

**BOARD OF WATER COMMISSIONERS
DENVER, COLORADO**

ADDENDUM NO. 2

TO THE CONTRACT DOCUMENTS

FULTON INLET PIPELINE SYSTEM

FOR S. PLATTE COLLECTION SYSTEM
NORTH METRO GRAVEL PITS COMPLEX

CONTRACT 12414A

July 30, 2009

TO ALL PLAN-HOLDERS:

This Addendum No. 2 consists of Page AD2-1. The following changes, additions, and/or deletions are hereby made part of the Contract Documents for Fulton Inlet Pipeline System for S. Platte Collection System North Metro Gravel Pits Complex, Contract 12414A, dated July 2009, as fully and completely as if the same were fully set forth therein:

SPECIFICATIONS:

1. APPENDIX A - GEOTECHNICAL REPORT:

ADD: Attached new appendix.

CLARIFICATIONS:

1. As stated by Mike Miller (Denver Water) in the pre-bid site tour, the Mounding Drain will be operational by the start of the contract. Further review of the operational status indicates that the Mounding Drain will be operational by September 15, 2009. Groundwater level adjacent to the Mounding Drain will not reach an instantaneous, lowered operational level when the drain becomes active. When the Mounding Drain is operational, Bidders should be aware that the static groundwater levels at the Fulton Inlet Pipeline adjacent to the Mounding Drain will not necessarily be lowered to the top of the Mounding Drain pipe and likely will be higher than the elevation of the Mounding Drain. For the estimation of the dewatering effort the CONTRACTOR should assume that the groundwater levels are as defined in the Bidding documents.

All Bidders shall acknowledge receipt and acceptance of this Addendum No. 2 in the space provided on the Bid Form.



Mike Miller, PE
Engineering Manager
Denver Board of Water Commissioners

EXHIBIT A

GEOTECHNICAL REPORT

Technical Memo

To: Michael J. Miller, PE – Denver Water Engineering Manager, Dam Safety
From: Steven R. Townsley, P.E., PMP – Project Manager
CC: James D. Light, P.E. – Denver Water Project Engineer
Date: July 29, 2009
Re: Fulton Inlet Pipeline System – Geotechnical Data Technical Memorandum

Purpose and Objectives

This memo presents the results of our geotechnical investigations and associated laboratory data used in the design of the Fulton Inlet Pipeline System.

Specific objectives of the investigation included:

- Reviewing existing geology and geotechnical investigations by others.
- Exploring subsurface conditions at specific proposed facility locations.
- Identify representative samples for laboratory testing.

Scope of Services

GEI Consultants, Inc. (GEI) performed the following services:

- Reviewed existing site geologic and geotechnical investigation data from previous investigations by other consultants and by GEI.
- Engaged a drilling subcontractor to drill 8 exploratory boreholes at the site.
- Coordinated, observed, and documented the drilling and operations. Logged soil and bedrock samples from the boreholes.
- Developed laboratory testing programs and performed laboratory tests on select soil and bedrock samples obtained from the explorations.
- Prepared this memo summarizing the geologic conditions onsite.

Project Purpose

The Fulton Inlet Pipeline System will be used to fill four individual gravel pits being converted into water storage reservoirs for Denver Water and a new water storage reservoir for SACWSD. The series of gravel pit reservoirs are referred to as the North Metro Complex, and are roughly bounded by the South Platte River on the west, East 120th Avenue to the north, Highway 85 to the east, and the extension of East 108th Avenue to the south, in Adams County, Colorado. Howe Haller A, Howe Haller B, and Hazeltine Reservoirs are located west of Brighton Road, and Dunes and Tanabe Reservoirs are located to the east of Brighton Road. Tanabe Reservoir is owned by SACWSD.

Site Location and Description

The site is located in Adams County, Colorado west of the intersection of 112th Avenue and Old Brighton Road. The site is located in Sections 3, 4, and 9, Township 2 south, Range 67 west of the 6th Principal Meridian. The site topography is generally level with small decreases in grade from South to North. Most of the site has been disturbed due to sand and gravel mining activities.

Existing Geologic and Groundwater Data

GEI reviewed data and information from previous geotechnical site investigations that were performed on site. GEI performed geotechnical investigations for the Hazeltine/Road Runners Rest II site in 2000 and 2001. In 2005, a geotechnical investigation for the Howe Haller Reservoirs Slope Improvements and Howe Haller Mounding Drain projects was performed by Tetra Tech. GEI considered the information from these investigations together with data from GEI's investigations to prepare this report.

Geology

The Fulton Inlet Pipeline System is located at the Denver Water North Metro Complex, approximately 20 miles east of the Front Range, within the Denver Structural Basin. Sedimentary strata generally dip gently downward to the east, away from the Rocky Mountain Front Range. Bedrock is not naturally exposed at the site.

Bedrock near the site is generally blanketed by surficial soils consisting of Pleistocene Age (less than 2 million years old) Louviers Alluvium and Holocene Age (less than 8,000 years old) Post-Piney Creek Alluvium. Louviers Alluvium typically ranges in thickness from 15 to 40 feet and generally consists of sand, gravel, and cobble with occasional lenses of silt and clay. Louviers Alluvium is typically covered by less than 5 feet of Post-Piney Creek Alluvium consisting mostly of silty clay and clayey sand.

Bedrock at the Howe Haller / Hazeltine site generally consists of the Denver Formation, which is late Cretaceous to early Tertiary in age (about 65 million years old). The formation consists mostly of interbedded and interlensed claystones, siltstones, and sandstones. The bedrock strata are generally deposits of compaction rather than cementation. Typically, claystone consists of over-consolidated clay and sandstone consists of dense, but generally uncemented to weakly cemented, sand. However, occasional well-cemented sandstone layers are present.

Exploration Program

The exploration consisted of 8 boreholes which were drilled on March 23rd and 24th by Precision Sampling, Colorado Springs, Colorado. GEI coordinated, observed, and documented drilling of the boreholes. The boreholes were located along the pipeline, at box culverts, vaults, manholes, and the proposed pump station.

Borehole locations are designated "200-series" (i.e. B-201) and are shown on Figure 1. Borehole logs are provided in Appendix A.

Exploration Procedures

Boreholes were auger drilled using a truck-mounted CME 75 drilling rig. The boreholes were advanced through the subsurface using 3.25 inch-inside-diameter, hollow stem augers. Soil samples were obtained ahead of the augers using a 2-inch-inside-diameter California sampler or 1.5-inch-inside-diameter split spoon sampler. Penetration testing (PT test) occurred concurrent with sampling and was performed using procedures similar to those defined in ASTM D 1586, *Penetration Test and Split-Barrel Sampling of Soils*. Uncorrected blowcounts for PT tests are presented in the borehole logs included in Appendix A of this report. Soil and bedrock samples were visually classified in the field by a GEI engineer in general accordance with ASTM D 2488, *Practice for Description and Identification of*

Soils (Visual-Manual Procedure). Rock coring was not conducted during this investigation. Total depth of the boreholes was between 21.5 and 41.5 feet. Boreholes were backfilled with cuttings after drilling. No groundwater observation wells were installed as part of this investigation.

Logging Procedures

Concurrent with drilling, GEI prepared field logs for each borehole. Soil and bedrock samples were visually classified in general accordance with the Unified Soil Classification System (USCS) guidelines as outlined in ASTM D 2487.

Laboratory Testing

General

Laboratory testing was performed on selected soil and bedrock samples obtained from the boreholes to characterize physical properties. Laboratory testing was conducted in general accordance with ASTM testing procedures. Tests performed on samples included:

- Moisture Content and Density (ASTM D 2216 & 2937)
- Atterberg Limits – 3 point test (ASTM D 4318)
- Hydrometer and Mechanical Sieve Analyses (ASTM D 422)
- Percent Fines (ASTM D 1140)
- Swell/Consolidation (ASTM D 4546)
- Soil Corrosivity
- Unconfined Compression with Stress-Strain Curve (ASTM 3148)

Laboratory testing was performed by Hepworth-Pawlak Geotechnical, Inc, Parker, Colorado. A summary of the laboratory testing programs is presented in Table 1.

Soil Testing Summary

Swell/Consolidation testing was performed on one claystone sample from B-208 at a depth of 14 feet below ground surface. This sample was remolded and the diameter of the sample was 0.2 inches smaller than the test fixture. Under a 2,000 psf surcharge the percent change is 0.3.

Hydrometer and/or mechanical grain size analyses were performed on 9 samples of materials ranging from clays to sands to claystones. Atterberg limits tests were performed on 7 samples. The majority of clays encountered on site ranged from low to medium plasticity. A high plasticity clay layer was encountered in Borehole B-208 at 10.5 feet below ground surface. The Atterberg limit test result for this layer is Liquid Limit 68 and Plasticity Index 51. Claystone bedrock samples ranged from low to medium plasticity. Hydrometer and/or mechanical grain size analyses were performed on 9 samples of materials ranging from clays to sands to claystones. Atterberg limits tests were performed on 7 samples. Plasticity of onsite clays ranged from low to medium. Claystone bedrock samples ranged from low to medium plasticity.

Corrosion tests on 4 samples were also performed. Corrosion testing included pH, sulfates, resistivity, and chlorides. The percentage of water soluble chlorides ranged from 0.01 to 0.02 percent. The percentage of water soluble sulfates ranged from 0.02 to 0.03 percent. A standard moisture-density relationship (Proctor) test was performed on 1 sample yielding a unit weight of 110 pcf.

South Platte River

The South Platte River hydrology consists of a perennial stream defined by the Adams County Survey to range from 50 to 300 feet wide and meanders in a northeast direction. Surface water historically drains to the South Platte River.

Groundwater

The local hydrogeology consists of the aforementioned Louviers Alluvium, also known as the Valley Fill Aquifer, which surrounds and is tributary to the South Platte River. Throughout the area, the Valley Fill Aquifer discharges to the river. The saturated thickness of this aquifer varies from about 10 to 40 feet, and is about 20 to 25 feet near the site. The general direction of groundwater flow around and beneath the Howe Haller / Hazeltine-Roadrunner reservoirs is generally toward the northwest.

Historic groundwater elevations have been modified at the site due to sand and gravel mining operations, construction of reservoir liners, and construction of the Howe Haller groundwater mounding drain. Due to these activities, historic groundwater data is invalid for the site. Groundwater measurements during the investigation may not represent the static groundwater levels at the time of drilling, as the boreholes were not left open to equilibrate. Groundwater levels near the alignment of the pipeline are subject to the seasonal diversion flow variations in the Fulton Ditch. The alluvial material adjacent to the Fulton ditch contains highly conductive layers of clean sands and gravels. Groundwater was observed at or near the levels of water in the ditch in adjacent borings.

Conclusions

Field investigations and laboratory testing programs at the Fulton Inlet Pipeline site indicate that the following geotechnical site conditions were considered during final design of the facilities:

- No observed site conditions preclude the proposed construction.
- Dewatering during construction will be important to reduce the occurrence of flowing sands like those encountered in some boreholes.
- Substantial dewatering efforts should be expected during construction of the pipeline and appurtenant facilities.

Limitations

The intent of this report is to present data that have been collected for use by GEI Consultants, Inc. and the Denver Water in evaluations, design, and construction of the Fulton Inlet Pipeline System. Summary information is provided only to assist in understanding the general subsurface conditions at the site.

The exploration methods employed indicate subsurface information only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depth penetrated. Samples cannot be relied on to accurately reflect variations in strata that may exist between sampling locations. Ground disturbances due to construction activities may have altered subsurface conditions at the borehole locations from those observed during the geotechnical investigation.

The nature and extent of variations in strata and groundwater conditions between borings may not become evident until construction. Timely and comprehensive inspection and evaluation of actual conditions supported by appropriate testing during construction will be critical, as variations from anticipated conditions may be encountered.

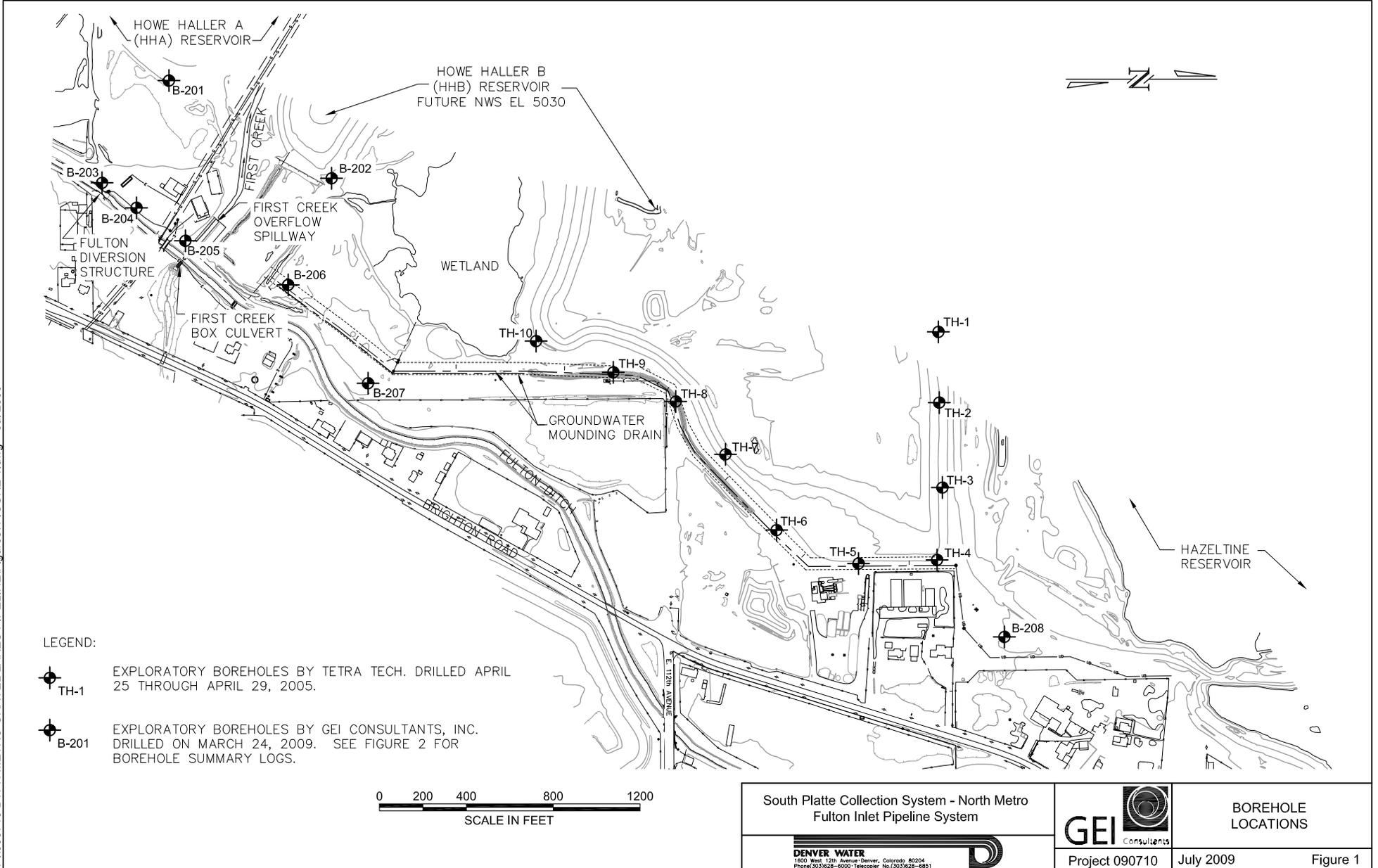
Our professional services for this project have been performed according to generally accepted engineering practices; no other warranty, express or implied, is made.

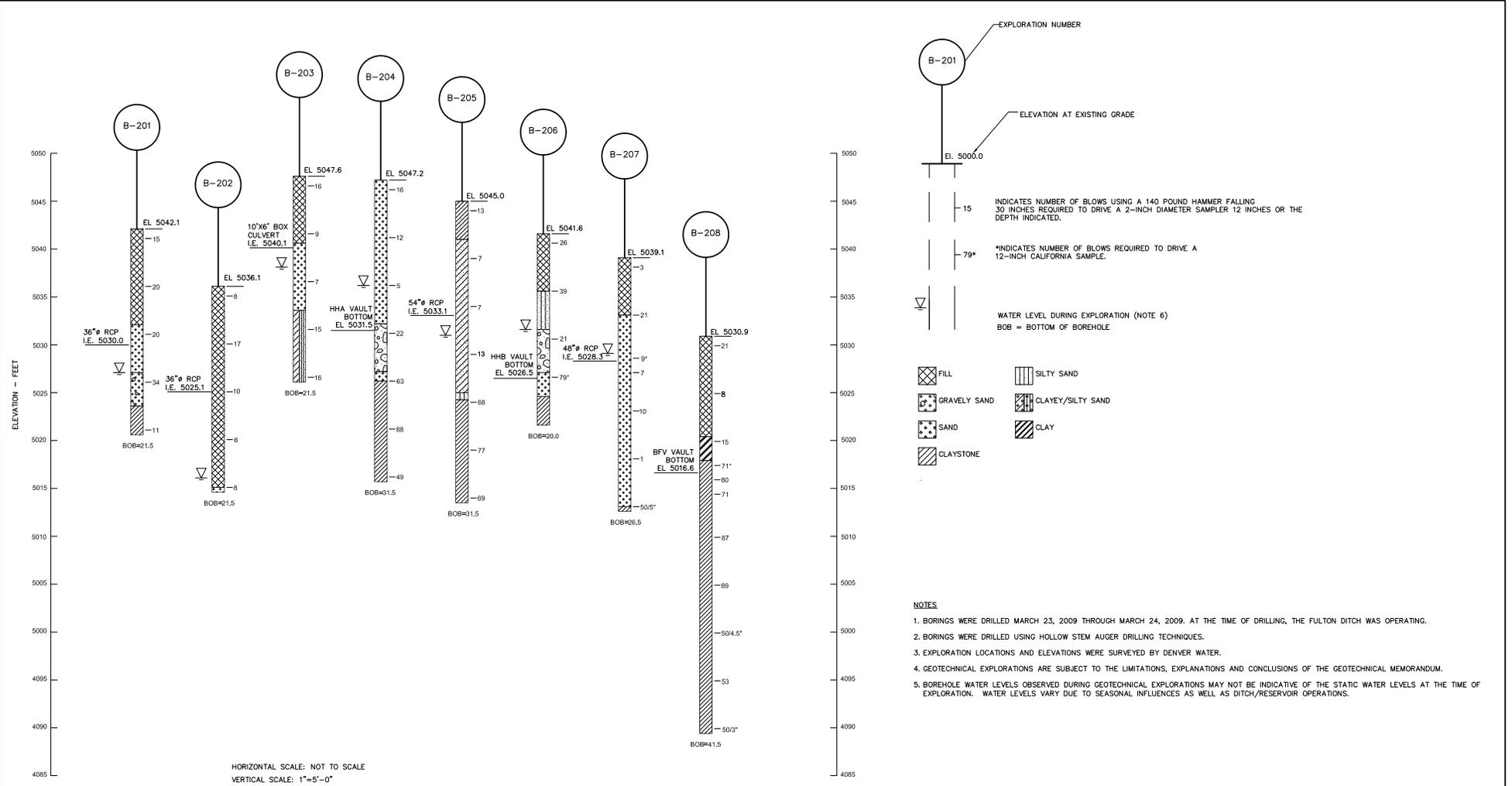
Table 1: Summary of Laboratory Testing Results

Sample Name	Depth (ft)	Natural Moisture Content (%)	Natural Dry Unit Weight (PCF)	Gradation			Atterberg Limits		pH	Water Soluble Chlorides (%)	Water Soluble Sulfates (%)	Swell-Compression, 2000 PSF surcharge (%)
				Gravel	Sand	Silt & Clay	Liquid Limit	Plastic Index				
B-201 (S3)	10	13		4	91	5	NV	NP				
B-202 (S3)	10	20.1		0	5	95	48	31				
B-203 (S3)	10	11.7		30	68	2						
B-203 (S4)	15	20		2	55	43	23	6				
B-204 (S3)	10	9.7		26	72	2						
B-204 (S4)	15			55	41	4			7.6	0.02	0.02	
B-205 (S3)	10	20.2				71	28	10				
B-205 (S5b)	21	15.9					43	28				
B-206 (CA1)	14.5	17.6	110	0	98	2						
B-206 (GRAB1)	18			5	38	57			7.5	0.01	0.02	
B-207 (CA1/S3)	10			9	89	2			7.9	0.01	0.02	
B-208 (S3b)	10	23.1				95	68	51				
B-208 (CA1/S4)	14					94	47	33	7.4	0.02	0.03	0.3 (sample dia 1.75 inches)

Figures

P:\090710 DW N METRO GRAVEL LAKES PIPELINE\Figures\FIGURE 1.dwg Jul 2009





Appendix A

Final Borelogs

BORING INFORMATION

STATION: B5+26
 GROUND SURFACE ELEV. (ft): 5036.1
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 21.5
 LOGGED BY: ALM

OFFSET: 35 ft Southwest
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING

B-202

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 20.0 3/24/2009

CASING I.D./O.D.: NM/ NM
 DRILL ROD O.D.:
 CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 1.5	18/15	2-3-5			SANDY SILT (ML); nonplastic fines; 30-35% fine to coarse grained sand; 10-15% medium plasticity fines; 0-5% fine gravel; brown [fill].
		S2	5 to 6.5	18/2	9-7-10	No basket in sampler tip		SANDY SILT (ML); non plastic fines; 30-35% fine to coarse grained sand; 10-15% medium plasticity fines; 0-5% fine gravel; brown [fill].
5030	10	S3	10 to 11.5	18/18	4-4-6	9-20 ft: reworked claystone fill		CLAYSTONE; 95% low plasticity fines; 5% fine grained sand; slightly weathered; blocky; very soft rock; blue gray [fill]. LL=48 PI=31
		S4	15 to 16.5	18/17	3-3-3			CLAYSTONE; low plasticity fines; 10-20% fine grained sand; moderately weathered; blocky; very soft rock; blue gray; moist at 16.5 ft [fill].
5020	20	S5	20 to 21.5	18/18	3-4-4			CLAYSTONE; low plasticity fines; 10-20% fine grained sand; very soft rock; 1 to 2 inch lenses of sandy clay; blue gray; wet [fill].
								WIDELY GRADED SAND (SW); fine to coarse grained; 0-10% fine gravel; 0-5% nonplastic; brown; wet. Bottom of boring at depth 21.5 ft. Borehole backfilled with auger cuttings

NOTES:
 Northing: 151661.3
 Easting: 171938.7

PROJECT NAME: Fulton Inlet Pipeline System

CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



GEI WOBURN STD 4-STA--OFFS--GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

BORING INFORMATION

STATION: 0+14
 GROUND SURFACE ELEV. (ft): 5047.6
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 21.5
 LOGGED BY: ALM

OFFSET: 16 ft Southwest
 DATE START/END: 3/24/2009 - 3/24/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING**B-203**

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 9.5 3/24/2009

CASING I.D./O.D.: NM/ NM CORE BARREL TYPE: NA
 DRILL ROD O.D.: _____ CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 1.5	18/17	10-8-8		SILTY SAND (SM); fine to coarse grained sand; subround to subangular; 30-40% nonplastic to low plasticity fines; 0-10% fine gravel; roots at surface; dark brown; moist [fill].	
		S2	5 to 6.5	18/8	5-5-4		CLAYEY SAND (SC); fine to coarse grained sand; subround to subangular; 30-40% low to medium plasticity fines; 0-10% fine gravel; dark brown; moist [fill].	
5040	10	S3	10 to 11.5	18/12	3-3-4		WIDELY GRADED SAND WITH GRAVEL (SW); 68% fine to coarse grained; subrounded to subangular; 30% fine gravel; subrounded; 2% nonplastic fines; brown; wet.	
		S4	15 to 16.5	18/16	WOH-6-9		CLAYEY SAND (SC); 55% fine grained sand; trace medium subangular sand; 43% low plasticity fines; 2% gravel; fine gravel in tip of spoon; light brown; wet. LL=23 PI=6	
5030	20	S5	20 to 21.5	18/18	2-7-9		SILT (ML); nonplastic fines; 5-10% fine grained sand; weathered; slightly blocky structure; trace iron staining; brown; wet.	
							Bottom of boring at depth 21.5 ft. Borehole backfilled with auger cuttings	

NOTES:
 Northing: 150604.5
 Easting: 171959.7

PROJECT NAME: Fulton Inlet Pipeline SystemCITY/STATE: Commerce City, ColoradoGEI PROJECT NUMBER: 090710

GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

STATION: 2+00
 GROUND SURFACE ELEV. (ft): 5047.2
 VERTICAL DATUM: Denver Water

OFFSET: 0
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.

**BORING
 B-204**
 PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S6	25 to 26.5	18/18	35-43-45		CLAYSTONE; medium plasticity; blocky; 10-15% fine grained sand; blue gray; moist.	
5020								
	30	S7	30 to 31.5	18/18	24-22-27		CLAYSTONE; medium plasticity; thinly laminated; 10-15% fine grained sand; blue gray; moist.	
							Bottom of boring at depth 31.5 ft. Borehole backfilled with auger cuttings	
5010								
	40							
5000								
	50							

GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

NOTES:
 Northing: 150763.2
 Easting: 172074.6

PROJECT NAME: Fulton Inlet Pipeline System
CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



BORING INFORMATION

STATION: 4+74
 GROUND SURFACE ELEV. (ft): 5045
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 31.5
 LOGGED BY: ALM

OFFSET: 34 ft Northwest
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING

B-205

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 14.0 3/23/2009

CASING I.D./O.D.: NM/ NM
 DRILL ROD O.D.:
 CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer
 S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger
 Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter
 NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 1.5	18/17	5-6-7			SANDY CLAY (CL); medium plasticity fines; 30-35% fine to coarse grained sand; 0-10% nonplastic fines; 0-10% fine gravel; brown.
5040		S2	5 to 6.5	18/18	3-3-4			CLAYEY SAND (SC); fine grained sand; 20% medium to coarse grained sand; 30-35% low to medium plasticity fines; 0-10% fine gravel; dark brown; moist.
10		S3	10 to 11.5	18/18	2-3-4			SANDY LEAN CLAY (CL); 71% low plasticity fines; 29% fine grained sand; iron staining; thin lenses of fine grained sand; brown; moist.
5030		S4	15 to 16.5	18/0	7-7-6	Traces of fine to coarse grained sand on spoon [wet]		*No Recovery*
20		S5A S5B	20 to 21.5	18/18	33-25-43			SILTY SAND (SM); fine to medium grained sand; 30-35% nonplastic fines; gray clay lenses; orange brown; wet. CLAYSTONE; medium plasticity fines; 10-20% fine grained sand; blocky; very soft rock; gray. LL=43 PI=28

NOTES:
 Northing: 150988.4
 Easting: 172226.1

PROJECT NAME: Fulton Inlet Pipeline System

CITY/STATE: Commerce City, Colorado

GEI PROJECT NUMBER: 090710



GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

STATION: 4+74
 GROUND SURFACE ELEV. (ft): 5045
 VERTICAL DATUM: Denver Water

OFFSET: 34 ft Northwest
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.

**BORING
 B-205**
 PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
5020		S6	25 to 26.5	18/18	15-32-45		CLAYSTONE; medium plasticity fines; 10-20% fine grained sand; blocky; soft rock; blue gray.	
	30	S7	30 to 31.5	18/18	24-33-36		CLAYSTONE; medium plasticity fines; 10-20% fine grained sand; blocky; soft rock; blue gray.	
							Bottom of boring at depth 31.5 ft. Borehole backfilled with auger cuttings	
5010								
	40							
5000								
	50							
4990								

GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

NOTES:
 Northing: 150988.4
 Easting: 172226.1

PROJECT NAME: Fulton Inlet Pipeline System
CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



BORING INFORMATION

STATION: 11+00
 GROUND SURFACE ELEV. (ft): 5041.6
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 20.0
 LOGGED BY: ALM

OFFSET: 0
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING

B-206

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 10.0 3/23/2009

CASING I.D./O.D.: NM / NM
 DRILL ROD O.D.:
 CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer
 S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger
 Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter
 NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
5040		S1	0 to 1.5	18/17	4-14-12		WIDELY GRADED SAND (SW); fine to coarse grained; 0-10% fine gravel; 0-10% nonplastic fines; trace pieces of concrete; brown [fill].	
		S2A S2B	5 to 6.5	18/18	15-21-18		SILTY SAND WITH GRAVEL (SM); fine to coarse grained; 15-20% gravel; 10-20% nonplastic fines; gray brown [fill]. SILTY SAND (SM); fine to coarse grained; 15-25% nonplastic fines; trace roots; dark brown.	
10		S3	10 to 11.5	18/13	12-10-11		WIDELY GRADED GRAVEL WITH SAND (GW); fine grained gravel, subangular to rounded; 35-45% fine to coarse grained sand; 0-5% nonplastic fines; orange brown; wet.	
5030		CA1	14.5 to 15.5	12/12	42-37	Flowing sands at 14.5ft, Added water to auger	WIDELY GRADED SAND (SW); 98% fine to coarse grained; 2% nonplastic fines; brown; wet.	
		GRAB1	17 to 20	36/36		17-20ft: blue gray claystone auger cuttings	CLAYSTONE; 57% low plasticity fines; 38% sand; 5% gravel; blue gray.	
20						Auger plug jammed in auger, Pulled out of hole	Bottom of boring at depth 20 ft. Borehole backfilled with auger cuttings	
5020								

NOTES:
 Northing: 151461.4
 Easting: 172429.2

PROJECT NAME: Fulton Inlet Pipeline System

CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE_GDT 7/30/09

BORING INFORMATION

STATION: 16+67
 GROUND SURFACE ELEV. (ft): 5039.1
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 26.5
 LOGGED BY: ALM

OFFSET: 136 ft Southeast
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING

B-207

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 10.0 3/23/2009

CASING I.D./O.D.: NM/ NM
 DRILL ROD O.D.:
 CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen. %
 WOR = Weight of Rods
 WOH = Weight of Hammer
 S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger
 Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter
 NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1A S1B	0 to 1.5	18/18	2-1-2			SILTY SAND (SM); fine to coarse grained sand; 30-35% nonplastic to low plasticity fines; 0-10% fine gravel; gray brown; moist at 1 foot [fill]. SILTY CLAY WITH SAND (CL); low plasticity fines; 30% nonplastic fines; 20% fine to coarse grained sand; 0-5% fine gravel; gray brown [fill].
		S2A S2B	5 to 6.5	18/13	7-6-15			SILTY SAND (SM); fine to medium grained; 15-25% nonplastic fines; 2 inch lense of dark brown silty fine to coarse grained sand with trace roots; gray brown [fill]. WIDELY GRADED SAND (SW); fine to coarse grained; 0-10% fine gravel; light brown.
5030	10	CA1 S3	10 to 11 11 to 12.5	12/12 18/12	5-4 3-3-4			WIDELY GRADED SAND (SW); 89% fine to coarse grained; 9% fine gravel; 2% nonplastic fines; brown; wet.
		S4	15 to 16.5	18/12	9-5-5			WIDELY GRADED SAND (SW); fine to coarse grained; 5-15% fine gravel; subrounded to subangular; 5-10% nonplastic fines; brown; wet. In tip of sampler: orange brown fine to medium grained sand, 10-20% nonplastic fines.
5020	20	S5	20 to 21.5	18/0	4-1- WOH			*No Recovery*

NOTES:
 Northing: 151829.0
 Easting: 172881.6

PROJECT NAME: Fulton Inlet Pipeline System
CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

STATION: 16+67
 GROUND SURFACE ELEV. (ft): 5039.1
 VERTICAL DATUM: Denver Water

OFFSET: 136 ft Southeast
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.

**BORING
 B-207**
 PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
5010	30	S6A	25 to 26.4	17/17	25-44-50/5"	Spoon bouncing	 WIDELY GRADED SAND (SW); fine to coarse grained; 5-15% fine gravel; subangular to subrounded; brown; wet.  CLAYSTONE; medium plasticity fines; 10-20% fine sand; slightly weathered; blue gray. Bottom of boring at depth 26.5 ft. Borehole backfilled with auger cuttings	
		S6B						
5000	40							
4990	50							

GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

NOTES:
 Northing: 151829.0
 Easting: 172881.6

PROJECT NAME: Fulton Inlet Pipeline System
CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710



BORING INFORMATION

STATION: 51+41 (extended along Centerline)
 GROUND SURFACE ELEV. (ft): 5030.9
 VERTICAL DATUM: Denver Water
 TOTAL DEPTH (ft): 41.5
 LOGGED BY: ALM

OFFSET: 163 ft Northeast of pipeline termination
 DATE START/END: 3/23/2009 - 3/23/2009
 DRILLING COMPANY: Precision Sampling, Inc.
 DRILLER NAME: Mike Weeks
 RIG TYPE: CME 75 Truck Rig

BORING

B-208

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer
 AUGER I.D./O.D.: 3.25 inch / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): Not measured

CASING I.D./O.D.: NM/ NM
 DRILL ROD O.D.:
 CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer
 S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger
 Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter
 NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
5030		S1	0 to 1.5	18/16	4-8-13		NARROWLY GRADED SAND (SP); fine grained; 5-15% medium grained; subangular; 0-10% nonplastic fines; trace roots; brown; moist.	
		S2	5 to 6.5	18/18	3-4-4		LEAN CLAY (CL); medium plasticity; 5-15% fine to medium grained sand; subangular; trace iron staining; dark brown; moist.	
10		S3A S3B	10 to 11.5	18/13	11-7-8		WIDELY GRADED SAND (SW); fine to coarse grained; subangular to subrounded; 0-10% fine gravel; 0-10% nonplastic fines; reddish brown; moist.	
5020		CA1	13 to 14	12/12	27-44		FAT CLAY (CH); 95% high plasticity fines; 5% fine to medium sand; iron staining; brown; moist. LL=68 PI=51	
		S4	14 to 15.5	18/18	18-34-46		CLAYSTONE; 94% medium plasticity fines; 6% fine sand; slightly to moderately weathered; trace iron staining; blocky; gray. LL=47 PI=33	
		S5	15.5 to 17	18/17	9-23-48		CLAYSTONE; medium plasticity fines; 5-15% fine sand; slightly to moderately weathered; trace iron staining; blocky; gray.	
20		S6	20 to 21.5	18/18	16-36-51	Flowing sands, Added water to auger at 20 ft	CLAYSTONE; medium plasticity fines; 5% fine sand; slightly weathered; block; dark gray; moist.	

NOTES:
 Northing: 154758.4
 Easting: 174047.8

PROJECT NAME: Fulton Inlet Pipeline System

CITY/STATE: Commerce City, Colorado

GEI PROJECT NUMBER: 090710



GEI WOBURN STD 4-STA-OFFS-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE_GDT 7/30/09

STATION: 51+41 (extended along Centerline)
GROUND SURFACE ELEV. (ft): 5030.9
VERTICAL DATUM: Denver Water

OFFSET: 163 ft Northeast of pipeline termination
DATE START/END: 3/23/2009 - 3/23/2009
DRILLING COMPANY: Precision Sampling, Inc.

**BORING
 B-208
 PAGE 2 of 2**

Elev. (ft)	Depth (ft)	Sample Information				PID Jar Headspace/ Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S7	25 to 26.5	18/18	19-38-51		CLAYSTONE; low plasticity fines; 10-20% fine sand; blocky; trace organics; light blue gray; moist.	
5000	30	S8	30 to 31.35	17/17	21-39-50/4.5		CLAYSTONE; low plasticity fines; 5-15% fine sand; blocky; trace iron staining; light blue gray; moist.	
		S9	35 to 36.5	18/18	12-19-34		CLAYSTONE; low to medium plasticity fines; 0-5% fine sand; blocky; light blue gray; moist.	
4990	40	S10	40 to 41.25	15/15	24-40-50/3		CLAYSTONE; medium plasticity fines; 5-15% fine sand; blocky; lenses of tan high plasticity fines with trace fine sand; blue gray.	
							Bottom of boring at depth 41.5 ft. Borehole backfilled with auger cuttings	
	50							
4980								

GEI WOBURN STD 4-STA.-OFFS.-GRAPHIC LOG 090710 WATER PIPELINE GINT LOGS 2.GPJ GEI DATA TEMPLATE.GDT 7/30/09

NOTES:
 Northing: 154758.4
 Easting: 174047.8

PROJECT NAME: Fulton Inlet Pipeline System
CITY/STATE: Commerce City, Colorado
GEI PROJECT NUMBER: 090710

