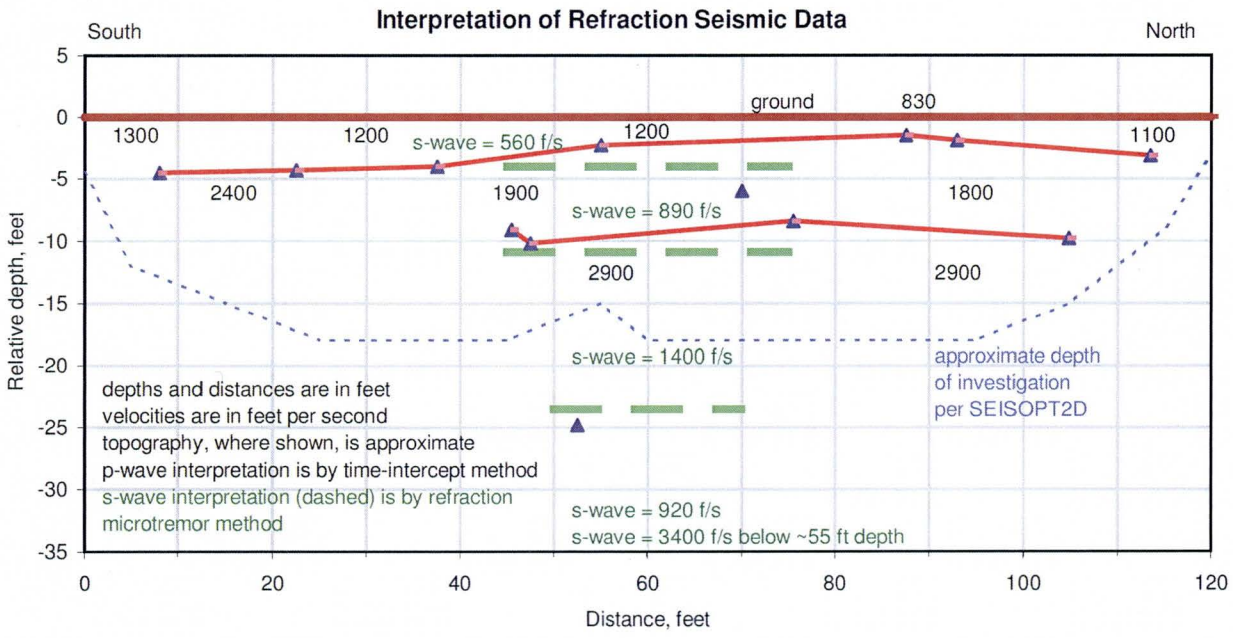
AASHTO R18

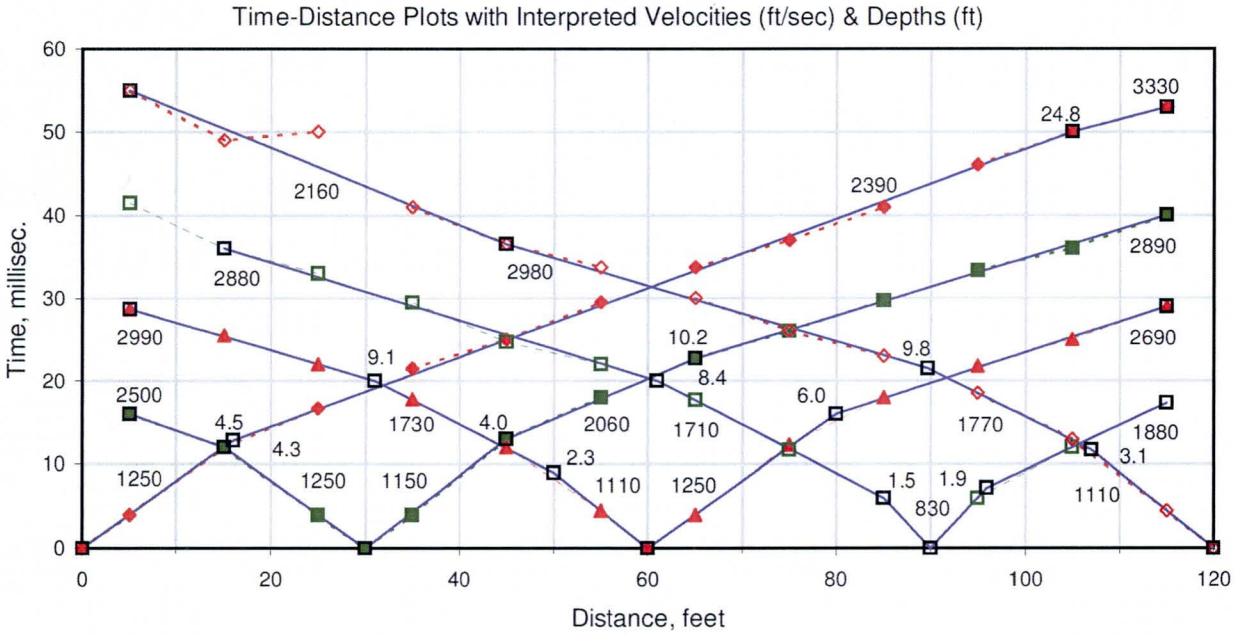
REVIEWED BY

Refraction Seismic Interpretation

Line 12

AMEC Job No. 6-117-001025

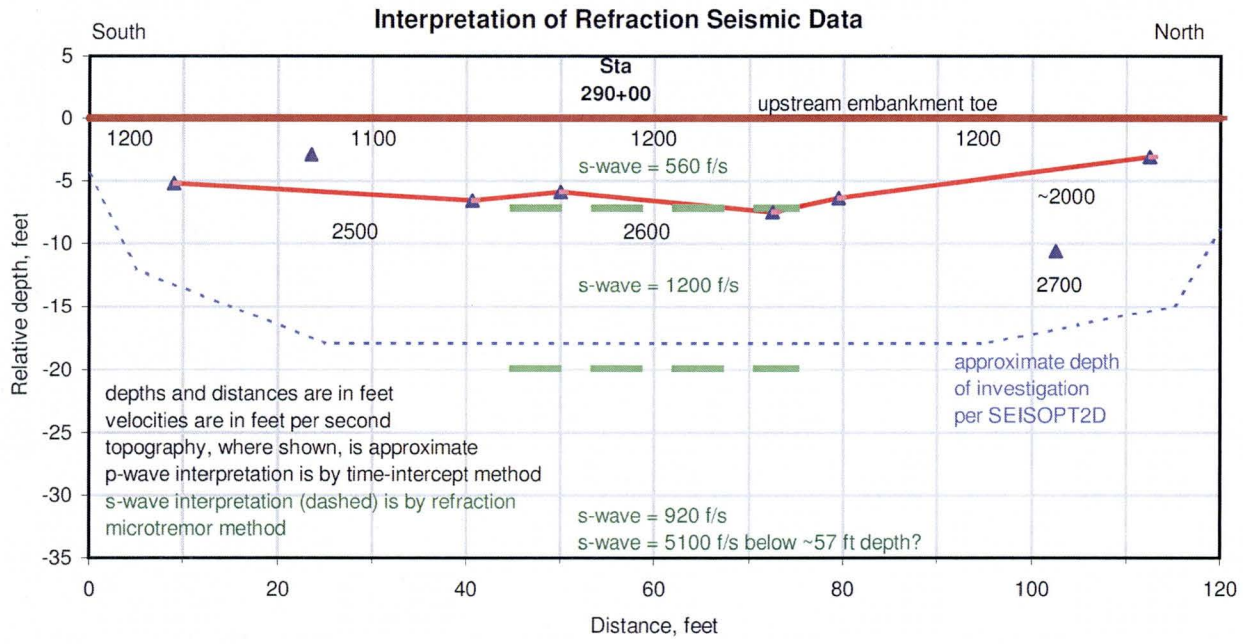


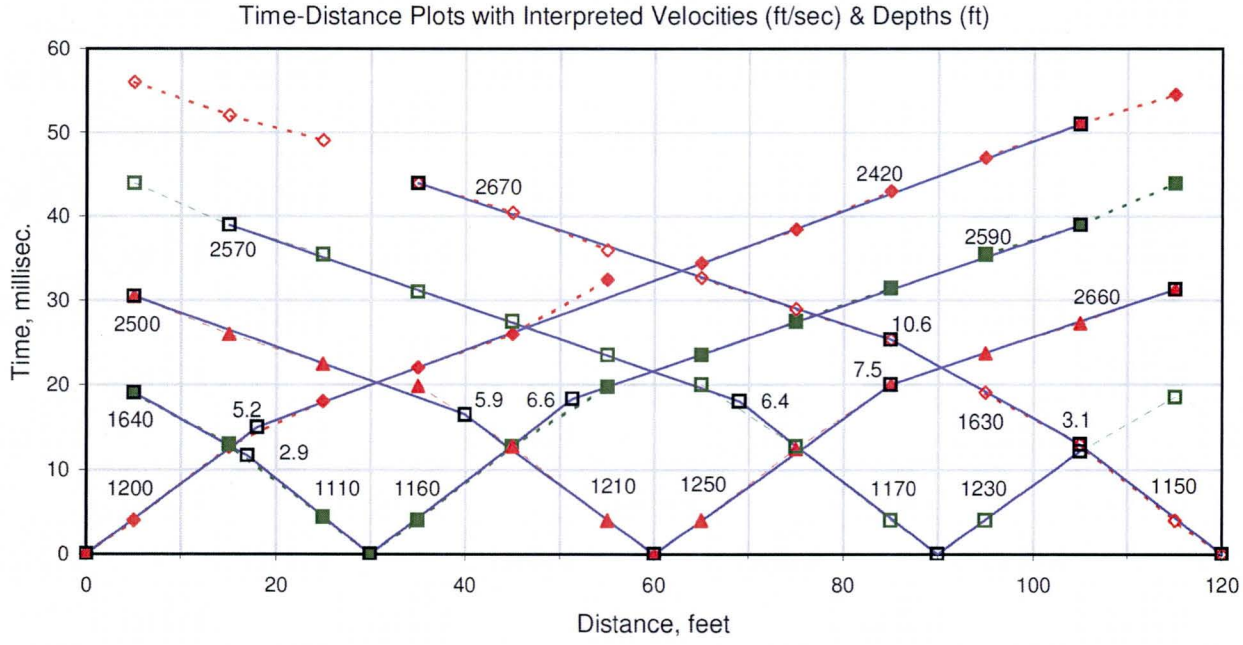


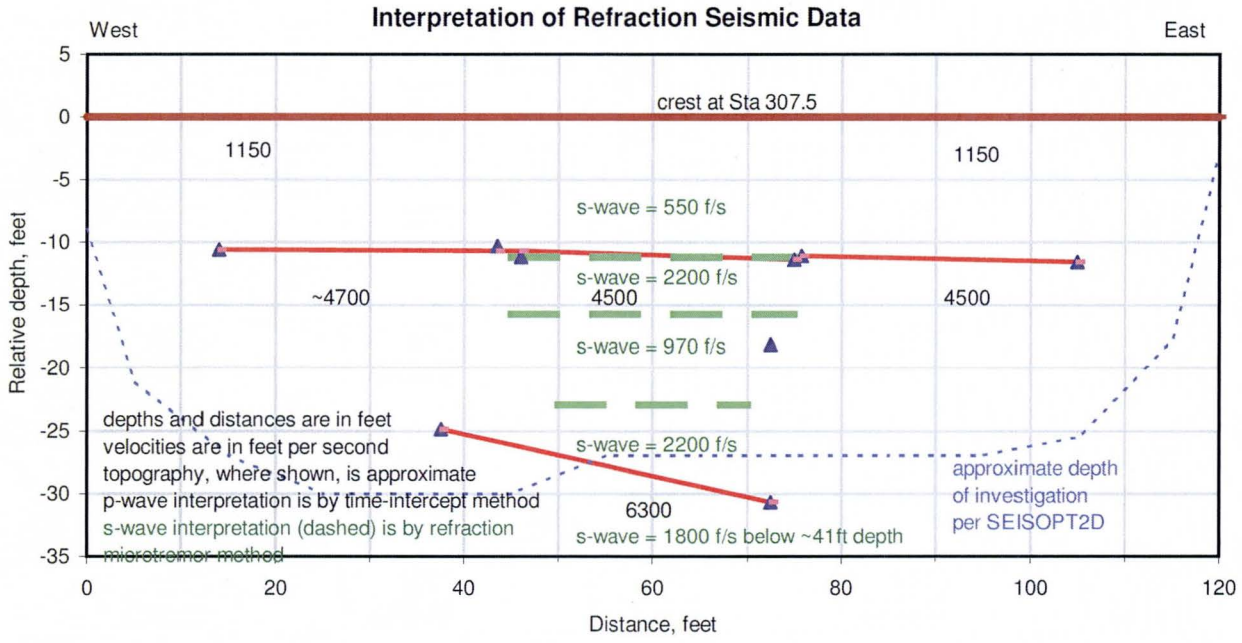
Refraction Seismic Interpretation

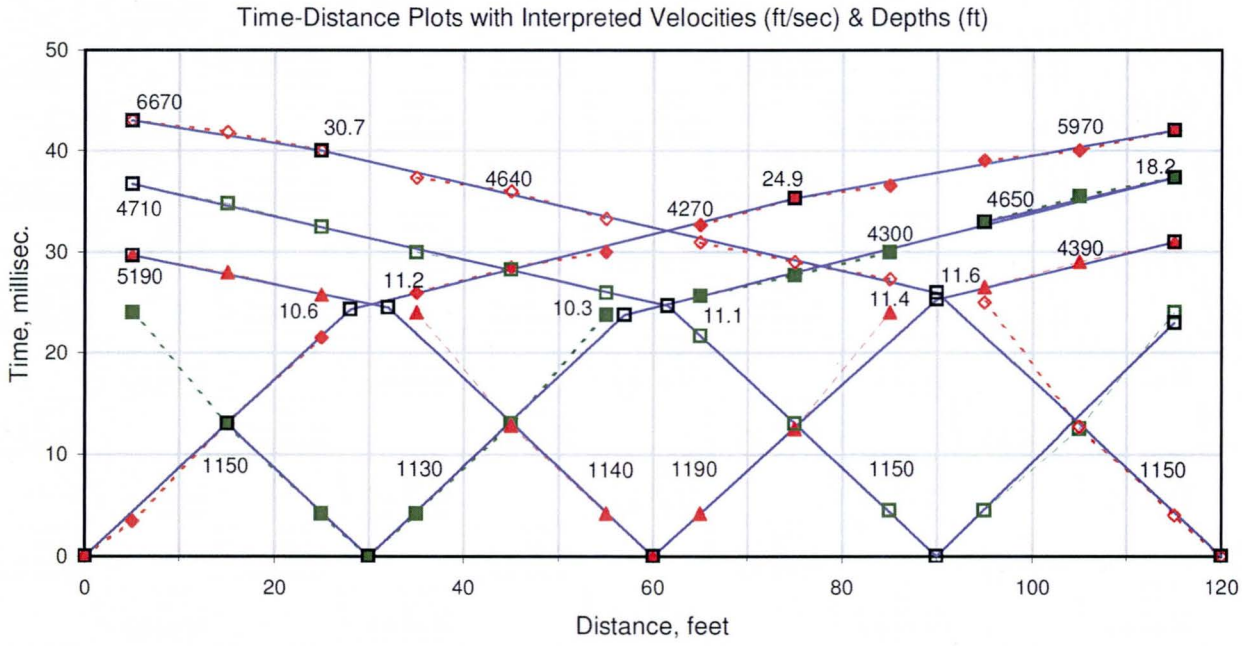
Line 13

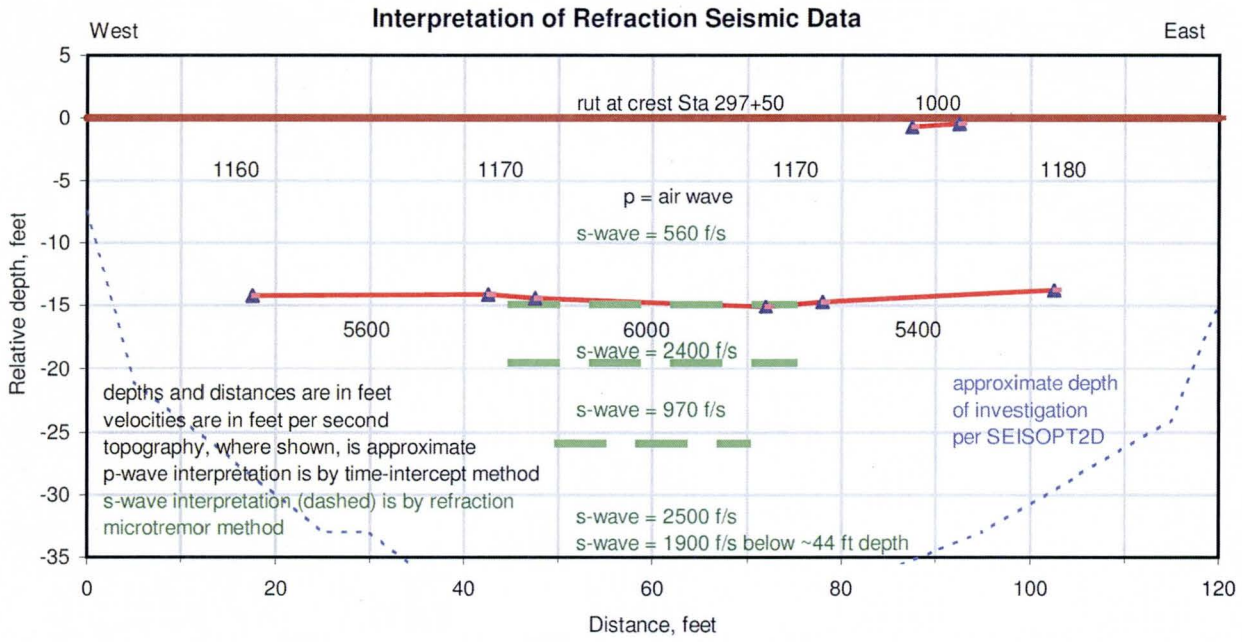
AMEC Job No. 6-117-001025

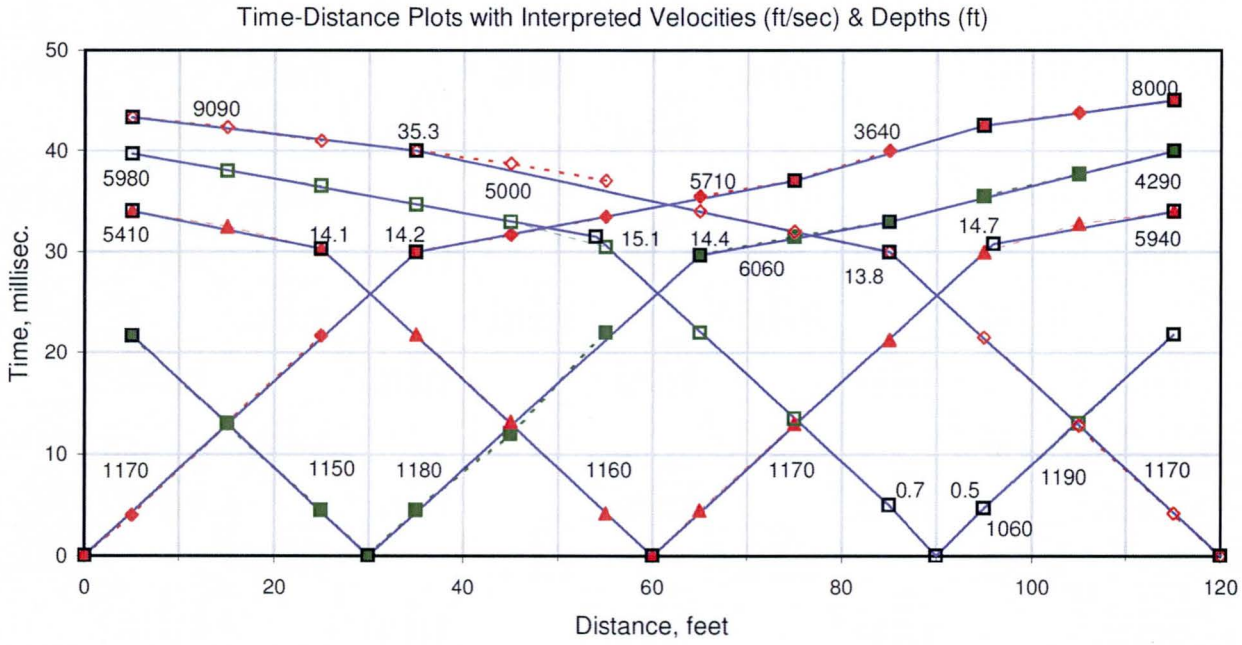


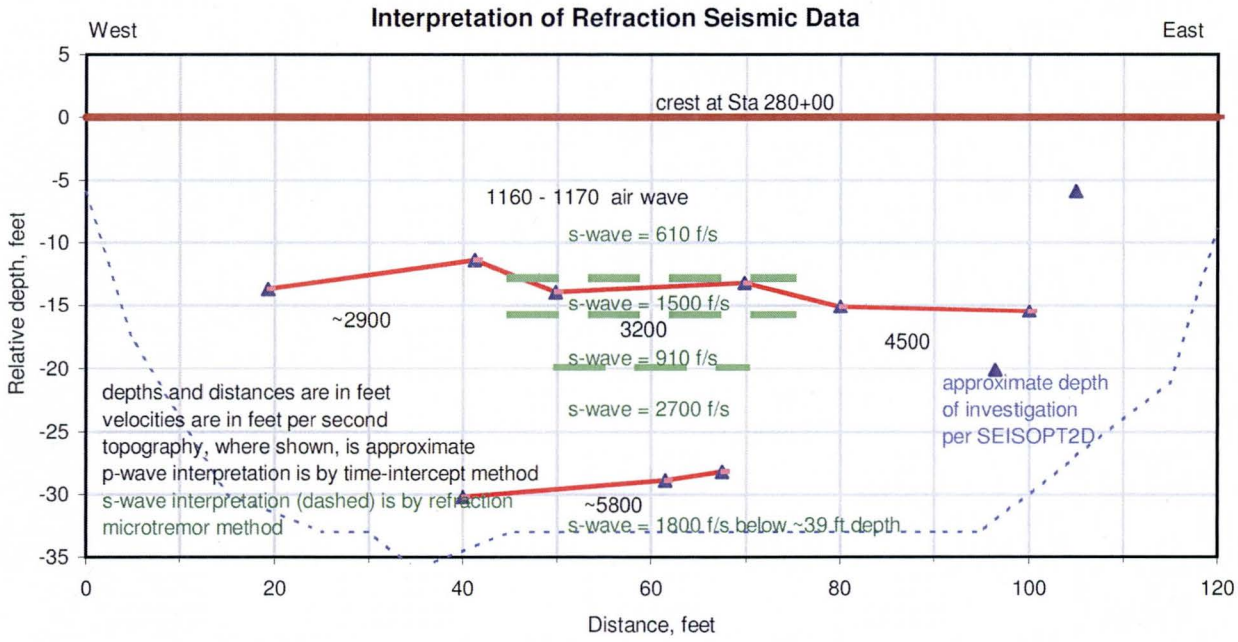


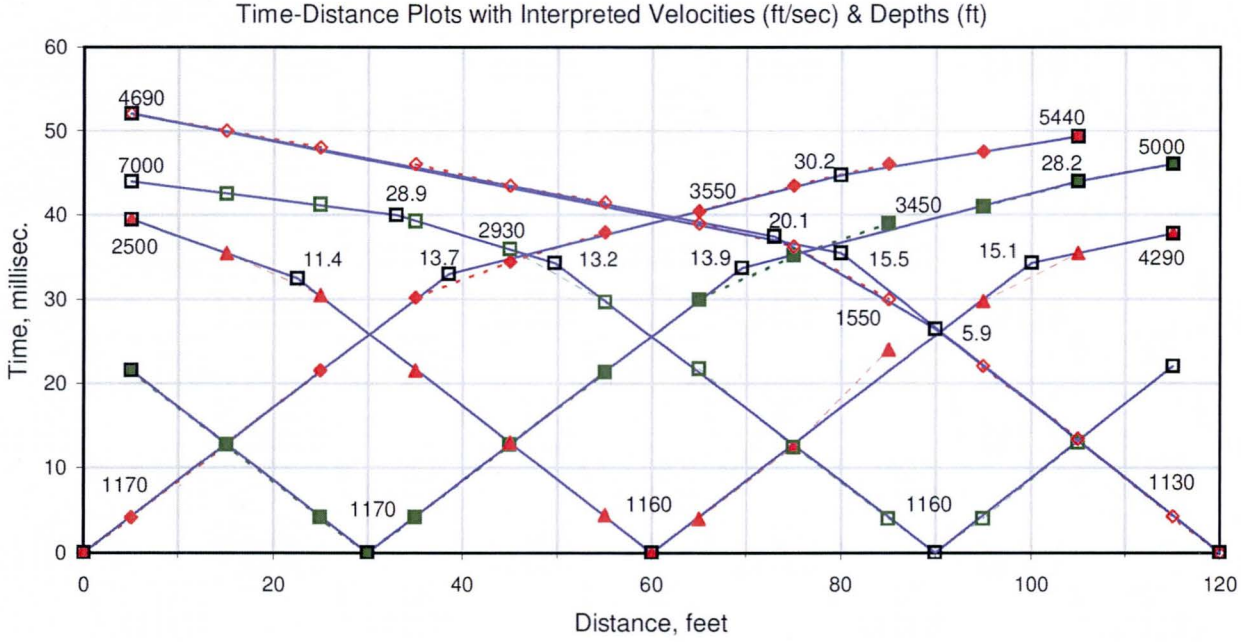

Interpretation of Refraction Seismic Data
West
East
crest at Sta 307.5
1150
1150
s-wave = 550 f/s
s-wave = 2200 f/s
~4700
4500
4500
s-wave = 970 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
s-wave = 2200 f/s
6300
s-wave = 1800 f/s below ~41ft depth
approximate depth of investigation per SEISOPT2D
Relative depth, feet
Distance, feet

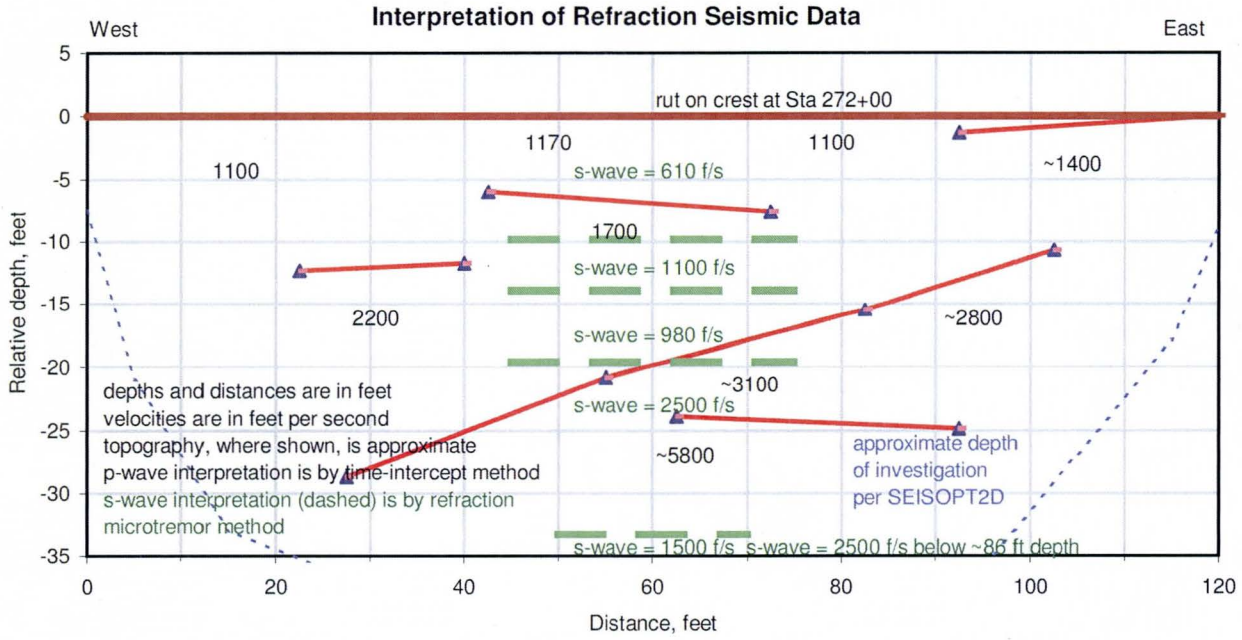

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
6670
30.7
4640
24.9
5970
18.2
4710
4270
4650
4300
4390
5190
11.2
10.6
10.3
11.1
11.4
11.6
1150
1130
1140
1190
1150
1150
Time, millisec.
Distance, feet

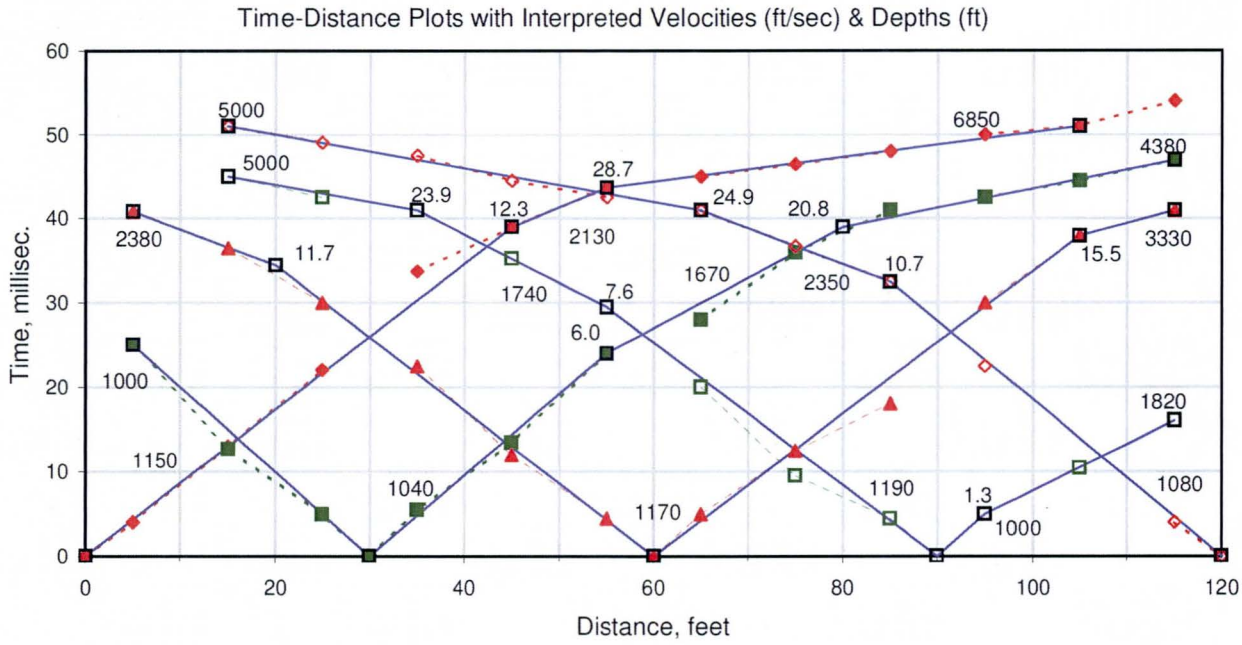

Interpretation of Refraction Seismic Data
West
East
rut at crest Sta 297+50
1000
1160
1170
1170
1180
p = air wave
s-wave = 560 f/s
5600
6000
5400
s-wave = 2400 f/s
s-wave = 970 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 2500 f/s
s-wave = 1900 f/s below ~44 ft depth
Relative depth, feet
Distance, feet

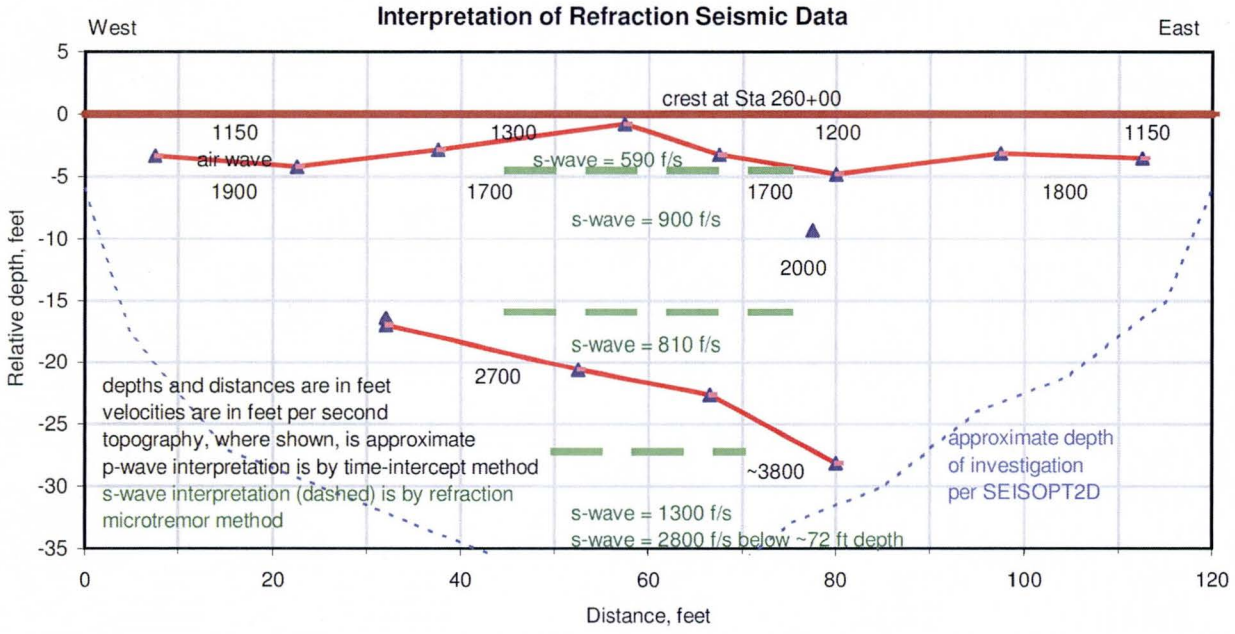

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
9090
35.3
5000
5710
3640
8000
5980
4290
5410
14.1
14.2
15.1
14.4
6060
13.8
14.7
5940
1170
1150
1180
1160
1170
0.7
0.5
1060
1190
1170
Time, millisec.
Distance, feet

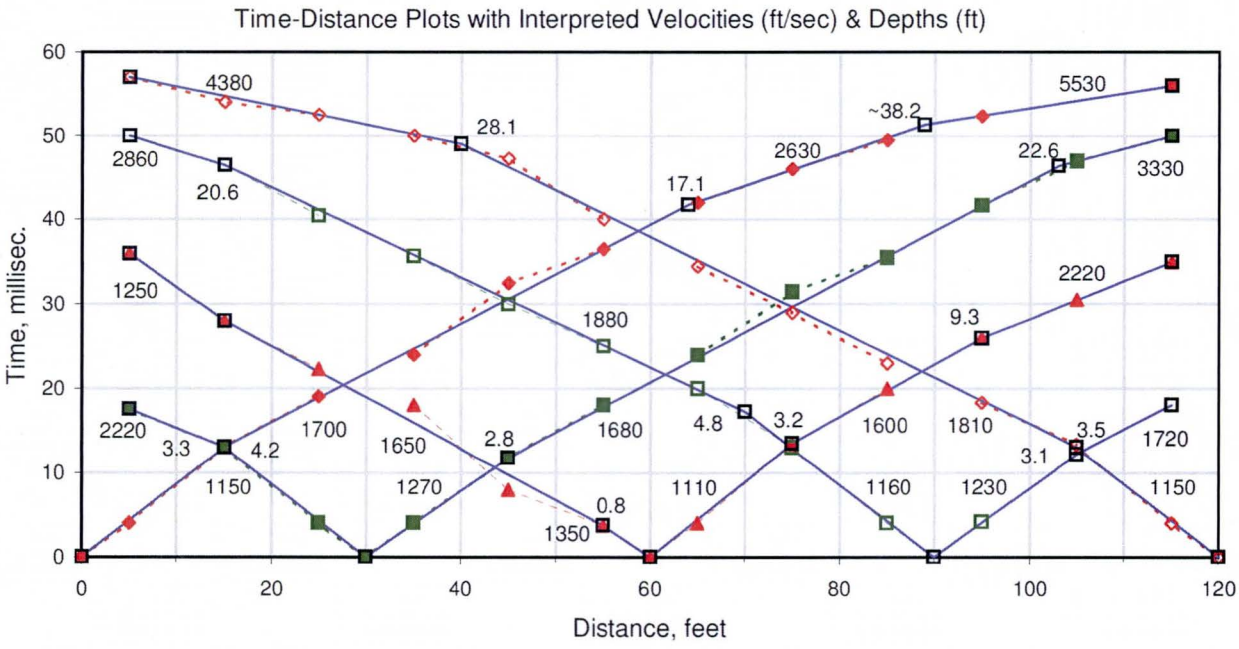

Interpretation of Refraction Seismic Data
West
East
crest at Sta 280+00
1160 - 1170 air wave
s-wave = 610 f/s
s-wave = 1500 f/s
~2900
3200
4500
s-wave = 910 f/s
s-wave = 2700 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
~5800
s-wave = 1800 f/s below ~39 ft depth
approximate depth of investigation per SEISOPT2D
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
4690
7000
2500
11.4
28.9
2930
13.7
13.2
3550
30.2
5440
20.1
13.9
3450
28.2
5000
15.5
15.1
4290
1550
5.9
1170
1170
1160
1160
1130
Time, millisec.
Distance, feet


Interpretation of Refraction Seismic Data
West
East
rut on crest at Sta 272+00
1100
1170
1100
~1400
s-wave = 610 f/s
1700
s-wave = 1100 f/s
2200
~2800
s-wave = 980 f/s
~3100
s-wave = 2500 f/s
~5800
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 1500 f/s s-wave = 2500 f/s below ~86 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
5000
5000
6850
4380
28.7
23.9
12.3
24.9
20.8
2380
11.7
2130
3330
15.5
1740
7.6
1670
2350
10.7
6.0
1000
1820
1150
1040
1190
1170
1.3
1080
1000
Time, millisec.
Distance, feet

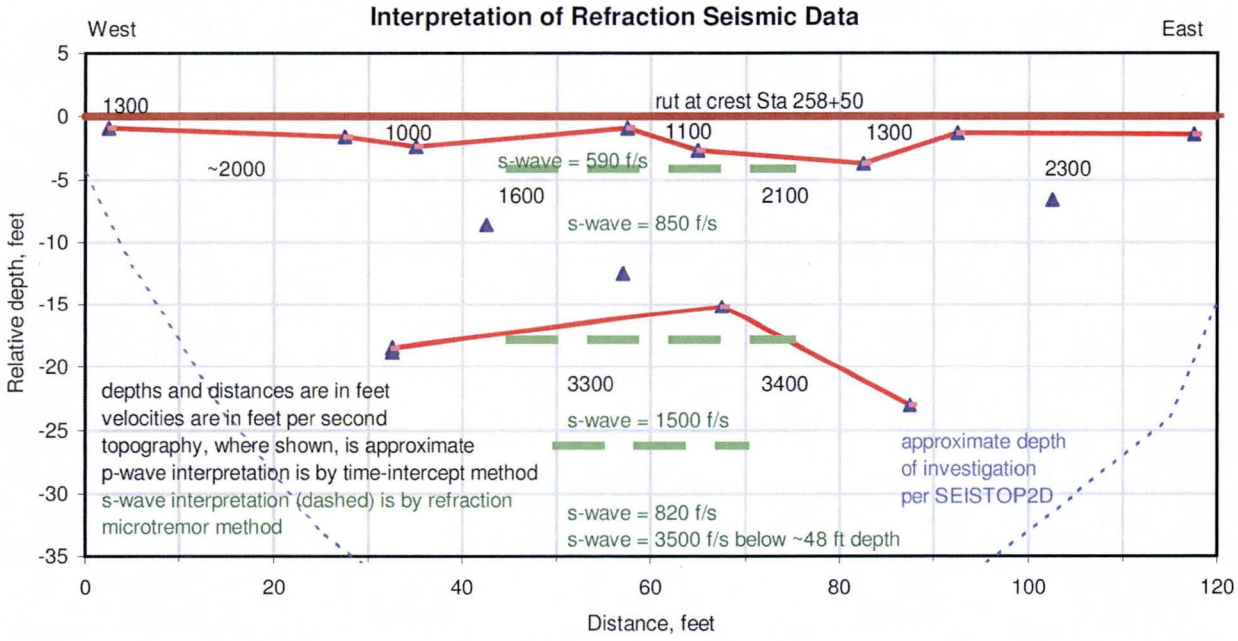

Interpretation of Refraction Seismic Data
West
East
crest at Sta 260+00
1150
air wave
1900
1300
1700
s-wave = 590 f/s
1700
1200
2000
1150
1800
s-wave = 900 f/s
s-wave = 810 f/s
2700
~3800
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
s-wave = 1300 f/s
s-wave = 2800 f/s below ~72 ft depth
approximate depth of investigation per SEISOPT2D
Relative depth, feet
Distance, feet

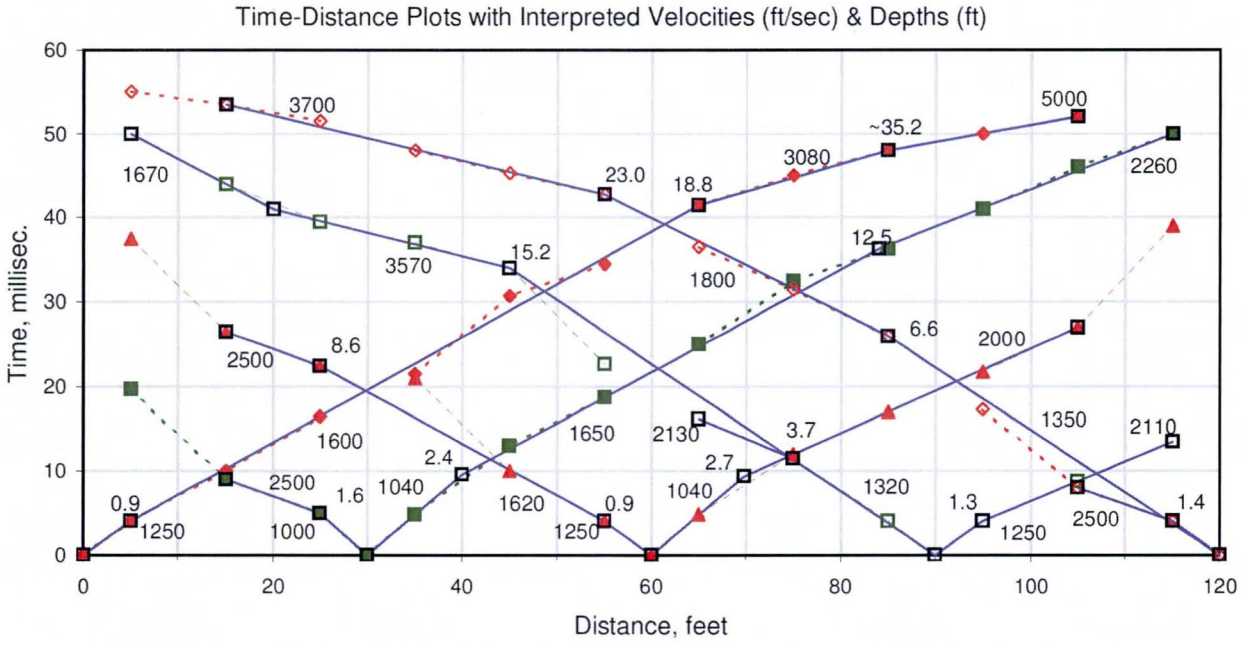

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
4380
28.1
2860
20.6
1250
2220
3.3
1150
4.2
1700
1650
2.8
1270
0.8
1350
1880
1680
4.8
3.2
1600
1810
1110
1160
1230
2630
~38.2
17.1
5530
22.6
3330
2220
9.3
3.5
3.1
1720
1150
Time, millisec.
Distance, feet

Refraction Seismic Interpretation

Line 21

AMEC Job No. 6-117-001025

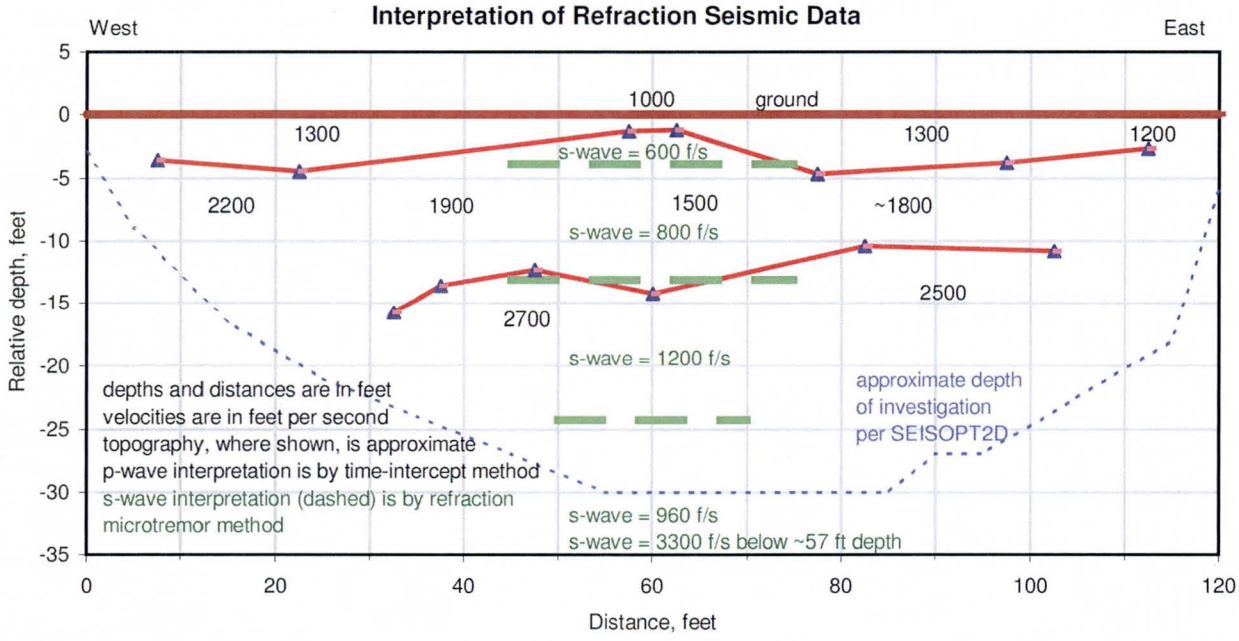


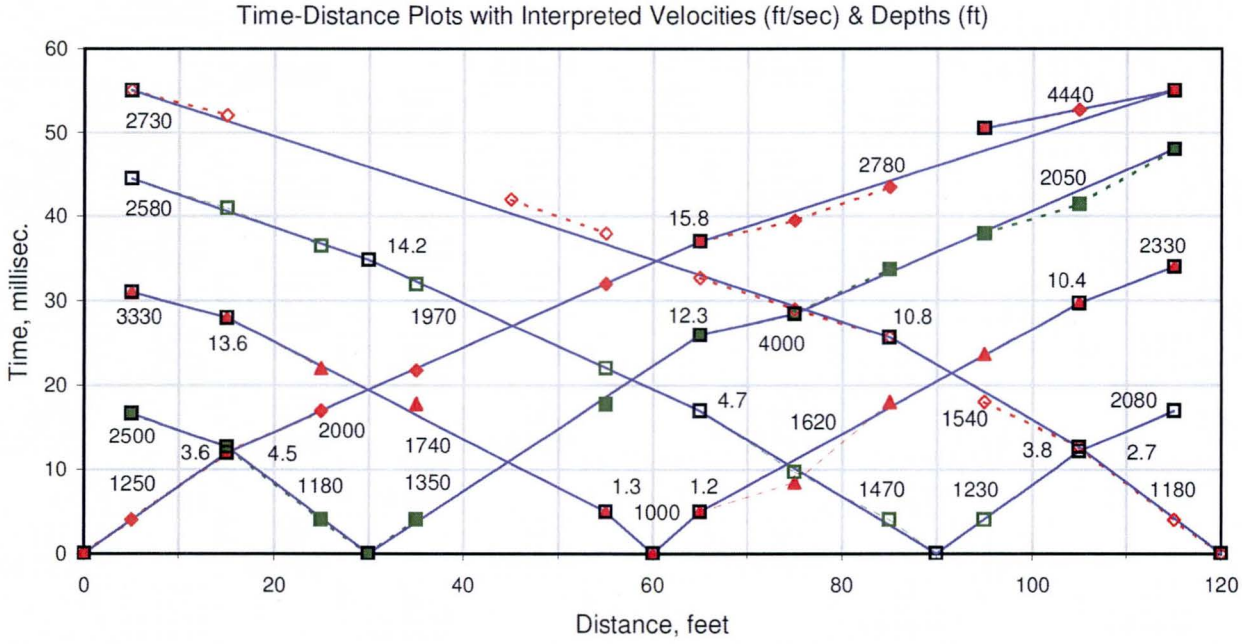


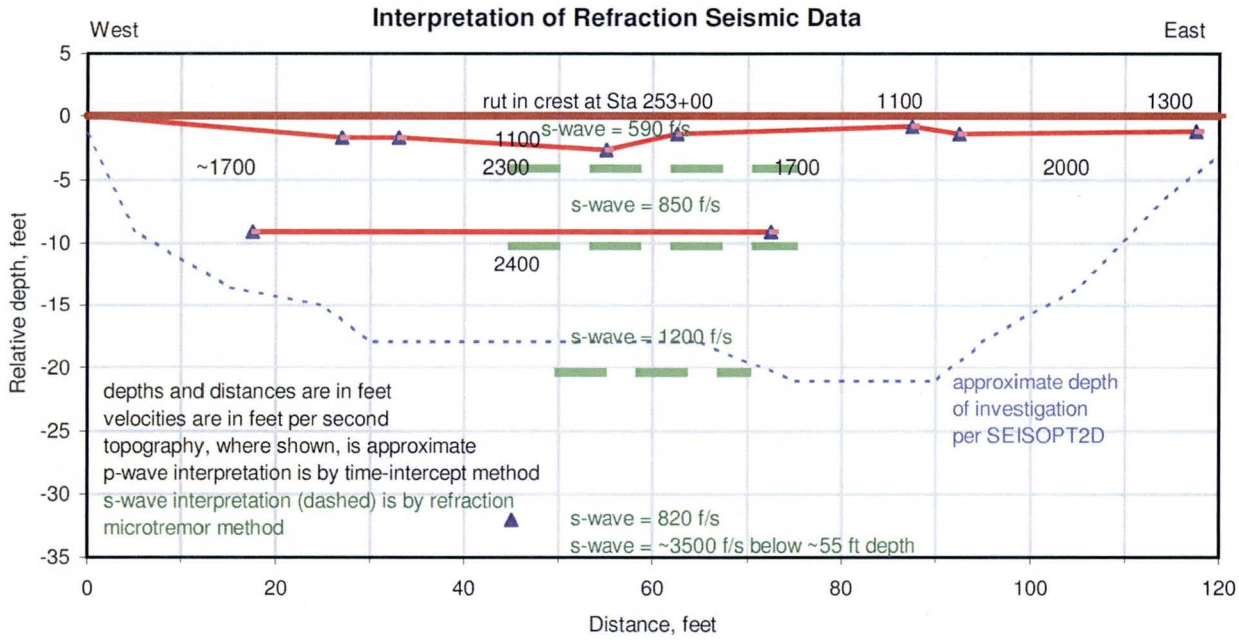
Refraction Seismic Interpretation

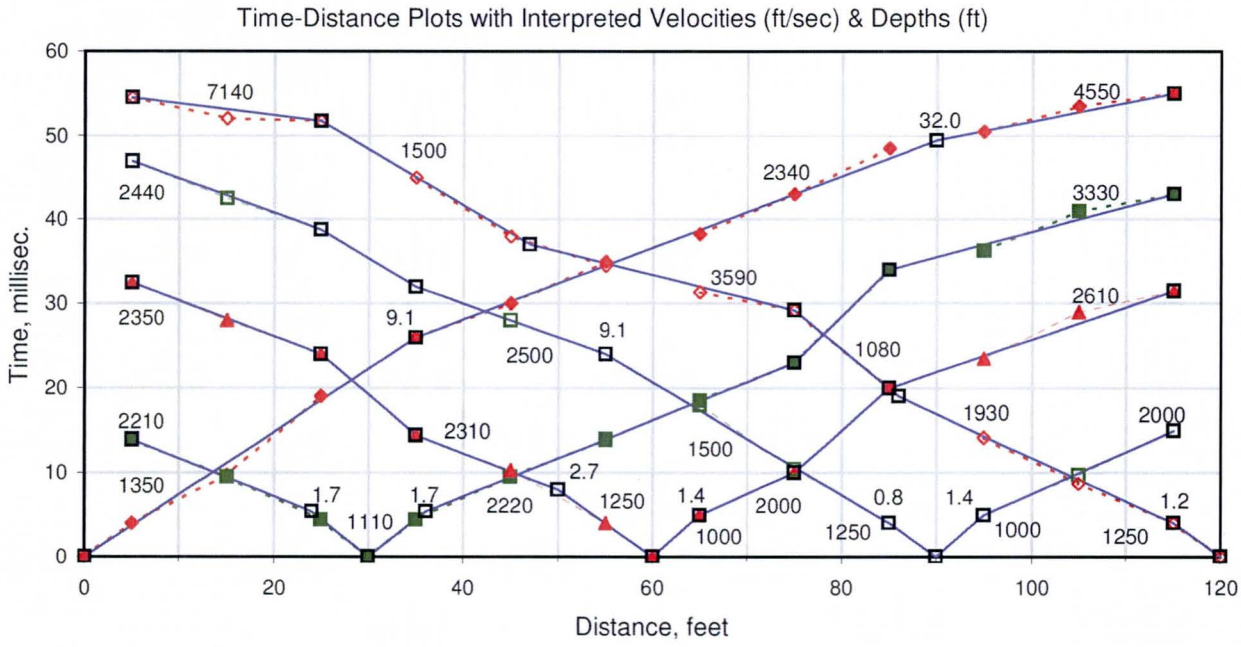
Line 22

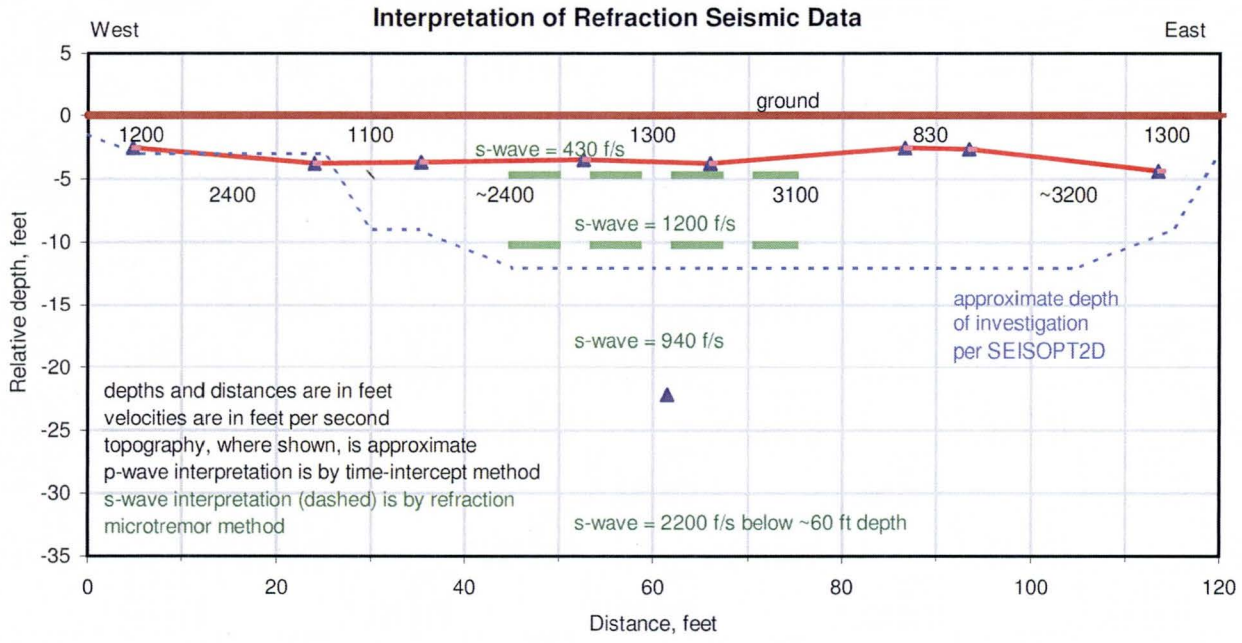
AMEC Job No. 6-117-001025

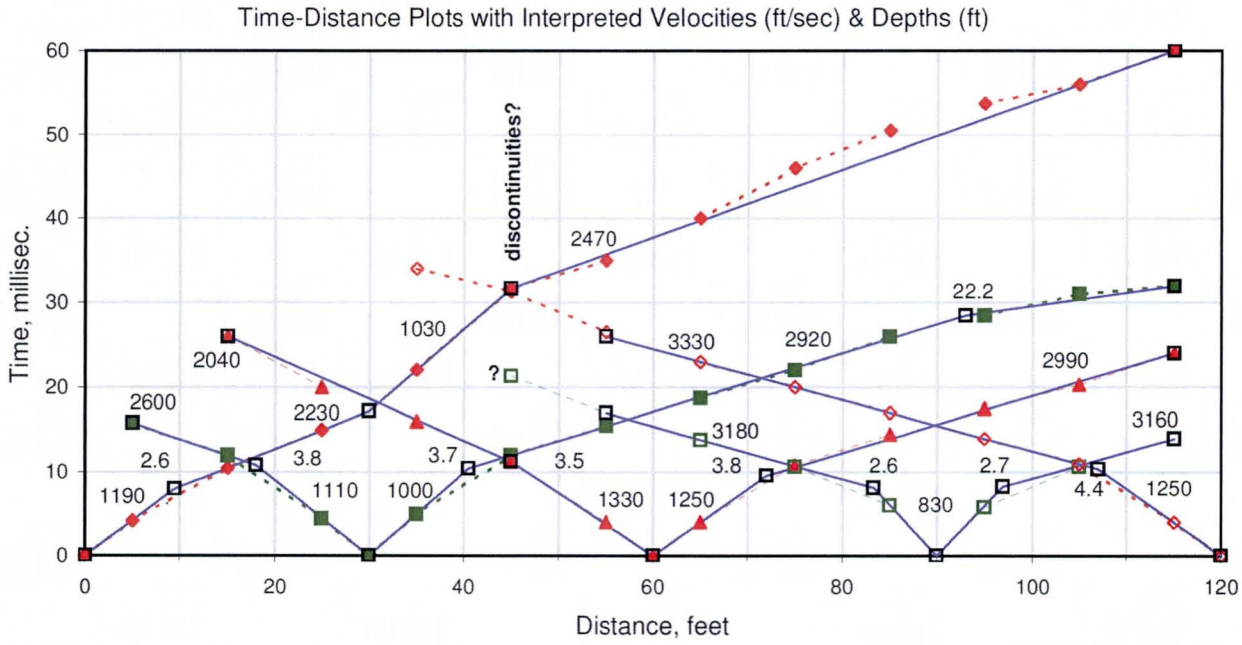





Interpretation of Refraction Seismic Data
West
East
rut in crest at Sta 253+00
1100
1300
s-wave = 590 f/s
1100
~1700
2300
1700
2000
s-wave = 850 f/s
2400
s-wave = 1200 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 820 f/s
s-wave = ~3500 f/s below ~55 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
7140
1500
2440
2340
32.0
4550
3330
3590
2350
9.1
2500
9.1
1080
2610
2210
2310
1930
2000
1500
1350
1.7
1110
1.7
2220
2.7
1250
1.4
2000
0.8
1.4
1.2
1000
1250
1000
1250
Time, millisec.
Distance, feet

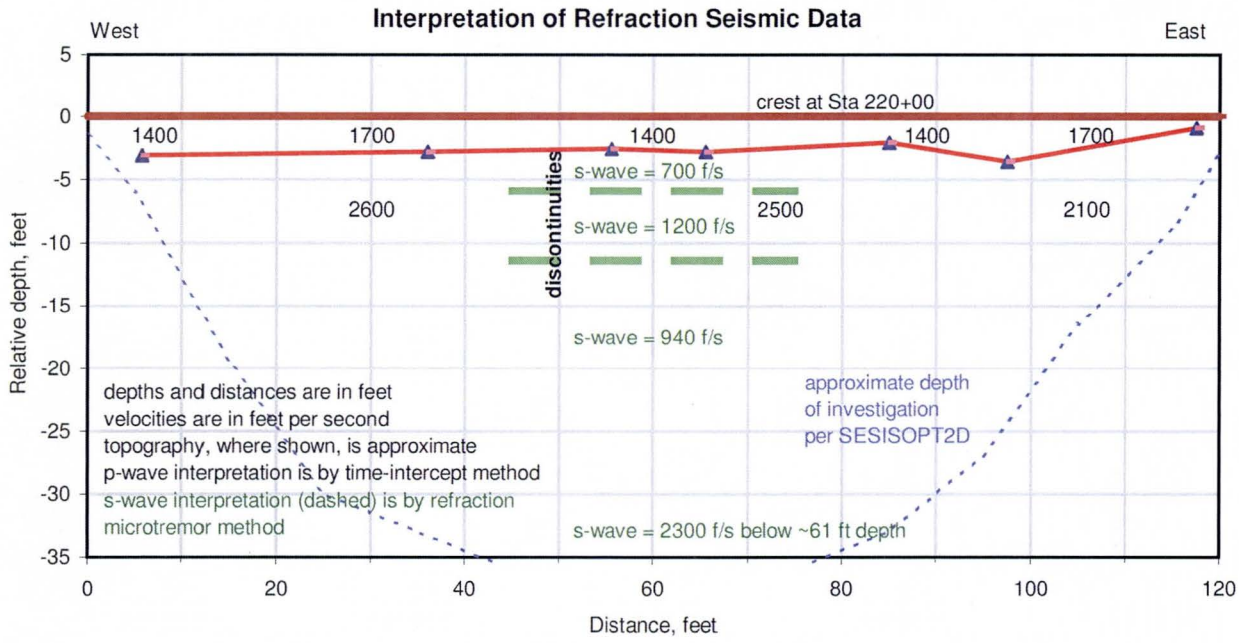

Interpretation of Refraction Seismic Data
West
East
ground
1200
1100
1300
830
1300
2400
~2400
3100
~3200
s-wave = 430 f/s
s-wave = 1200 f/s
s-wave = 940 f/s
approximate depth of investigation per SEISOPT2D
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
s-wave = 2200 f/s below ~60 ft depth
Relative depth, feet
Distance, feet

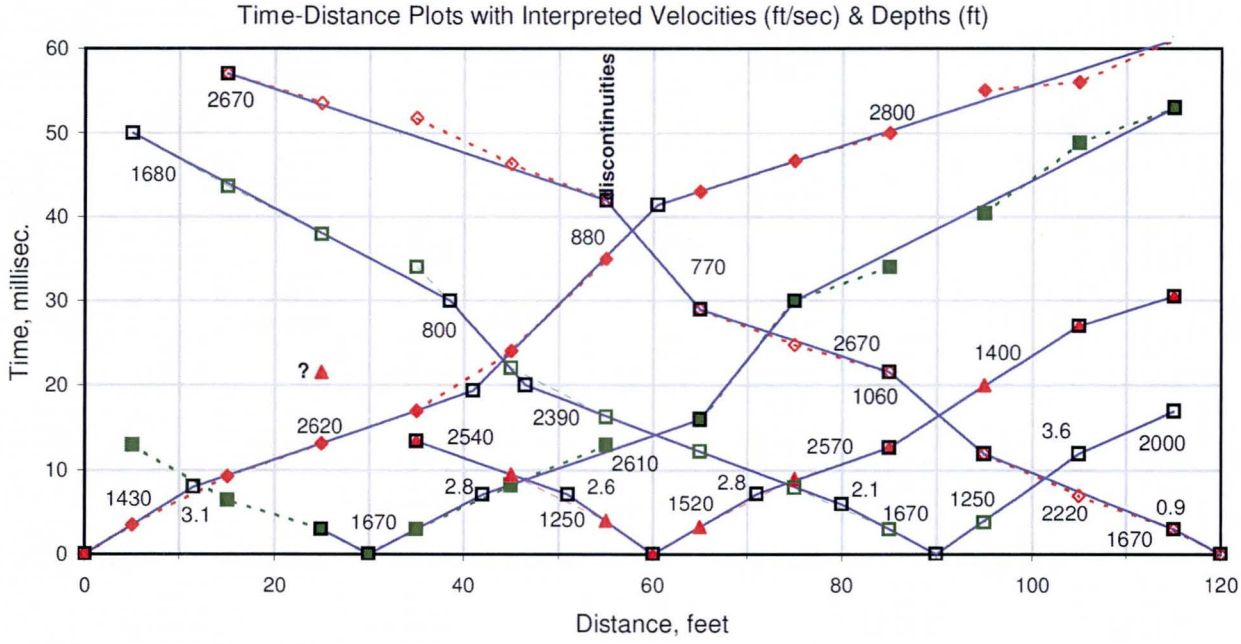

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
discontinuities?
2470
1030
2040
2600
2230
3330
2920
22.2
2990
3160
3180
2.6
3.8
3.7
3.5
3.8
2.6
2.7
4.4
1190
1110
1000
1330
1250
830
1250
?
Time, millisec.
Distance, feet

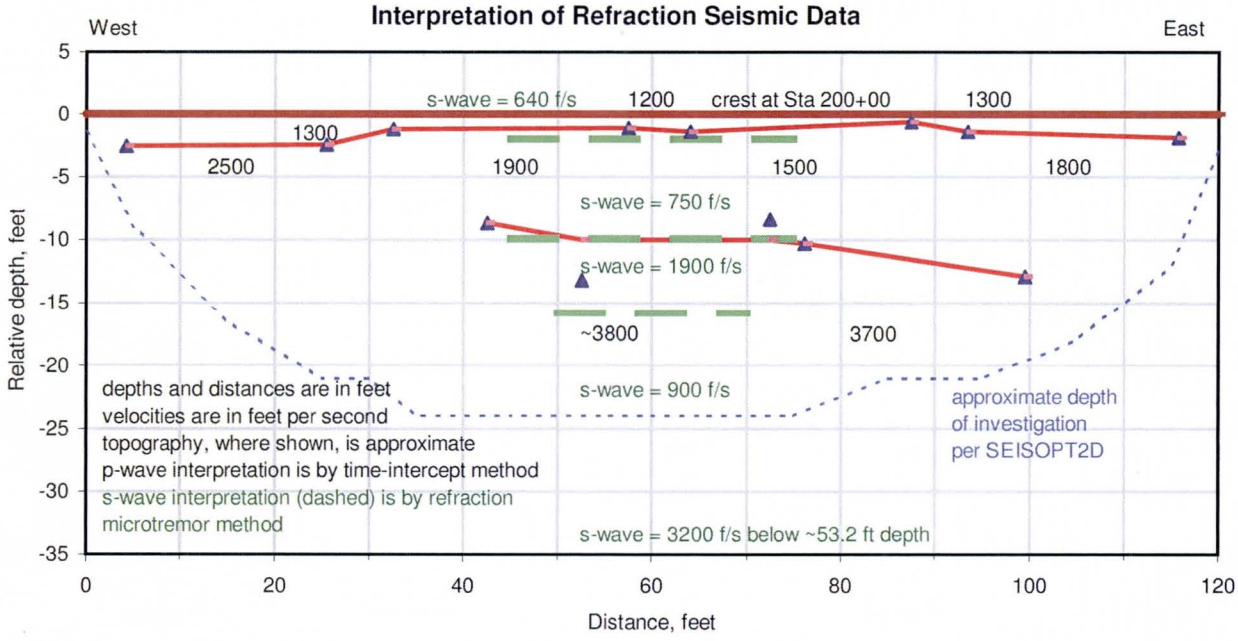
Refraction Seismic Interpretation

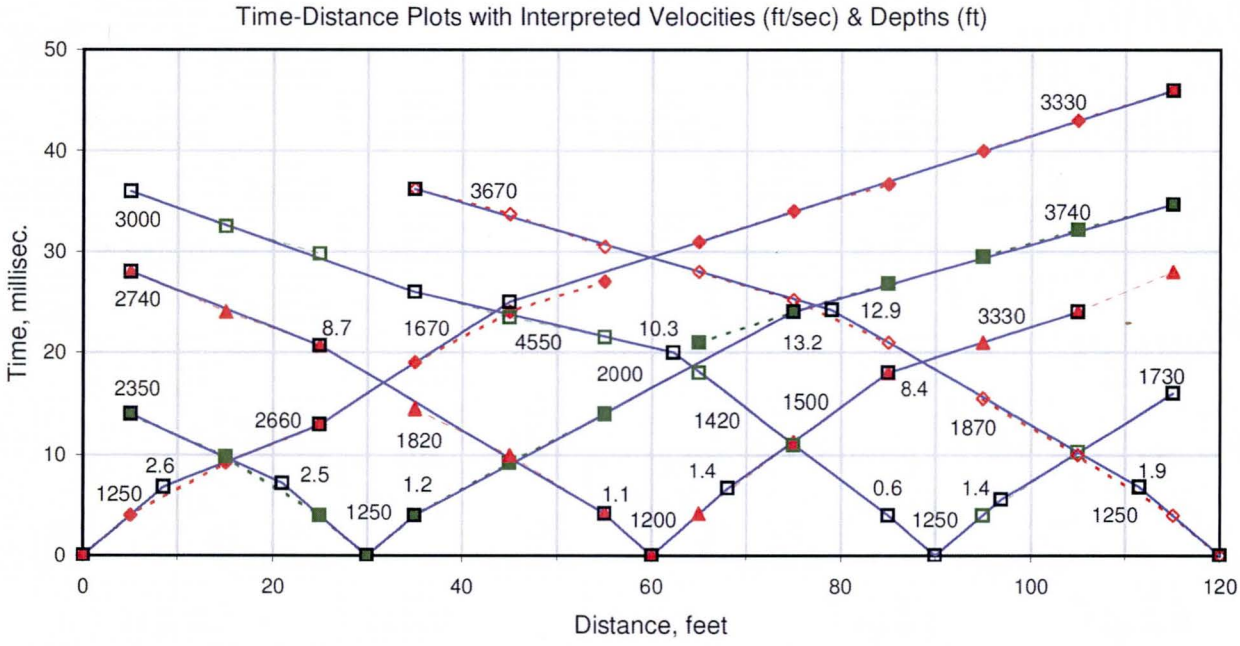
Line 25

AMEC Job No. 6-117-001025





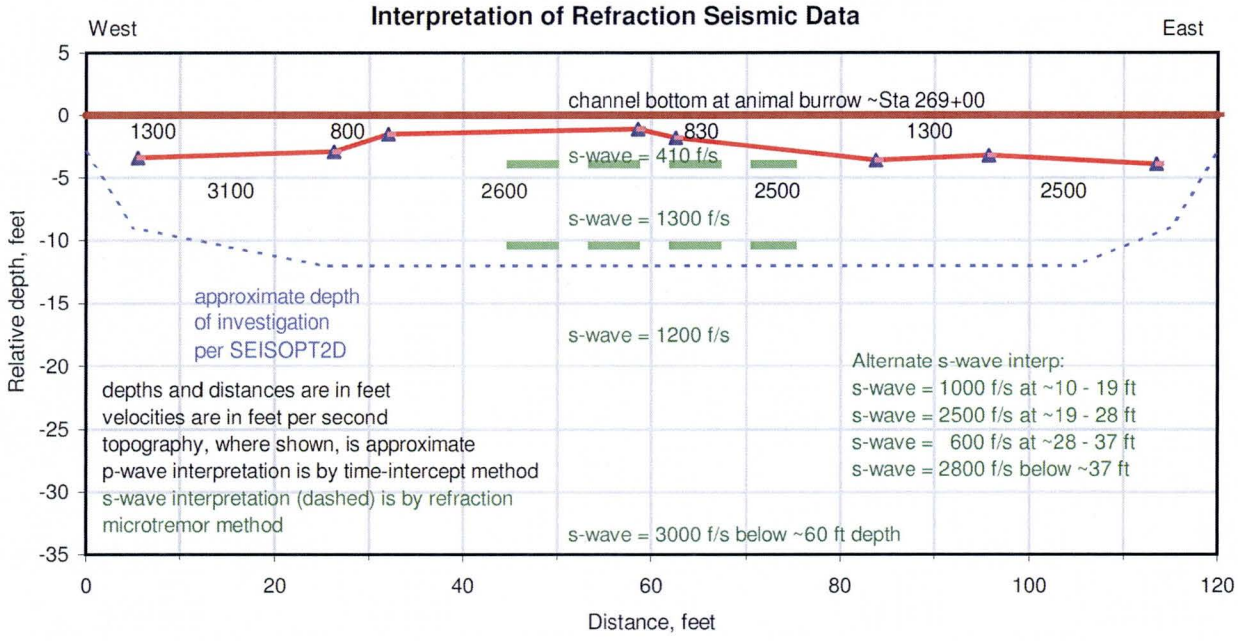

Interpretation of Refraction Seismic Data
West
East
s-wave = 640 f/s
1200
crest at Sta 200+00
1300
1300
2500
1900
1500
1800
s-wave = 750 f/s
s-wave = 1900 f/s
~3800
3700
s-wave = 900 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 3200 f/s below ~53.2 ft depth
Relative depth, feet
Distance, feet

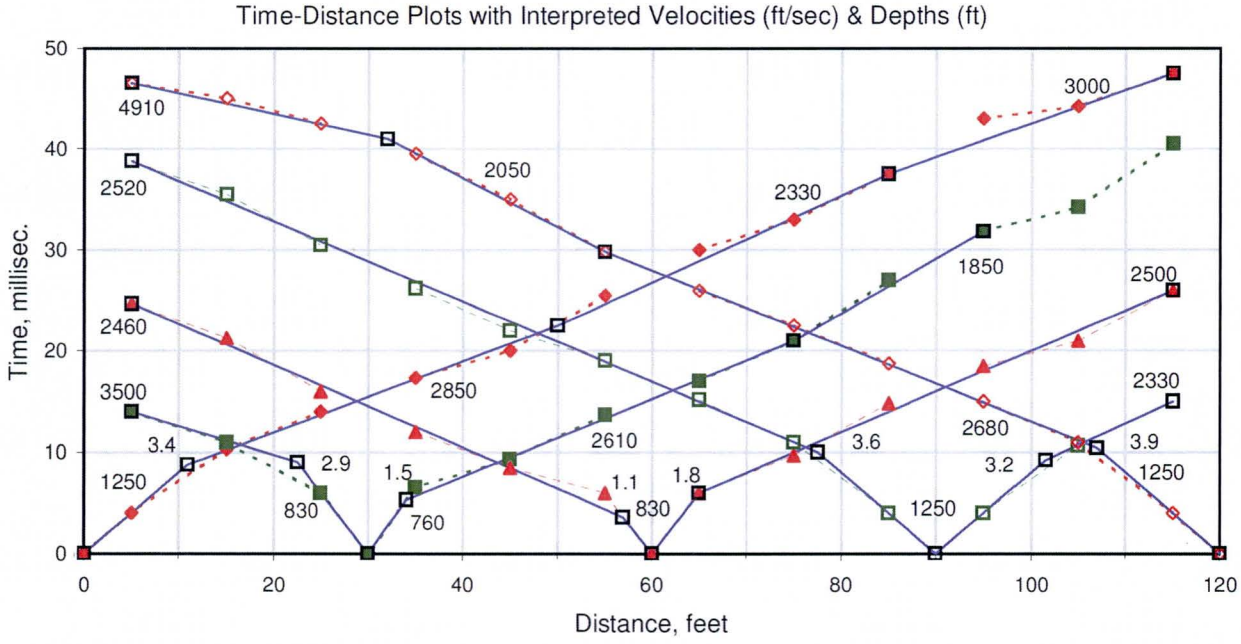

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
3330
3670
3740
3000
2740
8.7
1670
4550
10.3
13.2
12.9
3330
2000
8.4
1730
2350
1500
1420
1870
2660
1820
2.6
2.5
1.2
1.1
1.4
0.6
1.4
1.9
1250
1250
1200
1250
1250
Time, millisec.
Distance, feet

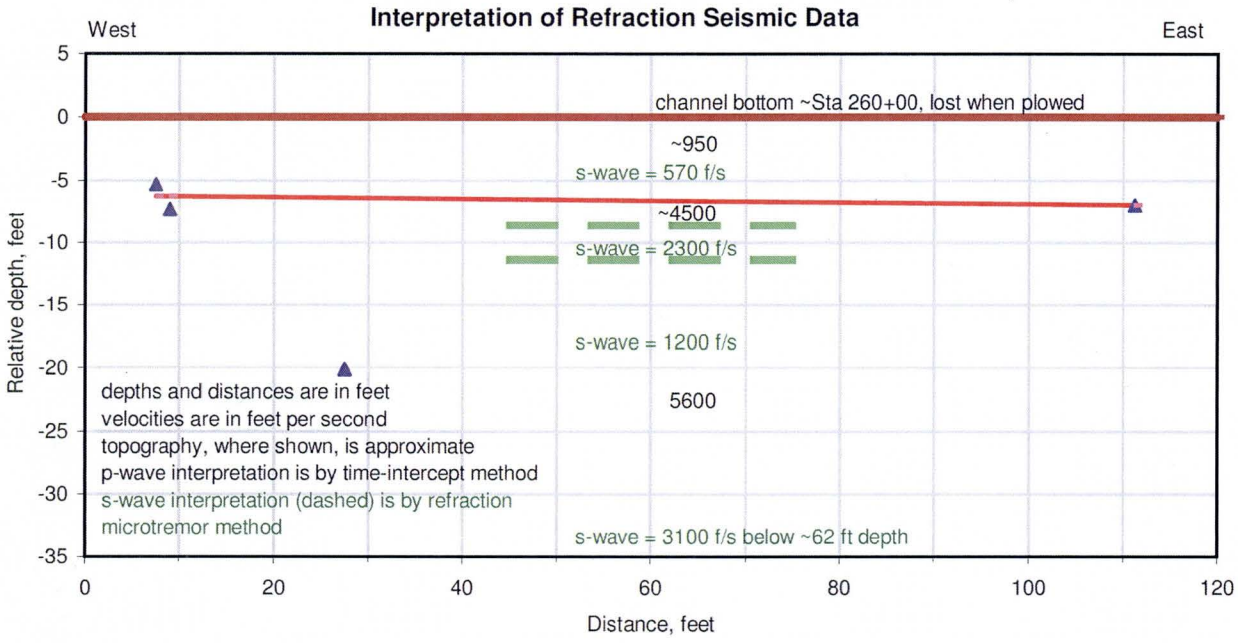
Refraction Seismic Interpretation

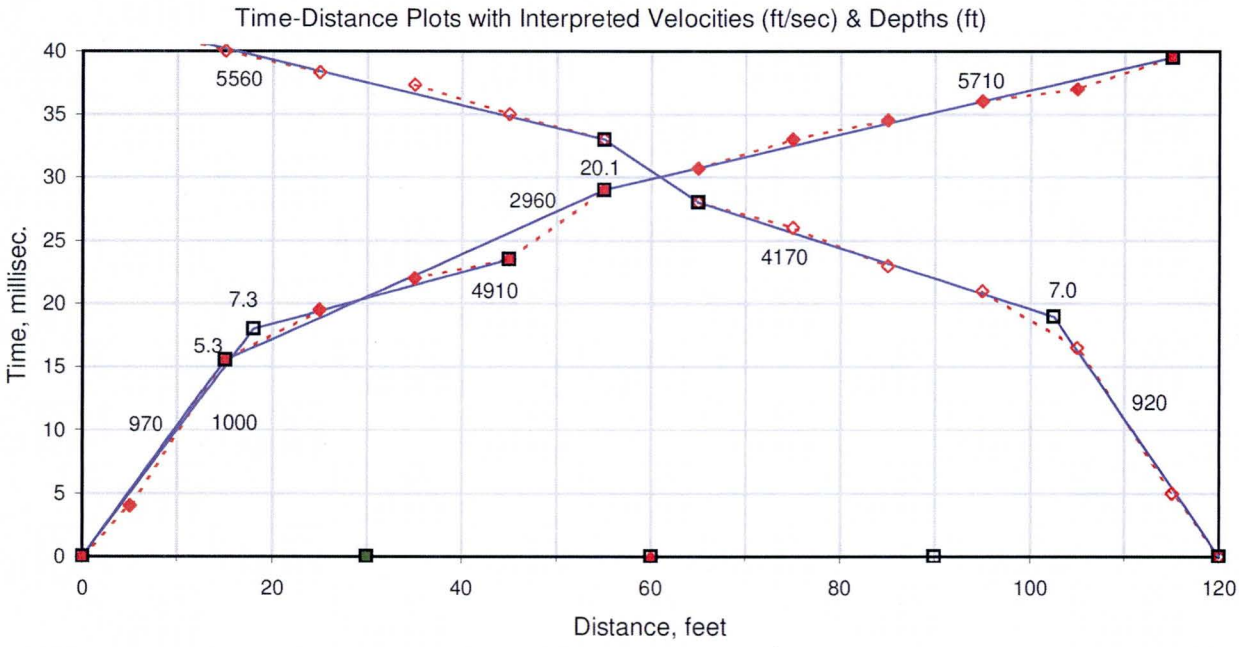
Line 27

AMEC Job No. 6-117-001025





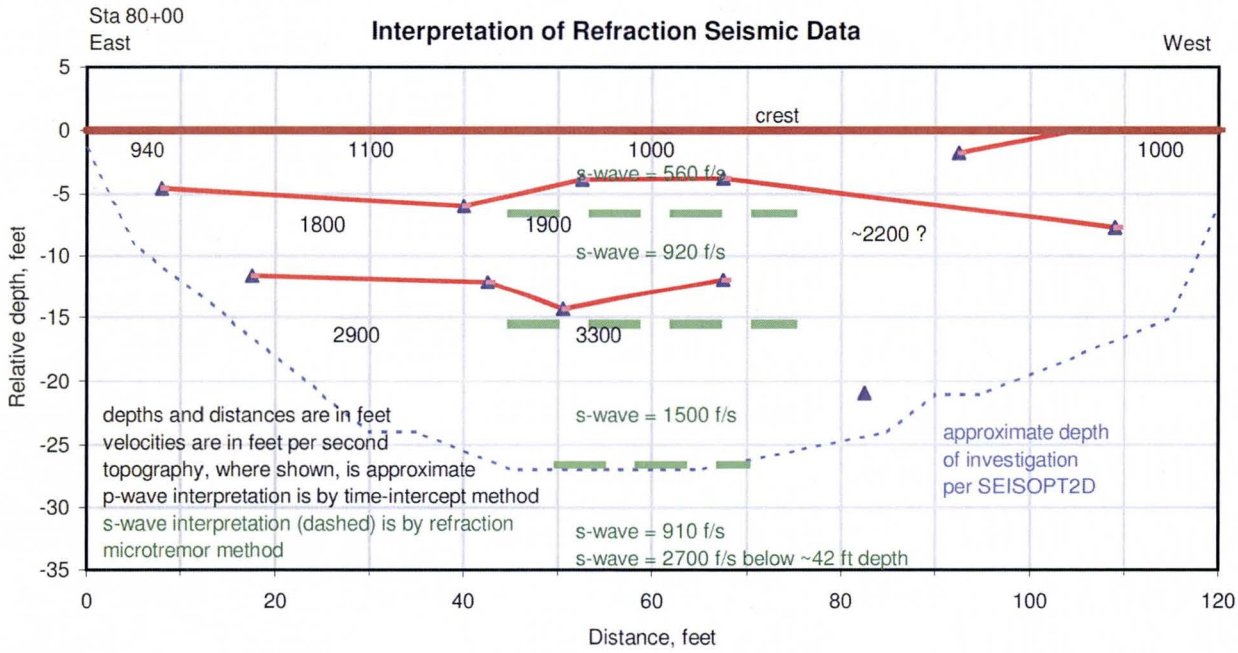

Interpretation of Refraction Seismic Data
West
East
channel bottom ~Sta 260+00, lost when plowed
~950
s-wave = 570 f/s
~4500
s-wave = 2300 f/s
s-wave = 1200 f/s
5600
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
s-wave = 3100 f/s below ~62 ft depth
Relative depth, feet
Distance, feet

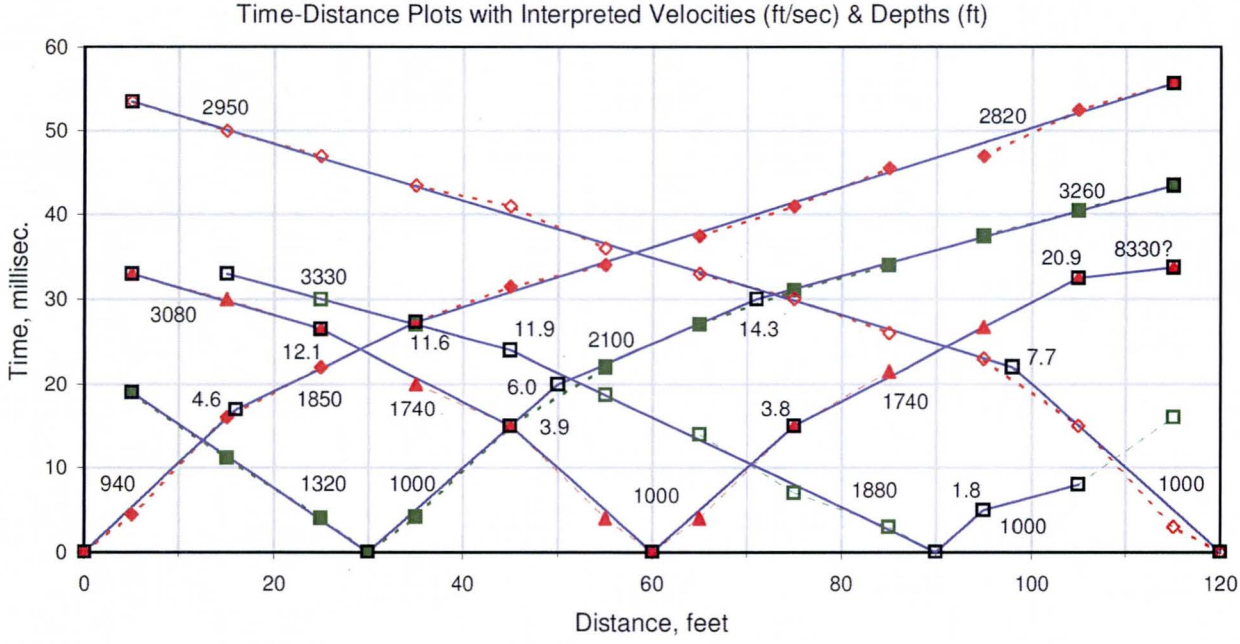

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
5560
5710
20.1
2960
4170
4910
7.3
7.0
5.3
920
970
1000
Time, millisec.
Distance, feet

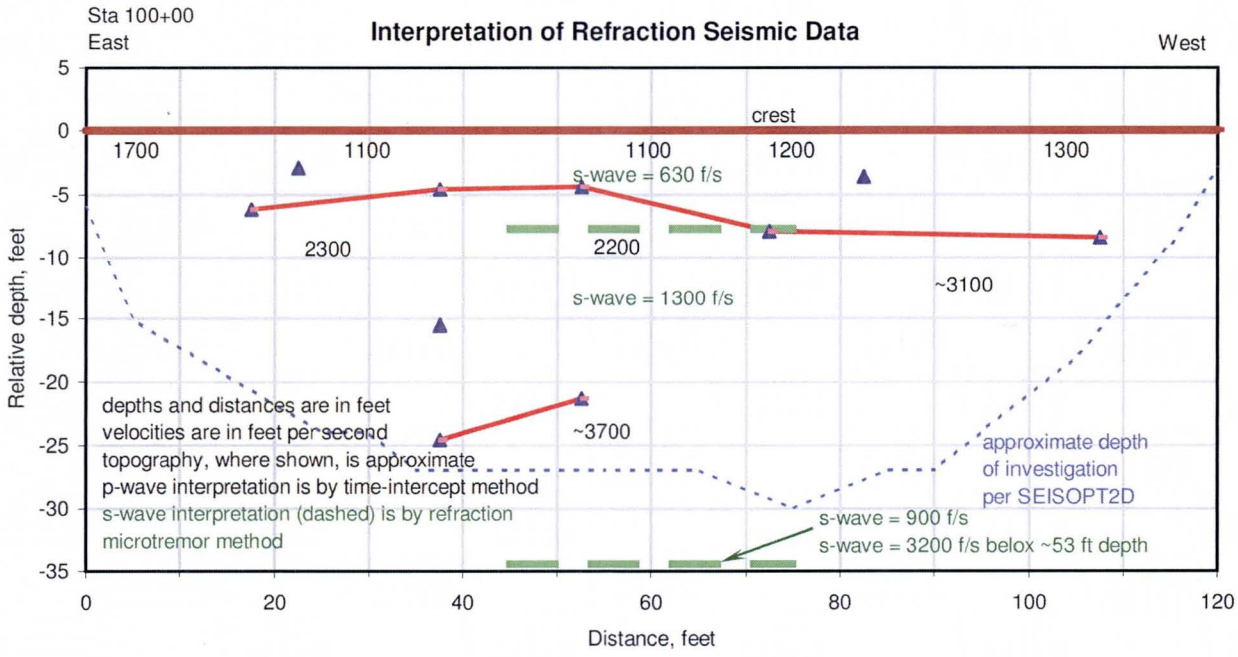
Refraction Seismic Interpretation

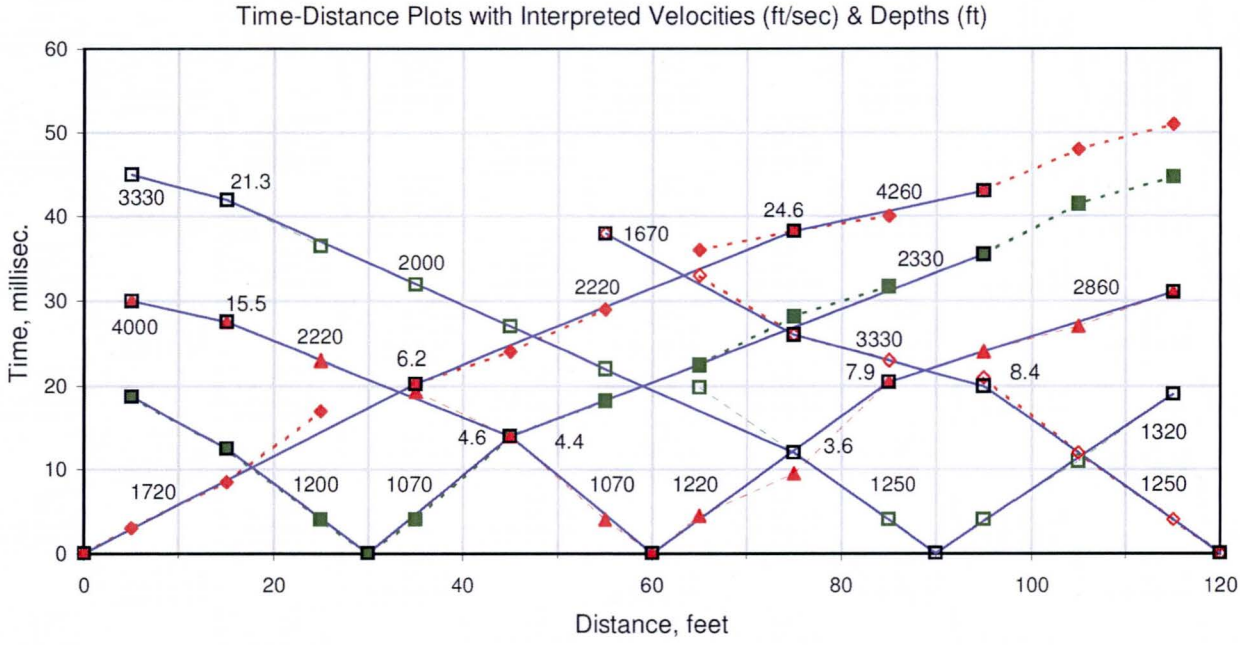
Line 53

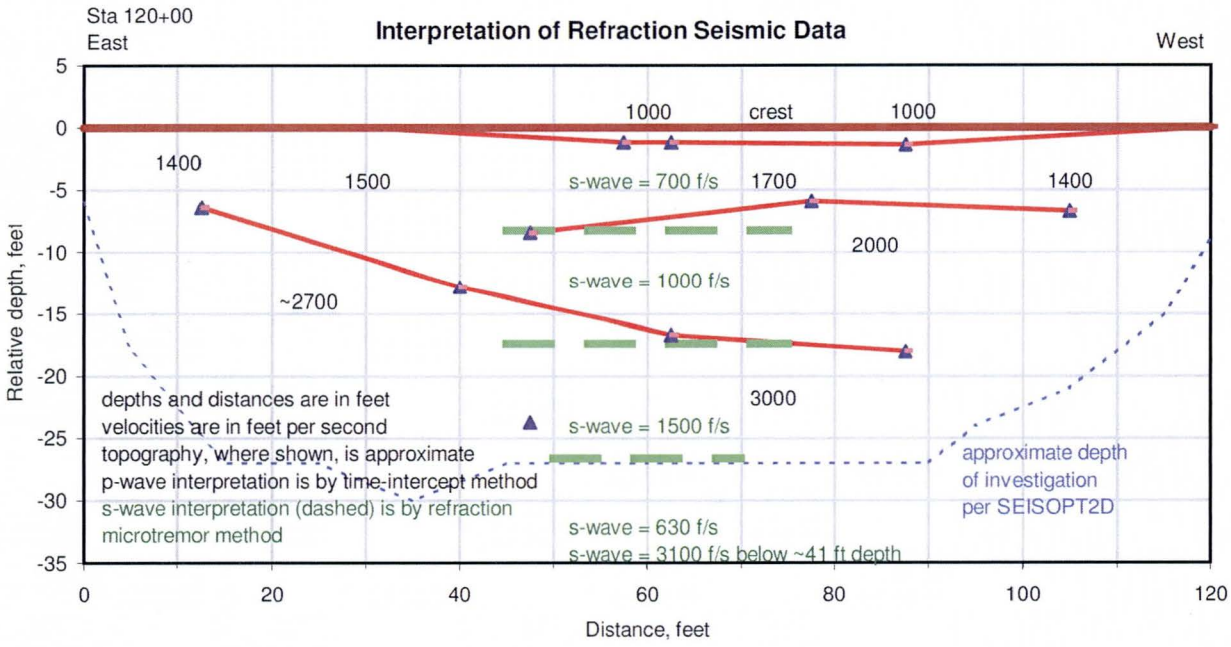
AMEC Job No. 6-117-001025

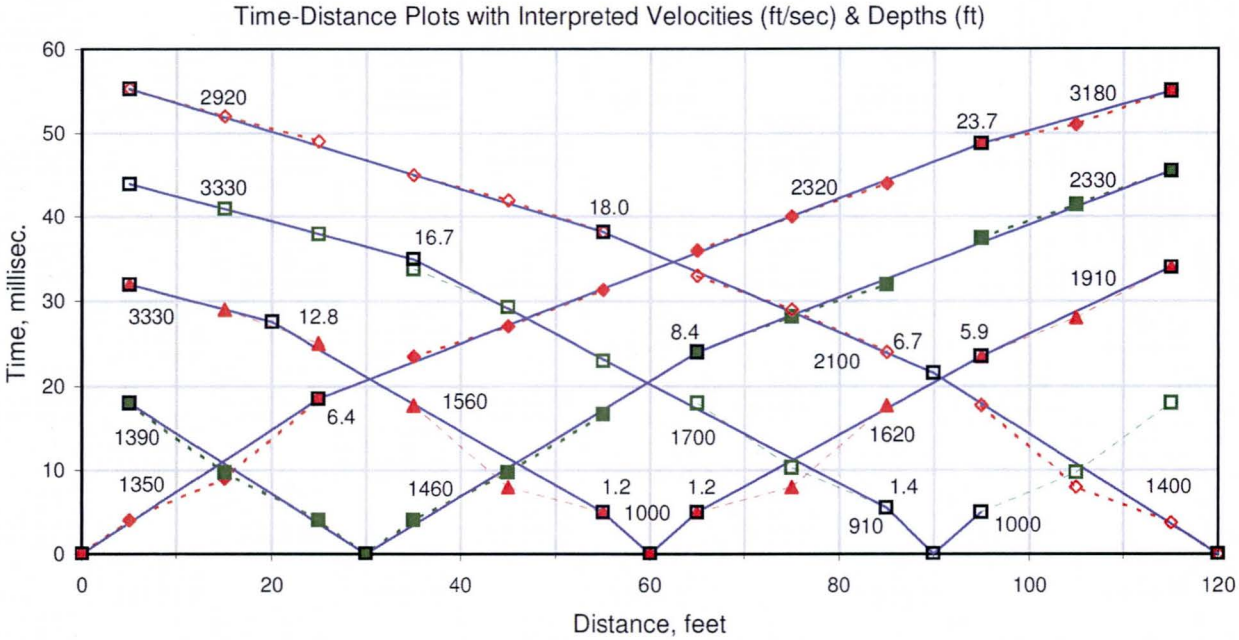





Sta 100+00
East
Interpretation of Refraction Seismic Data
West
crest
1700
1100
1100
1200
1300
s-wave = 630 f/s
2300
2200
~3100
s-wave = 1300 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
~3700
approximate depth of investigation per SEISOPT2D
s-wave = 900 f/s
s-wave = 3200 f/s belox ~53 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
Time, millisec.
Distance, feet
3330
21.3
2000
4000
15.5
2220
1720
1200
6.2
1070
4.6
4.4
1670
24.6
4260
2220
1070
2330
1220
3330
7.9
3.6
2860
8.4
1250
1320
1250

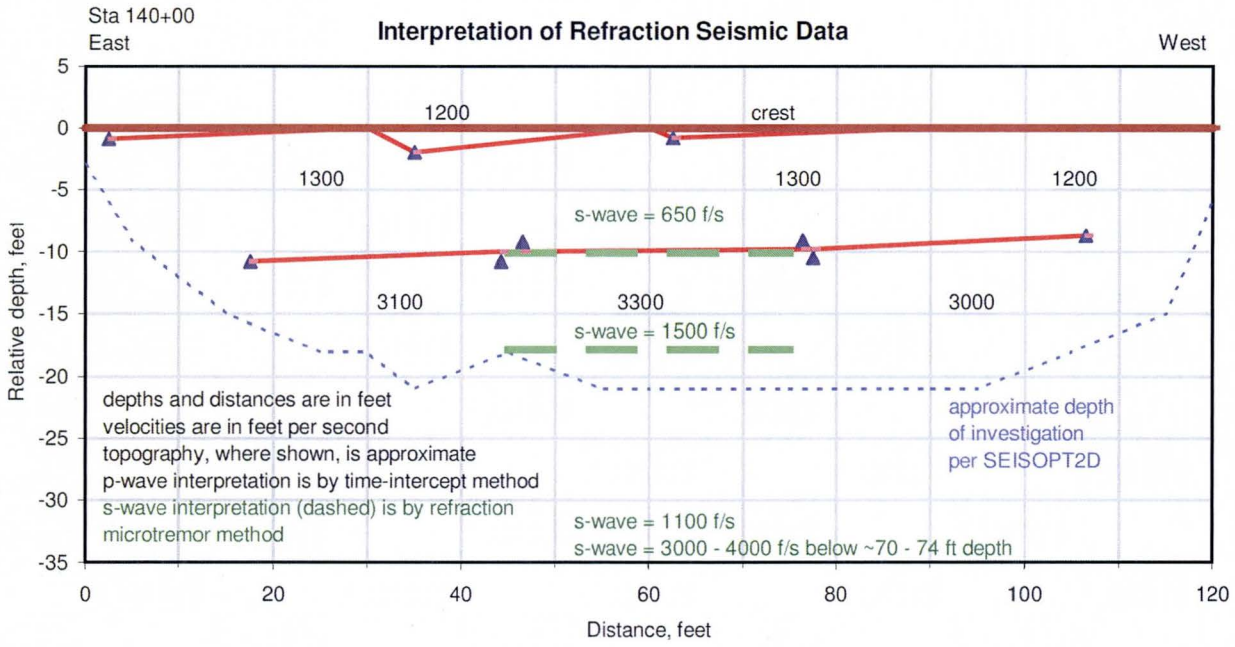

Sta 120+00
East
Interpretation of Refraction Seismic Data
West
1000
crest
1000
1400
1500
s-wave = 700 f/s
1700
1400
2000
s-wave = 1000 f/s
~2700
3000
s-wave = 1500 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 630 f/s
s-wave = 3100 f/s below ~41 ft depth
Relative depth, feet
Distance, feet

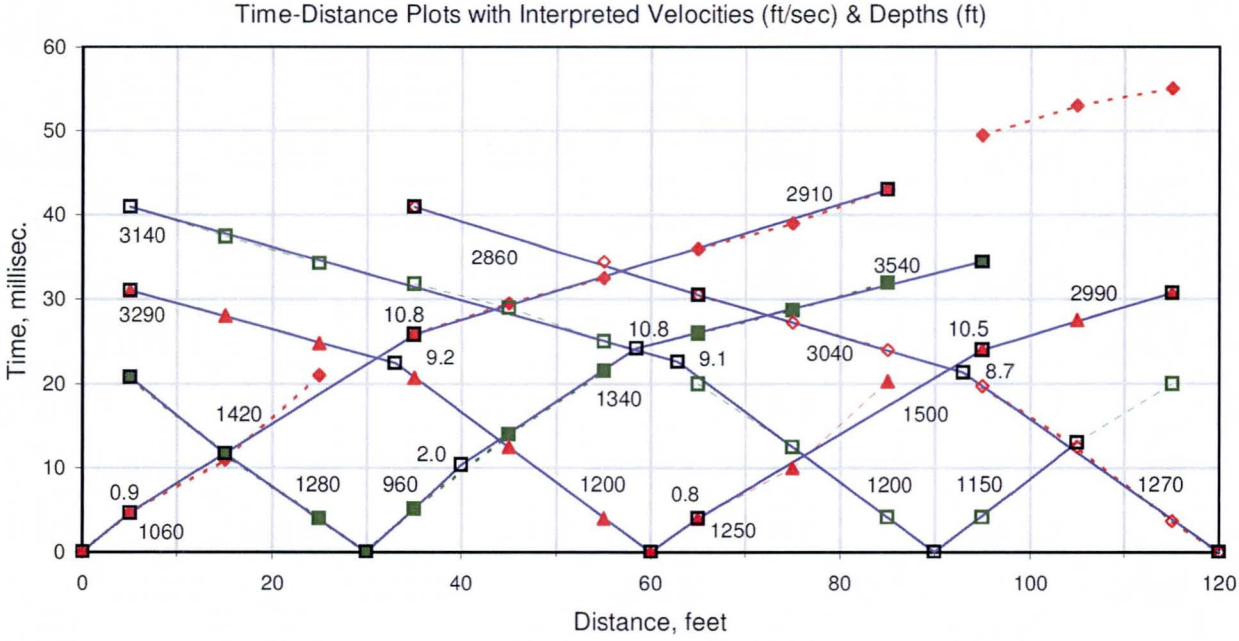

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
2920
3330
3330
12.8
6.4
1390
1350
1560
1460
18.0
16.7
1.2
1000
1700
8.4
1.2
2320
23.7
3180
2330
2100
6.7
5.9
1910
1620
1.4
910
1000
1400
Time, millisec.
Distance, feet

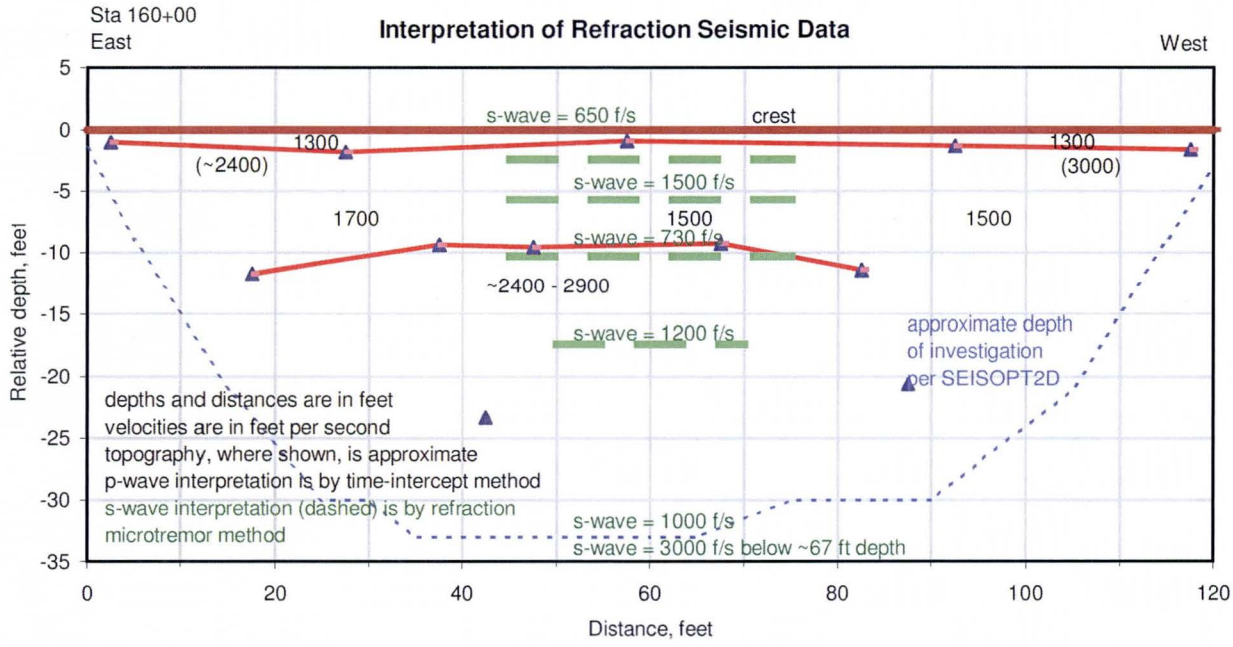
Refraction Seismic Interpretation

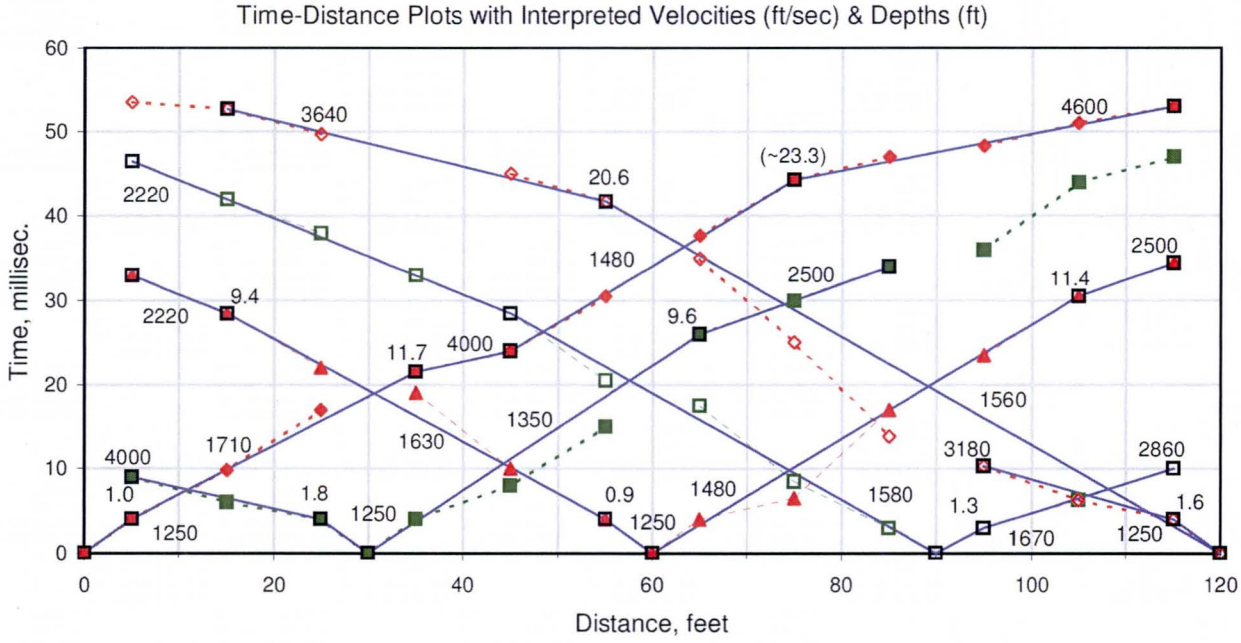
Line 56

AMEC Job No. 6-117-001025





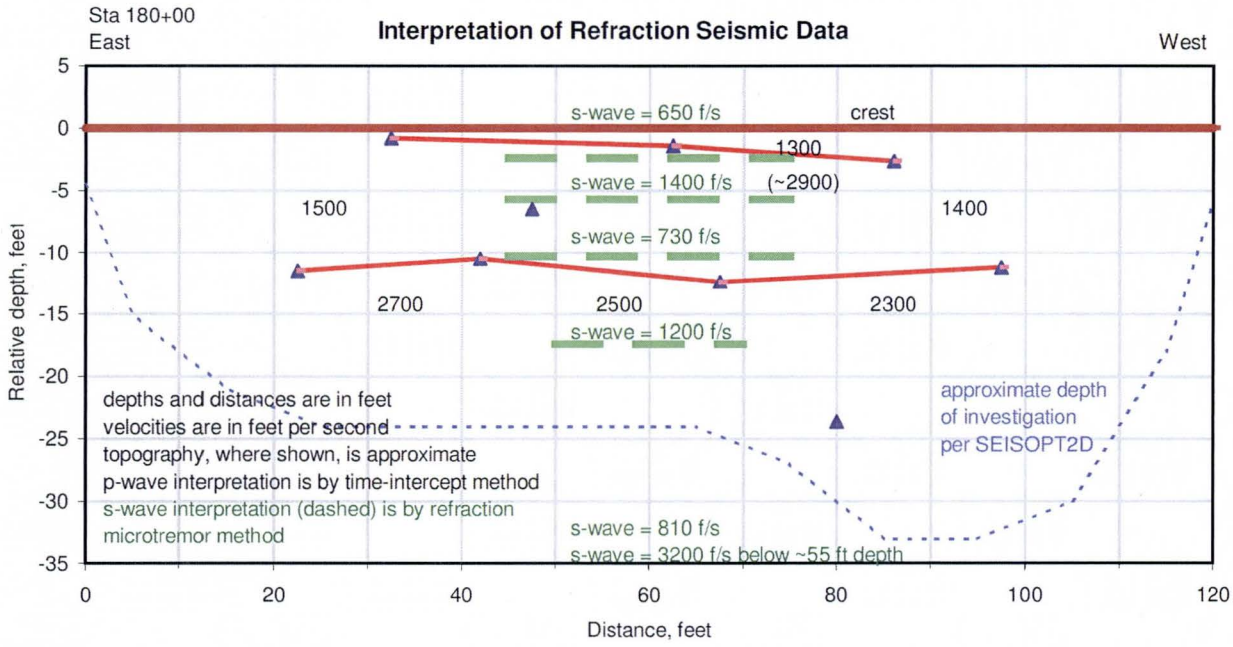

Sta 160+00
East
Interpretation of Refraction Seismic Data
West
s-wave = 650 f/s
crest
1300
(~2400)
1300
(3000)
s-wave = 1500 f/s
1700
1500
1500
s-wave = 730 f/s
~2400 - 2900
s-wave = 1200 f/s
approximate depth
of investigation
per SEISOPT2D
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction
microtremor method
s-wave = 1000 f/s
s-wave = 3000 f/s below ~67 ft depth
Relative depth, feet
Distance, feet

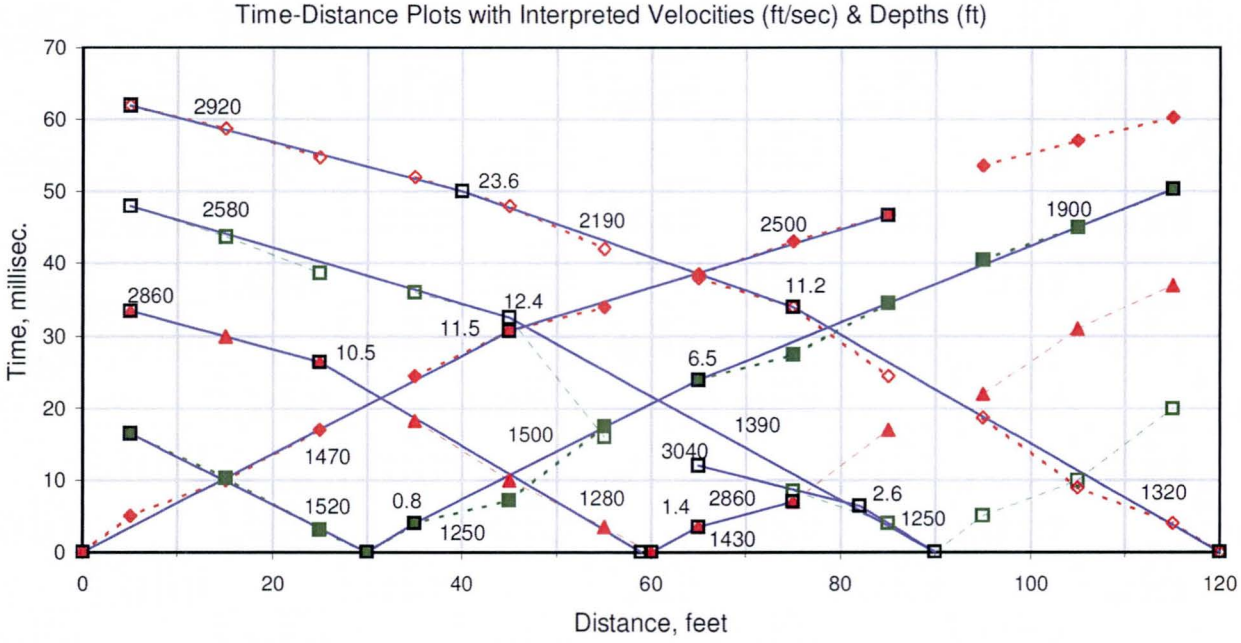

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
3640
20.6
(~23.3)
4600
2220
2220
9.4
1480
2500
2500
11.4
9.6
11.7
4000
1560
1710
1350
1630
4000
3180
2860
1.0
1.8
0.9
1480
1580
1.3
1.6
1250
1250
1250
1670
1250
Time, millisec.
Distance, feet

Refraction Seismic Interpretation

Line 58

AMEC Job No. 6-117-001025

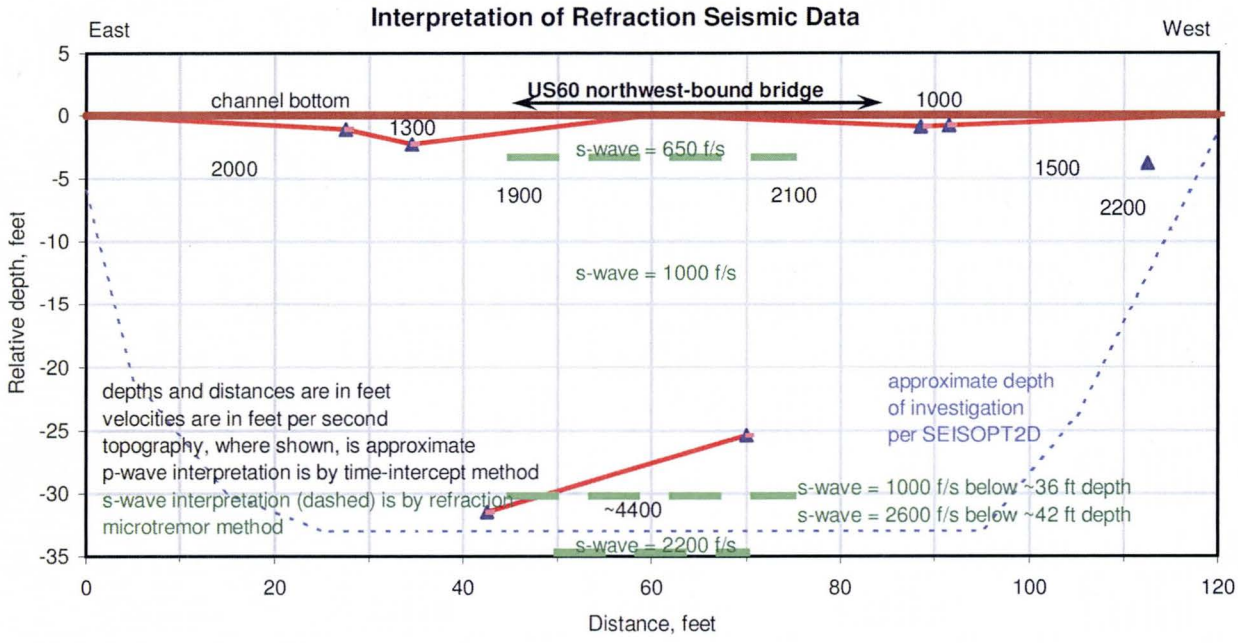


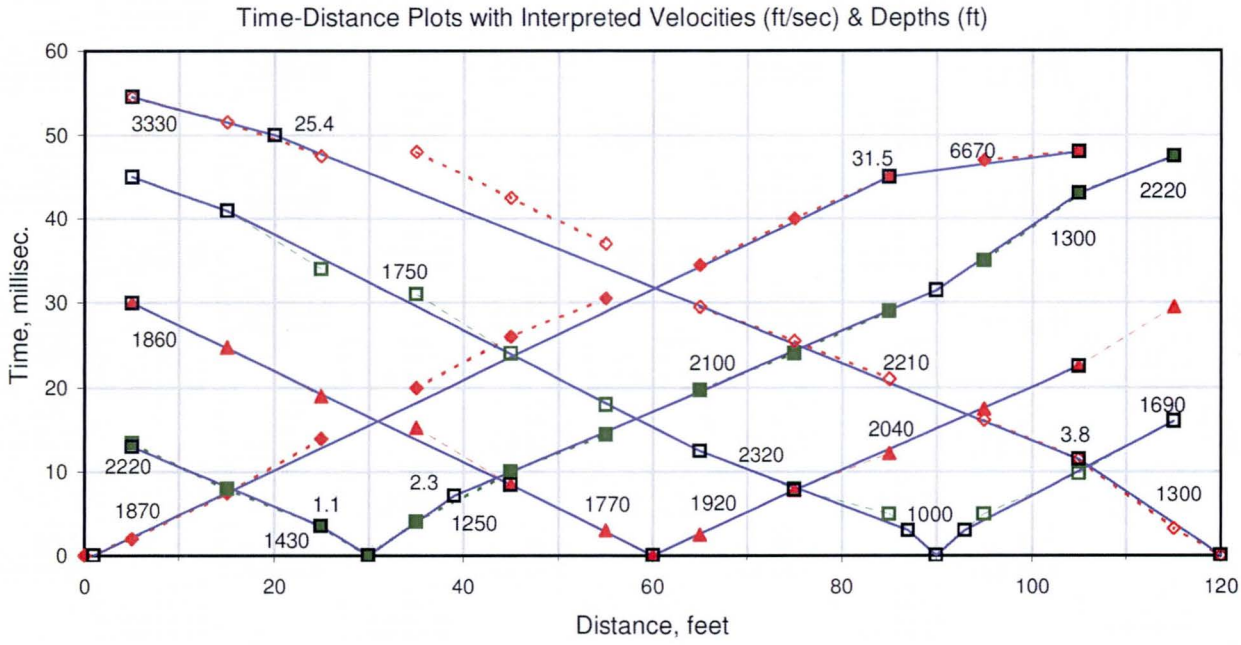


Refraction Seismic Interpretation

Line 70

AMEC Job No. 6-117-001025

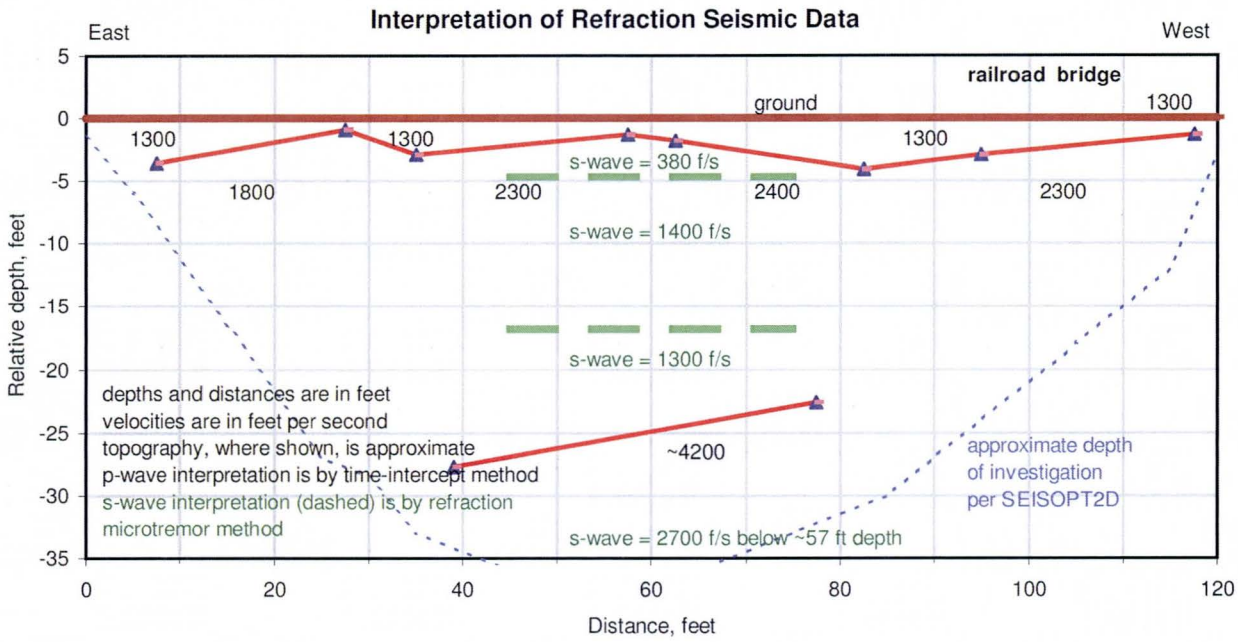


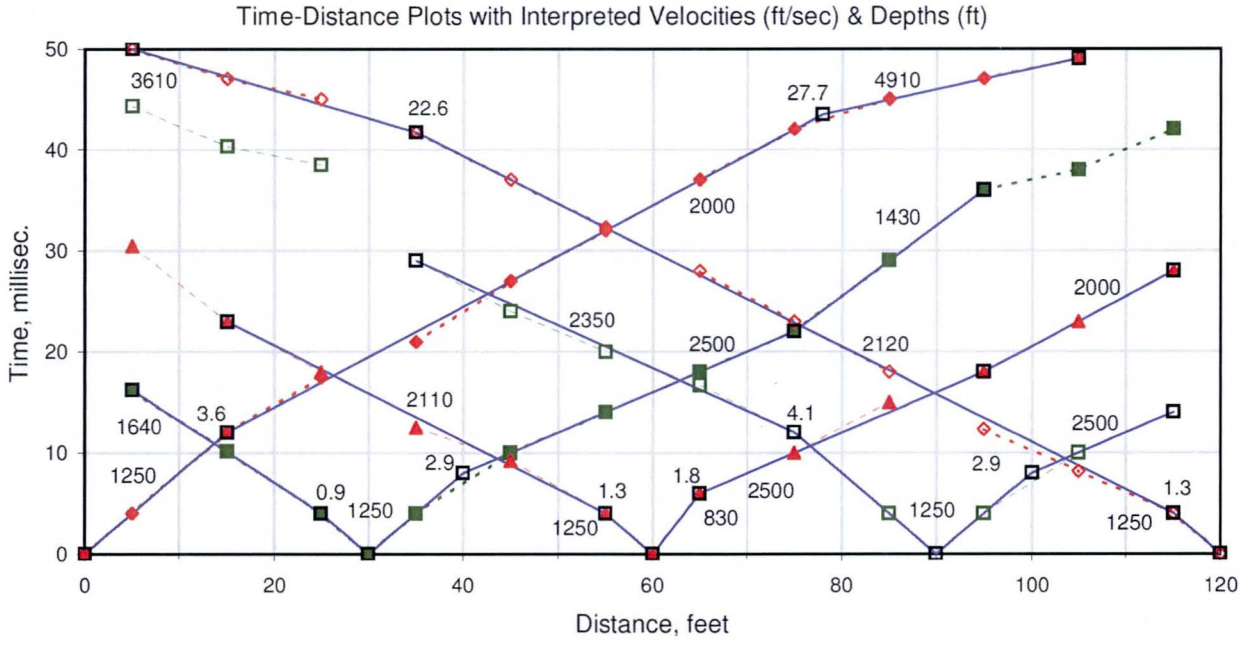


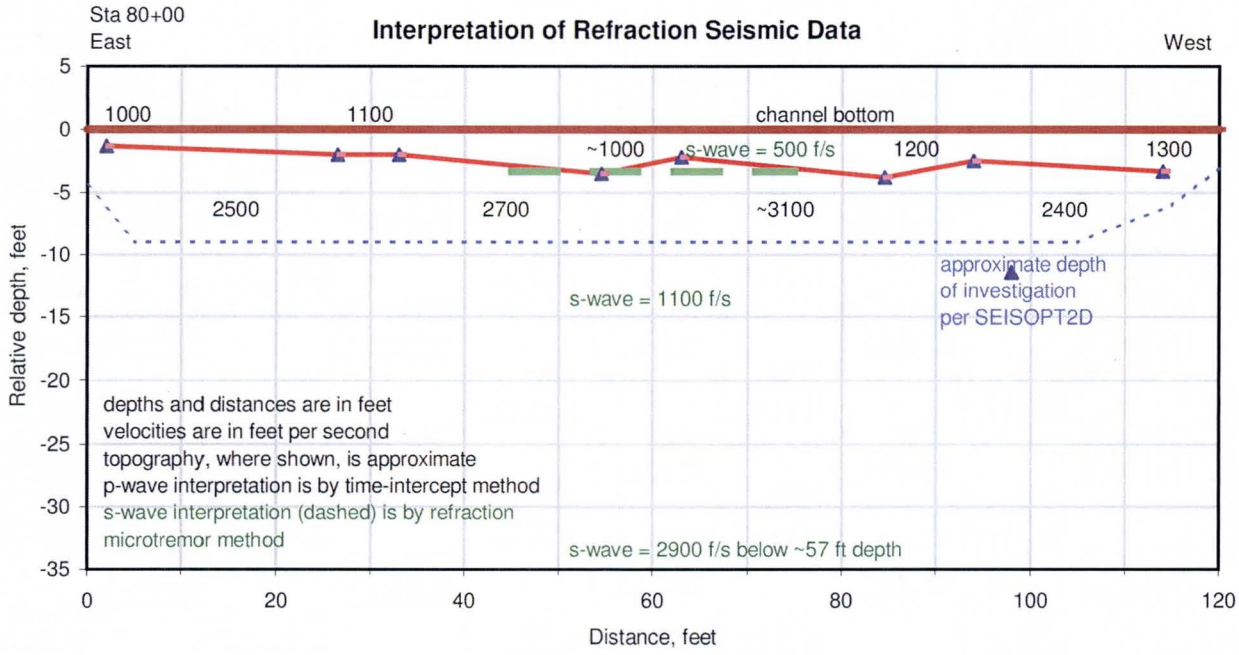
Refraction Seismic Interpretation

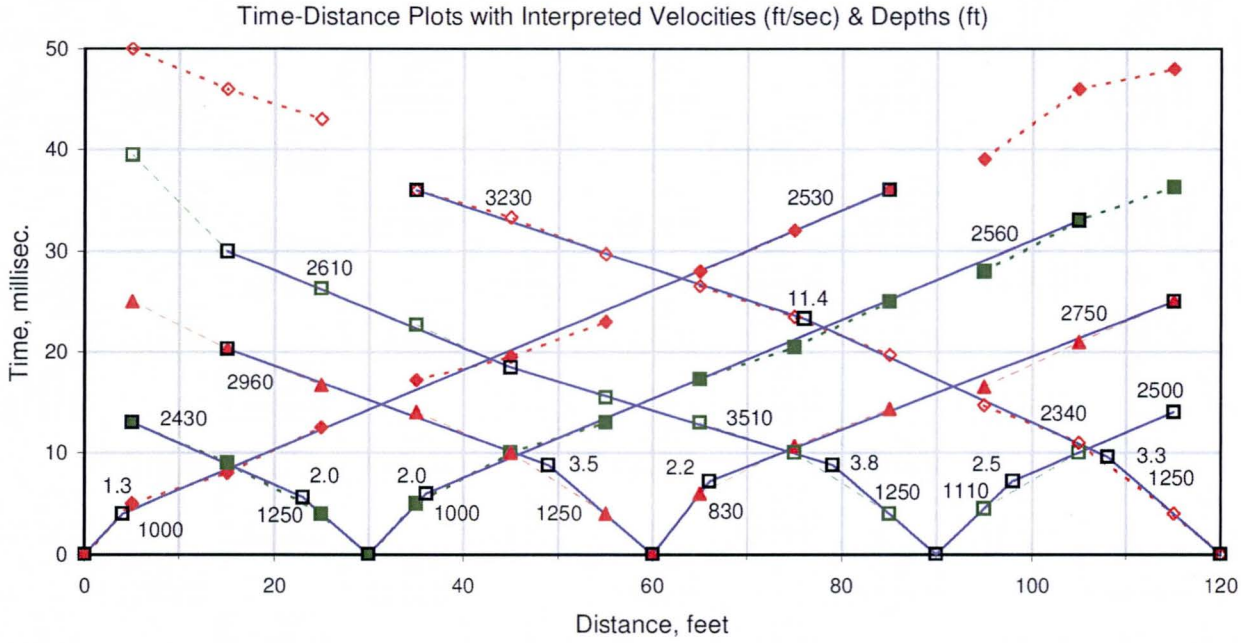
Line 71

AMEC Job No. 6-117-001025





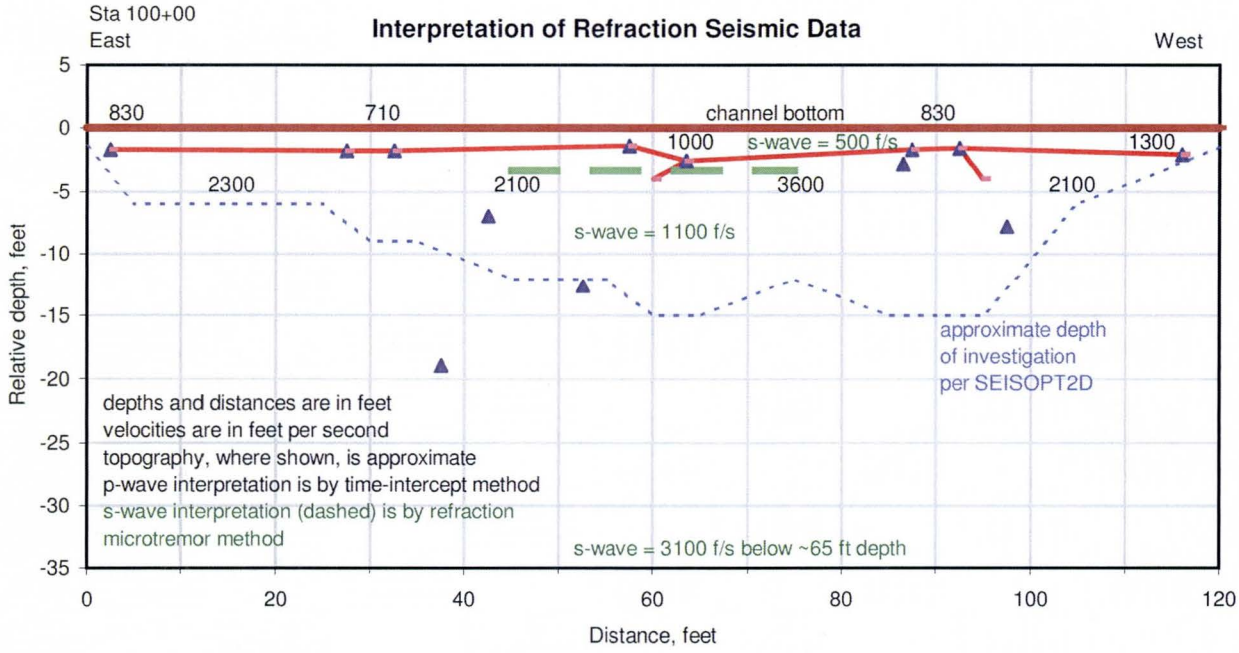

Sta 80+00
East
Interpretation of Refraction Seismic Data
West
1000
1100
channel bottom
~1000
s-wave = 500 f/s
1200
1300
2500
2700
~3100
2400
approximate depth
of investigation
per SEISOPT2D
s-wave = 1100 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction
microtremor method
s-wave = 2900 f/s below ~57 ft depth
Relative depth, feet
Distance, feet

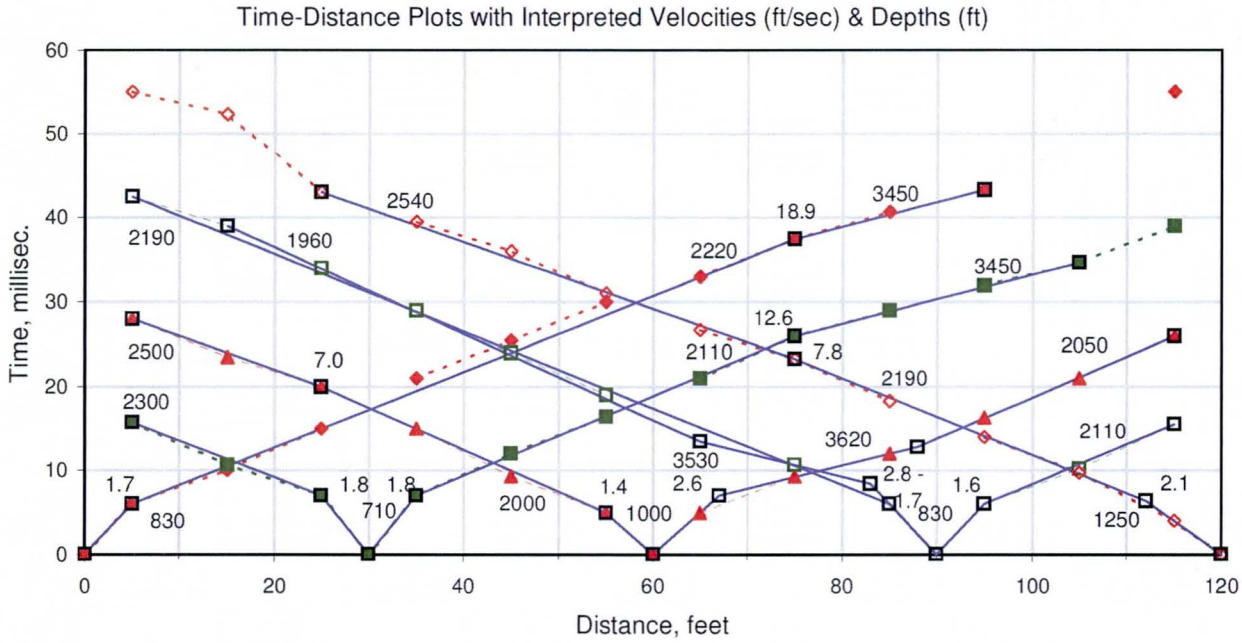

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
3230
2530
2610
2560
11.4
2750
2960
2430
3510
2340
2500
1.3
2.0
2.0
3.5
2.2
3.8
2.5
3.3
1250
1000
1250
1000
1250
830
1250
1110
Time, millisec.
Distance, feet

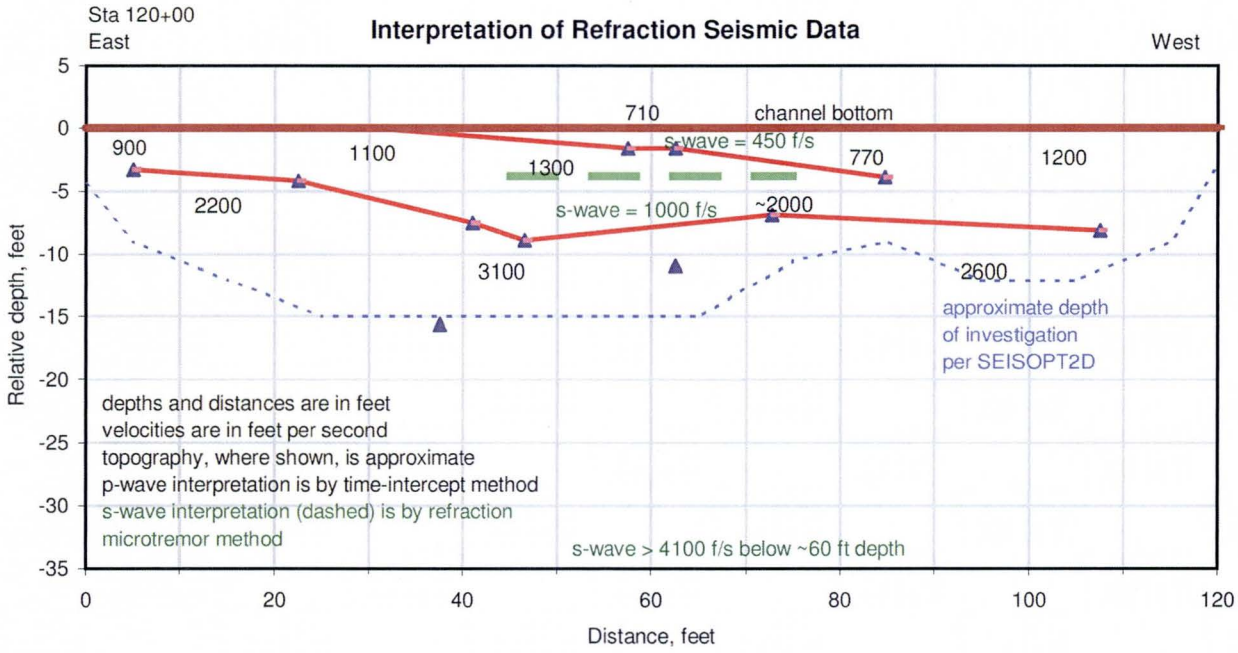
Refraction Seismic Interpretation

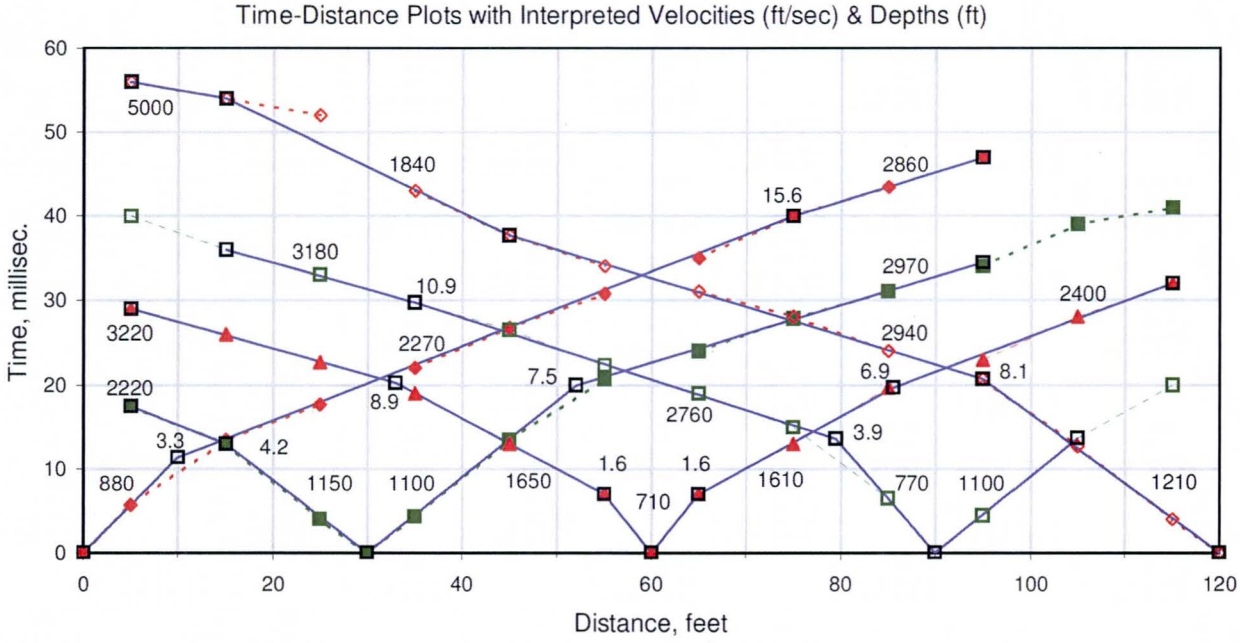
Line 73

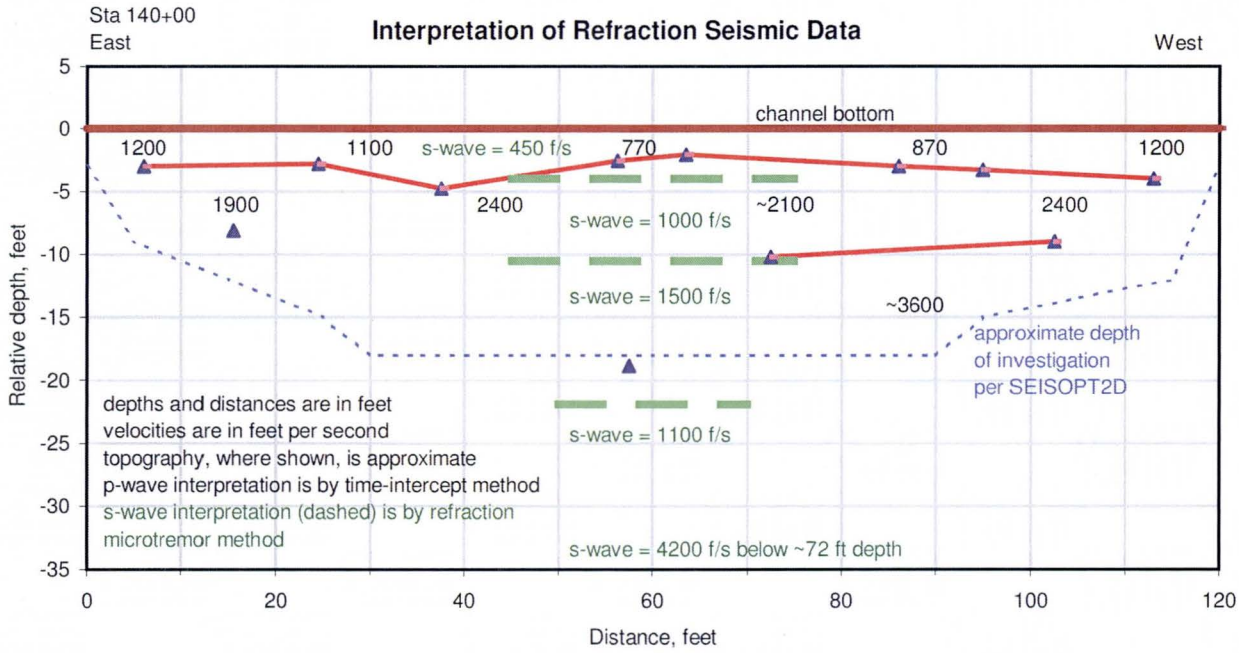
AMEC Job No. 6-117-001025

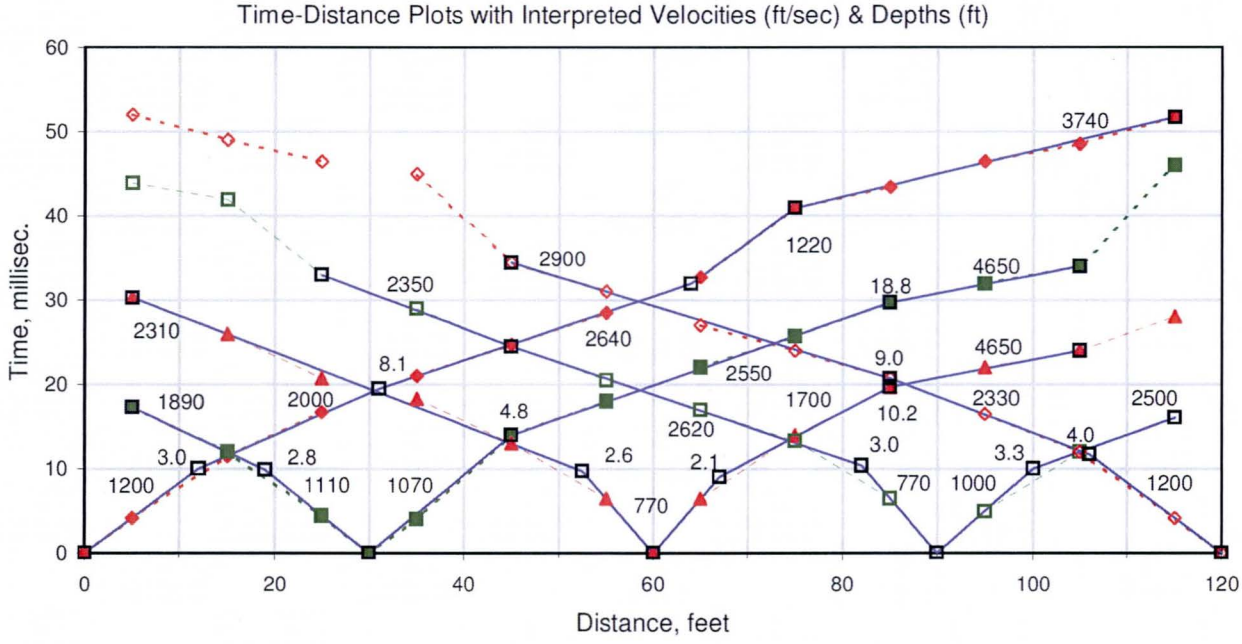


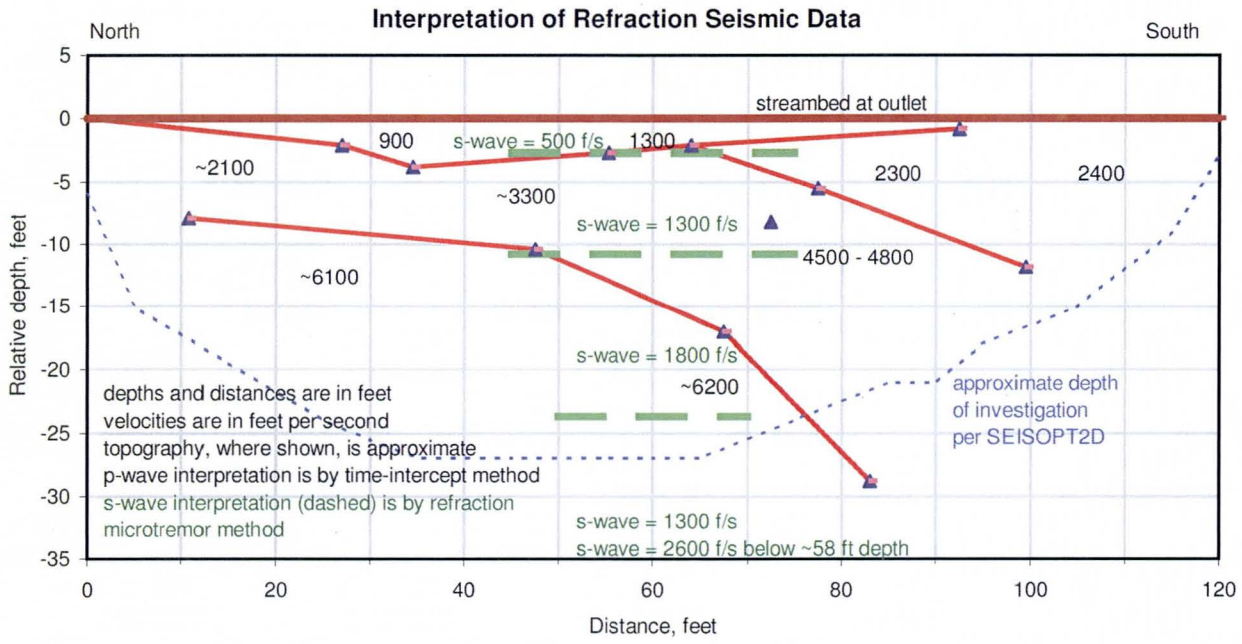


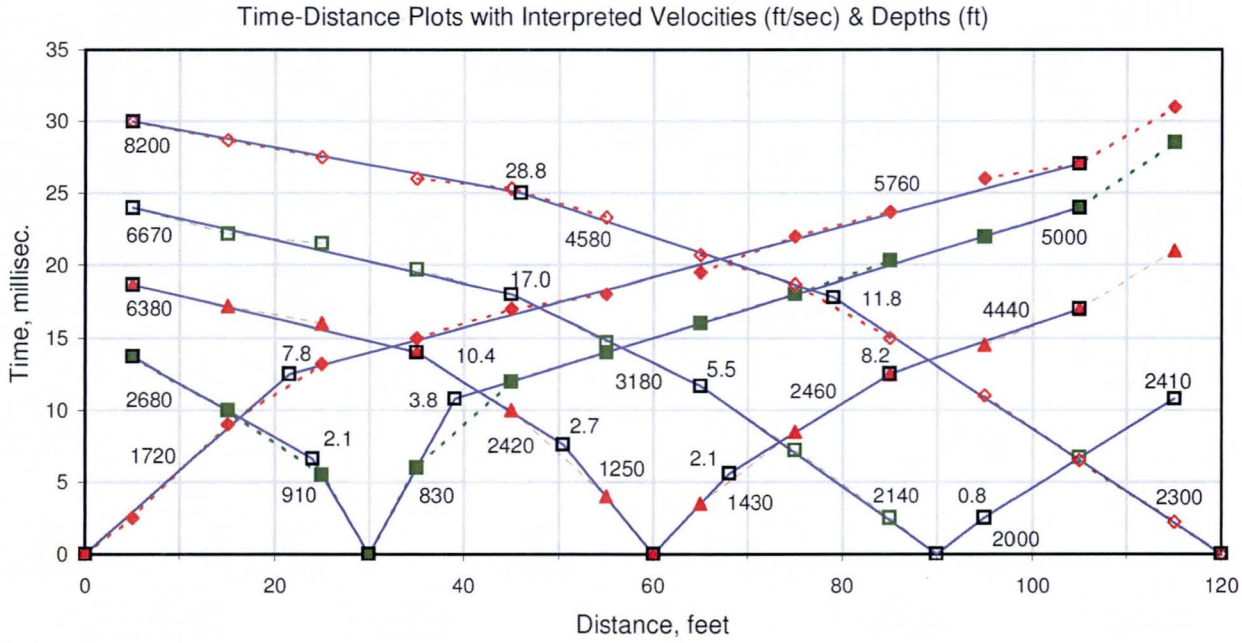

Sta 120+00
East
Interpretation of Refraction Seismic Data
West
710
channel bottom
s-wave = 450 f/s
900
1100
1300
770
1200
2200
s-wave = 1000 f/s
~2000
3100
2600
approximate depth
of investigation
per SEISOPT2D
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction
microtremor method
s-wave > 4100 f/s below ~60 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
5000
1840
2860
15.6
3180
10.9
2970
3220
2270
2940
2400
7.5
6.9
8.1
2220
8.9
2760
3.9
3.3
4.2
1.6
1.6
880
1150
1100
1650
710
1610
770
1100
1210
Time, millisec.
Distance, feet


Sta 140+00
East
Interpretation of Refraction Seismic Data
West
channel bottom
1200
1100
s-wave = 450 f/s
770
870
1200
1900
2400
~2100
2400
s-wave = 1000 f/s
s-wave = 1500 f/s
~3600
approximate depth
of investigation
per SEISOPT2D
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction
microtremor method
s-wave = 1100 f/s
s-wave = 4200 f/s below ~72 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
Time, millisec.
Distance, feet
3740
1220
2900
2350
2310
2640
18.8
4650
8.1
2550
9.0
4650
1890
2000
4.8
1700
10.2
2330
2500
2620
3.0
2.8
2.6
2.1
3.0
3.3
4.0
1200
1110
1070
770
770
1000
1200

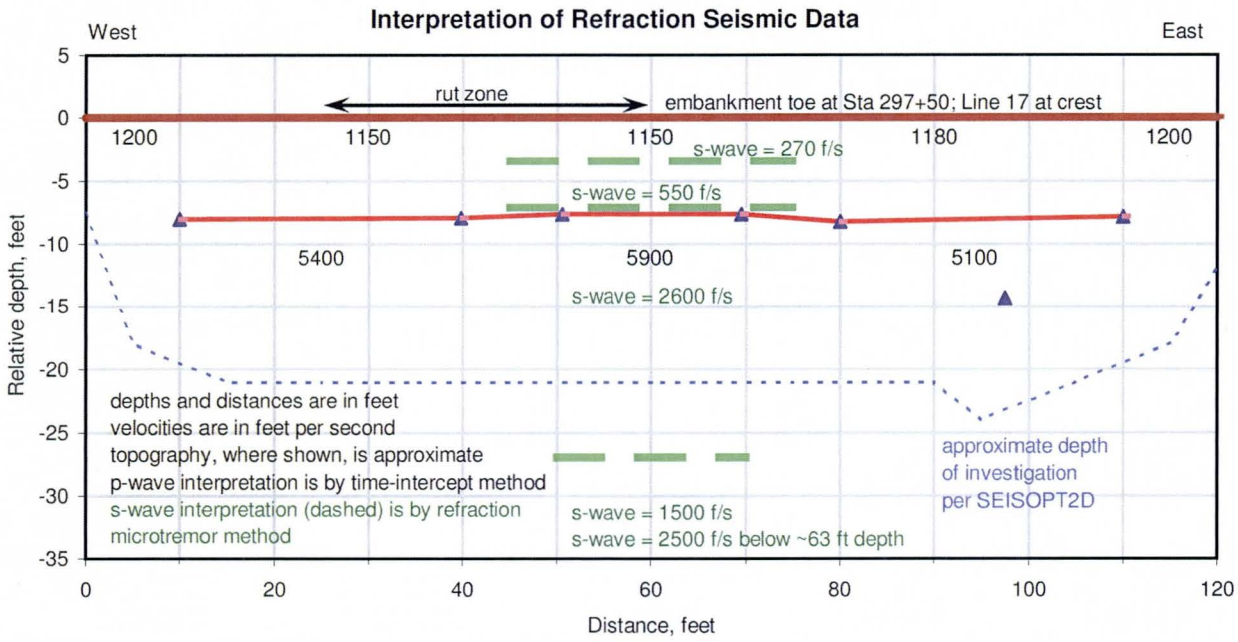

Interpretation of Refraction Seismic Data
North
South
streambed at outlet
900
s-wave = 500 f/s
1300
~2100
2300
2400
~3300
s-wave = 1300 f/s
4500 - 4800
~6100
s-wave = 1800 f/s
~6200
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 1300 f/s
s-wave = 2600 f/s below ~58 ft depth
Relative depth, feet
Distance, feet

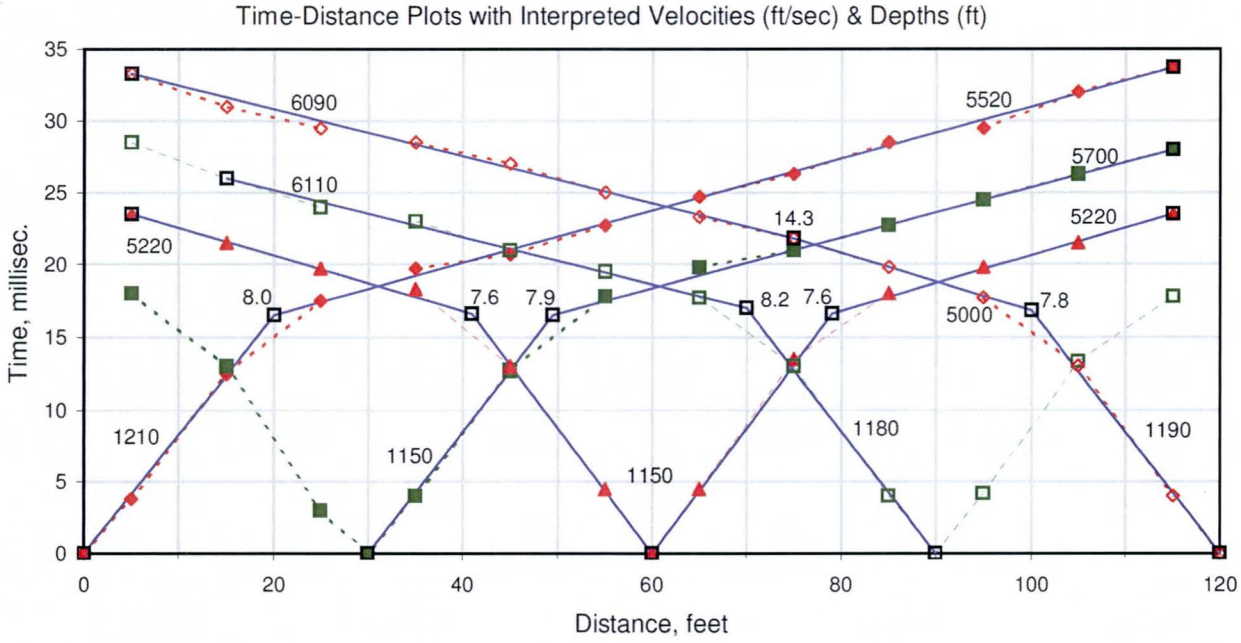

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
8200
28.8
4580
5760
6670
5000
6380
17.0
11.8
4440
7.8
10.4
8.2
2680
3180
5.5
2460
2410
3.8
2.1
2420
2.7
1720
1250
2.1
910
830
1430
2140
0.8
2300
2000
Time, millisec.
Distance, feet

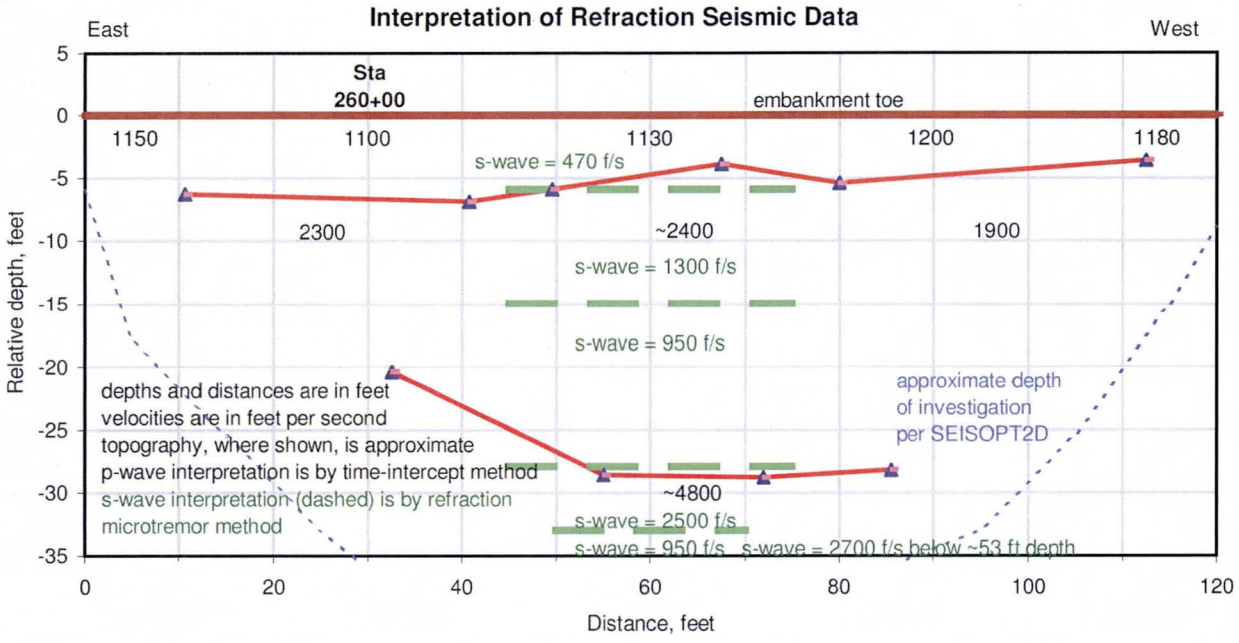
Refraction Seismic Interpretation

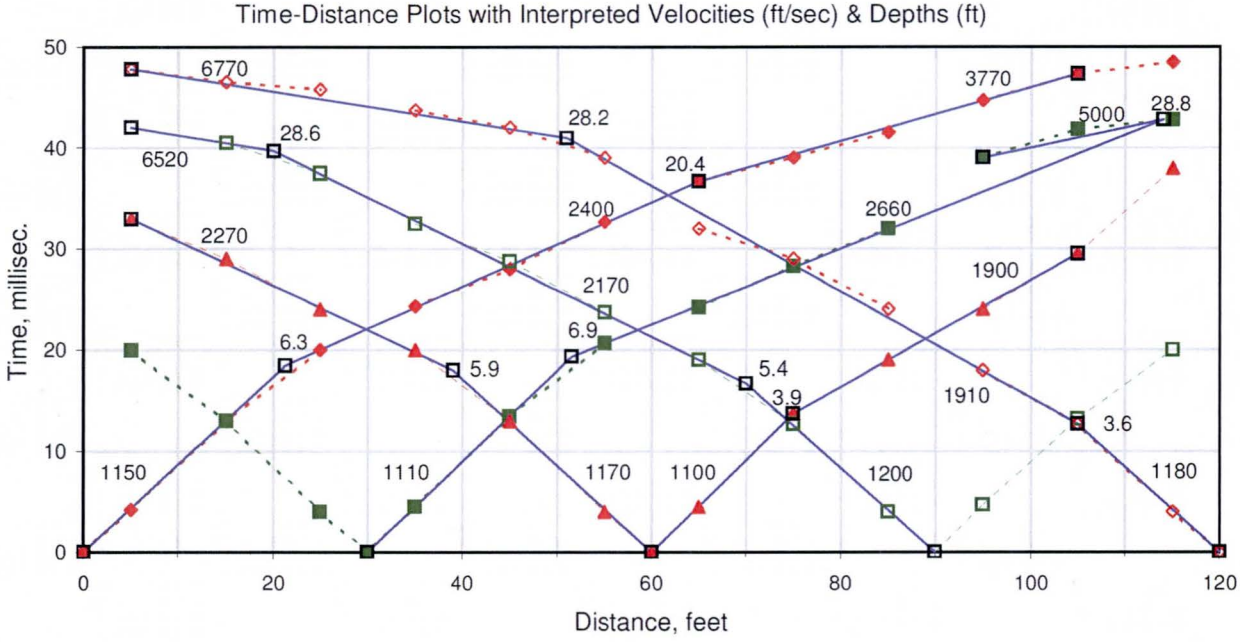
Line 81

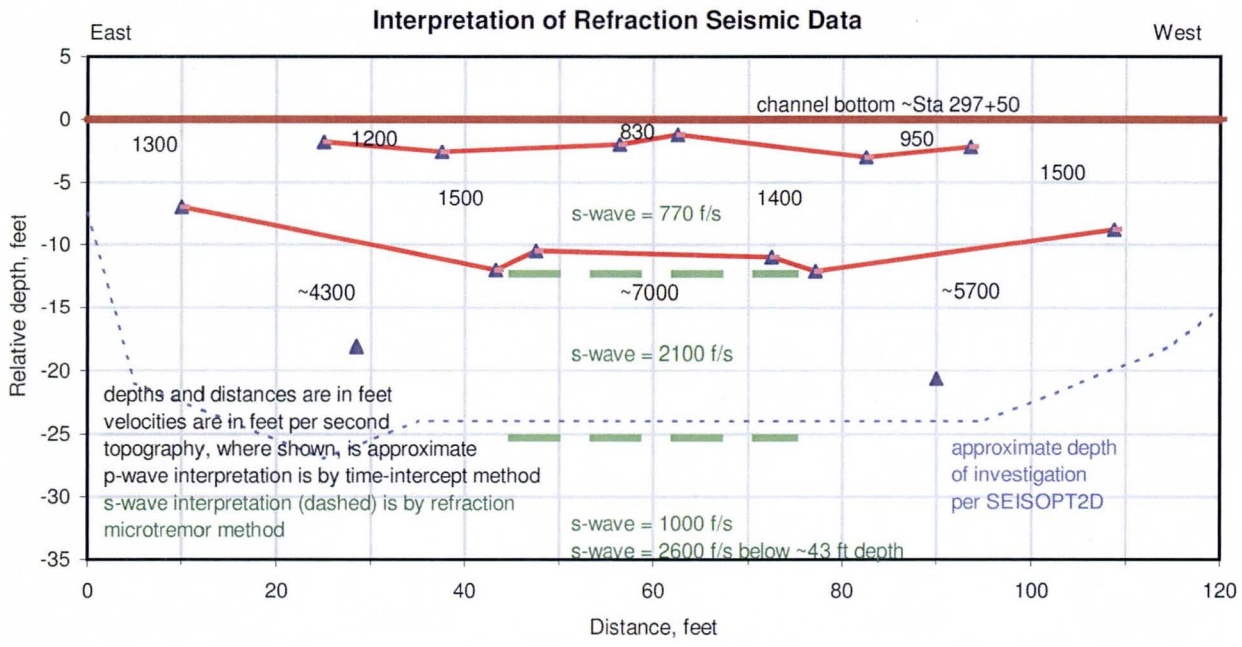
AMEC Job No. 6-117-001025

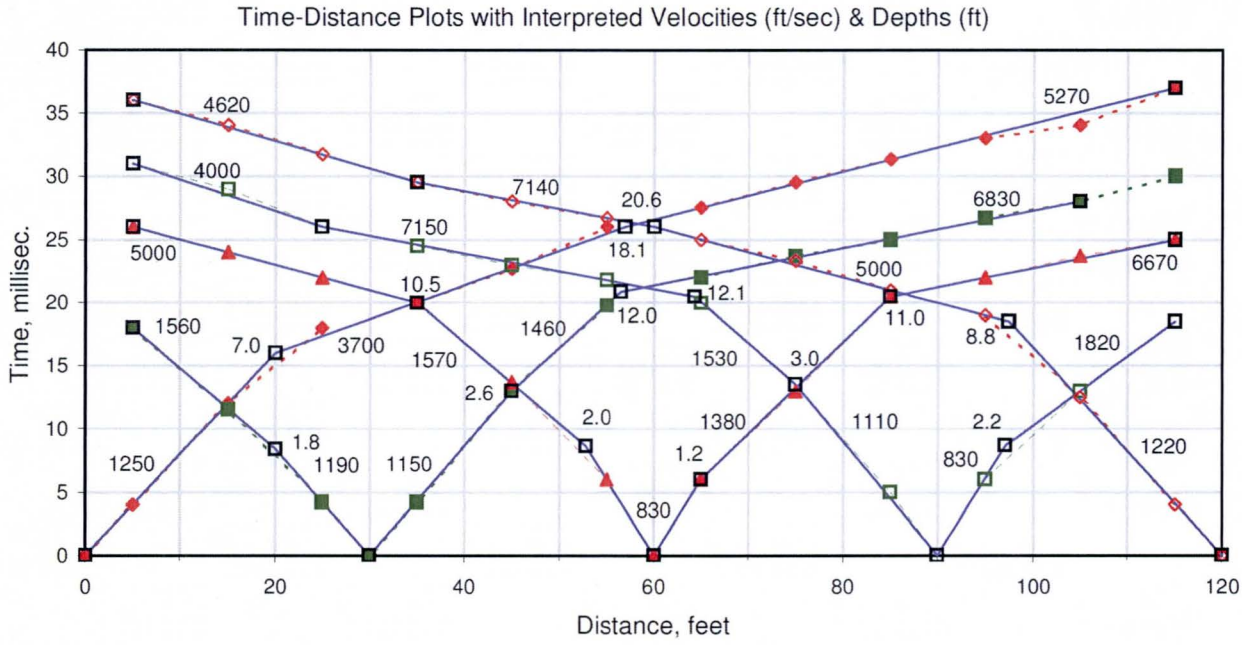


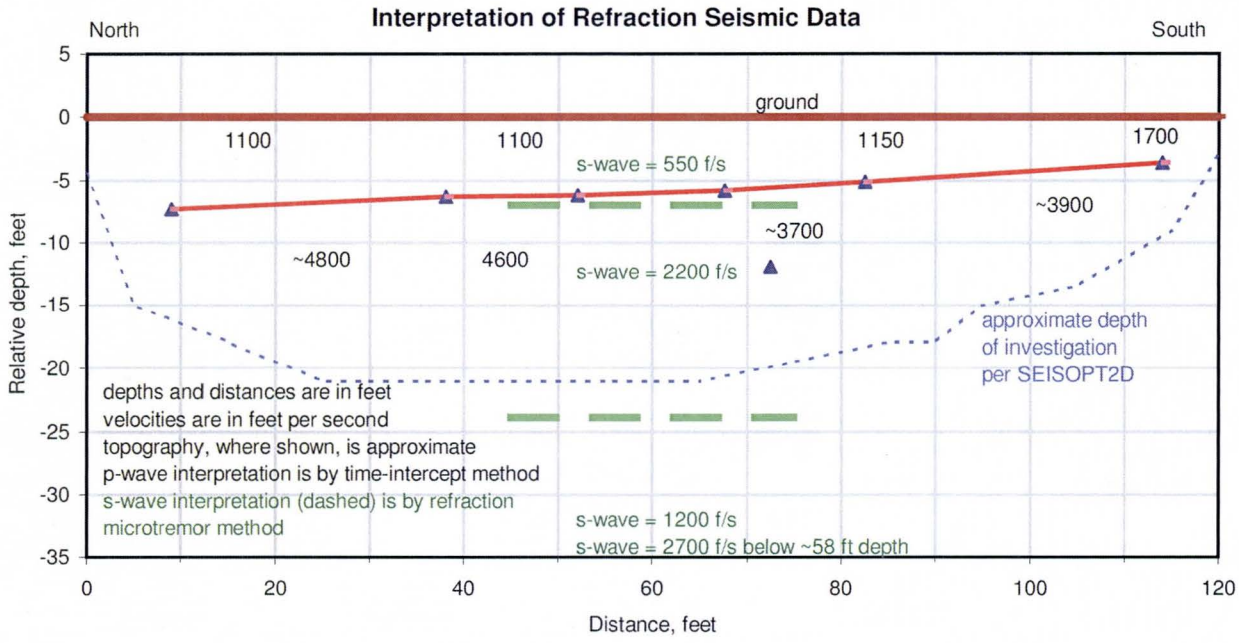


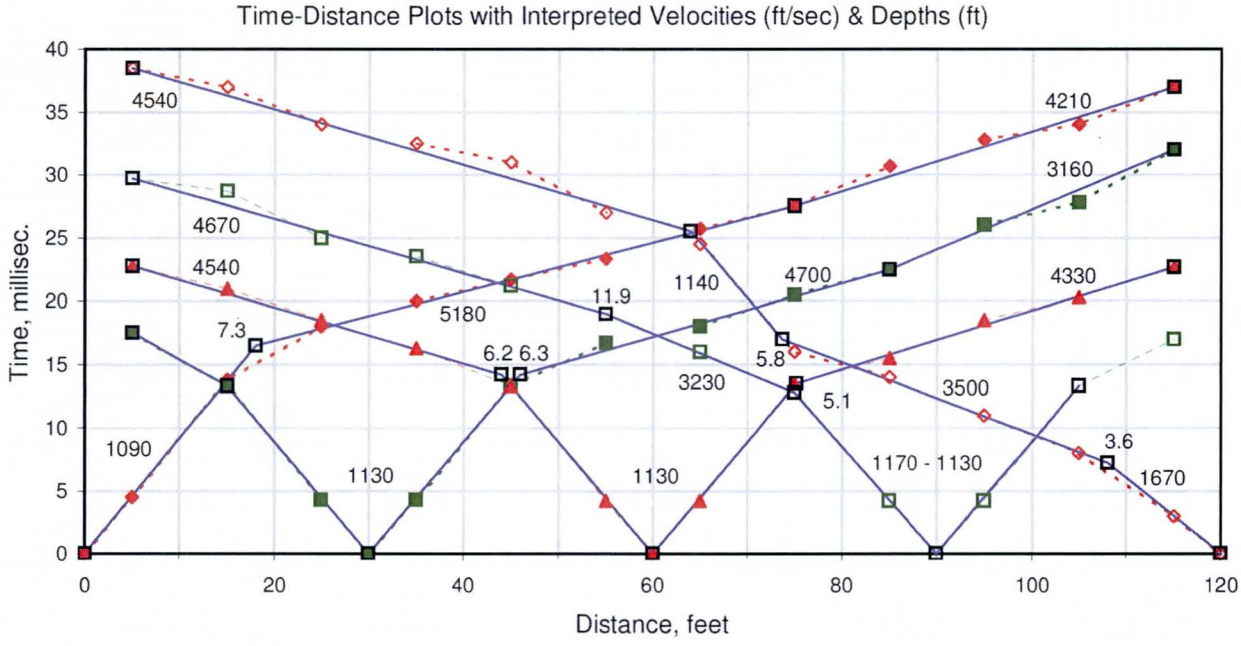

Interpretation of Refraction Seismic Data
East
West
Sta
260+00
embankment toe
1150
1100
1130
1200
1180
s-wave = 470 f/s
2300
~2400
1900
s-wave = 1300 f/s
s-wave = 950 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
~4800
s-wave = 2500 f/s
s-wave = 950 f/s
s-wave = 2700 f/s below ~53 ft depth
Relative depth, feet
Distance, feet

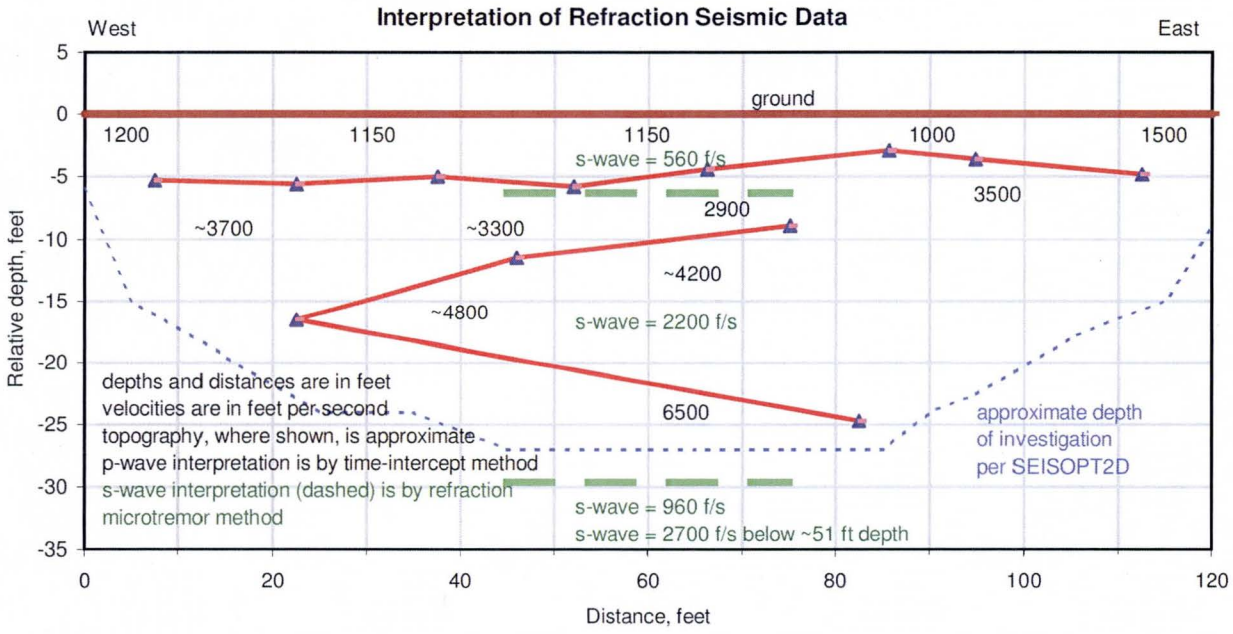

Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
6770
28.2
3770
5000
28.8
28.6
6520
20.4
2400
2660
2270
2170
1900
6.3
6.9
5.9
5.4
3.9
1910
3.6
1150
1110
1170
1100
1200
1180
Time, millisec.
Distance, feet

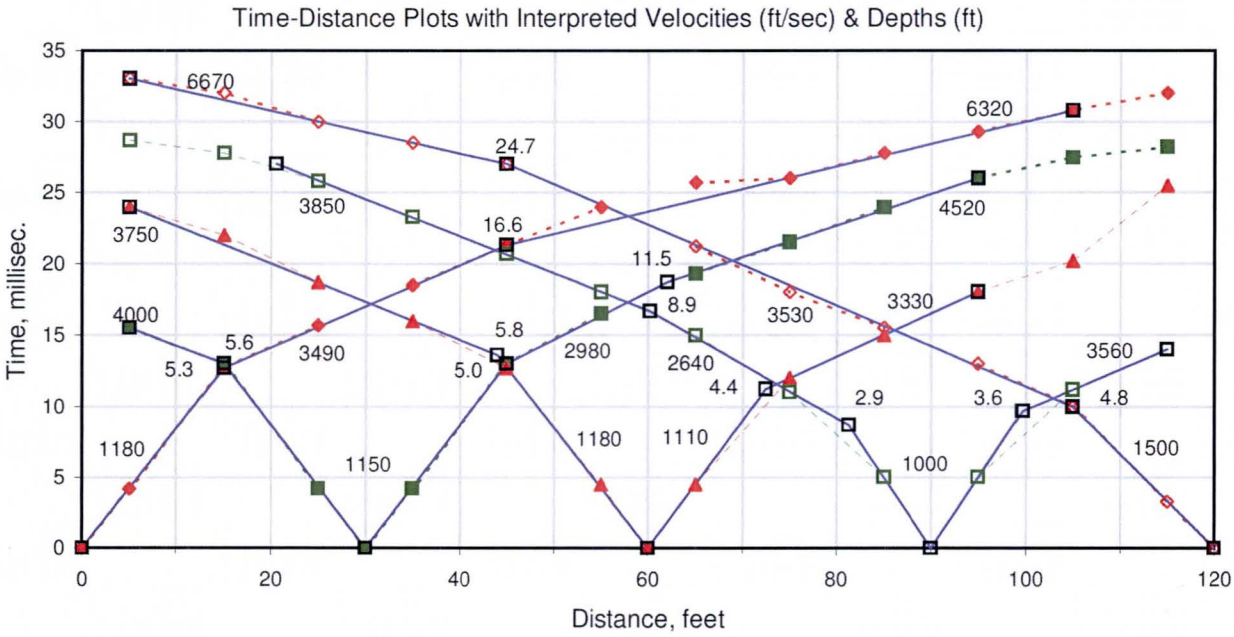

Interpretation of Refraction Seismic Data
East
West
channel bottom ~Sta 297+50
1300
1200
830
950
1500
1500
1400
s-wave = 770 f/s
~4300
~7000
~5700
s-wave = 2100 f/s
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 1000 f/s
s-wave = 2600 f/s below ~43 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
4620
4000
5000
7140
7150
10.5
20.6
18.1
12.1
12.0
5270
6830
6670
5000
11.0
8.8
1820
1560
7.0
3700
1570
1460
2.6
2.0
1530
3.0
1380
1110
2.2
1220
1250
1.8
1190
1150
830
1.2
830
Time, millisec.
Distance, feet


Interpretation of Refraction Seismic Data
North
South
ground
1100
1100
1150
1700
s-wave = 550 f/s
~3900
~3700
~4800
4600
s-wave = 2200 f/s
approximate depth of investigation per SEISOPT2D
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
s-wave = 1200 f/s
s-wave = 2700 f/s below ~58 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
4540
4210
3160
4670
4540
4330
4700
1140
11.9
5180
7.3
6.2 6.3
5.8
3230
3500
5.1
1090
1130
1130
1170 - 1130
3.6
1670
Time, millisec.
Distance, feet


Interpretation of Refraction Seismic Data
West
East
ground
1200
1150
1150
1000
1500
s-wave = 560 f/s
3500
2900
~3700
~3300
~4200
~4800
s-wave = 2200 f/s
6500
depths and distances are in feet
velocities are in feet per second
topography, where shown, is approximate
p-wave interpretation is by time-intercept method
s-wave interpretation (dashed) is by refraction microtremor method
approximate depth of investigation per SEISOPT2D
s-wave = 960 f/s
s-wave = 2700 f/s below ~51 ft depth
Relative depth, feet
Distance, feet


Time-Distance Plots with Interpreted Velocities (ft/sec) & Depths (ft)
6670
24.7
6320
3850
3750
16.6
4520
11.5
4000
5.6
5.3
3490
5.8
5.0
2980
8.9
2640
3530
3330
4.4
2.9
3.6
4.8
3560
1180
1150
1180
1110
1000
1500
Time, millisec.
Distance, feet

APPENDIX E

TEST PIT PHOTOGRAPHS

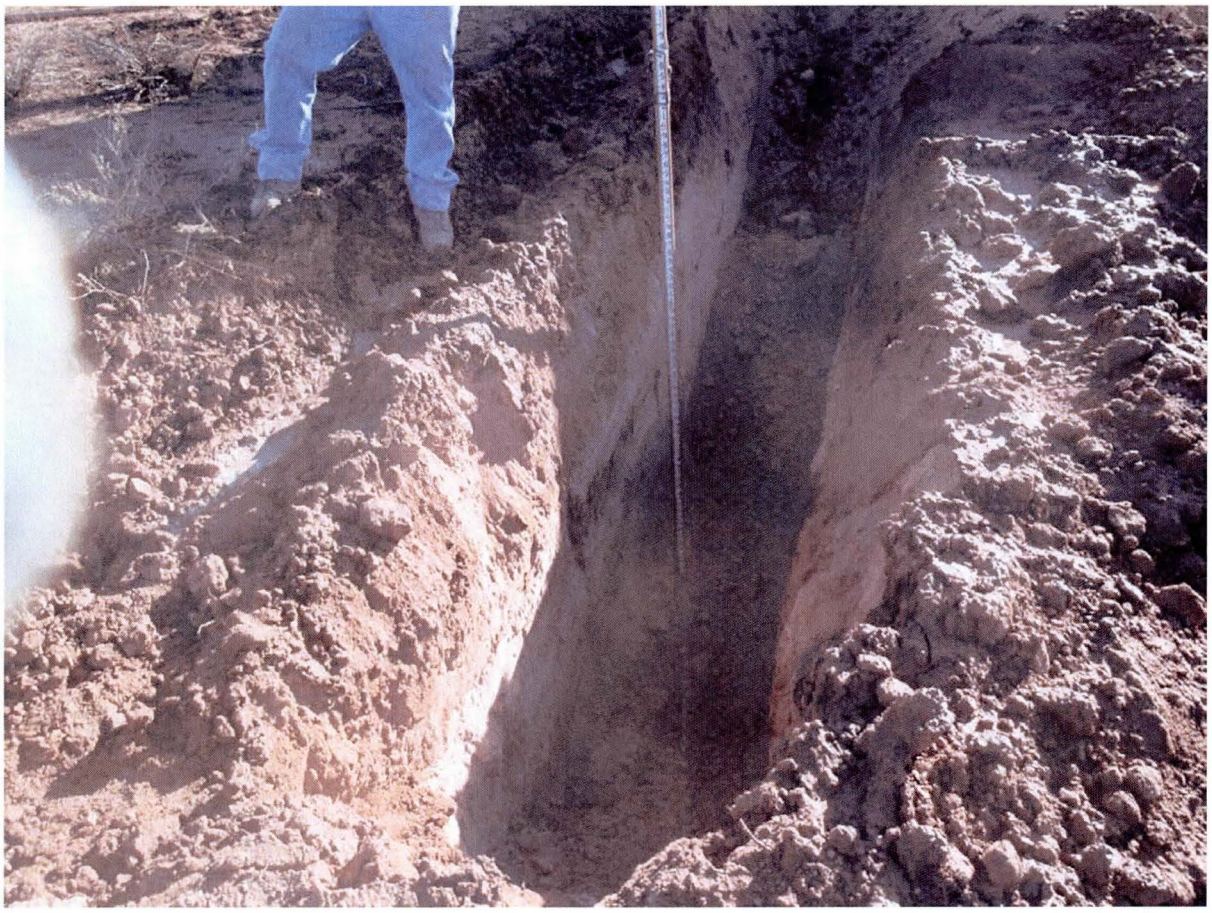
Test Pit TP-601 at 5.0'.

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
Sunny		Cloudy		Rainy		
<32	30s	40s	50s	60s	70s	80s
90s	100s		110s		120s	

Arrival:	700	Reg. Hours	7
Departure:	1200	OT Hours:	
Mileage:	93	Total Hours:	7

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 Gannet 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

AMEC Representative: Juan Valenciano Client Representative:

Project	**McMicken FRS**	Job Number	**17-2013-4059**
Location	**Surprise, Arizona**	Date	**04/28/14**
Reported By	**J. Valenciano**	Report Number	**JV-001**

DENSITY OF SOIL IN PLACE BY THE NUCLEAR METHOD (ASTM D6938)

CURVES:

	DESCRIPTION:	DENS. (PCF)	MOIST (%)
01	Onsite Native Material-1 point	102.4	20.3

NUCLEAR TESTS:

Test #	Location	Elevation*	Rock (%)	Tested Dry Density (pcf)	Tested Moisture (%)	Maximum Dry Density	Optimum Moisture (%)	Moisture Requirement	Compaction (%)	Required Compaction	Test Result	Curve
1	TP-601	-3.0	36	108.9	**15.1**	119.2	13.4	**N/A**	**92**	**N/A**	**N/A**	01
2	TP-601	-2.0	36	112.7	**11.4**	119.2	13.4	**N/A**	**95**	**N/A**	**N/A**	01
3	TP-601	-1.0	36	116.9	**11.7**	119.2	13.4	**N/A**	**98**	**N/A**	**N/A**	01

* DEPTH OF REFERENCE POINT: Finished elevation

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
Sunny		Cloudy		Rainy		
<32	30s	40s	50s	60s	70s	80s
90s	100s		110s		120s	

Arrival:	700	Reg. Hours	4.5
Departure:	930	OT Hours:	
Mileage:	102	Total Hours:	4.5

Very windy conditions.

Report No.	JV-002
Corrective Action Required:	

SERVICES REQUESTED: *Compaction Testing*

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 obatined 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

AMEC Representative: Juan Valenciano Client Representative: _____

Project	**McMicken FRS**	Job Number	**17-2013-4059**
Location	**Surprise, Arizona**	Date	**04/30/14**
Reported By	**J. Valenciano**	Report Number	**JV-002**

DENSITY OF SOIL IN PLACE BY THE NUCLEAR METHOD (ASTM D6938)

CURVES:

	DESCRIPTION:	DENS. (PCF)	MOIST (%)
01	Onsite Native Material-1 point	102.4	20.3
02	Onsite Native Material-1 point TP-603	117.3	13.5

NUCLEAR TESTS:

Test #	Location	Elevation*	Rock (%)	Tested Dry Density (pcf)	Tested Moisture (%)	Maximum Dry Density	Optimum Moisture (%)	Moisture Requirement	Compaction (%)	Required Compaction	Test Result	Curve
1	TP-604	0.0	36	120.4	**5.8**	119.2	13.4	**N/A**	**102**	**N/A**	**N/A**	01
2	TP-603	0.0	2	107.6	**12.1**	117.3	13.5	**N/A**	**92**	**N/A**	**N/A**	02
3	TP-602	0.0	36	119.8	**10.3**	119.2	13.4	**N/A**	**101**	**N/A**	**N/A**	01
4	TP-601	0.0	36	119.5	**7.8**	119.2	13.4	**N/A**	**100**	**N/A**	**N/A**	01

* DEPTH OF REFERENCE POINT: Finished elevation