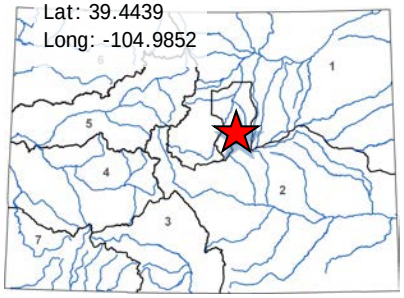
COLORADO
Colorado Water Conservation Board

Water Plan Grant Application

Castle Rock Reservoir No. 2
Castle Rock Water
July 2020 Board Meeting



LOCATION	
County/Counties:	Douglas
Drainage Basin:	South Platte

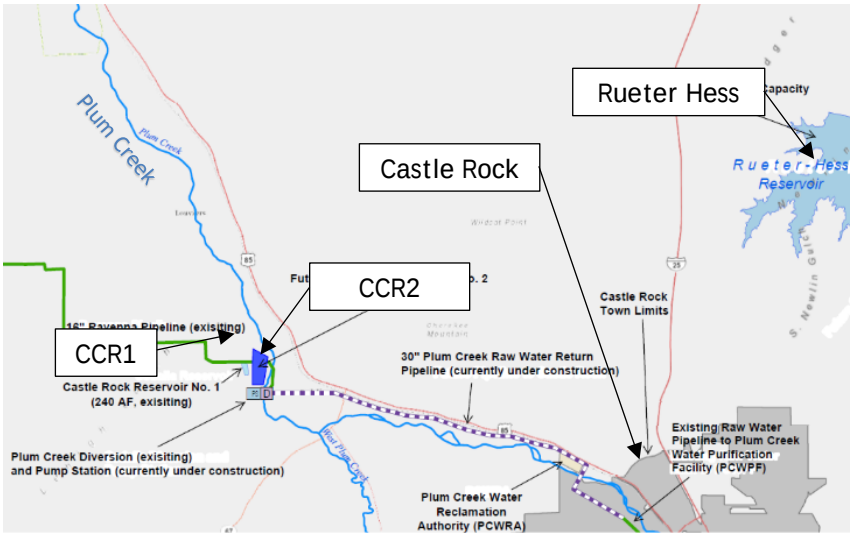
DETAILS	
Total Project Cost:	$250,000
Water Plan Grant Request:	$125,000
Recommended Amount:	$125,000
Other CWCB Funding:	$0
Other Funding Amount:	$0
Applicant Match:	$125,000
Project Type(s):	Study
Project Category(Categories):	Storage & Supply
Measurable Result:	1,130 acre-feet new acre feet (design)

Castle Rock Water is owned by the Town of Castle Rock and oversees its water, wastewater and stormwater systems serving over 22,822 customers and approximately 73,000 people. This includes five water treatment plants, 52 deep groundwater wells, 13 alluvial wells, two surface water diversions, a 240 acre-foot reservoir, and an imported supply network (WISE). An important component of Castle Rock's long term water plan is to have the ability to capture reusable water and return it to the water system for reuse.

This grant request is for the permitting and design (including construction drawings and specifications) of Castle Rock Reservoir No. 2 (CRR2). Ultimately, this project will help Castle Rock Water to reach its goal of 75% renewable water by 2050. Castle Rock Reservoir No.1 (CRR1) has 240 AF capacity. CRR2 will have a storage capacity of 1,130 AF. A return pipeline, and upgraded pump station on the Plum Creek Trust Property, where CRR1 and the future CRR2 are located are in the final stages of construction and anticipated to be online by summer 2020. This return pipeline will allow for stored renewable water from the Town's reservoirs to be treated at the advanced treatment Plum Creek Water Purification Facility, and returned back to the Town, allowing for successive treatment and reuse. The Plum Creek Diversion, which allows Castle Rock Water to capture the Town's fully consumable effluent released upstream at the Plum Creek Water Reclamation Facility, as well as junior water rights in case 05CW270 and 17CW3211, is also on the Plum Creek Trust Property.

This project meets goals identified by the Metro Roundtable towards developing new storage supplies. It also aligns with Water Plan goals related to innovation through conservation and reuse.

Funding Recommendation: Staff is recommending approval of the full request of $125,000 from the Storage and Supply category. This is 50% of project costs.



COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Last Updated: July 2019

Colorado Water Conservation Board

Water Plan Grant Application

Instructions

To receive funding for a Water Plan Grant, applicant must demonstrate how the project, activity, or process (collectively referred to as "project") funded by the CWCB will help meet the measurable objectives and critical actions in the Water Plan. Grant guidelines are available on the CWCB website.

If you have questions, please contact CWCB at (303) 866-3441 or email the following staff to assist you with applications in the following areas:

Water Storage Projects	Anna.Mauss@state.co.us
Conservation, Land Use Planning	Kevin.Reidy@state.co.us
Engagement & Innovation Activities	Ben.Wade@state.co.us
Agricultural Projects	Alexander.Funk@state.co.us
Environmental & Recreation Projects	Chris.Sturm@state.co.us

FINAL SUBMISSION: Submit all application materials in one email to *waterplan.grants@state.co.us*
in the original file formats [Application (word); Statement of Work (word); Budget/Schedule (excel)]. Please do not combine documents. In the subject line, please include the funding category and name of the project.

Water Project Summary

Name of Applicant	Castle Rock Water
Name of Water Project	Castle Rock Reservoir No. 2

CWP Grant Request Amount	$ 125,000.00
Other Funding Sources _____	$
Other Funding Sources _____	$
Other Funding Sources _____	$
Applicant Funding Contribution	$ 125,000.00
Total Project Cost	$ 250,000.00 (estimated)

Last Updated: July 2019

Applicant & Grantee Information
Name of Grantee(s) **Castle Rock Water**
Mailing Address **175 Kellogg Court, Castle Rock, CO 80109**
FEIN **84-6000640**
Organization Contact **Matt Benak, P.E.**
Position/Title **Water Resources Program Manager**
Email **mbenak@crgov.com**
Phone **720-733-6037**
Grant Management Contact **(same)**
Position/Title
Email
Phone
Name of Applicant (if different than grantee) **N/A**
Mailing Address
Position/Title
Email
Phone

Description of Grantee/Applicant
Provide a brief description of the grantee's organization (100 words or less).
Castle Rock Water oversees the Town's water, wastewater and stormwater systems and serves over 22,822 customers and approximately 73,000 people. The Town secured its first water rights in 1880, and today, operates five water treatment plants, 52 deep groundwater wells, 13 alluvial wells, two surface water diversions, a 240 AF reservoir, an imported supply network (WISE), nearly 300 miles of sanitary sewer main and ten lift stations, and 350 stormwater detention ponds. CRW strives to provide our community with exceptional service that protects public health and balances social, environmental and fiscal responsibilities in a sustainable manner.

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Type of Eligible Entity (check one)	
✓	**Public (Government):** Municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.
	Public (Districts): Authorities, Title 32/special districts (conservancy, conservation, and irrigation districts), and water activity enterprises.
	Private Incorporated: Mutual ditch companies, homeowners associations, corporations.
	Private Individuals, Partnerships, and Sole Proprietors: Private parties may be eligible for funding.
	Non-governmental organizations (NGO): Organization that is not part of the government and is non-profit in nature.
	Covered Entity: As defined in Section 37-60-126 Colorado Revised Statutes.

Type of Water Project (check all that apply)	
	Study
	Construction
✓	Identified Projects and Processes (IPP)
	Other

Category of Water Project (check the primary category that applies and include relevant tasks)		
✓	Water Storage - Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.. *Applicable Exhibit A Task(s):* ***Statement of Work – Project Permitting & Reservoir Design***	
	Conservation and Land Use Planning - Activities and projects that implement long-term strategies for conservation, land use, and drought planning. *Applicable Exhibit A Task(s):*	
	Engagement & Innovation - Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website. *Applicable Exhibit A Task(s):*	
	Agricultural - Projects that provide technical assistance and improve agricultural efficiency. *Applicable Exhibit A Task(s):*	
	Environmental & Recreation - Projects that promote watershed health, environmental health, and recreation. *Applicable Exhibit A Task(s):*	
	Other	Explain:

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Location of Water Project	
Please provide the general county and coordinates of the proposed project below in **decimal degrees**. The Applicant shall also provide, in Exhibit C, a site map if applicable.	
County/Counties	**Douglas County**
Latitude	**39.443972868**
Longitude	**-104.985204994**

Water Project Overview
Please provide a summary of the proposed water project (200 words or less). Include a description of the project and what the CWP Grant funding will be used for specifically (e.g., studies, permitting process, construction). Provide a description of the water supply source to be utilized or the water body affected by the project, where applicable. Include details such as acres under irrigation, types of crops irrigated, number of residential and commercial taps, length of ditch improvements, length of pipe installed, and area of habitat improvements, where applicable. If this project addresses multiple purposes or spans multiple basins, please explain. The Applicant shall also provide, in Exhibit A, a detailed Statement of Work, Budget, Other Funding Sources/Amounts and Schedule.
An important component of Castle Rock's long term water plan is to have the ability to capture our reusable water and return this source back to Town for treatment. The permitting, design, and construction of Castle Rock Reservoir No. 2 (CRR2) will help Castle Rock Water to reach it's goal of 75% renewable water by 2050. Along with Castle Rock Reservoir No.1 (currently 240 AF capacity), this new reservoir will have a storage capacity of 1,130 AF. A return pipeline and upgraded pump station on the Plum Creek Trust (PCT) Property, where CRR1 and the future CRR2 are located are in the final stages of construction and anticipated to be online by Summer 2020. This return pipeline will allow for stored renewable water at the Town's reservoirs to be returned back to the Town and be treated at an advanced treatment surface water facility, Plum Creek Water Purification Facility, allowing for successive treatment and reuse. Also on the PCT Property, and part of the Town's infrastructure, is the Plum Creek Diversion, which allows Castle Rock Water to capture the Town's fully consumable effluent released upstream at the Plum Creek Water Reclamation Facility, as well as junior water rights in case 05CW270 and 17CW3211. The CWP Grant funding will be used towards the project permitting and reservoir design, which is to include construction drawings and specifications.

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Measurable Results

To catalog measurable results achieved with the CWP Grant funds, please provide any of the following values as applicable:

1,130	New Storage Created (acre-feet)	
5,500	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive	
-	Existing Storage Preserved or Enhanced (acre-feet)	
-	Length of Stream Restored or Protected (linear feet)	
-	Efficiency Savings (indicate acre-feet/year OR dollars/year)	
-	Area of Restored or Preserved Habitat (acres)	
-	Quantity of Water Shared through Alternative Transfer Mechanisms	
-	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning	
72,168	Number of Coloradans Impacted by Engagement Activity	
-	Other	Explain:

Water Project Justification

Provide a description of how this water project supports the goals of Colorado's Water Plan, the most recent Statewide Water Supply Initiative, and the applicable Roundtable Basin Implementation Plan and Education Action Plan. The Applicant is required to reference specific needs, goals, themes, or Identified Projects and Processes (IPPs), including citations (e.g. document, chapters, sections, or page numbers).

The proposed water project shall be evaluated based upon how well the proposal conforms to Colorado's Water Plan Framework for State of Colorado Support for a Water Project (CWP, Section 9.4, pp. 9-43 to 9-44;)

- CWP – Analysis & Technical Update, Section 4.8.6, identifies an average annual gap for the South Platte Basin M&I in the range of 192,800 – 390,600 AFY. This storage project will aid in reducing this gap by allowing for 1,130 AF of storage that can be captured during free river conditions in wet years as well as allowing for the Town's fully consumable effluent to be captured and reused successively when there is a call on the river.
- The Metro Roundtable has identified a need for an additional 183,000 - 272,000 AF by 2050 to meet demands. In addition to recognizing the need for additional water supplies, Castle Rock Water set a goal to achieve 75% renewable water by 2050 as part of the Town's 2016 Water Resources Strategic Master Plan. The plan also recognizes that by 2050, the Town will likely be at buildout, effectively doubling the current population of 73,000 residents.
- CWP Section 6.1 & 6.3 goals identify the need for uncertainty planning as well innovation through conservation and reuse. While the construction of a new 1,130 AF reservoir will certainly help with the uncertainty of future weather conditions, its location downstream of a wastewater treatment facility (PWCRA) and the nearly completed raw water return pipeline and water treatment plant upgrades at PCWPF will allow for the Town to treat this water to an incredibly high standard.

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Related Studies

Please provide a list of any related studies, including if the water project is complementary to or assists in the implementation of other CWCB programs.

Sutton Ponds Bedrock & Water Storage Evaluation, prepared by Civil Resources, LLC, July 2009. This report was prepared for United Water & Sanitation District in order to investigate the feasibility of creating water storage on the PCT Property, of which the water rights were owned by United Water & Sanitation District at the time. In 2016, Castle Rock Water purchased the infrastructure and water rights on the PCT property. At the time of the purchase, the existing infrastructure included a diversion along Plum Creek, a tributary to the South Platte, as well as a 240 AF water storage reservoir, which is now known as Castle Rock Reservoir No. 1. This report provides a preliminary scope for expanding Castle Rock Reservoir No.1 from 240 AF to 610 AF and creating a 1,130 AF additional reservoir, Castle Rock Reservoir No. 2 on the PCT Property.

Previous CWCB Grants, Loans or Other Funding

List all previous or current CWCB grants (including WSRF) awarded to both the Applicant and Grantee. Include: 1) Applicant name; 2) Water activity name; 3) Approving RT(s); 4) CWCB board meeting date; 5) Contract number or purchase order; 6) Percentage of other CWCB funding for your overall project.

Castle Rock Water
Plum Creek Water Purification Facility Advanced Treatment Project
$200,000
CMS 113558
CORE CTGG1 2019-2255
No other CWCB funds on this project.

Castle Rock Water
Drought Management Plan
$35,000
PO# POGG1 PDAA 201800000058
No other CWCB funds on this project.

City of Aurora (Castle Rock Water participated in this project in conjunction with Aurora)
Lost Creek Underground Storage Pilot (LCUSP) Project
$100,000
5/18/2017 Pagosa Springs
PO# POGG1 PDAA 201700001081
No other CWCB funds on this project.

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Taxpayer Bill of Rights
The Taxpayer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect your application.
Since Castle Rock Water's divisions (Water, Wastewater, Water Resources, and Stormwater) are enterprise funds, the revenue limitation within TABOR does not apply.

Submittal Checklist	
✓	I acknowledge the Grantee will be able to contract with CWCB using the Standard Contract.
Exhibit A	
✓	Statement of Work(1)
✓	Budget & Schedule(1)
-	Engineer's statement of probable cost (projects over $100,000)
-	Letters of Matching and/or Pending 3rd Party Commitments(1)
Exhibit C	
✓	Map (if applicable)(1)
✓	Photos/Drawings/Reports
-	Letters of Support (Optional)
✓	Certificate of Insurance (General, Auto, & Workers' Comp.) (2)
✓	Certificate of Good Standing with Colorado Secretary of State(2)
✓	W-9(2)
-	Independent Contractor Form(2) (If applicant is individual, not company/organization)
Engagement & Innovation Grant Applicants ONLY	
-	Engagement & Innovation Supplemental Application(1)

(1) Required with application.
(2) Required for contracting. While optional at the time of this application, submission can expedite contracting upon CWCB Board approval.

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Colorado Water Conservation Board
Water Plan Grant - Exhibit A

Statement Of Work	
Date:	**August 2020**
Name of Grantee:	**Castle Rock Water**
Name of Water Project:	**Castle Rock Reservoir No. 2**
Funding Source:	**Colorado Water Plan – Water Storage Project**

Water Project Overview:

An important component of Castle Rock's long term water plan is to have the ability to capture our reusable water and return this source back to Town for treatment. The permitting, design, and construction of Castle Rock Reservoir No. 2 (CRR2) will help Castle Rock Water to reach it's goal of 75% renewable water by 2050. Along with Castle Rock Reservoir No.1 (currently 240 AF capacity), this new reservoir will have a storage capacity of 1,130 AF. A return pipeline and upgraded pump station on the Plum Creek Trust (PCT) Property, where CRR1 and the future CRR2 are located are in the final stages of construction and anticipated to be online by Summer 2020. This return pipeline will allow for stored renewable water at the Town's reservoirs to be returned back to the Town and be treated at an advanced treatment surface water facility, Plum Creek Water Purification Facility, allowing for successive treatment and reuse. Also on the PCT Property, and part of the Town's infrastructure, is the Plum Creek Diversion, which allows Castle Rock Water to capture the Town's fully consumable effluent released upstream at the Plum Creek Water Reclamation Facility, as well as junior water rights in case 05CW270 and 17CW3211. The CWP Grant funding will be used towards the project permitting and reservoir design, which is to include construction drawings and specifications.

Project Objectives:

Project objectives include issuing a Request for Proposals (RFP) for permitting and reservoir design in May 2020 and selecting an engineering/environmental consultant by July 2020. The anticipated start for consultant work will be August 2020, with a completion date of February 2020. Upon successful completion of permitting and design, the construction phase will begin for Castle Rock Reservoir No. 2.

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Tasks
Task 1 – Project Permitting
Description of Task:
Identify what specific permits are necessary for the implementation of a new off-channel water storage reservoir.
Method/Procedure:
Work with selected professional engineering/environmental consultant to identify the necessary permits for implementing a new reservoir.
Deliverable:
• Technical Memorandum No. 1 – Permitting Required for Castle Rock Reservoir No. 2

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Tasks
Task 2 – Reservoir Design
Description of Task:
Professional Engineering Consultant will develop a basis of design report (including geotechnical study), engineering drawings and specifications to be used for the construction of Castle Rock Reservoir No. 2.
Method/Procedure:
Standard civil and environmental engineering practice shall be used for this task.
Deliverable:
• Castle Rock Reservoir No. 2 Basis of Design Report • Castle Rock Reservoir No. 2 Construction Drawings • Castle Rock Reservoir No. 2 Construction Specifications

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Water Plan Grant - Exhibit B
Budget and Schedule

Prepared Date: January 28, 2020

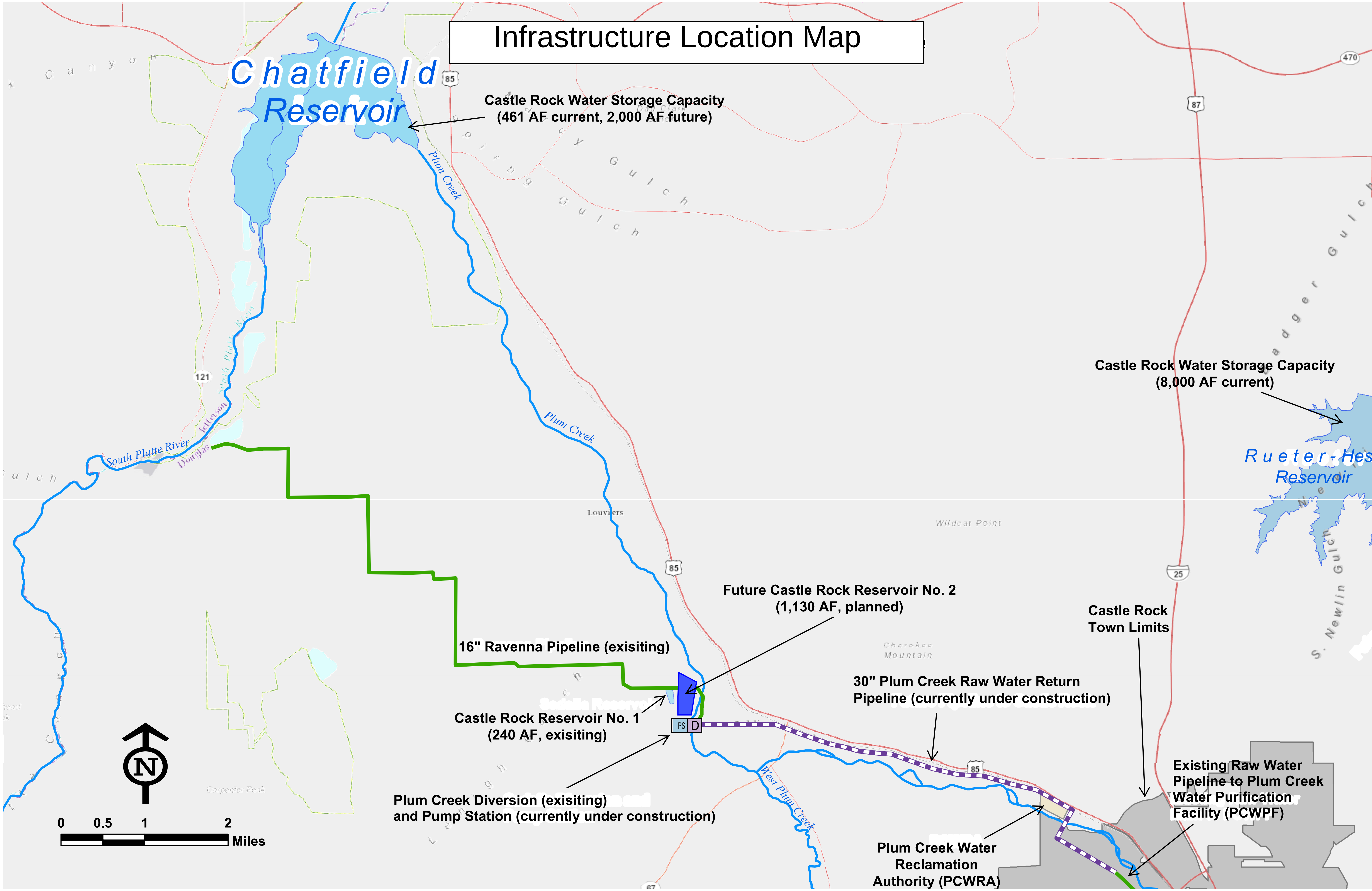
Name of Applicant: Castle Rock Water

Name of Water Project: Castle Rock Reservoir No. 2

Project Start Date: August 15, 2020

Project End Date: February 15, 2021

Task No.	Task Description	Task Start Date	Task End Date	Grant Funding Request	Match Funding	Total
1	Project Permitting	8/15/2020	2/15/2020	$ 25,000	$ 25,000	$50,000
2	Reservoir Design	8/15/2020	2/15/2020	$ 100,000	$ 100,000	$200,000
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
			Total	$125,000	$125,000	$250,000



Infrastructure Location Map
Chatfield Reservoir
Castle Rock Water Storage Capacity
(461 AF current, 2,000 AF future)
Plum Creek
Castle Rock Water Storage Capacity
(8,000 AF current)
Rueter-Hess Reservoir
South Platte River
Louviers
Wildcat Point
Future Castle Rock Reservoir No. 2
(1,130 AF, planned)
Castle Rock
Town Limits
16" Ravenna Pipeline (exisiting)
30" Plum Creek Raw Water Return
Pipeline (currently under construction)
Castle Rock Reservoir No. 1
(240 AF, exisiting)
PS
D
West Plum Creek
Plum Creek Diversion (exisiting)
and Pump Station (currently under construction)
Existing Raw Water
Pipeline to Plum Creek
Water Purification
Facility (PCWPF)
Plum Creek Water
Reclamation
Authority (PCWRA)
N
0
0.5
1
2
Miles
85
87
470
121
25

SUTTON PONDS

BEDROCK & WATER STORAGE EVALUATION

PREPARED FOR:

United Water and Sanitation District
5460 South Quebec Street, Suite 110
Greenwood Village, CO 80111

PREPARED BY:

Civil Resources, LLC
323 5th Street
P.O. Box 680
Frederick, CO 80530
Ph: 303-833-1416

DATE PREPARED: JULY 2009

CIVIL RESOURCES, LLC
ENGINEERS & PLANNERS

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LIST OF FIGURES

APPENDIX

1.0 PROJECT INFORMATION

United Water & Sanitation District directed Civil Resources, LLC review existing geotechnical data, investigate the characteristics and quality of the underlying bedrock, and to provide three (3) alternate pond layouts and at the Sutton Reservoir site. The goal of the investigation was to evaluate the feasibility of creating water storage at the site. The Site is located north of Rio Grand Avenue and west of Highway 85 in Douglas County, Colorado as shown on Figure 1.

2.0 GEOTECHNICAL EXPLORATION

Existing geotechnical data was reviewed in combination with additional investigation to estimate the underlying bedrock characteristics and quality at the Sutton Reservoir site. Civil Resources drilled a total of five (5) borings for this evaluation. The borings were advanced using a truck mounted CME 75 drill rig equipped with 6-inch ID hollow-stem continuous flight auger and hx core steel. The borings were advanced to bedrock with hollow stem augers. Samples of the overburden material (i.e. all material above the bedrock) were collected at selected intervals with a split spoon sampler using a standard penetration test. Bedrock samples were then collected with either a split spoon sampler or by continuous hx core. The borings were continuously logged by a Professional Engineer and selected samples were taken for laboratory testing. The soil stratifications and laboratory test results are shown on the summary logs of exploratory borings on Figures 2 and 3. Laboratory results are included in Appendix A.

2.1 Previous Geotechnical Evaluations

Civil Resources has reviewed *Geotechnical Investigation, Ravenna Surface Impoundment, Sedalia, Colorado 80135*, dated June 20, 2006 by ATEST, Inc. This geological data provided information about the bedrock in the area of the existing pond at the subject site. ATEST bore logs for borings SP-1, SP-2, and SP-3 show the bedrock material as claystone and claystone/shale bedrock in the vicinity of the existing pond. The lab data in this report shows that the soil particles passing the no. 200 sieve ranged from 19.4 to 39.8 percent. Typically bedrock along the Colorado Front Range is classified as claystone or claystone/shale when the percent passing the no. 200 sieve is greater than 50 percent and the soils are classified as CL or CH according to the Unified Soil Classification System (USCS). The liquid limit in these borings ranged from 29.5 to 50.7 and the plastic index ranged from 8.8 to 20.8 percent. The samples would classify as either SC or SM according to USCS.

2.2 Site Location and Description

The site is mostly undeveloped with moderate covering of grasses and weeds. Plum Creek runs along the eastern edge of the site. There is an existing pond on the west side of the property. A buried water line runs north/south along Plum Creek, east/west along the north property line from the northeast corner and another pipeline runs southwest from the northeast corner to the existing pond. An overhead electrical line runs north/south just east of the existing pond. Figure 4 shows existing conditions at the Site.

2.3 Subsurface Conditions

Our borings encountered native soils consisting of clay, sand, and sand with gravel at depths ranging from the existing ground surface to 38 feet below ground surface (BGS). Bedrock was encountered in all five borings and consisted of siltstone and sandstone. Bedrock was encountered at depths ranging from thirteen (13) feet to thirty eight (38) feet and extended to the maximum depths drilled. Groundwater was encountered in four of the five borings at depths ranging from thirteen and one-half to fourteen feet below the existing ground surface during or subsequent to drilling operations. The bedrock material encountered consisted of siltstone, sandstone, and conglomerate. Figure 5 illustrates the bedrock contour map based on available information.

This subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs and legend shown on Figures 2 and 3 should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, groundwater data, laboratory data, and packer test results. Laboratory data is shown on the bore logs and is attached at the end of this report as Appendix A.

Locations of the borings are shown on Figure 4. The stratifications shown on the boring logs represent the conditions only at the actual boring locations as variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

2.4 Groundwater Information

Groundwater was encountered in four of the five borings at depths ranging from thirteen and one half (13 ½) feet to fourteen (14) feet below the existing ground surface during and subsequent to drilling operations. The eastern portion of the site along Plum Creek contains an alluvial aquifer. Approximately, the western 2/3rds of the site may contain perched groundwater and does not appear to have any substantial aquifers near the surface. It should be noted that it is possible for the groundwater table to fluctuate depending upon climatic, rainfall, and mining conditions. The groundwater levels presented in this report are the levels that were measured at the time of our field activities.

3.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

3.1 Site Geology

The site is located along the western edge of the Colorado Front Range on the western flank of the Denver Structural Basin. The basin is a down warp of sedimentary strata that trends north-northwest, parallel to the mountain front. In the project area, the sedimentary beds dip gently eastward toward the axis of the basin east of the site. Based on regional geologic mapping (Trimble and Machette, 1979), the near surface bedrock immediately west of the project area is the Paleocene and Upper Cretaceous Dawson/Arapahoe Formation. The bedrock is overlain by upper Pleistocene and upper Holocene (Quaternary age) deposits. The deposits exist primarily within the Louviers Alluvium on the western half of the site and Post Piney Creek, and Piney Creek Alluvium deposits on the eastern half of the site. The bedrock unit consists of siltstone, sandstone, and conglomerate.

The Dawson/Arapahoe formation forms the near surface bedrock at this site. The lithology of this formation is complex consisting of interbedded claystone, siltstone, lenticular sandstone, and conglomerate. Tracing distinguishable lithologic units within the Dawson Formation for more than a few hundred feet is difficult. Conglomerate material was observed in Borings B1 and B3 through B5 which were located on the east side of the site. The bedrock samples tested in the laboratory classified as either sandstone or siltstone.

The overburden material at the Sutton Reservoir site thickens as you get closer to Plum Creek. The overburden material consisted primarily of sand and sand with gravel with clay in parts.

In-situ permeability of the siltstone was determined in one location using a packer test in Boring 4 (B4). The siltstone bedrock permeability at this location was 5.73×10^{-6} and is considered to have a very low permeability at this location. A packer test was performed in the conglomerate with a result of 2.18×10^{-5} cm/s and is considered to be semi pervious.

3.2 Geotechnical Evaluation

Bedrock was encountered across the site at depths ranging from approximately thirteen (13) feet to thirty-eight (38) feet BGS. The bedrock surface slopes downward toward the northeast.

The near surface bedrock is interbedded siltstone, sandstone, and conglomerate. The siltstone is generally very hard, slightly plastic, moist to very moist, and cemented in parts. The sandstone is generally fine grained, slightly to moderately cemented, and medium moist to moist. The conglomerate is generally coarse grained with gravel and where groundwater was located within the conglomerate, the conglomerate was non to slightly cemented. The conglomerate was slightly too moderately cemented where groundwater was not observed. The conglomerate thickness averages approximately 30 feet and is located predominately along the eastern part of the project under the proposed embankment area of pond 1. The conglomerate lense thickens towards the northeast corner of the project.

Based on the soils observed, testing, and our experience with similar soils, the on-site siltstone and sandstone bedrock can be characterized as very low permeability to semi pervious. The conglomerate bedrock can be characterized as being semi-

pervious to pervious.

3.3 Geotechnical Recommendations & Conclusions

The following statements summarize the geotechnical findings as they relate to the construction of water storage on the Site:

- An alluvial aquifer is located along the east side of the project site and may be cut off with a grout curtain wall. The grout curtain should tie into the existing bedrock at the south and northwest points of the east pond and extend to the bottom of the conglomerate material. An average curtain depth of 45 to 50 feet is expected if drilled from the existing ground surface. To reduce the depth of the grout curtain the overburden material may be excavated creating a key, and then the grout curtain can be installed from the bottom of the key to the bottom of the conglomerate material. The excavation should then be backfilled with a clay/siltstone core material with a minimum Plasticity Index (PI) of 10. Dimensions of the key and the grout curtain will have to be determined in a seepage analysis.

- The grout curtain will cut off the alluvial aquifer along the eastern edge of the property from the western portion of the pond(s). Any groundwater in the western portion of the project site is likely to be perched groundwater. The grout curtain when tied into the bedrock and extended to the bottom of the conglomerate material will seal off the alluvial groundwater from infiltration and the pond(s) will meet the state leak testing (groundwater infiltration) criteria.

- The grout curtain was selected because the bedrock material is anticipated to be too hard for slurry wall excavation. Two test trenches should be excavated with a backhoe and ripper bucket where harder bedrock is likely to confirm this. If the bedrock material can be excavated a slurry wall may be used instead of a grout wall resulting in significant savings. The hardest bedrock is anticipated to be southwest of B1 and west of B4.

- The siltstone material at the site tends to have a PI of 10 or higher and therefore this material could be used in the construction of the core of the embankments. A PI of 10 should be considered the minimum PI for an embankment and proper material selection will be critical to ensuring the stability and low permeability of the embankment. Any material with a PI of less than 10 should not be used in the core of the embankment.

- The sandstone and conglomerate material may be used for embankment fill on either side of the core. Sizing of the core should be completed during a seepage analysis.

- The siltstone formation will be a suitable semi-permeable material for the project if no modifications are made to the material. Clay (bentonite or similar material) may be added to the upper reworked material to decrease the permeability if a pond liner is made from this bedrock material. Typical application rates of clay would be between 0.3 and 0.7 pounds per square foot per 6 inches. Synthetic liners will also work once the groundwater is cut off from the east.

- A slope stability analysis should be completed to determine the final slopes of the pond(s) especially with the siltier materials on site.

- Conventional excavation equipment for commercial construction in the Colorado Front Range area will be suitable for excavation purposes in the overburden soils. Difficult excavation is generally anticipated in bedrock areas of this site. Heavy bull dozers with ripping equipment may be needed for bedrock excavation. Blasting of the conglomerate bedrock material may be necessary at this site where groundwater is not present. Water injection into the conglomerate material may reduce the strength of the conglomerate. All excavations should be adequately shored or sloped to prevent side wall collapse. As a minimum, all applicable state, federal, and local codes should be observed including OSHA regulations.

4.0 WATER STORAGE

Three alternate water storage options were created for the project. Alternate 1A is to leave the existing pond and add a pond to the east (Figure 6). Alternate 1B is to raise the existing pond and add a pond to the east (Figure 7). Alternate 2 is to create one large pond for the entire site (Figure 8). Following is the water storage and earthwork totals summary table for the three proposed alternatives.

Sutton Ponds
Water Storage & Earthwork Totals

Alternate I.D.		[1]Max Dam Ht (ft)	Crest Width (ft)	Crest El. (ft)	Side Slopes (H:V)	Earthwork Cut (cy)	Earthwork Dam Fill (cy)	Net Earthwork (cy)	[2]Added Water Storage (ac-ft)
Alt 1A	Existing Pond	-	-	4760	3H:1V	-	-	-	0
	East Pond	47	25	4760	3.5H:1V	725,000	750,000	-25,000	1,130
	Alt 1A Totals					725,000	750,000	-25,000	1,130
Alt 1B	West Pond	25	25	4780	3.5H:1V	-	-	-	360
	East Pond	47	25	4760	3.5H:1V	-	-	-	1,130
	Alt 1B Totals					970,000	930,000	40,000	1,490
Alt 2	1 Pond	57	25	4770	3.5H:1V	870,000	1,125,000	-255,000	1,560

[1]Maximum dam height is located at the lowest existing elevation at the crest

[2]Each pond has 3 foot of freeboard.

5.0 CONSTRUCTION COST

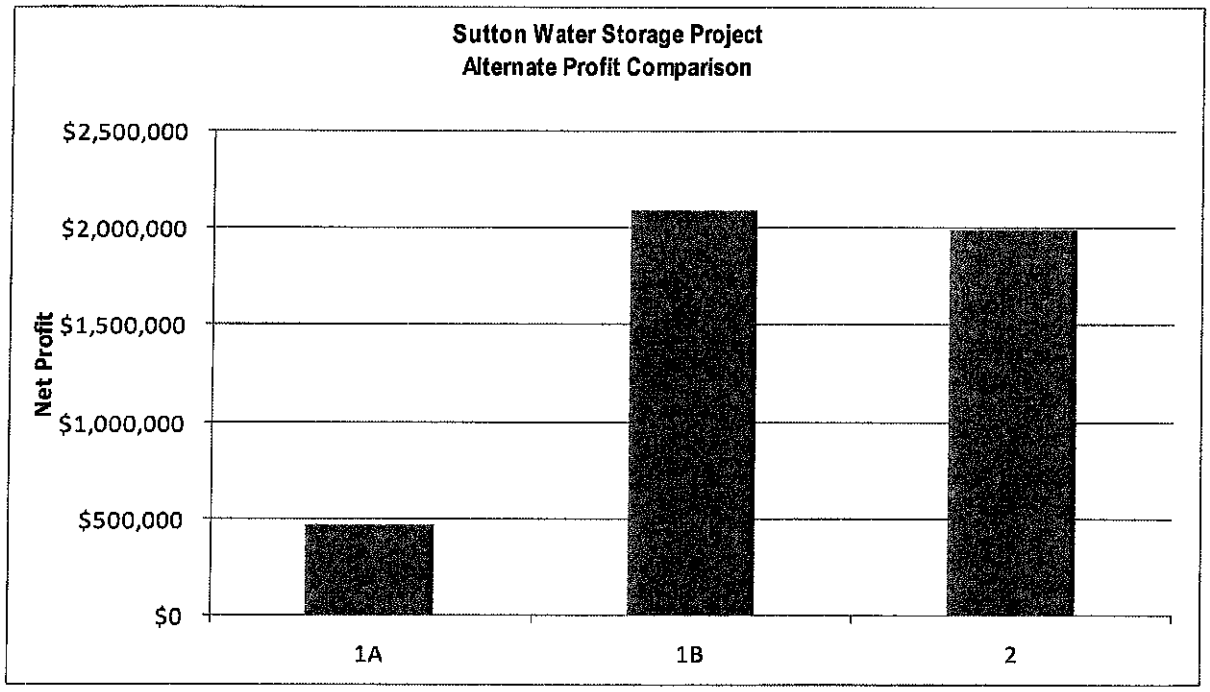
Construction cost estimates were generated for the three alternatives. The following table summarizes the results of this analysis. The construction cost does not include infrastructure costs associated with diverting or returning water to and from the storage facilities or interconnection of the facilities. Other costs associated with the spillway(s) and erosion protection except for a geotextile membrane along the downstream embankment from flood flows in Plum Creek ant interior slope protection have not been included. Relocation of existing utilities and a grout curtain along the east side of the east pond costs have been included. No payment of royalty or other cash value was assigned to the aggregate for this analysis. Detailed cost sheets are attached as Appendix B.

If slurry wall excavation is achievable by standard methods (refer recommendations regarding test excavating) then the expected construction cost would decrease by approximately $1,250,000 based on a slurry wall unit cost of $4.00 per square foot.

Table 3: *Alternative Cost and Profit Comparison*

Alternative	CAPACITY AND COST SUMMARY			NET PROFIT	Cost Per Acre-ft
	Construction Cost, $[1]	Added Storage Capacity, ac-ft	Water Payment[2]	Water Payment - Construction Cost	
1A	*$6,650,500*	1,130	$9,040,000	$2,389,500	$5,885
1B	$7,910,690	1,490	$11,920,000	$4,009,310	$5,309
2	$8,567,408	1,560	$12,480,000	$3,912,592	$5,492

Notes:
[1] Based on 2009 Dollar.
[2] Valued at $8,000 per acre-foot storage.

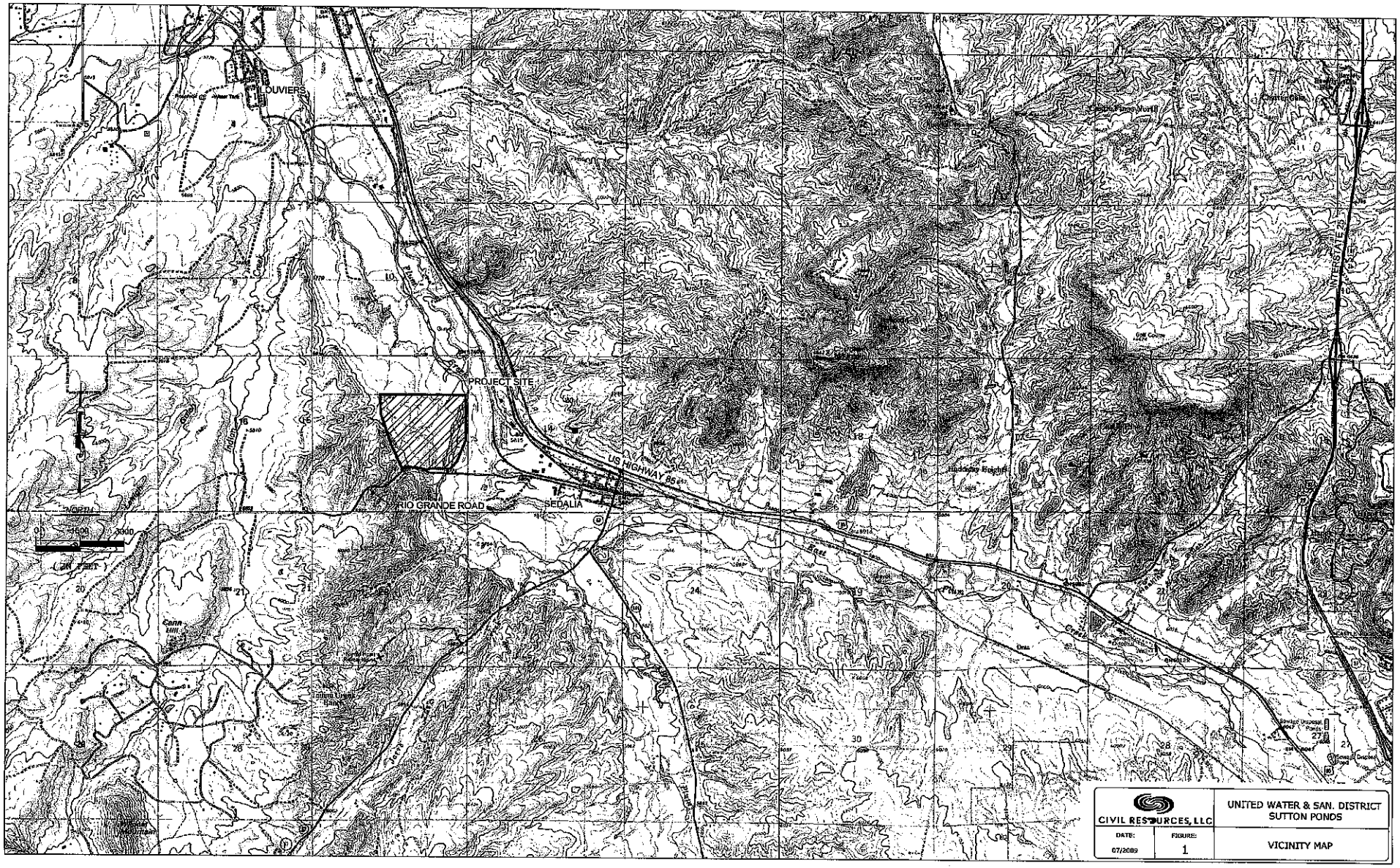


6.0 GEOTECHNICAL RISK & REPORT LIMITATIONS

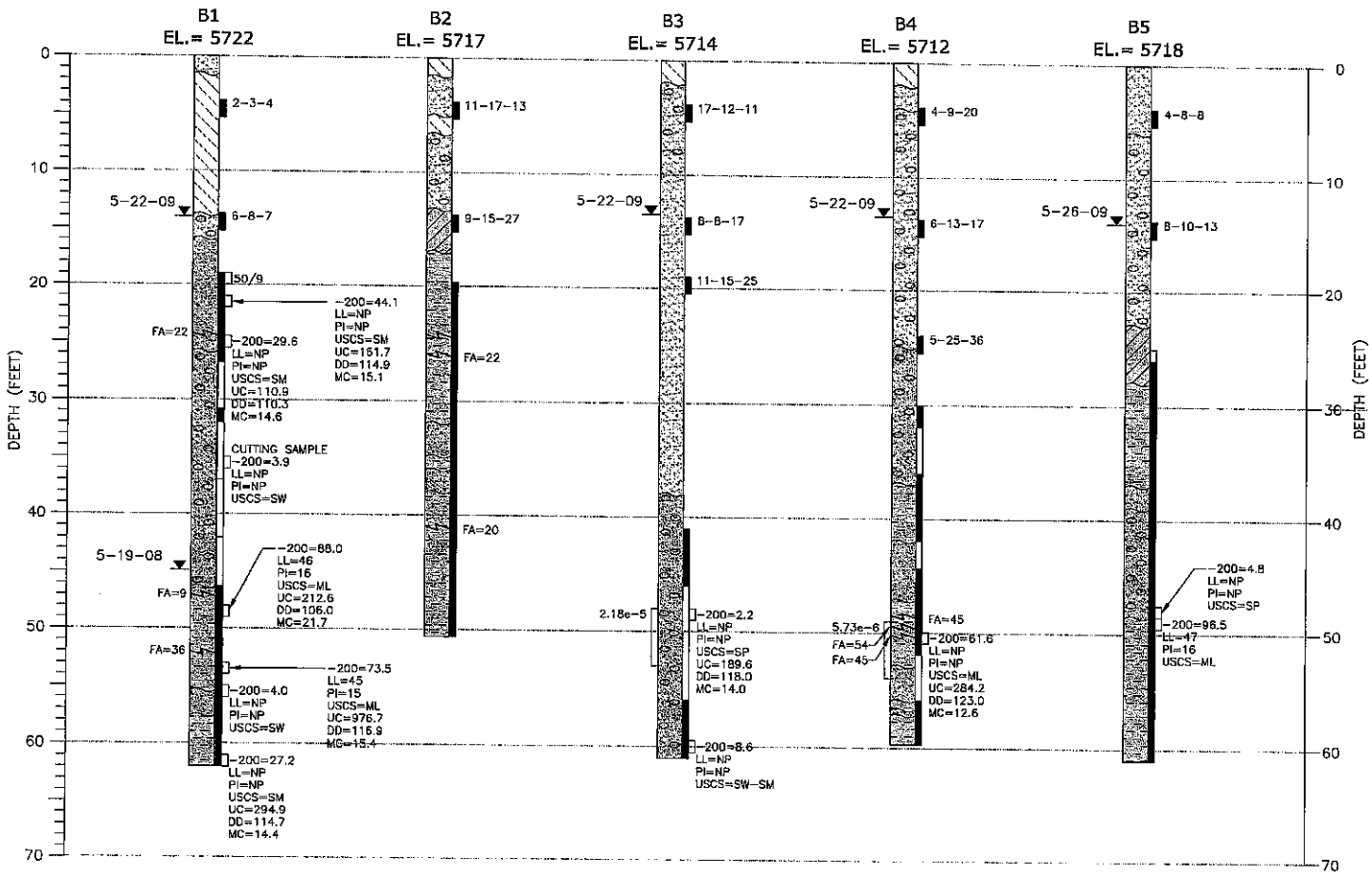
The concept of risk is an important aspect of any geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be tempered by engineering judgment and experience. Therefore, the solutions or recommendations presented in any geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as desired or intended. The engineering recommendations presented in the preceding sections constitute our best estimate of those measures that are necessary to help the structure perform in a satisfactory manner, based on the information generated during this and previous evaluations, and our experience in working with these conditions. The builder and future owner must understand this concept of risk, as it is they who must decide what is an acceptable level of risk for the proposed structure.

The recommendations presented in this report are based on the available subsurface information obtained by Civil Resources for the proposed project. The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

FIGURES



CIVIL RESOURCES, LLC		UNITED WATER & SAN. DISTRICT SUTTON PONDS
DATE: 07/2009	FIGURE: 1	VICINITY MAP



CIVIL RESOURCES, LLC	UNITED WATER & SAN. DISTRICT SUTTON PONDS
DATE: 07/2009	FIGURE: 2
	BORING LOGS

LEGEND:

SAND, SILTY, FINE TO MEDIUM GRAIN SIZES, MEDIUM DENSE TO DENSE, SLIGHTLY MOIST TO WET (SM)

CLAY, SANDY IN PARTS, BROWN TO BLACK ORGANICS IN PARTS, MEDIUM SOFT TO VERY STIFF, SLIGHTLY MOIST TO MOIST, DARK GRAY, DARK BROWN, BLACK (CL)

SAND WITH GRAVEL, MEDIUM DENSE TO DENSE, MEDIUM MOIST TO WET, BROWN TO DARK BROWN (SP, SW)

WEATHER SILTSTONE, MEDIUM HARD, MEDIUM MOIST, DARK GRAY, BROWN WITH IRON STAINING (ML)

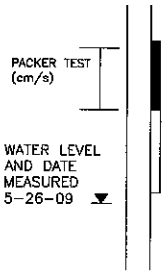
SANDSTONE, FINE TO COARSE GRAIN SIZES, CEMENTED IN PARTS, HARD TO VERY HARD, MEDIUM MOIST, GRAY TO DARK GRAY (SM, SW, SP)

CONGLOMERATE, MEDIUM TO COARSE GRAIN SIZES WITH GRAVEL SLIGHTLY CEMENTED TO CEMENTED, MEDIUM HARD TO HARD, MEDIUM MOIST TO WET, GRAY TO DARK GRAY WITH BROWN GRAVEL (SP, SW, SW–SM)

SANDSTONE, SILTY, HARD TO VERY HARD, MEDIUM MOIST TO MOIST, GRAY TO DARK GRAY, GREEN IN PARTS (ML, SM)

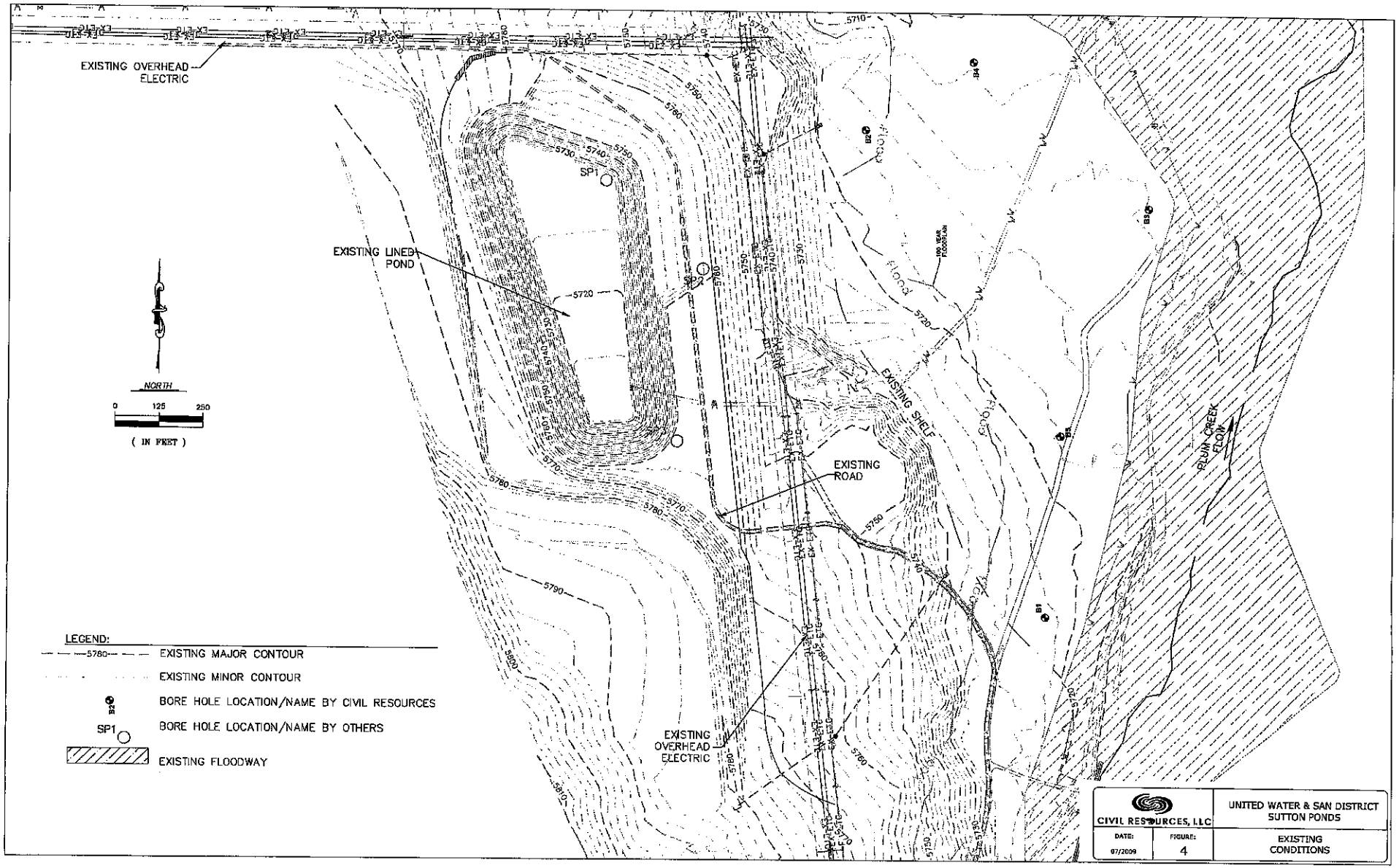
NOTES:

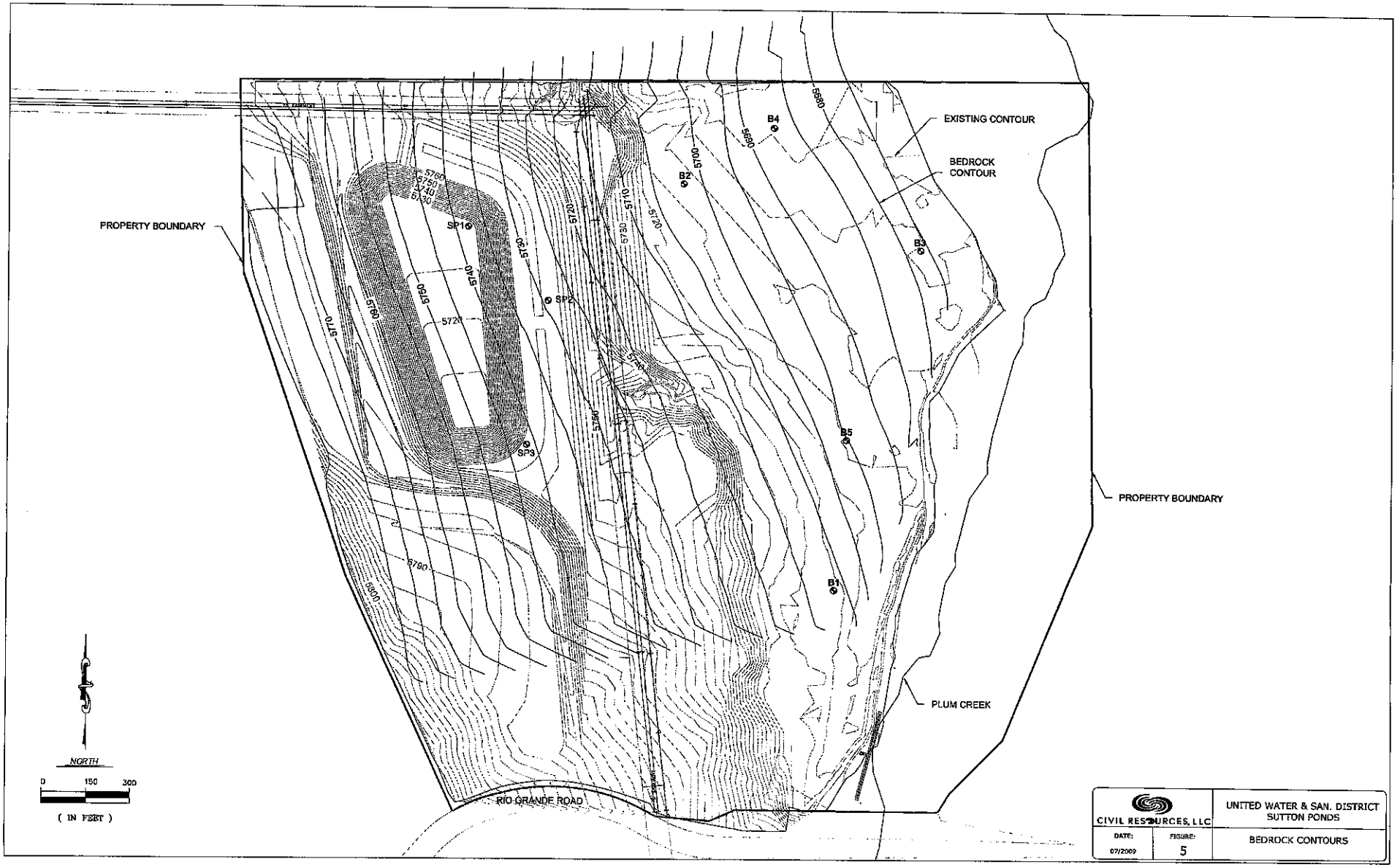
1. EXPLORATORY BORINGS WERE DRILLED MAY 21, MAY 22, AND MAY 26 WITH A CME CONTINUOUS SAMPLER AND 6" OD HOLLOW STEM AUGERS USING A TRUCK MOUNTED CME–75 RIG.
2. LINES BETWEEN MATERIALS REPRESENT APPROXIMATE BOUNDARIES BETWEEN TYPES. TRANSITIONS MAY BE GRADUAL.
3. GROUNDWATER LEVELS WILL FLUCTUATE.
4. BORING ELEVATIONS ARE ESTIMATED FROM TOPOGRAPHICAL MAPPING AND SHALL BE CONSIDERED APPROXIMATE

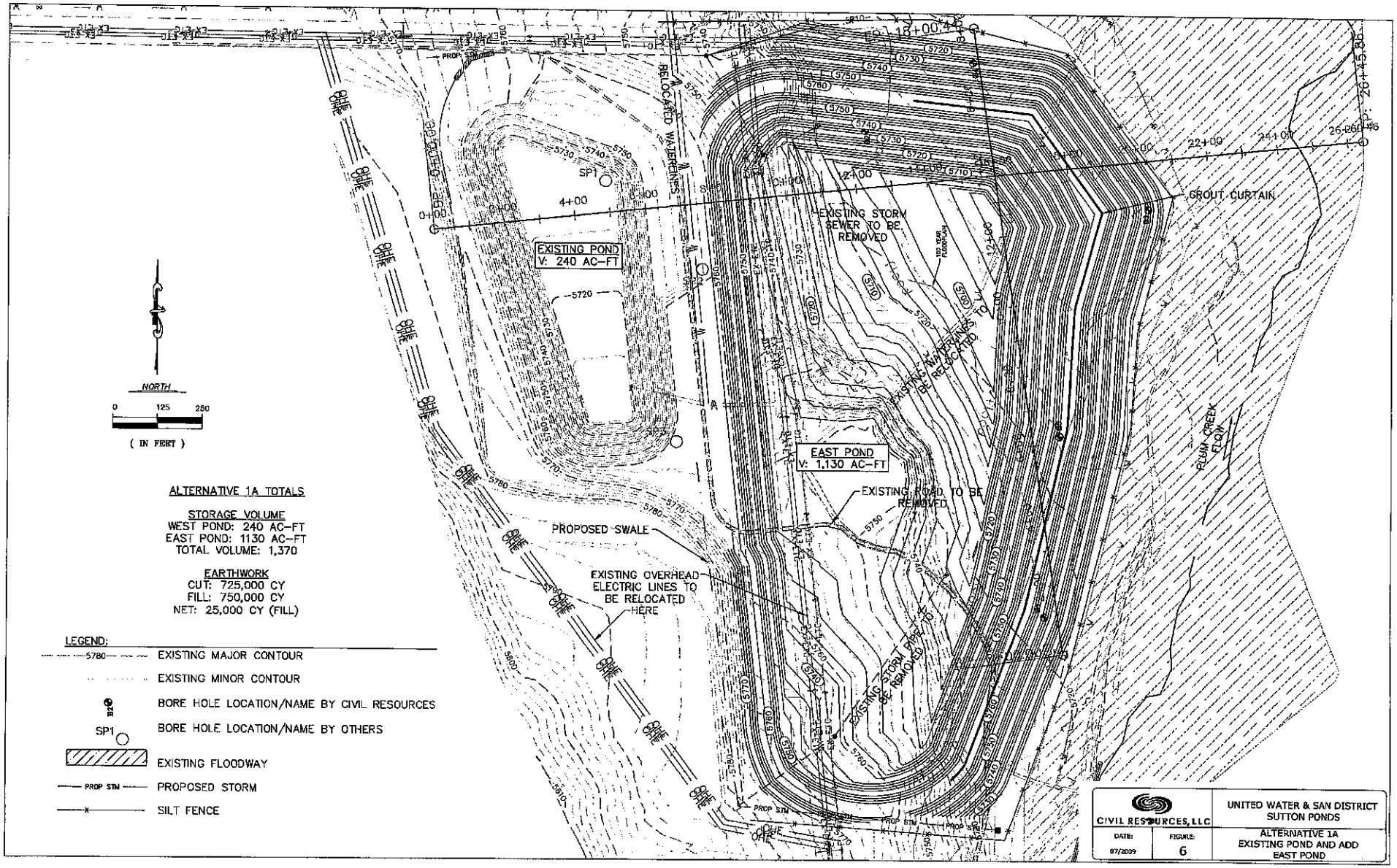


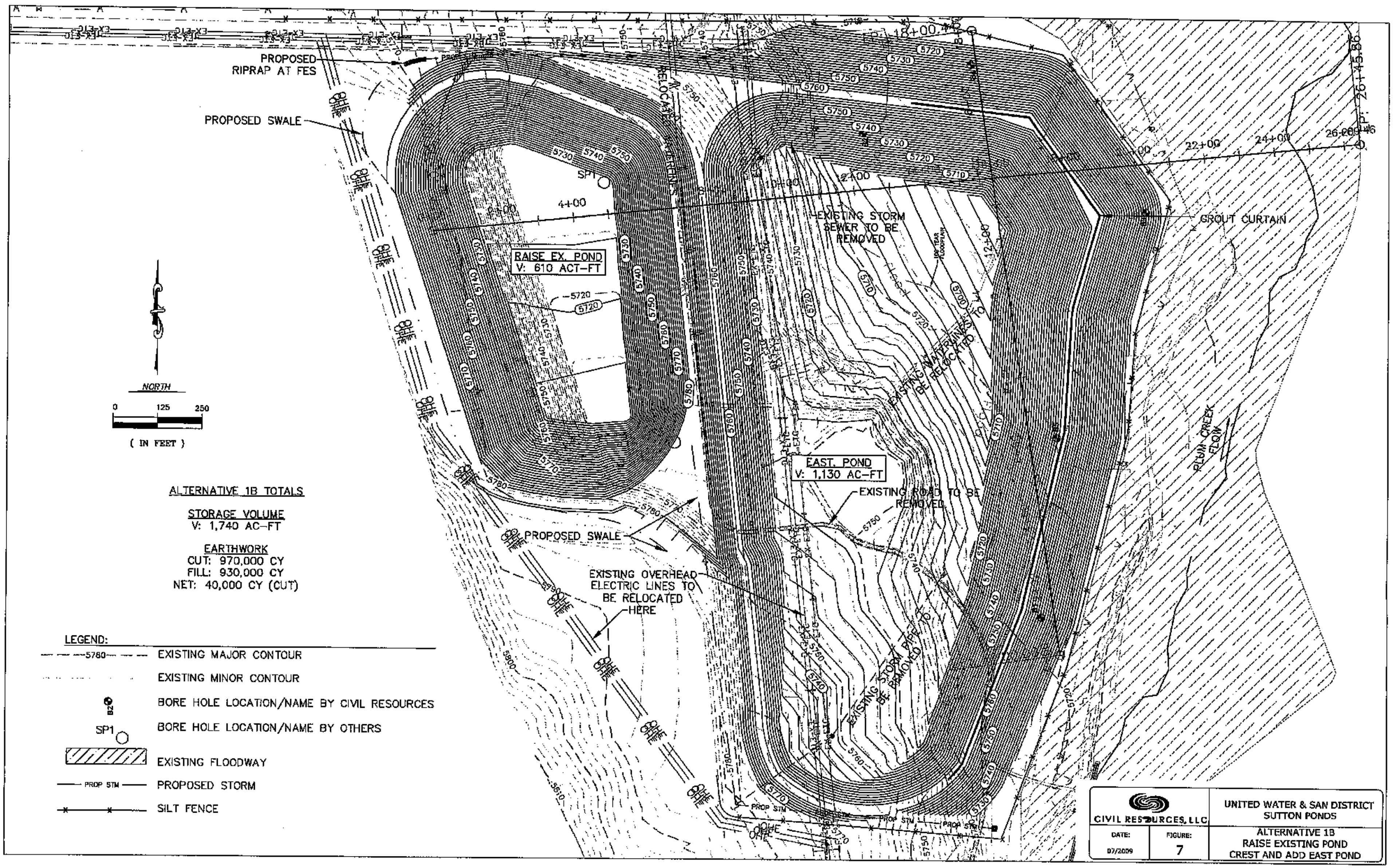
–200 = PERCENT PASSING A NO. 200 SIEVE
LL = LIQUID LIMIT
PI = PLASTICITY INDEX
USCS = UNIFIED SOIL CLASSIFICATION
UC = UNCONFINED COMPRESSIVE STRENGTH (PSI)
DD = DRY DENSITY (PCF)
MC = MOISTURE CONTENT (%)
FA = FRACTURE ANGLE

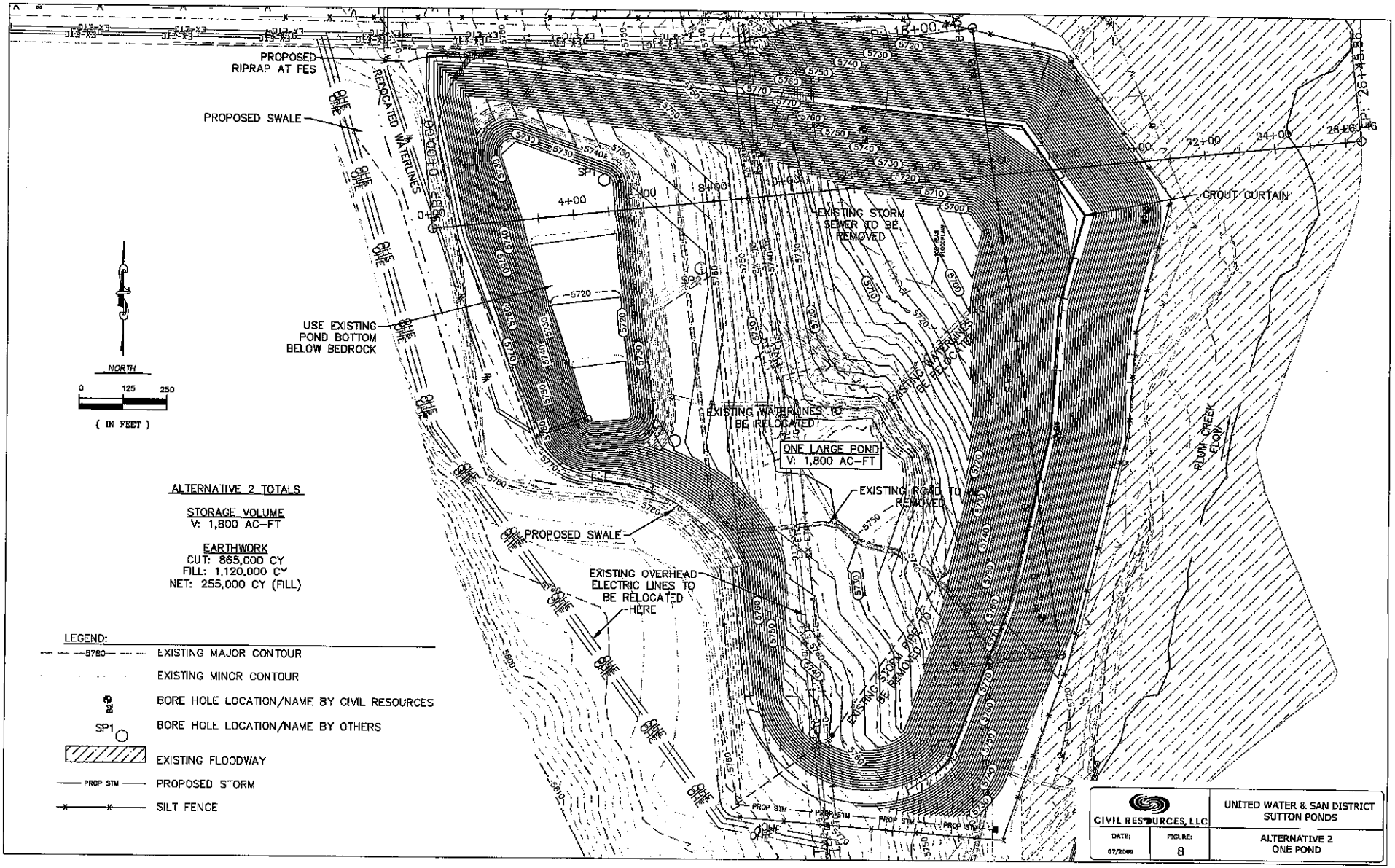
CIVIL RESOURCES, LLC		UNITED WATER & SAN. DISTRICT SUTTON PONDS
DATE: 07/2009	FIGURE: 3	BORING LOGS

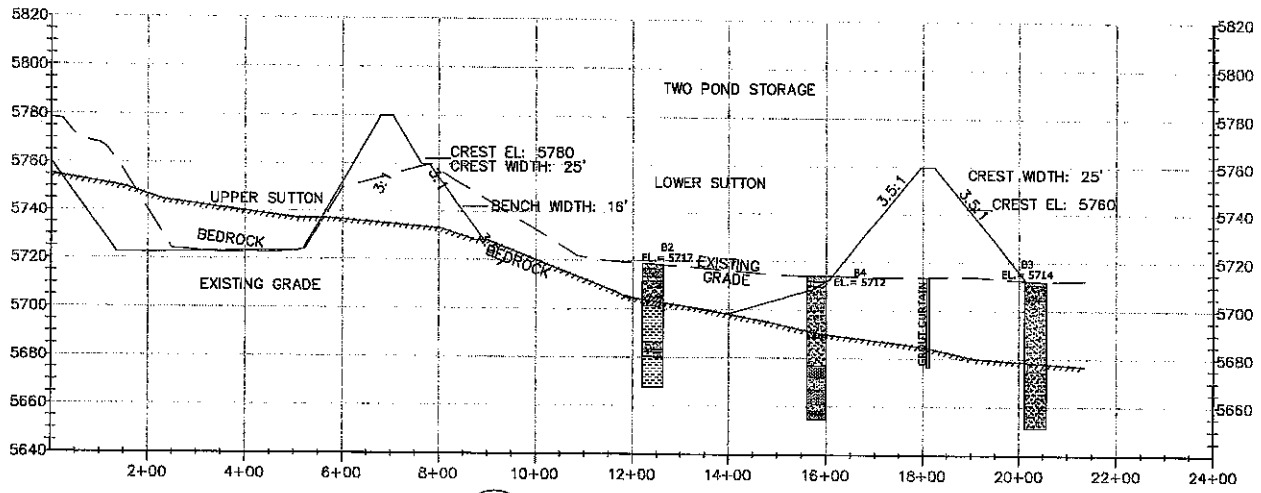

EXISTING OVERHEAD ELECTRIC
EXISTING LINED POND
SP1
SP2
EXISTING ROAD
EXISTING SHELF
EXISTING OVERHEAD ELECTRIC
PLUM CREEK FLOW
NORTH
0 125 250
(IN FEET)
LEGEND:
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
BORE HOLE LOCATION/NAME BY CIVIL RESOURCES
BORE HOLE LOCATION/NAME BY OTHERS
EXISTING FLOODWAY
CIVIL RESOURCES, LLC
UNITED WATER & SAN DISTRICT
SUTTON PONDS
DATE: 07/2009
FIGURE: 4
EXISTING CONDITIONS


EXISTING CONTOUR
BEDROCK CONTOUR
PROPERTY BOUNDARY
PROPERTY BOUNDARY
PLUM CREEK
RIO GRANDE ROAD
B1
B2
B3
B4
B5
SP1
SP2
SP3
NORTH
0
150
300
(IN FEET)
CIVIL RESOURCES, LLC
UNITED WATER & SAN. DISTRICT
SUTTON PONDS
DATE:
07/2009
FIGURE:
5
BEDROCK CONTOURS

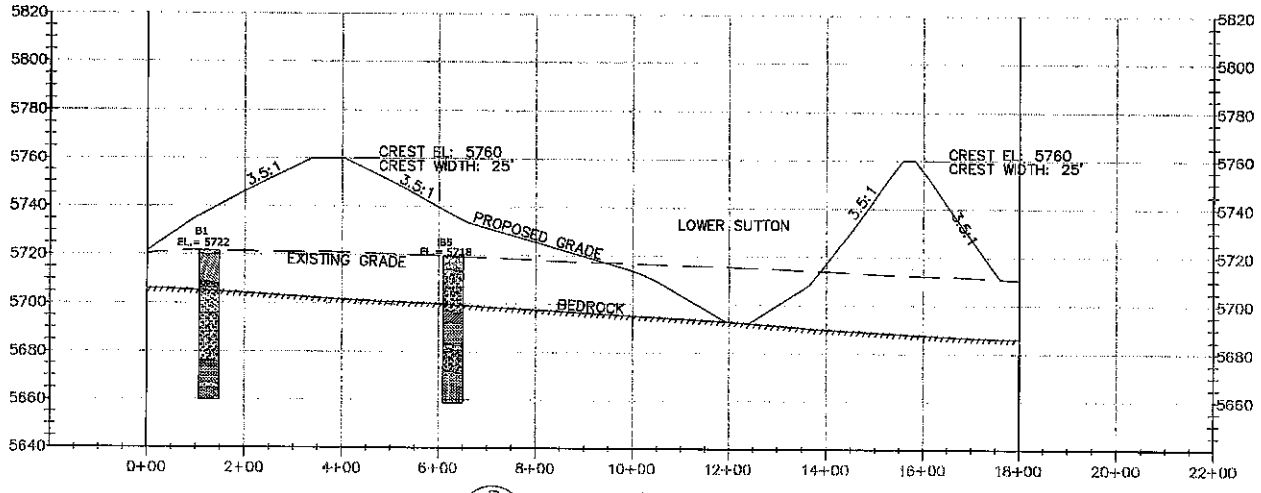

EXISTING POND
V: 240 AC-FT
EAST POND
V: 1,130 AC-FT
RELOCATED WATERLINES
EXISTING STORM SEWER TO BE REMOVED
GROUT CURTAIN
EXISTING WATERLINES TO BE RELOCATED
EXISTING ROAD TO BE REMOVED
PROPOSED SWALE
EXISTING OVERHEAD ELECTRIC LINES TO BE RELOCATED HERE
EXISTING STORM PIPE TO BE REMOVED
RUIN CREEK FLOW
NORTH
0 125 250
(IN FEET)
ALTERNATIVE 1A TOTALS
STORAGE VOLUME
WEST POND: 240 AC-FT
EAST POND: 1130 AC-FT
TOTAL VOLUME: 1,370
EARTHWORK
CUT: 725,000 CY
FILL: 750,000 CY
NET: 25,000 CY (FILL)
LEGEND:
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
BORE HOLE LOCATION/NAME BY CIVIL RESOURCES
BORE HOLE LOCATION/NAME BY OTHERS
EXISTING FLOODWAY
PROPOSED STORM
SILT FENCE
CIVIL RESOURCES, LLC
UNITED WATER & SAN DISTRICT
SUTTON PONDS
DATE: 07/2009
FIGURE: 6
ALTERNATIVE 1A
EXISTING POND AND ADD
EAST POND


PROPOSED RIPRAP AT FES
PROPOSED SWALE
RAISE EX. POND
V: 610 ACT-FT
SP1
EXISTING STORM SEWER TO BE REMOVED
EXISTING WATERLINE TO BE RELOCATED
GROUT CURTAIN
PLUM CREEK FLOW
EAST. POND
V: 1,130 AC-FT
EXISTING ROAD TO BE REMOVED
EXISTING STORM PIPE TO BE REMOVED
PROPOSED SWALE
EXISTING OVERHEAD ELECTRIC LINES TO BE RELOCATED HERE
NORTH
0
125
250
(IN FEET)
ALTERNATIVE 1B TOTALS
STORAGE VOLUME
V: 1,740 AC-FT
EARTHWORK
CUT: 970,000 CY
FILL: 930,000 CY
NET: 40,000 CY (CUT)
LEGEND:
5780 EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
B2 BORE HOLE LOCATION/NAME BY CIVIL RESOURCES
SP1 BORE HOLE LOCATION/NAME BY OTHERS
EXISTING FLOODWAY
PROP STM PROPOSED STORM
SILT FENCE
CIVIL RESOURCES, LLC
DATE: 07/2009
FIGURE: 7
UNITED WATER & SAN DISTRICT
SUTTON PONDS
ALTERNATIVE 1B
RAISE EXISTING POND
CREST AND ADD EAST POND


PROPOSED RIPRAP AT FES
PROPOSED SWALE
RELOCATED WATERLINES
USE EXISTING POND BOTTOM BELOW BEDROCK
NORTH
0 125 250
(IN FEET)
ALTERNATIVE 2 TOTALS
STORAGE VOLUME
V: 1,800 AC-FT
EARTHWORK
CUT: 865,000 CY
FILL: 1,120,000 CY
NET: 255,000 CY (FILL)
LEGEND:
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
BORE HOLE LOCATION/NAME BY CIVIL RESOURCES
BORE HOLE LOCATION/NAME BY OTHERS
EXISTING FLOODWAY
PROPOSED STORM
SILT FENCE
EXISTING STORM SEWER TO BE REMOVED
GROUT CURTAIN
EXISTING WATERLINES TO BE RELOCATED
ONE LARGE POND
V: 1,800 AC-FT
EXISTING ROAD TO BE REMOVED
PROPOSED SWALE
EXISTING OVERHEAD ELECTRIC LINES TO BE RELOCATED HERE
EXISTING STORM PIPE TO BE REMOVED
PLUM CREEK FLOW
CIVIL RESOURCES, LLC
UNITED WATER & SAN DISTRICT
SUTTON PONDS
DATE: 07/2009
FIGURE: 8
ALTERNATIVE 2
ONE POND

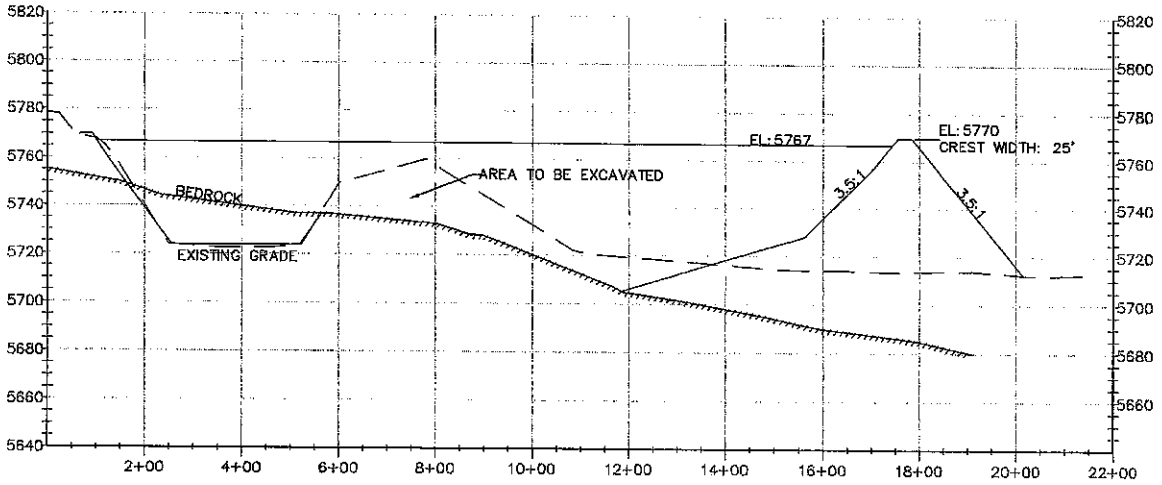


A
7 | 9
RESERVOIR SECTION

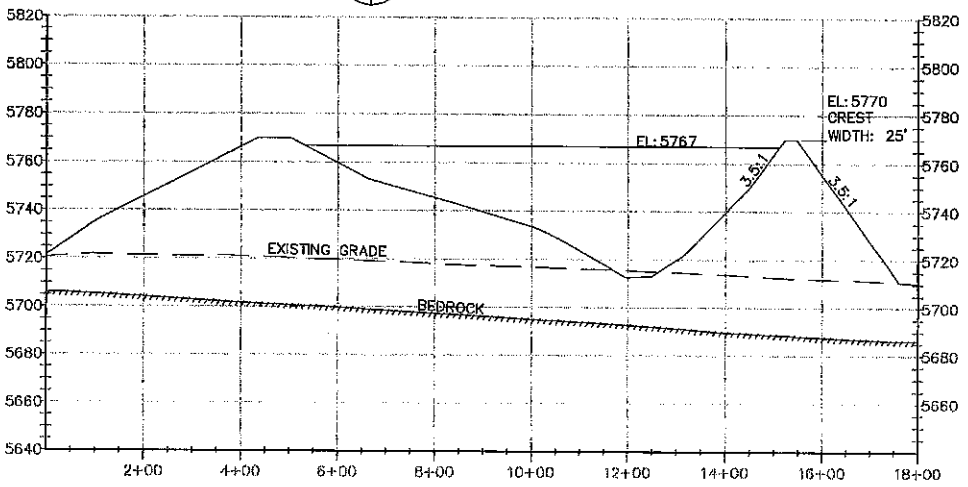


B
7 | 9
RESERVOIR SECTION

CIVIL RESOURCES, LLC	UNITED WATER & SAN DISTRICT SUTTON PONDS
DATE: 07/2009	FIGURE: 9
	ALTERNATIVE 1B RAISE EXISTING POND AND ADD EAST POND



A
8|10 RESERVOIR SECTION



B
8|10 RESERVOIR SECTION

CIVIL RESOURCES, LLC		UNITED WATER & SAN DISTRICT SUTTON PONDS
DATE: 07/2009	FIGURE: 10	ALTERNATIVE 2 ONE POND

APPENDIX A

LABORATORY DATA

RockSol
Consulting Group, Inc.

6510 W. 91st Ave, Ste 130
Westminster, CO 80301

Phone: (303) 962-9300
Fax: (303) 962-9350
e-mail: saeb@rocksol.com

July 22, 2009

Mr. Andy Jesik
Civil Resources
323 5th Street
P.O. Box 680
Frederick, CO 80530

Submittal of Invoice
Materials Testing for Sutton
Client #: 141.001.01
RockSol Project 230.04

Dear Andy,

Please find enclosed an invoice and the test results for soils tests conducted for the Sutton Project. The samples and test orders were delivered to our office. RockSol sent the test results to you via e-mail as soon as they became available. Soil classifications listed in the test results are based on Atterberg and Gradation data and do not reflect bedrock terminology.

RockSol appreciates the opportunity to provide this service. If I can be of any other support or you need additional information, please do not hesitate to call me at (303) 962-9301.

Respectfully submitted,

Saeid Saeb, Ph.D., P.E.
President
RockSol Consulting Group, Inc.

RockSol
Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	USCS Classification	AASHTO Classification	Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)
B1	21	NP	NP	NP		44.1	SM	A-4 (0)	15.1	114.9	161.7	
B1	24.5	NP	NP	NP		29.6	SM	A-2-4 (0)	14.6	110.3	110.9	
B1	35	NP	NP	NP		3.9	SW	A-1-a (0)				
B1	48	46	30	16		88.0	ML	A-7-5 (17)	21.7	106.0	212.6	
B1	53	45	30	15		73.5	ML	A-7-5 (11)	15.4	116.9	967.7	
B1	55	NP	NP	NP		4.0	SW	A-1-b (0)				
B1	61	NP	NP	NP		27.2	SM	A-2-4 (0)	14.4	114.7	294.9	
B3	48	NP	NP	NP		2.2	SP	A-1-b (0)	14.0	118.0	189.6	
B3	60.5	NP	NP	NP		8.6	SW-SM	A-1-b (0)				
B4	49.9	NP	NP	NP		61.6	ML	A-4 (0)	12.6	123.0	284.2	
B5	47.5	NP	NP	NP		4.8	SP	A-1-b (0)				
B5	48	47	31	16		96.5	ML	A-7-5 (19)				

ATTERBERG LIMITS' RESULTS

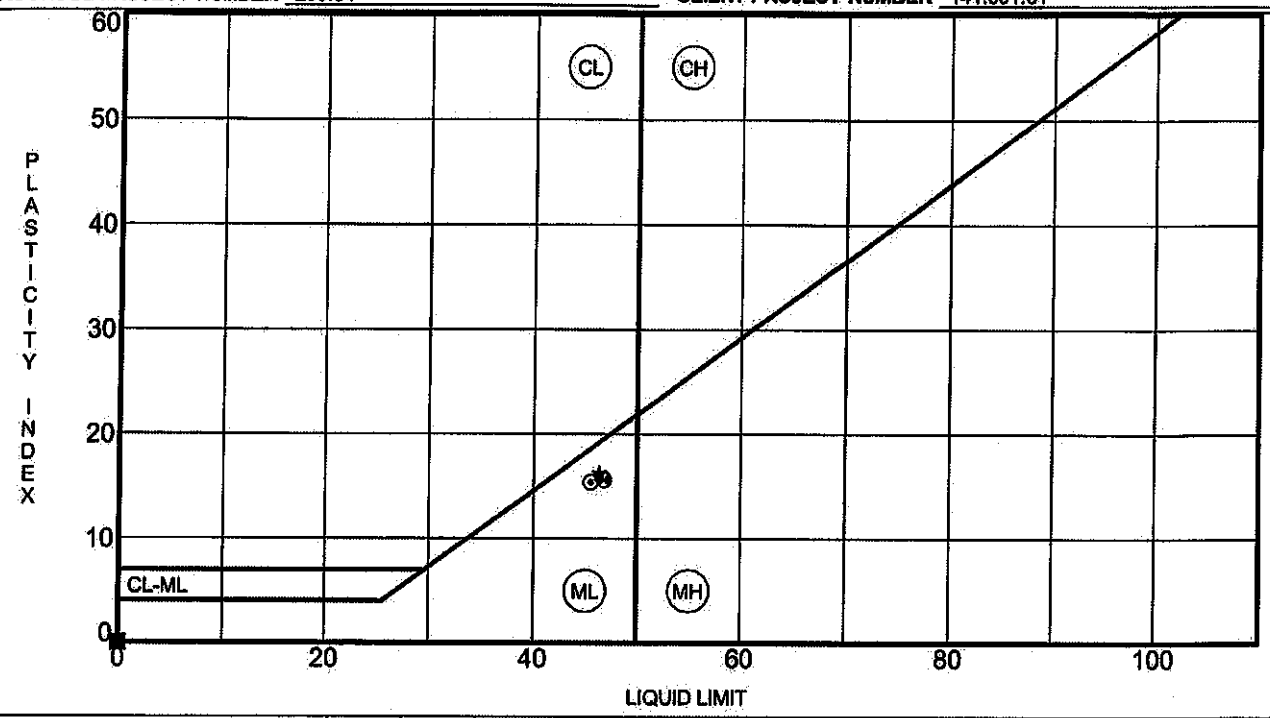
RockSol Consulting Group, Inc.

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B1	21.0	NP	NP	NP	44.1	SILTY SAND(SM)
⊠	B1	24.5	NP	NP	NP	29.6	SILTY SAND(SM)
▲	B1	35.0	NP	NP	NP	3.9	WELL-GRADED SAND with GRAVEL(SW)
★	B1	48.0	46	30	16	88.0	SILT(ML)
⊙	B1	53.0	45	30	15	73.5	SILT with SAND(ML)
✿	B1	55.0	NP	NP	NP	4.0	WELL-GRADED SAND(SW)
○	B1	61.0	NP	NP	NP	27.2	SILTY SAND(SM)
△	B3	48.0	NP	NP	NP	2.2	POORLY GRADED SAND(SP)
⊗	B3	60.5	NP	NP	NP	8.6	WELL-GRADED SAND with SILT(SW-SM)
⊕	B4	49.9	NP	NP	NP	61.6	SANDY SILT(ML)
□	B5	47.5	NP	NP	NP	4.8	POORLY GRADED SAND(SP)
⊖	B5	48.0	47	31	16	96.5	SILT(ML)

ATTERBERG LIMITS - CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

GRAIN SIZE DISTRIBUTION

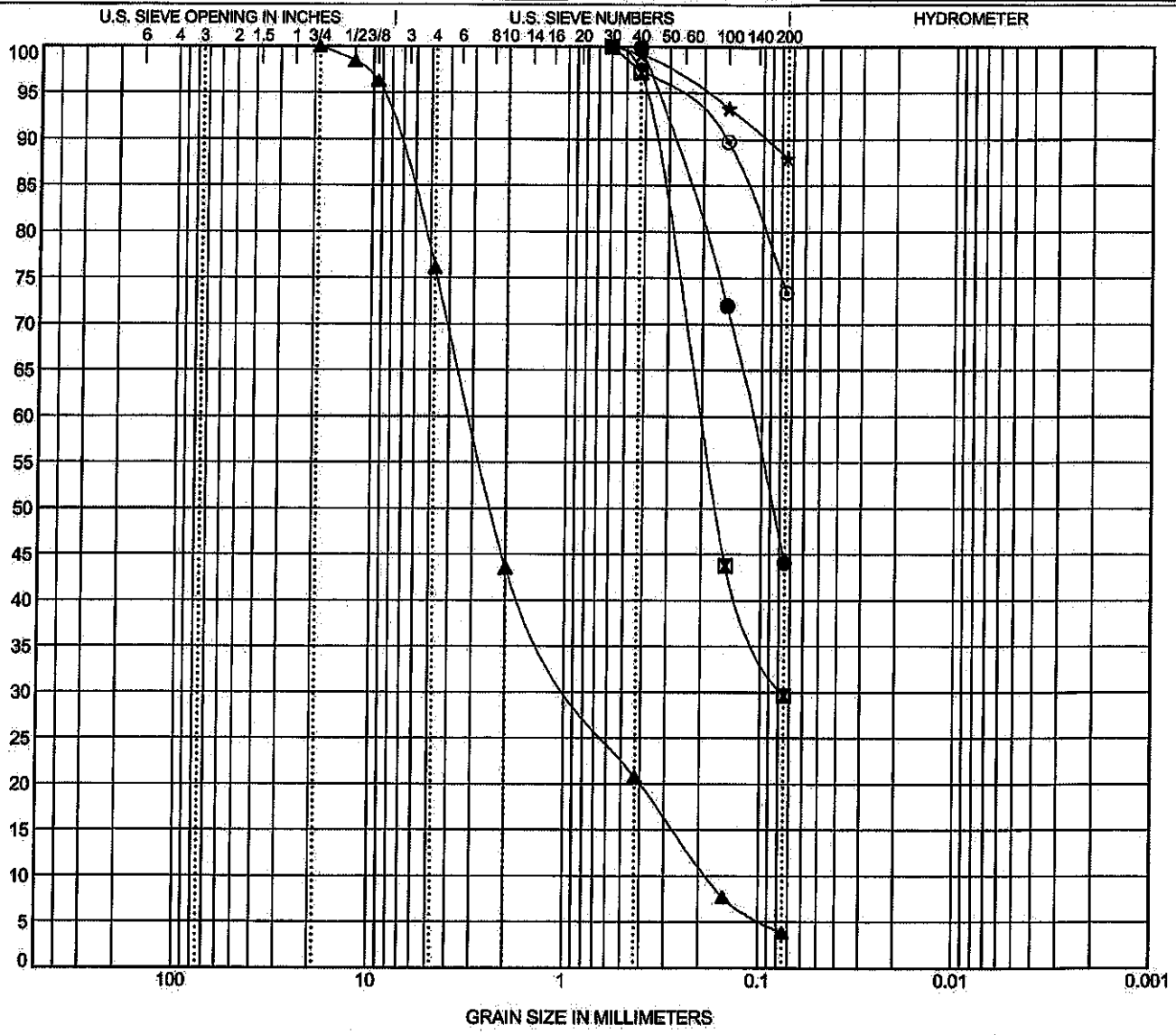
RockSol Consulting Group, Inc.

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B1	21.0	SILTY SAND(SM)	NP	NP	NP		
⊠	B1	24.5	SILTY SAND(SM)	NP	NP	NP		
▲	B1	35.0	WELL-GRADED SAND with GRAVEL(SW)	NP	NP	NP	1.14	17.23
★	B1	48.0	SILT(ML)	46	30	16		
⊙	B1	53.0	SILT with SAND(ML)	45	30	15		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B1	21.0	0.6	0.111			0.0	55.9	44.1	
⊠	B1	24.5	0.6	0.206	0.076		0.0	70.4	29.6	
▲	B1	35.0	19	3.094	0.795	0.18	23.9	72.3	3.9	
★	B1	48.0	0.6				0.0	12.0	88.0	
⊙	B1	53.0	0.6				0.0	26.5	73.5	

GRADATION - CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

GRAIN SIZE DISTRIBUTION

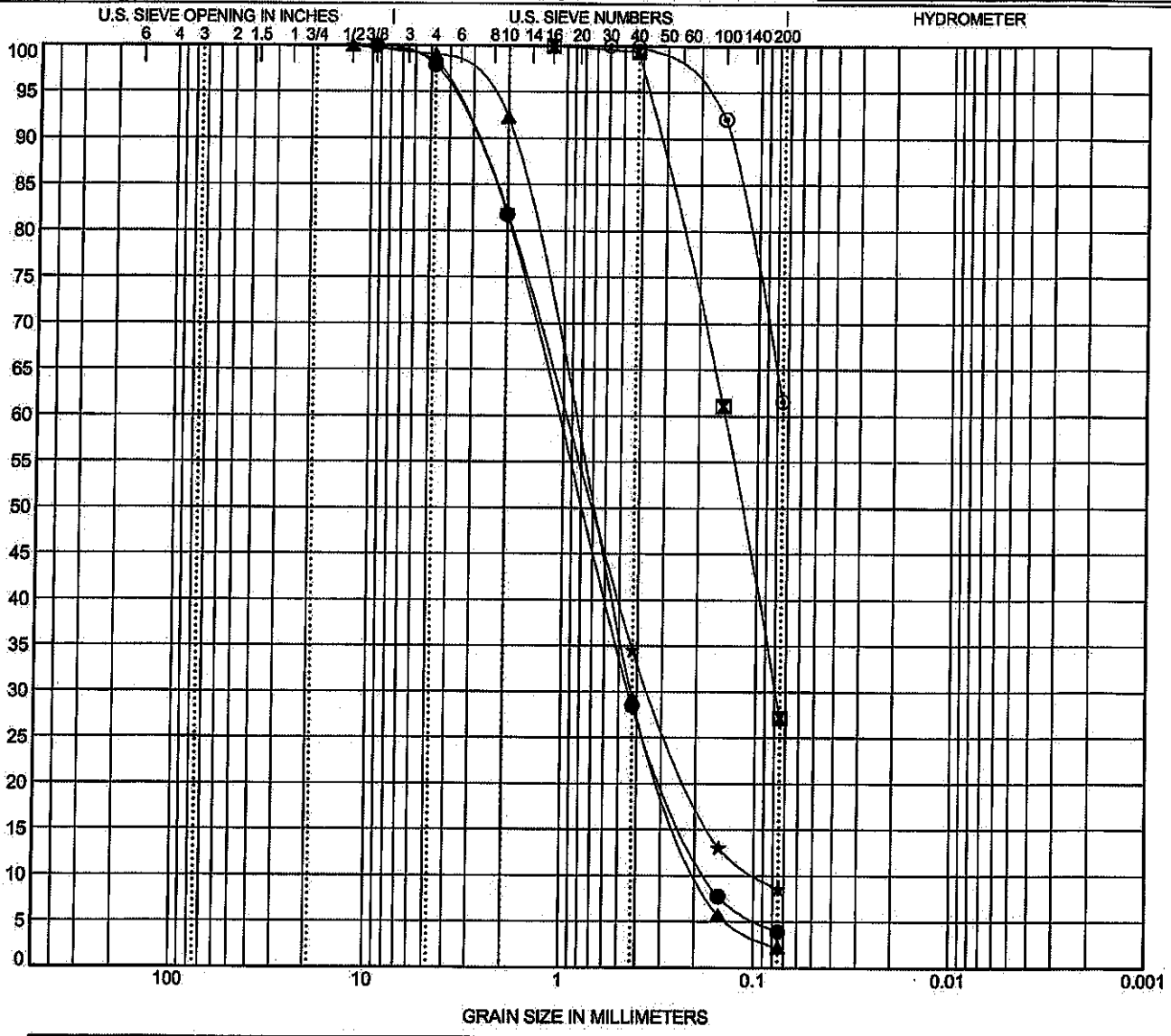
RockSol Consulting Group, Inc.

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B1	55.0	WELL-GRADED SAND(SW)	NP	NP	NP	1.11	6.34
⊠	B1	61.0	SILTY SAND(SM)	NP	NP	NP		
▲	B3	48.0	POORLY GRADED SAND(SP)	NP	NP	NP	1.14	5.00
★	B3	60.5	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.28	10.45
⊙	B4	49.9	SANDY SILT(ML)	NP	NP	NP		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B1	55.0	9.5	1.062	0.444	0.168	2.1	93.9	4.0	
⊠	B1	61.0	1.18	0.147	0.079		0.0	72.8	27.2	
▲	B3	48.0	12.5	0.904	0.432	0.181	1.0	96.9	2.2	
★	B3	60.5	12.5	0.973	0.341	0.093	1.7	89.7	8.6	
⊙	B4	49.9	0.6				0.0	38.4	61.6	

GRADATION - CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

GRAIN SIZE DISTRIBUTION

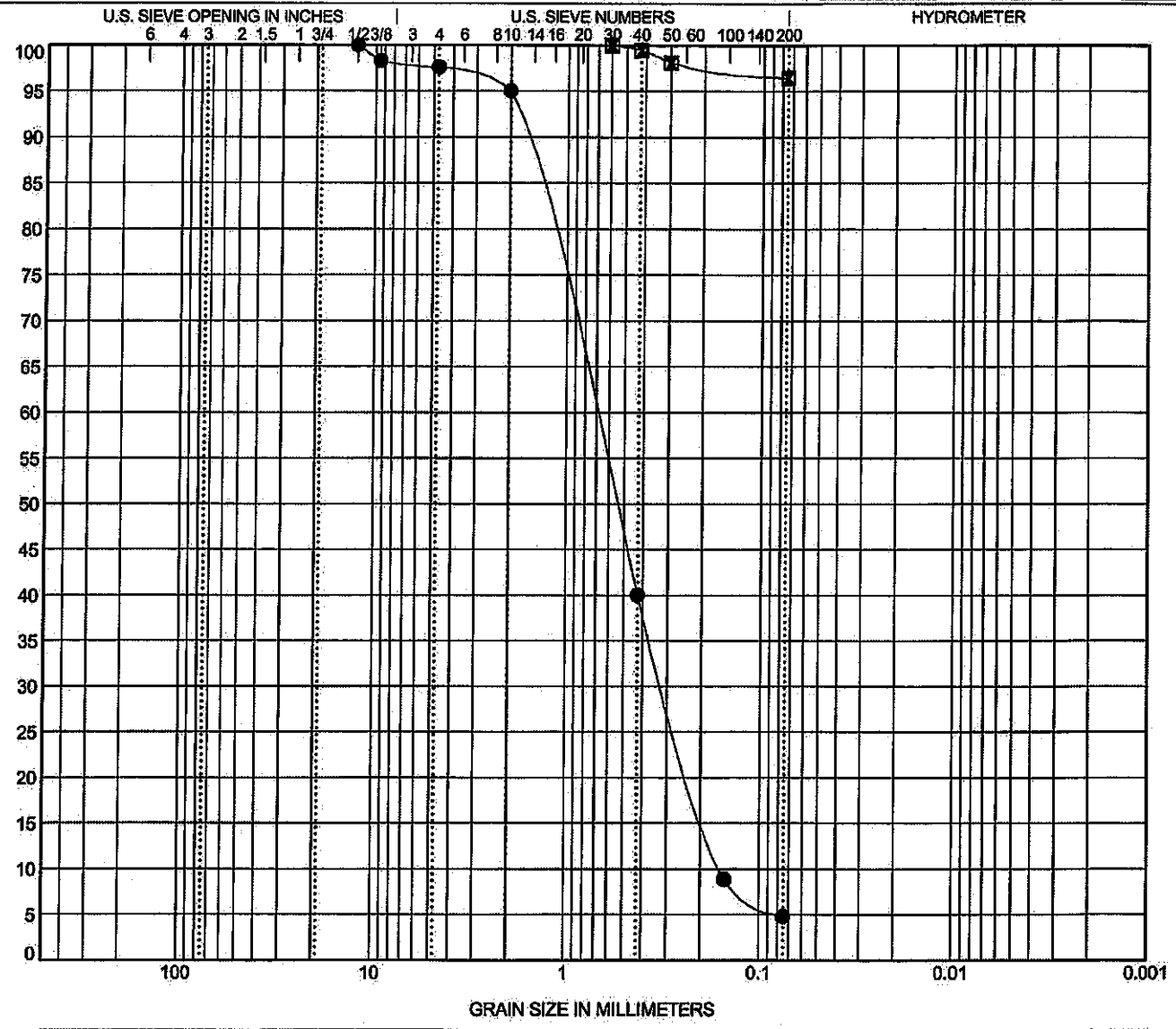
RockSol Consulting Group, Inc.

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

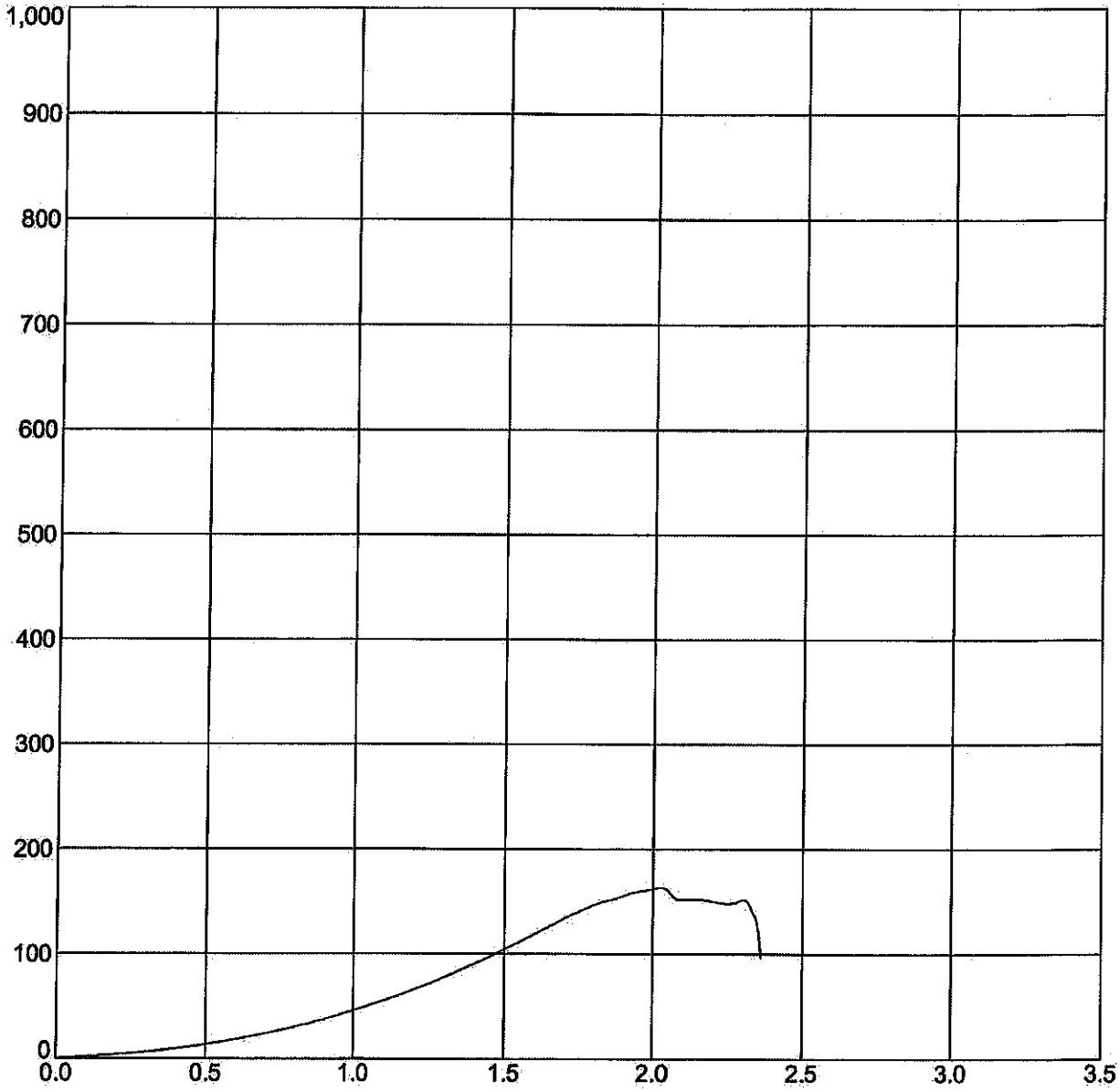
	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B5	47.5	POORLY GRADED SAND(SP)	NP	NP	NP	0.79	4.78
☒	B5	48.0	SILT(ML)	47	31	16		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B5	47.5	12.5	0.745	0.304	0.156	2.4	92.8	4.8	
☒	B5	48.0	0.6				0.0	3.5	96.5	

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC
PROJECT NAME Sutton
ROCKSOL PROJECT NUMBER 230.04
CLIENT PROJECT NUMBER 141.001.01



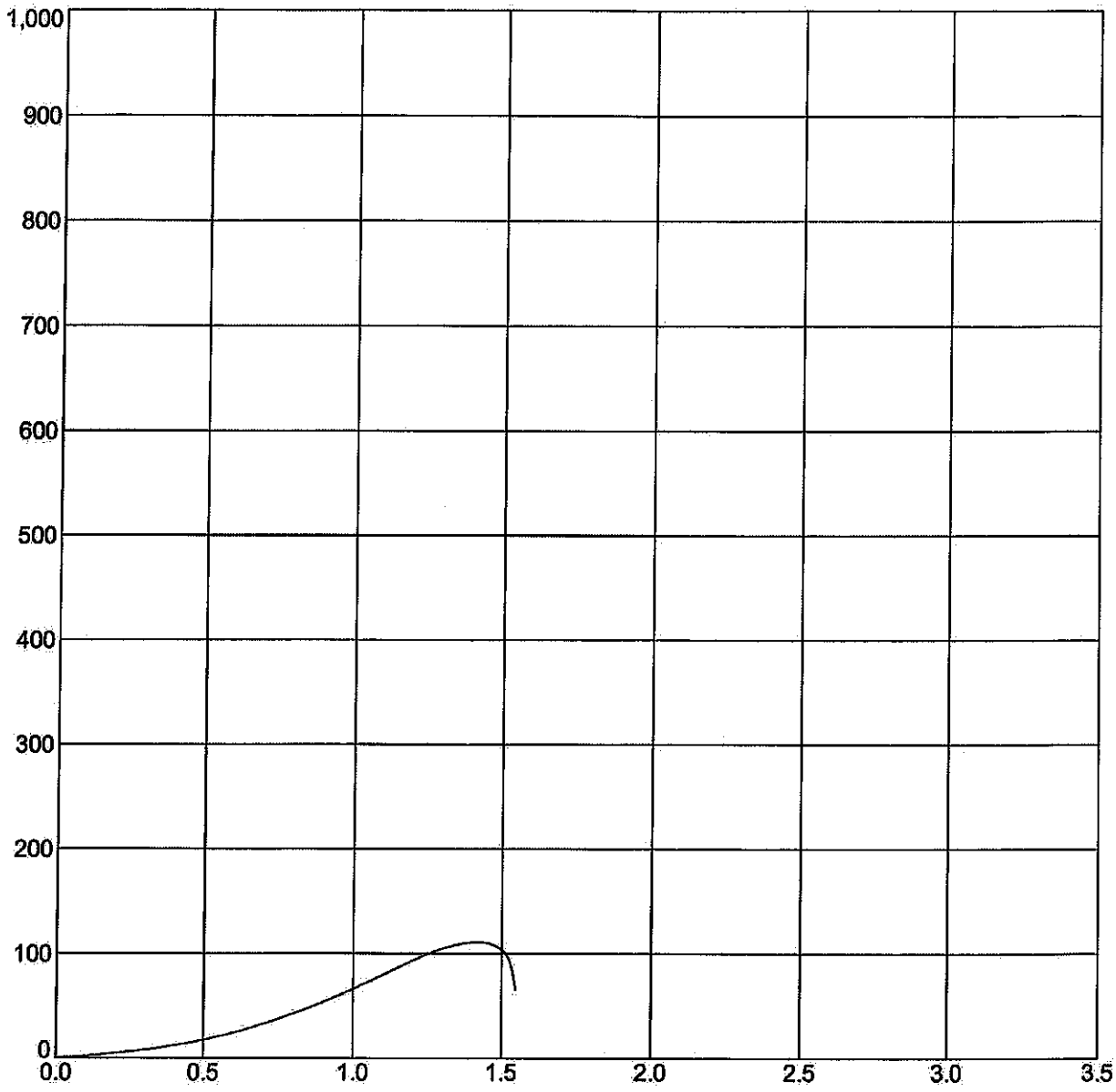
	Specimen Identification		Classification	γ_d (pcf)	MC%
●	B1	21.0	SILTY SAND(SM)	115	15
■					
▲					
★					
◎					
◆					

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC **PROJECT NAME** Sutton

ROCKSOL PROJECT NUMBER 230.04 **CLIENT PROJECT NUMBER** 141.001.01



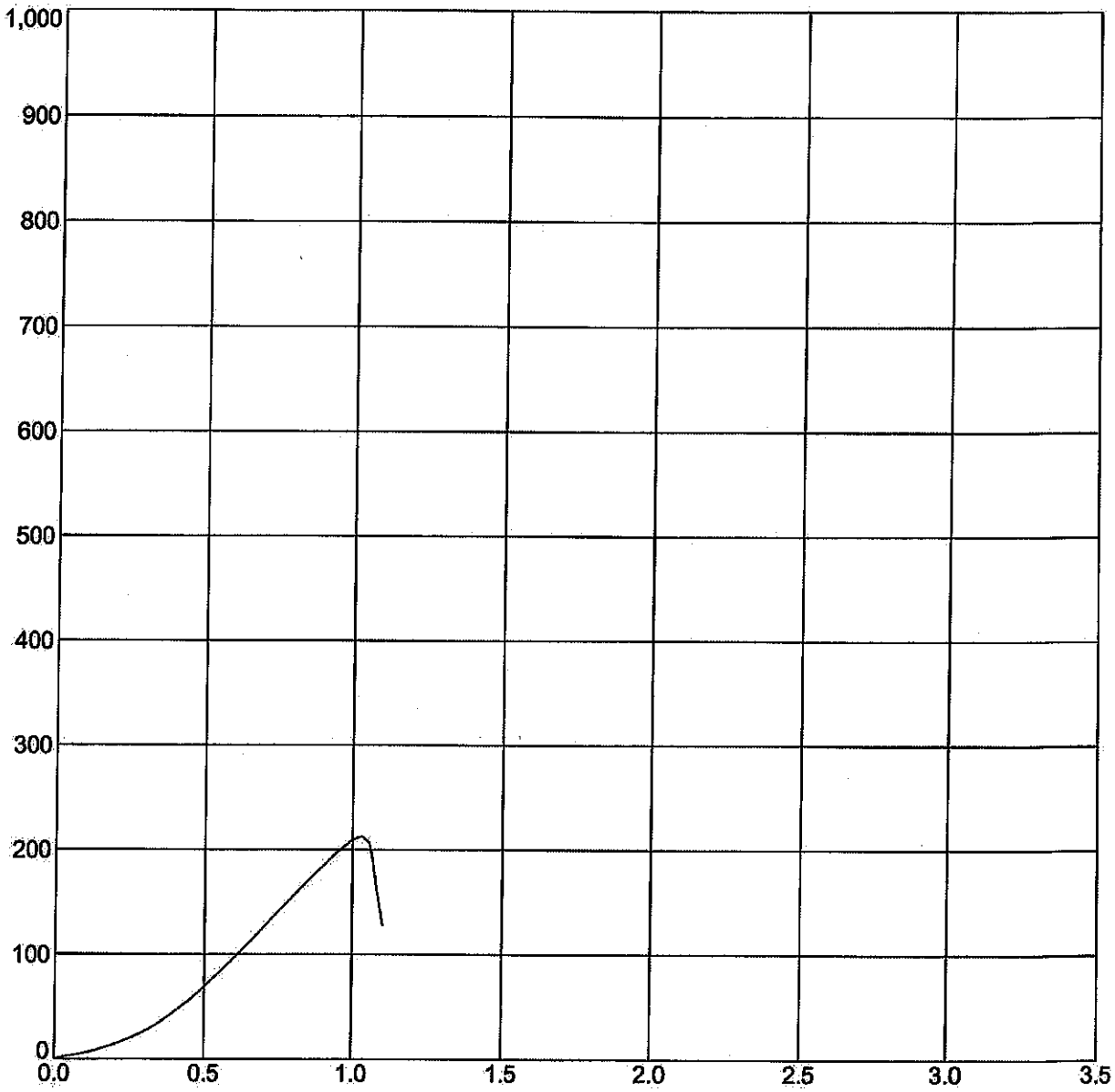
Specimen Identification		Classification	γ_d (pcf)	MC%
● B1 24.5		SILTY SAND(SM)	110	15
▣				
▲				
★				
◎				
✿				

UNCONFINED -CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC
PROJECT NAME Sutton
ROCKSOL PROJECT NUMBER 230.04
CLIENT PROJECT NUMBER 141.001.01



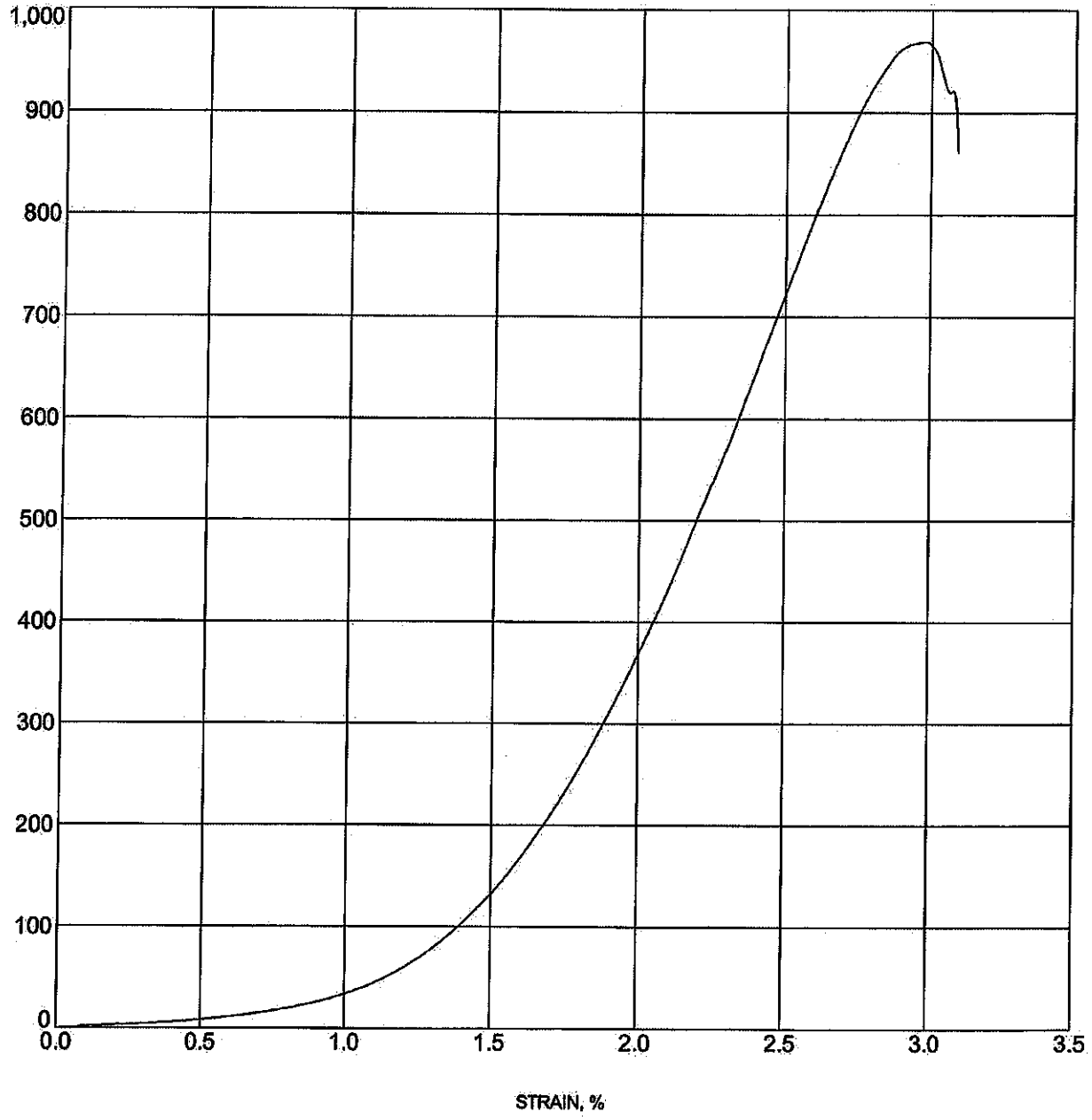
Specimen Identification		Classification	γ_d(pcf)	MC%
● B1 48.0		SILT(ML)	106	22
▣				
▲				
★				
◎				
✿				

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC **PROJECT NAME** Sutton

ROCKSOL PROJECT NUMBER 230.04 **CLIENT PROJECT NUMBER** 141.001.01



Specimen Identification		Classification	γ_d(pcf)	MC%
● B1	53.0	SILT with SAND(ML)	117	15
■				
▲				
★				
◎				
✿				

RockSol
Consulting Group, Inc.

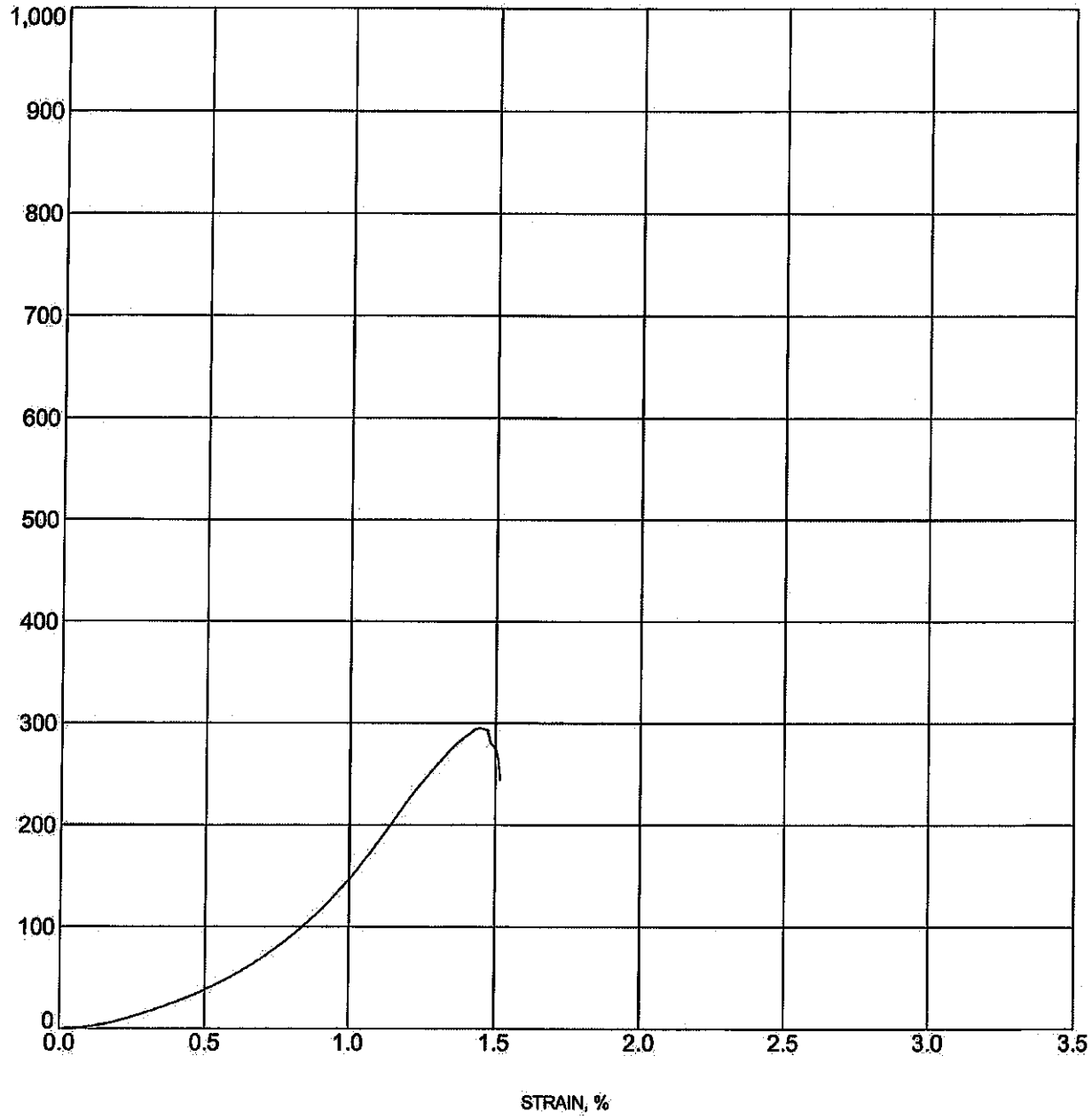
UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC

PROJECT NAME Sutton

ROCKSOL PROJECT NUMBER 230.04

CLIENT PROJECT NUMBER 141.001.01

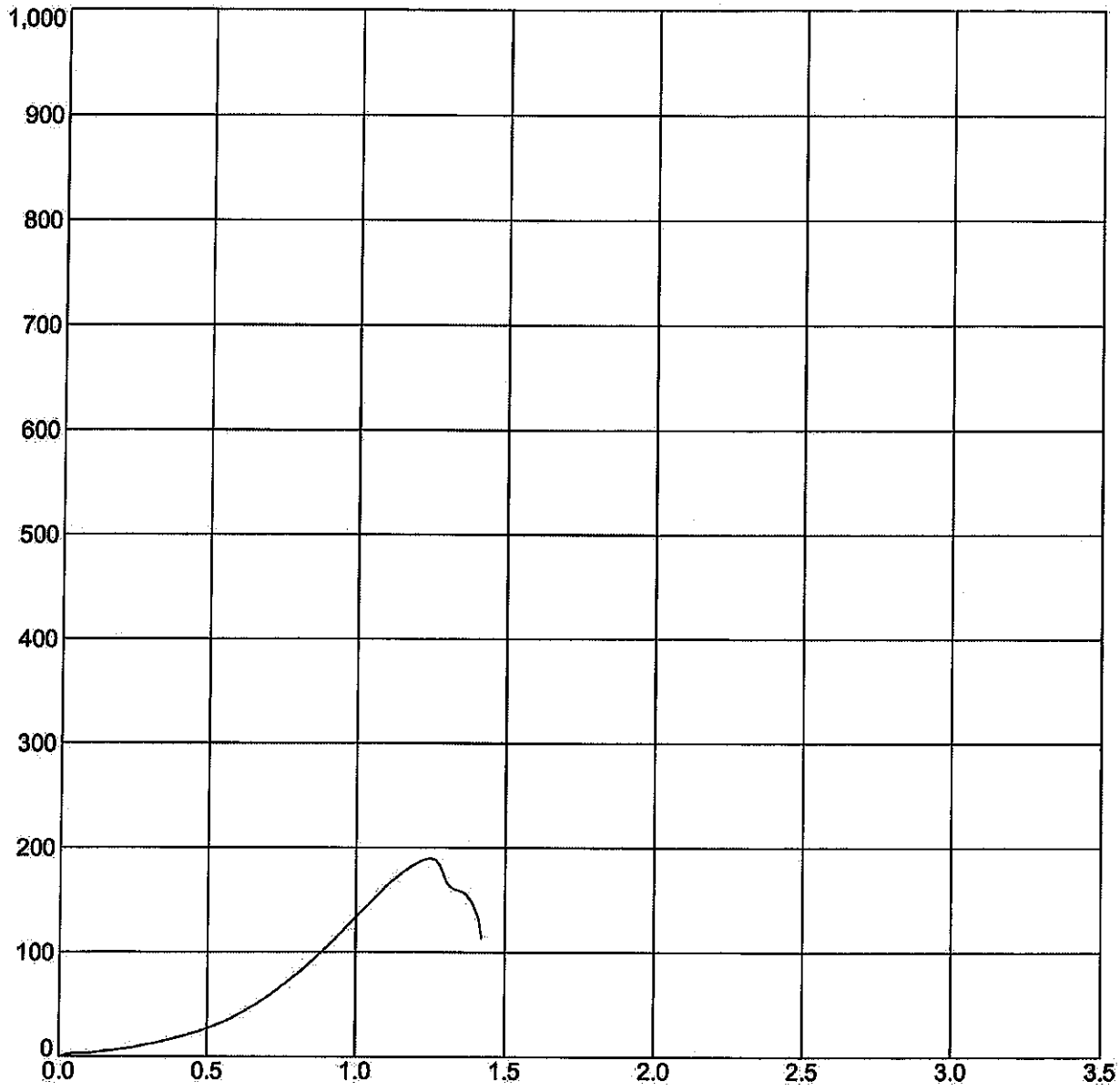


Specimen Identification		Classification	γ_d(pcf)	MC%
● B1 61.0		SILTY SAND(SM)	115	14
▣				
▲				
★				
◎				
✿				

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC
PROJECT NAME Sutton
ROCKSOL PROJECT NUMBER 230.04
CLIENT PROJECT NUMBER 141.001.01



Specimen Identification		Classification	γ_d(pcf)	MC%
● B3 48.0		POORLY GRADED SAND(SP)	118	14
■				
▲				
★				
◉				
✿				

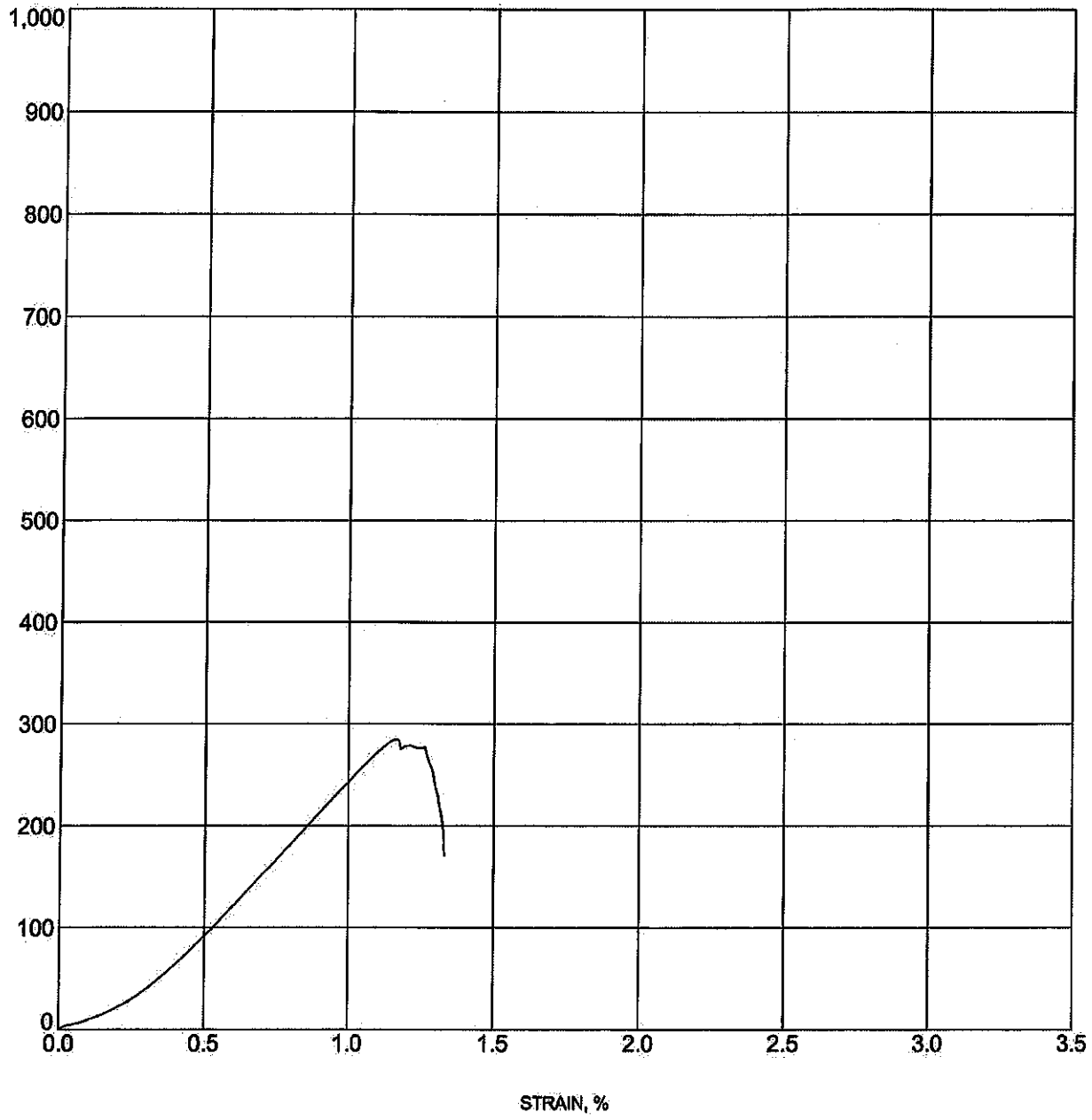
UNCONFINED -CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

RockSol
Consulting Group, Inc.

UNCONFINED COMPRESSION TEST

CLIENT Civil Resources, LLC **PROJECT NAME** Sutton

ROCKSOL PROJECT NUMBER 230.04 **CLIENT PROJECT NUMBER** 141.001.01



Specimen Identification		Classification	γ_d (pcf)	MC%
● B4 49.9		SANDY SILT(ML)	123	13
▣				
▲				
★				
⊙				
✿				

UNCONFINED -CLIENT STANDARD 230.03 SUTTON - CIVIL RESOURCES.GPJ GINT US LAB.GDT 7/22/09

APPENDIX B

ALTERNATIVE COSTS

Opinion of Construction Cost
Alt 1A - Use Existing Pond and Construct East Pond

Site Preparation						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
1	Clear & Grub	1	LS	[redacted]	$24,000	
2	Surveying	1	LS	$10,000	$10,000	
				Subtotal =	$34,000	

Site Work						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
3	Water Control / Pumping	1	LS	$10,000	$10,000	
4	Erosion Control					
	- Silt Fence / Soil Berms	4,300	LF	$1.25	$5,375	
	- Permit / Monitoring/Maintenance	1	LS	$5,000	$5,000	
	- Seed / Mulch	19	AC	$1,250	$23,750	
5	Relocate Existing Electrical Line	8,500	LF	$47	$399,500	Relocate west of existing pond
6	Relocate Water Lines	3,650	LF	$60	$219,000	
7	Relocate Storm Sewer	1,500	LF	$50	$75,000	
				Subtotal =	$737,625	

Grout Curtain						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
8	Grout Curtain (Drill)	1	LS	$1,800,000.00	$1,700,000	Assumes average depth of 45' feet and length of 2,350 LF. Hayward Baker rough estimate.

Embankment						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
9	Embankment Borrowing and Placement	750,000	CY	$1.80	$1,350,000	
10	Outer Slope Protection (Geotextile)	12,000	SY	$6	$72,000	Assume 25' wide (includes anchoring length)
11	Interior slope protection (Type L Riprap)	28,000	CY	$40	$1,120,000	Assumes 2' deep from crest to existing grade
				Subtotal Alt 1A	$2,542,000	

Total Construction Cost Estimate - Alt 1A		
Mobilization	$263,875	5% of total cost by contract
Site Preparation	$34,000	
Site Work	$737,625	
Grout Curtain and Embankment	$4,242,000	
Total Construction Cost Estimate =	**$5,277,500**	

Total Project Cost - Alt 1A		
Construction Cost Subtotal =	$5,277,500	
Engin. / Admin. / Constr. Observ. @ 6% =	$317,000	
Contingency @ 20% =	$1,056,000	
Subtotal =	$1,373,000	
Alt 1A Total Project Cost =	**$6,650,500**	

Opinion of Construction Cost
Alt 1B - Raise Existing Pond and Construct East Pond

Site Preparation						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
1	Clear & Grub	1	LS	[redacted]	$35,000	
2	Surveying	1	LS	$15,000	$15,000	
				Subtotal =	$50,000	

Site Work						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
3	Water Control / Pumping	1	LS	$15,000	$15,000	
4	Erosion Control					
	- Silt Fence / Soil Berms	5,750	LF	$1.25	$7,188	
	- Permit / Monitoring/Maintenance	1	LS	$7,500	$7,500	
	- Seed / Mulch	25	AC	$1,250	$31,250	
5	Relocate Existing Electrical Line	8,500	LF	$47	$399,500	Relocate west of existing pond
6	Relocate Water Lines	3,650	LF	$60	$219,000	
7	Relocate Storm Sewer	1,500	LF	$50	$75,000	
				Subtotal =	$754,438	

Grout Curtain						
Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
9	Grout Curtain (Drill)	470	EA	$955	$1,700,000	Assumes average depth of 45' feet and length of 2,350 LF. Hayward Baker rough estimate.
Embankment						
11	Embankment Borrowing and Placement	970,760	CY	1.80	$1,747,368	
10	Outer Slope Protection (Geotextile)	12,000	SY	6.00	$72,000	Assume 25' wide (includes anchoring length)
11	Interior slope protection (Type L Riprap)	41,000	CY	$40	$1,640,000	Assumes 2' deep from crest to existing grade
				Subtotal Alt 1B	$3,459,368	

Total Construction Cost Estimate - Alt 1B		
Mobilization	$313,884	5% of total cost by contract
Site Preparation	$50,000	
Site Work	$754,438	
Grout Curtain and Embankment	$5,159,368	
Total Construction Cost Estimate =	**$6,277,690**	

Total Project Cost - Alt 1B		
		Notes
Construction Cost Subtotal =	$6,277,690	
Engin. / Admin. / Constr. Observ. @ 6% =	$377,000	
Contingency @ 20% =	$1,256,000	
Subtotal =	$1,633,000	
Total Project Cost =	**$7,910,690**	

Opinion of Construction Cost
Alt 2 - Construct one large pond

Site Preparation

Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
1	Clear & Grub	1	LS	[redacted]	$32,000	
2	Surveying	1	LS	$20,000	$20,000	
				Subtotal =	*$52,000*	

Site Work

Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
3	Water Control / Pumping	1	LS	$20,000	$20,000	
4	Erosion Control					
	- Silt Fence / Soil Berms	5,750	LF	$1.25	$7,188	
	- Permit / Monitoring/Maintenance	1	LS	$7,500	$7,500	
	- Seed / Mulch	17	AC	$1,250	$21,250	
5	Relocate Existing Electrical Line	8,500	LF	$47	$399,500	Relocate west of existing pond
6	Relocate Water Lines	4,000	LF	$60	$240,000	
7	Relocate Storm Sewer	1,500	LF	$50	$75,000	
				Subtotal =	*$770,438*	

Grout Curtain

Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
9	Grout Curtain (Drill)	470	EA	$955	$1,700,000	Assumes average depth of 45' feet and length of 2,350 LF. Hayward Baker rough estimate.

Embankment

Item #	Item	Qty	Unit	Unit Cost	Total Cost	Notes
10	Embankment Borrowing and Placement	1,125,000	CY	$1.80	$2,025,000	
10	Outer Slope Protection (Geotextile)	12,000	SY	$6	$72,000	Assume 25' wide (includes anchoring length)
11	Interior slope protection (Type L Riprap)	46,000	CY	$40	$1,840,000	Assumes 2' deep from crest to existing grade
				Subtotal Alt 2	*$3,937,000*	

Total Construction Cost Estimate - Alt 2

Mobilization	$339,970	*5% of total cost by contract*
Site Preparation	$52,000	
Site Work	$770,438	
Grout Curtain and Embankment	$5,637,000	
Total Construction Cost Estimate =	***$6,799,408***	

Total Project Cost - Alt 2

		Notes
Construction Cost Subtotal =	$6,799,408	
Engin. / Admin. / Constr. Observ. @ 6% =	$408,000	
Contingency @ 20% =	$1,360,000	
Subtotal =	*$1,768,000*	
Alt 2 Total Project Cost =	***$8,567,408***	

COLORADO INTERGOVERNMENTAL RISK SHARING AGENCY
(CIRSA)
CERTIFICATE OF PARTICIPATION
FOR PROPERTY/CASUALTY COVERAGES
issued to the

Town of Castle Rock

CIRSA hereby certifies that the above-named entity is a participating member of CIRSA for property/casualty coverages for the coverage period of January 1, 2020 to January 1, 2021.

CIRSA liability coverages for the coverage period will be as described in a CIRSA liability policy and Pennsylvania Manufacturers' Association Insurance Company reinsurance policy which will provide the liability and errors and omissions coverages summarized below. CIRSA property and crime coverages for the coverage period will be as described in a CIRSA property policy, excess policies from the carriers identified on the attached Property Coverage Schematic, and deductible buy-back policy from participating Lloyds Syndicate market insurers.

The coverages, conditions of membership, and other provisions applicable to CIRSA property/casualty members are described in CIRSA's Bylaws and Intergovernmental Agreement, coverage and/or excess/reinsurance coverage policies, and general policies adopted by the members, as from time to time amended.

The types and monetary limits of the coverages to be provided to CIRSA property/casualty members for the coverage period shall be as described below. The scope, terms, conditions, and limitations of the coverages shall be governed by the applicable policies and/or excess/reinsurance policies, the CIRSA Bylaws and Intergovernmental Agreement, and other applicable documents.

I. **TYPES OF COVERAGES** (subject to the limit on CIRSA's liability as described in Section II below)**:**

A. Property coverage (including auto physical damage and public relations, privacy breach, and cyber extortion expense)
B. Liability coverage:
    1. General liability
    2. Auto liability
    3. Law enforcement liability
    4. Public Officials errors and omissions liability
    5. Security and privacy breach liability
C. Crime coverage (including employee dishonesty and money and securities)

II. CIRSA Loss Funds, Retentions, Excess Insurers/reinsurers, Aggregate Limits, and Member Deductibles:

For the coverages described in Section I, CIRSA shall be liable only for payment of the applicable self-insured retentions and only to a total annual aggregate amount for CIRSA members as a whole of the amount of the applicable CIRSA loss fund for the coverage period. There shall be no aggregate excess coverage over any loss fund.

Coverages in excess of CIRSA's self-insured retentions shall be provided by the applicable excess insurers and/or reinsurers in applicable excess and reinsurance policies and shall be payable by those excess insurers and/or reinsurers.

The limits of coverage provided by the excess insurers and/or reinsurers for the coverage period shall be described in the coverage documents issued to the members. Sublimits, aggregate and other limits shall apply as provided in said documents.

CIRSA Loss Fund Amounts for the Coverage Period:

Loss fund amounts are as adopted or amended from time to time by the Board of Directors based on the members in the property/casualty pool for the year. Information on current loss fund amounts is available from the CIRSA Chief Financial Officer.

CIRSA Self-Insured Retentions for the Coverage Period:

A. $1,000,000 each and every loss and/or occurrence property*
B. $100,000 each claim/annual aggregate public relations and security breach
C. $1,000,000 each and every loss and/or occurrence liability
D. $1,000,000 each and every claim Public Officials liability
E. $500,000 each claim/annual aggregate security and privacy liability
F. $150,000 each and every loss and/or occurrence crime

*Subject further to CIRSA retention of first $5,000,000 each and every hail/wind loss and/or occurrence

Excess Insurers/Reinsurers for the Coverage Period:

A. Property: Per Property Coverage Schematic attached
B. Liability: Pennsylvania Manufacturers' Association Insurance Company (reinsurance)
C. Excess Crime: AIG

LIMITS/EXCESS LIMITS FOR THE COVERAGE PERIOD:

A.	Excess property:	to $500 million per claim/occurrence
B.	Excess liability:	to $10 million per claim/occurrence (except excess auto liability to $5 million and Public Officials Errors and Omissions and class-action suits arising out of discrimination to $10 million per claim/$10 million annual aggregate per member)
C.	Excess Crime (optional):	up to $5 million per claim/occurrence

III. MEMBER DEDUCTIBLES:

The member shall be responsible for payment of the member-selected deductible on each claim/occurrence. The deductible amounts selected by the above named entity are: $100,000 (Liability), $5,000 (Auto Liability), $100,000 (Auto Physical Damage), and $100,000 (Property). Payment of the deductible shall reduce the amount otherwise payable under the applicable CIRSA retention. In the event of a loss or occurrence involving more than one CIRSA member, each member shall pay its full applicable deductible(s).

IV. POLICIES GOVERN PAYMENTS:

Payments within the member's deductible(s) and/or CIRSA's self-insured retention(s), or in excess of the member's deductible(s) and/or CIRSA's self-insured retention(s), in connection with any claims/occurrences shall be governed by the excess and/or reinsurance policies.

Countersigned on behalf of the Colorado Intergovernmental Risk Sharing Agency.

Tami A. Tanoue, Executive Director