Briar Branch Channel Improvements
(Units W140-01-00)

Preliminary Engineering Report

Prepared for:
Memorial City Redevelopment Authority

TIRZ 17
REDEVELOPMENT
AUTHORITY

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September 16, 2013

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Background

Lockwood, Andrews & Newnam, Inc. (LAN) was authorized by the Tax Increment Reinvestment Zone No. 17 (TIRZ 17) to prepare a preliminary engineering report for potential channel improvements to Harris County Flood Control (HCFCD) Unit No. W140-01-00 (Briar Branch) from Gessner Road east to TIRZ 17's proposed Briar Branch Detention Basin. This basin is currently under construction east of Bunker Hill Road, and is the first phase of a mulit-phase regional drainage solution for the Briar Branch watershed north of IH-10 and west of Blaylock. The proposed channel improvements, which are the focus of this report, are the second phase of the regional drainage solution. The third and final phase involves storm sewer improvements that drain to the proposed improved channel.

Problem Statement

Briar Branch is within a relatively flat region just north of IH-10 and is south of the Long Point Fault. This fault has approximately 2-4-feet of elevation difference along its length through this area. The lower area on the south side of the fault presents a significant topographic challenge in terms of adequately draining the area between the fault and IH-10. Much of the study area adjacent to the channel is lower in elevation than the channel top bank. This topographic challenge results in problems with overland flow accessing the channel and with sufficient elevation for proper storm sewer function. The results is structural flooding simulated in advanced computer models and supported by evidence from the April 2009 flooding event.

To address these challenges a multi-phase regional solution concept was developed as part of the 2012 TIRZ 17 Regional Drainage Study. As described above, the proposed channel improvements are the second phase of the adopted regional solution which contains three phases in total.

Challenges specific to improving Briar Branch start with the limited Rights-of-Way (ROW). The majority of the channel falls within a 50 foot HCFCD easement. The existing channel does not meet current HCFCD design criteria. This is due in large part to the ROW width, channel depth, side slopes, and maintenance berm width. Improvements to the channel within the existing easement limits are also unable to meet HCFCD design criteria.

HCFCD Coordination

This report is to provide a means for HCFCD to further evaluate the proposed alternatives with an end goal of an agreed to proposed channel configuration and associated maintenance responsibilities. Continued coordination with HCFCD is recommended throughout the design process to ensure their expert knowledge is integrated into the design and that their concerns are adequately addressed.

Jurisdictional Determination

A request for a jurisdictional determination for Briar Branch was submitted to the Galveston District of the Army Corps of Engineers in 2012. The channel was determined to be non-jurisdictional on February 20, 2013 (SWG 2012-00174) and does not "contain waters of the United States".

Improvement Concepts

Multiple improvement concepts were developed to balance flood damage reduction benefit, constructability challenges, potential for adjacent impacts, maintenance, and safety. Five (5) improvement alternatives were considered in detail and are presented in detail in this report. The following is a list of the alternatives considered.

Alternative Descriptions

Alternative	Description	Notes
A	Rectangular Concrete Low Flow	Extension of existing channel section from 1300 feet east of Bunker Hill upstream to Gessner Road.
B	Dry Bottom Storage Channel	Maximum cross-sectional area at minimum flow line slope. Vertical wall configuration with maintenance berm in channel on bench.
C	Wet Bottom Storage Channel	Maximum cross-sectional area with flat flow line slope and storage pools. Vertical wall configuration with maintenance berm located in channel.
D	Hybrid Storage Channel	Alternative B with flatter side slopes and less cross-sectional area
E	Storm Sewer Box Enclosure	Storm sewer boxes with shallow swale above the box culvert that is collected with drainage inlets.

A typical section representation of each alternative can be viewed on **Exhibits 8a through 8e**. A detailed matrix of considerations, advantages, disadvantages, benefits, and statistics is provided on **Table 2**. Information documented in Table 2 includes flood damage reduction, channel cross sectional area and volume, typical velocities, maintenance challenges including desiltation and mowing, constructability challenges, water quality, potential to cost share, and construction cost estimate.

Flood damage reduction was measured in terms of structures removed from flooding using the two-dimensional (2D) regional stormwater model developed for the 2012 TIRZ 17 Regional Drainage Study. Phase 1 (mitigation detention basin) and Phase 3 (storm sewer improvements) regional solution components were held constant to measure the effectiveness of each alternative channel improvement. Structures estimated to be removed flooding range from 66 for Alternative E to 78 for Alternative C.

Alternatives B, C and D are shown as the most effective in reducing storm water elevations and flood risk in the area. This is a function of the additional in-line channel storage provided with these alternatives. The flood damage reduction potential is directly related and proportional to the provided storage volume for each alternative. Alternatives A and E provide valuable benefit but are less effective relative to B, C and D due to their smaller cross sectional area and correspondingly lower storage volumes.

Impact Evaluation

The potential for impacts to adjacent and downstream areas was a primary consideration during the evaluation of the various improvement options. This report assesses the ability and the difficulty to demonstrate no adverse impact as a factor when evaluating alternatives. Significant attention was given to the advantages, disadvantages, and complexities of each alternative related to constructing a no adverse impact solution. Channel improvement options that efficiently convey water downstream pose a greater challenge than those that slow the water down through storage. To prevent downstream impacts, control structure adjustments to the detention basin (currently under construction) were evaluated.

All channel improvement scenarios were evaluated for potential downstream impacts. The channel improvement that presents the greatest challenge for demonstrating no adverse impact is Alternative A - Rectangular Concrete Low Flow. This improvement alternative has the least amount of added channel storage and is the most efficient conveyance configuration. A detailed impact analysis evaluation was performed for Alternative A only as the worst case scenario. This action functions as a way of demonstrating the ability for each of the alternatives to be constructed with no adverse impact. A detailed impact analysis will be performed on the selected alternative to determine the appropriate basin weir configuration and accompanying storm sewer improvements (Regional Solution Phase 3) that are necessary to prevent and demonstrate no adverse impact.

Recommendation

All channel improvement alternatives will accomplish the key goal of lowering the water surface elevation in the channel to relieve the adjacent community without causing adverse impact. The different alternatives provide varying levels of benefit and include advantages and disadvantages relative to each other. The purpose of this report is to present the alternatives to HCFCD to facilitate review and general approval of acceptable alternatives. While this report presents recommended alternatives, TIRZ 17 is committed to working with HCFCD to select the alternative that provides the right balance of flooding relief and maintenance considerations. Variations to the presented alternatives proposed by HCFCD that better meets the needs will be considered and evaluated.

Alternatives B (Dry Bottom Storage) and D (Hybrid Channel Storage) have the best blend of potential benefits and other considerations, and are therefore recommended as the preferred alternatives. Alternatives B and D minimize potential maintenance issues relative to the other alternatives and favorable constructability scenarios. All five alternatives include complete maintenance access per the HCFCD Policy Criteria manual. Maintenance access paths and routs are shown on **Exhibit 12.** Alternative C (Wet Bottom Storage) provides similar benefit to B and D but is more costly to construct and maintain. Alternatives A (Rectangular Concrete Low Flow) and E (Storm Sewer Box Enclosure) are considered the most conventional or traditional improvements but provide the least benefit of the five alternatives. The estimated construction cost for Alternatives B & D is approximately $9 million. Alternative C is estimated at over $10 million and Alternatives A and E are estimated at $4 million and $13 million respectively.

Alternatives B and D are considered the optimal approach in implementing Phase 2 of the Briar Branch Regional Solution. Additional data in the report evaluates considerations such

as maintenance access, structural elements, and long term maintenance, and can be reviewed in more detail within the report as desired.

1.0 INTRODUCTION

1.1 Project Description

In June 2012, Lockwood, Andrews & Newnam, Inc. (LAN) was authorized by the Tax Increment Reinvestment Zone No. 17 (TIRZ 17) to prepare a preliminary engineering analysis for improvements to Briar Branch (W140-01-00) channel that were originally identified by the TIRZ 17 Regional Drainage Study (RDS). This report summarizes the preliminary engineering efforts for the proposed channel improvements to Briar Branch between Gessner Road and 1300 feet east of Bunker Hill Road. The RDS included W151, W153, and portions of the W140-01-00 subwatershed. The focus of the RDS was on the identification and or confirmation of drainage problems in the RDS study area, and the identification of efficient and effective solutions. The proposed channel improvements are the second phase of the regional drainage solution. The first phase of the regional improvement plan is the construction of a regional detention basin adjacent to and south of Briar Branch. The regional detention basin is currently under construction. The third and final phase involves storm sewer improvements that drain to the proposed improved channel.

1.2 Project Limits

The proposed channel improvements begin at Gessner Road and extend downstream to the regional detention basin, which is currently under construction, located 1300 feet east of Bunker Hill Road on the south side of Briar Branch. The primary study area limits used to evaluate the project beginning at Conrad Sauer Road and extending east to Campbell Road. The study limits are largely consistent with the FEMA effective contributing area for subbasin W140C, as shown on **Exhibit 1**, Project Location Map.

1.3 Project Objectives

The objective of this project is to reduce flooding and flood damages for the area contributing to Briar Branch between Gessner Rd and the basin with a focus on the area south of the Long Point Fault and north of IH-10. This area is shown on **Exhibit 2**, Effective Floodplain and W140C Drainage Area Map. The channel improvements are the second phase of a regional solution that will benefit the target area. The intended purpose of the channel improvements is to lower the water surface in Briar Branch to relieve the storm sewer systems contributing to the channel that drain the target improvement area.

The basin, which was the first phase of the regional solution and is currently under construction, serves to mitigate for the channel improvements. The final phase will consist of storm sewer improvements along adjacent roadways, which will also be mitigated in the basin. Collectively, this three-phased regional solution serves to reduce flooding and flood damages in the target area.

1.4 Report Objectives

This report serves to document the alternatives analysis and selection of a preferred alternative for improving Briar Branch Channel. Multiple channel improvement alternatives will be detailed and a selection process will be applied to give a

recommended improvement alternative. While the subject will be discussed here, this report is not intended for demonstrate no adverse impact of either then channel improvements or the full regional solution. It is anticipated an impact analysis will be submitted separately for the channel improvements before the approval of the construction documents.

1.5 Assumptions and Constraints

A fully dynamic analysis of the interaction between W140-01-00, W151-00-00 and W153-00-00 was performed for this study. This dynamic analysis dictates the interaction of the watersheds including the volume and peak of runoff passing from one subbasin to another. Consistent with the TIRZ 17 RDS and the two HCFCD W151 studies, the 10-year event is the design event for this improvement. Additional regional improvements are currently being planned that will relieve W151-00-00 and assist in achieving a 100-year level of protection for the Briar Branch region.

1.6 Project Survey and Datum

All project data sources, engineering and analysis results reference the TSARP Benchmark Network and the NAV Datum 1988 with 2001 Adjustment. The following sources were used for topographic information:

- A survey of the channel was performed by Kuo & Associates, Inc. in August 2012. This data was used as the basis of the existing conditions channel cross sections, as well as the pipe outfall and other elevation information.
- For overbank cross section information where survey data was unavailable, the HCFCD 2008 LiDAR data was utilized.

1.7 Prior Studies

The following studies have been completed in this area and were utilized in the development of the RDS and/or specifically for this analysis effort:

- Katy Freeway Program – 2002 - TxDOT – An XP-SWMM model was developed for the drainage system that connects to W151 and drains N. Gessner and Witte Roads. A series of oversized box culverts were used under the IH-10 frontage roads to mitigate the impacts of the IH-10 highway expansion.
- Tropical Storm Allison Recovery Project (TSARP) – HCFCD/FEMA – Completed effective models for the entire Harris County area, with effective maps updated June 18, 2007. This study included Briar Branch up to Adkins Road and did not include Blalock Road just upstream of this bridge structure.
- Drainage Study of Briar Branch – August 2007 – Memorial City Redevelopment Authority (TIRZ 17) – This study extended the Briar Branch FEMA effective models to Gessner Road, and looked at the level of service for this channel, and investigated potential improvements in the area.
- W151 Implementation Study – 2009 – HCFCD – This study focused on areas in the W151-00-00 watershed downstream of IH-10; however it included the TxDOT Katy Freeway Program drainage models and improvements to the IH-10 corridor. This included the large Briar Branch drainage areas north of IH-10, but did not look at the hydraulics of Briar Branch. The assumptions used in the

TxDOT – Katy Freeway Program analysis of the IH-10 area were kept in this modeling.

- TIRZ 17 Regional Drainage Study (RDS) – 2010 – Memorial City Redevelopment Authority (TIRZ 17) – studied portions of the W140-01-00, W151-00-00 and W153-00-00 watersheds that drain the TIRZ 17 area that were heavily impacted by the April 2009 storm event. This model is an inlet-level, 2D analysis of more than 3,000 acres, using InfoWorks.
- Briar Branch Stormwater Detention Basin Impact Analysis Report – 2013 – TIRZ 17 – studied W140-01-00 for the purpose of permitting and approval of a regional detention basin intended to mitigate for future channel and storm sewer improvements. This report was approved by HCFCD on May 28th, 2013.

2.0 EXISTING CONDITIONS

The Briar Branch watershed covers a relatively flat area north of IH-10, south of Neuens Road, east Conrad Sauer Road, and west of Campbell Road. Portions of the area have been documented as being susceptible to flooding, especially the areas located immediately north of Briar Branch and south of the Long Point Fault line that traverses this area. This report section reviews the existing conditions of the area.

2.1 Location and Topography

This study reviews the portion of Briar Branch within the W140C subbasin as defined for the FEMA Effective Model for the Buffalo Bayou watershed. Subbasin W140C has an area of 2.75 sq. miles at a slope of approximately 0.14% from the northwest corner of the subbasin down to the southeast corner. Redevelopment has occurred on much of the land between Briar Branch and IH-10, and areas along N. Gessner are currently under redevelopment. The most distinguishing characteristic of the area is the Long Point Fault that runs from the southwest corner to the northeast corner of W140C, just north of Briar Branch. There is approximately 3-5 feet of drop across the fault in this area.

Many of the roadways north of Briar Branch within the Spring Branch Woods and Long Point Woods subdivisions are at elevations lower than the top of bank at Briar Branch, which limits conveyance into Briar Branch. Storm sewer systems drain these areas to Briar Branch, but there are few effective overland pathways to drain the areas into Briar Branch.

2.2 Land Use

The northern portion of the study area is mostly residential, while the portion along IH-10 is mostly commercial. The FEMA Effective model determined that this area is 58.8% impervious cover and is considered fully developed. The existing conditions dynamic model uses data from the Harris County Appraisal District (HCAD and aerial imagery to determine that the area draining to Briar Branch is approximately 61.3% impervious. The current land use is shown on **Exhibit 3**, Land Use Map.

2.3 HCFCD Facilities and Unit Numbers

Briar Branch is HCFCD Unit #W140-01-00 and is the focus of this analysis and the proposed improvements. Briar Branch drains to Spring Branch (HCFCD Unit #W140-00-00) near Wirt Road, and eventually Buffalo Bayou (HCFCD Unit #W100-00-00) near Chimney Rock Road. Other channels that drain to Briar Branch within the vicinity of the proposed improvements include an existing drainage channel between Springrock Lane and Confederate Road named W140-01-05 connects to Briar Branch via a 72" CMP.

2.4 Jurisdictional Determination

A request for a determination for Briar Branch was submitted to the Galveston District of the Army Corps of Engineers in 2012. The channel was determined to be non-jurisdictional on February 20, 2013 (SWG 2012-00174) and does not "contain waters of the United States", and is not subject to Section 10 of the Rivers and Harbors Act or

Section 404 of the Clean Water Act and does not require a Department of the Army permit.

2.5 Right-of-Way

Briar Branch right-of-way varies from 50-feet wide at Gessner Road to 45-feet wide just west of Witte Road, to 50-feet wide from Witte Road to Bunker Hill Road to 60' downstream of Bunker Hill Road to the Briar Branch Detention Basin. The right-of-way is made up of various fee, deed, and easement strips, which are shown in **Exhibit 4**, Right-of-Way Map. In some locations these property descriptions overlap as shown just north of the Briar Branch Detention Basin. A previous maintenance project by HCFCD in 2011 removed a number of encroachments to the channel; however there are a number of remaining encroachments along the project that will be subject to removal for this project.

2.6 Pipelines and Utilities

Within the Briar Branch Channel project limits there are a number of utilities and easements. The following is a listing of pipelines and utilities that are crossing or are parallel with the project. These utilities can be seen on **Exhibit 4**, Right-of-Way Map, or channel stations that can be referenced on **Exhibit 13**, Briar Branch Plan and Profile drawings.

- Witte Road (Right-of-Way)
  - 21" and 10" sanitary sewer lines
  - 20" water line

- Bunker Hill Road (Right-of-Way)
  - 6" and 8" sanitary sewer lines
  - 12" water line.

- Briar Branch Basin –
  - An 8" water line crossing at the downstream property line of the basin site.

- Utilities within 10-ft Easement parallel and along north side of Briar Branch Channel or other parallel utilities.
  - 2-inch Centerpoint gas line (From Gessner to Witte Road, and from Bunker Hill to Confederate Lane)
  - Centerpoint overhead power lines (Gessner to Confederate Lane)
  - 10-inch Sanitary Sewer (From Witte Road to just west of Bunker Hill Road)
  - 6, 8, and 10-inch Sanitary Sewer from Bunker Hill Road to Confederate Lane)
  - 4-inch Centerpoint Gas along South right-of-way from STA. 38+20 to 22+50

- Utility Crossings
    - 8-inch Sanitary at STA. 52+20
    - 21-inch Sanitary at STA. 50+00
    - 10-inch Sanitary at STA. 48+60
    - 20-inch Water at STA. 48+20
    - SBC Buried Cable STA 47+10
    - 10-inch Sanitary at STA. 46+25
    - 2-4-inch Steel Pipes near STA 46+25
    - ½ - inch Steel Pipe near STA 46+25

3.0 HYDROLOGY & HYDRAULICS

3.1 Analysis Objectives

The primary analysis objective is to evaluate the performance of multiple Briar Branch Channel improvement alternatives. This evaluation includes flood damage reduction effectiveness and potential for adverse impacts. Modeling for this study is consistent with the Briar Branch Detention Basin Drainage Impact Study (April 2013), as the same Infoworks 2D models used in this previous study were used to evaluate channel improvement alternatives. A discussion of the hydrology of the area and development of the hydrologic and hydraulic models is included (from the April 2013 study) below for reference.

3.2 Hydrologic Modeling Methodology

Hydrology for the dynamic model was developed using an inlet level analysis between Conrad Sauer Rd and Campbell Rd. The following is a summary of the hydrologic study approach. Please reference **Appendix A,** Briar Branch Stormwater Detention Basin Impact Analysis, for a more detailed discussion of the hydrologic and hydraulic analysis. This prior report also contains results for Phase 1 (Basin Only), Phase 2 (Channel Improvements), which represent Alternative A, and Phase 3 (Storm Sewer Improvements).

Drainage area boundaries were delineated utilizing 2008 LiDAR data in combination with field visit verification. Boundaries from previous studies, as-built drawings, or models were confirmed to the extent reasonable prior to inclusion in the study. Percent impervious values were calculated for each drainage area based on the most recent land use data available from Harris County Appraisal District (HCAD), and reviewed with aerial imagery and updated as necessary. The slope for each drainage area was calculated using GIS and the 2008 LiDAR data. A drainage width parameter for each drainage area was assigned based on its physical dimensions.

Total subcatchment runoff volume was determined using initial abstractions for impervious surfaces and Green & Ampt infiltration for pervious surfaces. Subcatchment runoff routing was determined using Storm Water Management Model (SWMM) routing utilizing two of the three normally used surfaces; impervious area with initial abstraction, and pervious area with initial abstraction. To be consistent with the HCFCD W151-00-00 implementation study methods, impervious area without initial abstraction was not determined. Losses were computed using the Green & Ampt method with loss rates set according to the values in the TSARP white paper titled "Recommendation for: Replacing HEC-1 Exponential Loss Function in HEC-HMS." Note that this is different from the FEMA effective model for Buffalo Bayou, which used values outside the ranges recommended in the TSARP white paper.

3.3 Hydraulic Modeling Methodology

Hydraulics calculations are performed with the InfoWorks ICM model. The model consists of an inlet-level analysis between Conrad Sauer Road and Campbell Road. The

study area between the proposed basin location and Campbell Road was added to the dynamic model study area to better match the extents of the W140C subbasin of the FEMA effective model. Hydraulic parameters for storm sewers and box culverts were assigned according to the Manning's roughness "n" values set forth in the City of Houston Infrastructure Design Manual. Harris County Flood Control drainage channels are modeled with roughness values according to those outlined in the HCFCD *Hydrology & Hydraulics Guidance Manual* and the HCFCD *Policy Criteria & Procedure Manual*. Briar Branch is modeled using one dimensional (1D) river reaches that are similar to HEC-RAS sections, in order to more accurately define channel cross sections. Overbank flows are handled with the InfoWorks ICM 2D computation engine, as are inlet ponding and overland flow computations. **Exhibit 5**, Dynamic Model Drainage System Map shows all the drainage system and elements used in the 2D analysis.

Pipe and channel hydraulic calculations are handled using dynamic pipe flow calculations and a 2D mesh surface for storage and surface flow routing. The InfoWorks ICM software utilizes a combination of numeric methods for solving the Saint Venant equations to determine hydraulic states within the model. Once subsurface storm sewer capacity is exceeded, water will overflow onto the 2D mesh surface of the model.

The 2D surface was developed using the 2008 Harris County LiDAR supplemented with survey data in areas where topographic changes were known to have occurred. Buildings within the study area are modeled as void spaces to prevent flow through or storage within structures. Overland roughness values for the 2D surface were developed from land use data, Harris County Appraisal District information, aerial imagery, and field visits. The river sections for Briar Branch are linked to the 2D surface along the banks of the channel so that overbank flow occurs on the 2D mesh.

The dynamic model has several discharge or outflow locations. Dynamic tail water conditions were developed where these systems are backwater-controlled. The system outfalls include:

- W140-01-00 at Campbell Road. A normal depth outfall condition is used.
- W151-00-00 underneath IH-10 near Witte Road. For the W151-00-00 system, the entire storm sewer and overland flow drainage system was modeled as part of the RDS. To limit the size of the Briar Branch Model the time stage results from for this W151-00-00 model was used to represent downstream W151-00-00 tail water conditions.
- W156-00-00 via multiple small storm sewers east and west of Conrad Sauer Road. These systems do not appear to be backwater controlled so a dynamic tail water was not used for this boundary.
- W140-00-00 via a 96" RCP under Nuens Road. This system also did not use a dynamic tail water.

3.4 Existing Conditions

The current Briar Branch Channel sections can be seen on **Exhibit 6**, Existing Briar Branch Cross Sections. As shown the current channel is relatively shallow between Gessner and Witte Roads and gets progressively deeper as larger off-site drainage systems enter the channel downstream of Witte Road. There is a flowline drop just upstream of Bunker Hill Road. Downstream of this 2-7'x7' box culvert the channel is a typical HCFCD concrete channel with an 8-foot wide by 4-foot tall concrete section and steep grass slopes to the top of bank. The results of the existing conditions dynamic 2D model of this region are shown in **Exhibit 7**, Existing Conditions 10-Year Inundation Map. This model indicates several limitations of the existing drainage system. The primary issues that cause drainage problems in this area can be summarized as listed below;

- High tailwater elevations due to the limited conveyance capacity of both the W151 drainage system that is the primary drainage outlet for the storm sewer at Gessner and Witte Roads, and the limited channel conveyance available within the Briar Branch Channel W140-01-00.
- Perched banks for Briar Branch are higher than adjacent roadways and overland storm water overflows generally drain parallel to W140-01-00 until captured by storm sewer and do not generally overflow the top of bank.
- Roadways south of the Long Point Fault and north of W140-01-00 exist approximately 2-3-ft lower than the top of bank for W140-01-00. This limits the available conveyance area of W140-01-00 before street ponding starts to occur.
- Existing storm sewers are generally sized for 2-yr storm frequencies, and are not effective in conveying 100-yr storm flows to W140-01-00.
- Existing homes in many areas are not elevated much higher than the existing curb.
- A number of structures in the area have been known to have repetitive loss claims. Blue areas on the inundation maps developed from Infoworks 2D provided on **Exhibit 7** show the current potential flooding risk near the project area for a 10-year storm frequency.

4.0 PROPOSED DRAINAGE PLAN

4.1 Description

Improvements to the Briar Branch watershed are proposed to be constructed in three phases. Phase one is a detention basin currently under construction just east of Bunker Hill to provide mitigation for future regional solutions. The second phase, the purpose of this report, includes channel improvements between Gessner Road and the detention basin to increase conveyance into the basin and lower water surface elevations within Briar Branch west of the detention basin. A third phase will include storm sewer conveyance improvements to increase conveyance to the channel and lower the water surface elevations in the neighborhoods adjacent to Briar Branch between Gessner Road and Bunker Hill Road.

The existing storm sewer connection from Gessner road to Briar Branch will be maintained. The elevated section of channel between the 36" Gessner system connection and Briar branch will be maintained. The proposed crossing at Witte Road is generally consistent for each channel improvement alternative. The two existing 48" pipes crossing Witte road are proposed to be replaced with a 4'x4' RCB upstream of Witte Road and a 5'x4' downstream of Witte Road. For evaluation and comparison purposes, it was necessary for the crossing to remain consistent for each alternative. Final configurations for the Gessner tie in and Witte connection will be determined post channel improvement selection. The existing Bunker Hill Road crossing is generally proposed to remain in place. Considerations for improved headwall and wingwall configurations are recommended during detailed design.

The analysis of the proposed drainage plan will focus first on the selection of a preferred alternative and then a discussion of items which should be addressed in the final design.

4.2 Hydrologic Analysis

The existing and proposed conditions hydrologic analysis is consistent and assumes that the Phase One basin has been constructed. No other changes were made to the existing conditions hydrology.

4.3 Hydraulic Analysis

The proposed hydraulic model consists of multiple improvement alternatives, which vary primarily by channel sections, as discussed in **Section 4.4**, below. However, each improvement alternative also includes the Briar Branch Stormwater Detention Basin, which is currently under construction, as well as storm sewer improvements which will increase conveyance into the channel within the proposed improvement limits. These storm sewer improvements will be considered in detail at a later date, as they are part of the 3rd phase of Briar Branch regional improvements. For the purpose of this analysis, all alternatives include the same phase three storm sewer improvements.

Initial results of the hydraulic analysis showed that the ability for any improvement alternative to eliminate structural flooding in the target zone, while avoiding downstream impacts, is tied to the storage volume of the channel. This is because the increased

volume of water that must be conveyed downstream in order to reduce flooding in the target area is larger than the volume available in the basin. Thus, it is necessary to design the channel to maximize its storage potential in addition to ensuring adequate conveyance.

Note that improvement alternatives presented in this report have downstream hydraulic impacts. "No-Impact" models were not produced for each alternative because it is anticipated that an impact analysis will be submitted separately for the preferred channel improvement alternative before the approval of the construction documents. A "No-Impact" model, using the "Rectangular Concrete Low Flow" Alternative A, was designed as part of the impact analysis for Briar Branch Stormwater Detention Basin, which was approved by HCFCD in May 2013 and included in **Appendix A**. Because this alternative contains no inline control structures, restrictors, or weirs, it is the most difficult alternative to prove no-impact; by analogy, the other alternatives will be able to prove no-impact at a later date.

4.4 Hydraulic Impact Approach

The potential for impacts to adjacent and downstream areas was a primary consideration during the evaluation of the various improvement options. This report is not a detailed hydraulic impact analysis, but rather considers the channels ability to demonstrate no adverse impact as a factor when evaluating alternatives. Upon the approval of a channel improvement alternative configuration, a complete hydraulic impact analysis will be necessary. Significant attention was given to the advantages, disadvantages, and complexities of each alternative related to constructing a no adverse impact solution. Channel improvement options that efficiently convey water downstream pose a greater challenge than those that slow the water down through storage. To prevent downstream impacts, control structure adjustments to the detention basin (currently under construction) were evaluated.

4.5 Channel Layout Alternatives

Five alternatives for the channel cross section were analyzed as outlined below, and are shown on **Exhibit 8**, Proposed Briar Branch Cross Section Alternatives. Analysis will center on the constructability, maintenance concerns, and performance of each alternative section. Note that the storage volumes given include the loss of storage due to lowered water surface elevations. All options would be designed and constructed according to the latest HCFCD specifications.

Table 1 below contains a description of the alternatives considered. **Table 2** shows the relative differences in results of each Alternative along with notes regarding the advantages and disadvantages of each alternative. The following sections review the alternatives in more detail individually, and are followed by general information that applies to each alternative such as right-of-way requirements, maintenance access, and structural elements such as retaining walls.

Table 1 – Alternatives Description

Alternative	Description	Notes
A	Rectangular Concrete Low Flow	Extension of existing channel section from 1300 feet east of Bunker Hill upstream to Gessner Road
B	Dry Bottom Storage Channel	Maximum cross-sectional area at minimum flow line slope. Vertical wall configuration with maintenance berm in channel on bench.
C	Wet Bottom Storage Channel	Maximum cross-sectional area with flat flow line slope and storage pools. Vertical wall configuration with maintenance berm in channel on bench.
D	Hybrid Storage Channel	Alternative B with flatter side slopes and less cross-sectional area
E	Storm Sewer Box Enclosure	Storm sewer with shallow swale above the box culvert that is collected with drainage inlets.

Table 2 – Decision Matrix

Decision Matrix For Briar Branch Channel Improvement Alternatives

Alt.	Description	Estimated Construction Cost	Structures Removed From Flooding (10-Year)	Avg. Cross Sectional Area		Channel Volume		Average Flow Velocity (ft/s) 10-Year	Mowing Challenges	Desiltation Challenges	Potential Cost Share Partner	Constructability Challenges	Water Quality Benefit	Amenity Benefit
				SF	Difference	Ac-ft	Difference							
	Existing			102		15		2.8	High[1,2]	High[1,2]	Low	N/A	Fair[1]	Poor[1,2]
A	Rectangular Concrete Low Flow	$ 4,200,000	67	143	+42	17	+2.6	3.2	Low[3]	Medium[2,3]	Low	Average[1,2]	Poor[1,2]	Poor[1,2]
B	Dry Bottomed Storage Channel	$ 9,520,000	77	326	+224	34	+18.9	2.0	Medium[1,4]	Low[3,4]	Medium[1]	High[2,4,5]	Good[3,4]	Good[3,4]
C	Wet Bottomed Storage Channel	$10,640,000	78	403	+301	51	+36.5	1.8	Low[4]	Medium[1,4]	Medium[1]	High[2,4,5]	Excellent[4,5]	Excellent[3,4,5]
D	Hybrid Storage Channel	$ 9,170,000	71	248	+146	29	+13.9	1.8	Low[4]	Low[3,4]	Medium[1]	Low[2,3,6]	Good[3,4]	Good[3,4]
E	Storm Sewer Box Enclosure	$13,180,000	66	128	+26	27	+12.6	2.0	Low[4]	Medium[5]	Low[1]	Medium[7]	Poor[1,2]	Poor[1,2]

Channel Length = 5,800 LF

Mowing Challenges Notes Key
1: Slopes too steep for tractor mowers
2: Obstructions and trees prevent mowing access
3: Concrete areas minimize mow areas
4: Maximum 4:1 slopes with good access

Desiltation Challenges Notes Key
1: Grass-lined areas where silt accumulates
2: Limited equipment access
3: Designed desiltation locations
4: Good equipment access
5: Must use vacuum truck to desilt subsurface boxes

Potential Cost Share Partner Notes Key
1: Possible Management District participation

Constructability Notes Key
1: Requires extensive cast in place concrete
2: Limited staging areas
3: Requires moderate temporary shoring
4: Requires extensive temporary shoring
5: Requires large wall foundations
6: Requires large wall foundations on only one side of the section
7: Difficult to move large boxes into place

Water Quality Notes Key
1: Little/no vegetation
2: High suspended solids
3: Moderate vegetation
4: Lowered suspended solids
5: Vegetation and wildlife potential in water pools.

Amenity Notes Key
1: No sidewalks
2: No landscaping
3: Jogging path
4: Landscaping
5: Normal water pool

4.5.1 Alternative A - Rectangular Concrete Low Flow

Description

The principal of this improvement alternative is to extend the section downstream of Bunker Hill Road all the way west to Gessner Road. The existing channel section between Bunker Hill Road and Campbell Road consists of an 8-foot by 4-foot concrete rectangular low-flow channel flanked by steep grass lined slopes which vary between a 1:1 and a 2:1 slope. Because of the geotechnical recommendations, a continuation of grass slopes is not recommended at these steep slopes, so in order to extend this existing section upstream, the banks above the low-flow section must be stabilized, preferably by concrete lining. Further, due to the concrete lining, there will be increasing conveyance through the channel upstream of Bunker Hill Road. This will result in higher flows downstream of Bunker Hill Road that require additional conveyance (channel capacity) must be added between Bunker Hill and the basin. To achieve the necessary flow rates the addition of a parallel storm sewer box under the side slopes parallel to the existing low-flow channel is proposed. See **Exhibit 8a**.

Design Considerations

Table 2, above, shows that while this is the cheapest improvement alternative, it functions primarily as increased conveyance and provides minimal storm water storage volume for the adjacent neighborhoods. This alternative can be considered among the simplest to construct as it is similar to previous HCFCD projects. Challenges include limited right-of-way that necessitates steep side-slopes, which approach 1:1 in some locations. Slope stability options for consideration include double-forming for concrete slope paving, gunite, or precast slabs. Other types of gravity walls may also be considered. Having a large area of concrete slope paving will not foster infiltration, vegetation, or wildlife along the channel which is considered poor environmental performance. In addition large areas of concrete slope paving are typically considered aesthetically displeasing, and this alternative is considered to have little to no amenity benefits to the community.

Performance

This alternative offers the least flood damage reduction of all alternatives analyzed. Because the channel functions primarily as conveyance and not as storage, it is necessary to limit the channel flows, and storm sewers which outfall into the channel to ensure no downstream impacts. As a result this alternative is the least effective in reducing structural flooding in the target zone for the 10-year event.

Maintenance Concerns

Because this design contains no walls higher than 4', it would not require fencing. Also, because the left wall and right wall are tied to a single structural slab, extensive foundations are not necessary. Mowing would only be required outside of the channel top bank between the bank and the ROW. Maintenance

access for desilting would be difficult because the low flow channel is difficult to access from the maintenance bench, which is narrow and located at roughly 10' above the flow line. Ramps can be located near crossing roadways to help gain access to the flowline for mini excavators. In addition, because this alternative offers few environmental and amenities benefits, this option is very unlikely to attract a maintenance cost sharing partner. Analysis shows that the peak flow velocities in the channel are between 3.5 and 4.0 feet per second, which may be sufficient to minimize sediment deposition.

4.5.2 Alternative B - Dry-Bottom Storage Channel

Description

The principal of this improvement alternative is to maximize the storage capacity of the channel by using a large cross sectional area and to maintain a minimum channel slope of 0.10% from the existing Bunker Hill 2-7'x7' culverts west to Gessner Road. Additional cross-sectional area is possibly by shifting the maintenance access area to within the cross-section and to maintain a minimum top of bank area of 8-ft that allows for adjacent land owners to maintain areas that are adjacent to the channel right-of-way. This alternative would require deepening the existing channel flowline by approximately 4-5 feet between Witte and Bunker Hill, and 4-8 feet between Gessner and Witte Roads. Control structures would be utilized to ensure the section acts principally as storage, as shown on **Exhibit 8b**.

Design Considerations

This alternative has the second deepest and second largest cross-sectional area analyzed, as the cross section provides almost 3 times as much storage volume as the existing channel. This alternative also presents construction challenges because the excavation depths will necessitate temporary shoring and the construction of wall foundations that typically would need to be set near the ground water elevations. The depths also limit the staging area available within the right-of-way. Due to the larger flow area channel velocities are generally below 2 feet per second. This alternative will remove significant quantities of Total Suspended Solids (TSS) from the flow, offering water quality benefit. The near vertical wall and limited distance between the top of bank and ROW require a creative design approach for draining the ROW and managing sheetflow coming to the channel. These considerations will be addressed and finalized in final design. To address safety concerns for maintenance personnel and pedestrians a hand rail is proposed along the top of the wall. This handrail is not expected to be a factor in the channel hydraulics as the WSEL is not expected to exceed the top of bank.

Performance

This channel section has 20 ac-ft more storage than Alternative A based on a cross-sectional area of approximately 326 square feet, and is the most effective for removing structures from flooding as shown on the Decision Matrix above.

Maintenance Concerns

This option includes maintenance access below the top of bank. Low maintenance plantings are proposed within the relatively narrow right-of-way zones along the right-of-way and top of the retaining walls on each side. Maintenance access will be available with a 15-ft maintenance access road that varies in elevation to ramp up to cross-streets, and will only be on one side of the channel. This restricts access, but will allow for inspection of walls and the flow line of the channel. Silt deposition could be a potential issue so sediment traps would be included at storm sewer outfalls to control silt entering the system and to provide a location to inspect and remove silt as necessary.

4.5.3 Alternative C - Wet-Bottom Storage Channel

Description

The principal of this improvement alternative is to maximize the storage capacity of the channel by using a large cross section that would generally follow a flat flowline from Bunker Hill west to Gessner Road. The channel would contain occasional permanent deep pools approximately 3-4 feet in depth, to allow for habitat development. Between Bunker Hill and Witte, the flow line would need to be at least 9 feet deeper than the existing channel at deeper pools, and upstream of Witte the flow line would need to be approximately 11 feet deeper. The limited cross section width requires tall gravity walls located approximately eight feet from the right-of-way line. The placement of the maintenance berm within the section is proposed similar to Alternative B, elevated 2 to 4 feet above the permanent pool elevation. Control structures are proposed at multiple locations to create pools and to control storage levels in the channel, as shown on **Exhibit 8c**.

Design Considerations

This is the deepest and largest cross-sectional area alternative analyzed, as the cross section provides almost 4-times as much storage volume as the existing channel. This alternative presents the greatest construction challenges of all the alternatives. The excavation depths will necessitate temporary shoring for the construction of wall foundations that typically would need to be set below the ground water elevations determined from preliminary soil studies. Some soil amendments may be necessary for slope stability, as less cohesive sandy soils exist at these deeper depths along the proposed channel. The depths also limit areas available for construction staging within the right-of-way. The permanent pools can support a complete wetland system that has significant bioremediation potential and provide an amenity benefit. Due to the larger flow area channel velocities are generally below 2 feet per second. This alternative will remove significant quantities of TSS from the flow, offering excellent water quality benefit. The near vertical wall and limited distance between the top of bank and ROW require a creative design approach for draining the ROW and managing sheetflow coming to the channel. These considerations will be addressed and finalized in final design. To address

safety concerns for maintenance personnel and pedestrians a hand rail is proposed along the top of the wall. This handrail is not expected to be a factor in the channel hydraulics as the WSEL is not expected to exceed the top of bank.

Performance

This alternative performs in a similar manner as Alternative B, and there is not a significant benefit as a result of the deeper section nor the additional 15 ac-ft of storage contained in this alternative. However the environmental and aesthetic benefits warrant consideration.

Maintenance Concerns

The flat bottom and pools will benefit the development of wetland habitats; however these flat channels will be difficult to maintain long term without some permanent silt control measures. Permitting issues may also occur in the future as regulations on wetland habitats can limit maintenance activities. Silt traps are more important for this alternative than Alternative B to minimize the need to desilt areas between point sources. Maintenance access via the 15-ft road will be similar to Alternative B, however the road will be lower in elevation and ramp transitions will be longer. Top of bank areas could be planted with low maintenance vegetation requiring limited control.

4.5.4 Alternative D - Hybrid Storage Channel

Description

The principal of this improvement alternative is to maximize the storage capacity of the channel by using a large cross sectional area and to maintain a minimum channel slope of 0.10% from the existing Bunker Hill 2-7'x7' culverts west to Gessner Road. Additionally, this alternative seeks to flatten and step retaining wall heights and slopes to provide improve structural stability and constructability. As on Alternatives B and C additional cross-sectional area is possible by shifting the maintenance access area to within the cross-section and by maintaining a minimum top of bank area of 8-ft to the channel right-of-way. The channel is deeper than the existing channel by approximately 4-5 feet between Witte and Bunker Hill, and between 4-8 feet between Gessner and Witte Roads. Control structures would be utilized to maximize storage and mitigate impacts, see **Exhibit 8d**.

Design Considerations

This alternative has a series of shorter walls on the maintenance access side, and the taller wall opposite of this will have a 9-inch set-back to provide a flatter slope and result in a smaller cross-sectional area. These changes would make this project easier to construct and would likely require minimal temporary shoring along to right-of-way to protect adjacent properties. Maintenance access is similar to Alternative B and C and the flatter slopes will make access to the channel flowline easier. Silt control is still recommended to allow easier maintenance. The near vertical wall and limited distance between

the top of bank and ROW require a creative design approach for draining the ROW and managing sheetflow coming to the channel. These considerations will be addressed and finalized in final design. To address safety concerns for maintenance personnel and pedestrians a hand rail is proposed along the top of the wall. This handrail is not expected to be a factor in the channel hydraulics as the WSEL is not expected to exceed the top of bank.

Performance

This alternative performs similar to Alternatives B and C and is the least costly of these three top performing alternatives. Alternative D is considered easier to maintain due to the flatter side slopes, with fewer constructability challenges. Water quality performance is similar to Alternative B, however both alternatives can benefit from adding some deep pools for water quality benefits or for an amenity if desired. Cost sharing is considered possible as this alternative can be constructed and landscaped and used as dual use pedestrian and maintenance trail. The flatter walls can be considered safer for pedestrians, and provide a higher geotechnical safety factor when compared to the steeper walls required for Alternatives B and C.

Maintenance Concerns

This option includes maintenance access below the top of bank. Low maintenance plantings are optional within the relatively narrow right-of-way zones along the right-of-way and top of the retaining walls on each side. Maintenance access will be available with a 15-ft maintenance access road that varies in elevation to ramp up to cross-streets, and will only be on one side of the channel. This restricts access, but will allow for inspection of walls and flowline of the channel. Silt deposition will be an issue so sediment traps would be constructed at storm sewer outfalls to control silt entering the system and to provide a location to inspect and remove silt as necessary.

4.5.5 Alternative E - Storm Sewer Box Enclosure

Description

This alternative consist of a proposed storm sewer that matches the existing 2-7’x7’ box culvert at Bunker Hill and continues west to Gessner. There is a shallow swale located above the box culvert to provide drainage for runoff to the channel ROW, additional storage, and some conveyance for less frequent storm events. With the shallow swale it is possible to add low retaining wall features that would add amenity benefits and provide room for a maintenance access and trail features that can meander and be more aesthetic, as shown on **Exhibit 8e**. However, a typical grass lined swale is a viable option as well.

Design Considerations

Preliminary estimates show that a minimum of 2-8’x8’ box culverts will be necessary and the construction of this within a 50-ft narrow right-of-way with limited access on either side will pose construction difficulties. Shoring and

construction access may dictate the location of the box culverts within the right-of-way.

Performance

The preliminary analysis of this alternative shows limited benefits to the areas when compared to the other alternatives. The primary reason for limited hydraulic benefit is poor conveyance between Bunker Hill and the detention basin. Therefore a channel improvement such as Alternative B, C or D would be necessary to improve conveyance downstream of Bunker Hill, which would allow more benefit upstream towards Gessner. Due to the very high hydraulic efficiency of storm sewer boxes, relative to open channel sections, internal control structures will be necessary to restrict flows downstream for mitigation purposes.

Maintenance Concerns

A closed storm sewer system is relatively low maintenance; however siltation is an issue with large box culverts over time. Junction boxes or other access areas along the box culvert will be necessary at logical intervals to aid in the removal of silt. Above ground areas could be constructed with low gravity walls for amenity benefits and a maintenance access path that can allow access to mowing. Grades would be a 2% minimum and typically 4:1 to concentrate flows at the designated channels that drain to either Type E or Grate Inlets surrounded by a mow strip to minimize inlet clogging.

The differences in the hydraulic performance and relative benefit to the adjacent neighborhoods can be seen on **Exhibits 9a to 9e**, Proposed 10-Year Inundation Reduction Maps. Based on the evaluation of Alternatives A, B, C, D and E in regard to hydraulic performance, storage potential, constructability, maintenance, water quality, and amenity benefits as shown on the **Decision Matrix (Table 3),** the Dry Bottom Storage Channel (Alternative B) and the Hybrid Storage Channel (Alternative D) are the preferred alternatives. These alternatives are similar in cost, constructability, and benefit. Both alternatives has the potential to provide amenity and water quality benefits depending on the level of landscaping and channel flowline options are implemented.

4.6 Right-of-Way Requirements

Each of the channel layout alternatives is intended to fit within the existing right-of-way. However, there are two locations where additional right-of-way is needed to provide sufficient room to construct and maintain the proposed channel improvements. These locations are as follows and shown on **Exhibits 10 and 13**;

- Acquire an additional 10’ x 210’ strip of property just west of Witte Road – This is necessary to have sufficient right-of-way to construct the proposed channel improvements and maintenance access just west of Witte Road. Currently this property has no fences or other obstructions.

- Access Easement - from STA 21+00 to STA. 28+24 along the north and south side of the channel right-of-way and south of the Villa's at Bunker Hill Apartment Complex. This additional access area would be desirable to provide transition areas or landscaping and to provide more room for maintenance access, minimize wall requirements within the curved areas just west of Bunker Hill Road. This area would may help route the maintenance access around an existing bridge located at STA 27+50 if it stays in place, however it is desirable for maintenance purposes to remove this abandoned structure.

4.7 Special Erosion Control Features

Erosion is a primary concern for areas where storm water flows enter the proposed channel via. storm sewer outfalls, and along the proposed retaining wall foundations. For the preferred channel improvement alternative, velocities are close to 2 ft/s for a 10-year storm frequency and peak velocities are not expected above 4 ft/s during transition periods where downstream tailwaters are lower. Storm water outfall locations will create the most localized turbulence that would create scour and sedimentation conditions. These existing storm sewers are also the conduit for most of the silt that is currently deposited into the channel. There are a number of different options available to control silt and erosion at the outfall locations and along the footings of retaining walls.

Retaining wall footing protection can be provided with Grade 1 riprap, or a 6 to 8 inch layered geocell that can be filled with a smaller granular material such as 2-3-inch gravel. The latter may be more conducive for the establishment of vegetation and habitats along the channel for some of the alternatives considered. Articulated blocks or slope paving can also be an option as well, but are considered to be a higher cost and are not as flexible and will not conform to settlements as well and may be more difficult to repair or replace. A graphical representation of some of these erosion control measures are on **Exhibit 11**.

Storm sewer outfalls within the minimum 6-foot wide bottom width of the channel can create scour issues due to the abrupt transition in flow direction as storm sewers may be as large as an 84-inch pipe. The turbulence at these locations will require a concrete headwall and box structure would be the most effective at minimizing local scour and could also be designed to provide a convenient location to catch and extract silt. Concrete headwalls and wingwalls can be incorporated and complement various retaining wall options. Downstream of the storm sewer connection a deep pool that is a few feet lower than the normal channel flowline is proposed to reduce velocities and catch accumulated silt, and would provide a location for periodic silt removal and maintenance. For smaller outfalls, a riprap lined pool may be sufficient to catch silt. A slightly raised riprap berm could also be effective in providing some measure to help filter floatable materials in addition to controlling the movement of silt deposits downstream.

4.8 Stormwater Quality Enhancements

Vegetation within the channel can mitigate erosion and improve stormwater quality. In general terms, vegetation reduces the energy of surface water flows and increases the infiltration of storm water. The benefits of proposed methods are described below:

- Vegetated Top of Slope - The use of small trees, native shrubs and low grasses along the top of bank buffers provides natural erosion control and slows down surface water to increase natural infiltration of water into surrounding soils. Reduced velocities reduce sediment transport and improve water quality. Increased infiltration further increases stormwater storage capacity.

- Aquatic Channel Plantings - Aquatic plants within the wet bottom channel have multiple benefits: they reduce the speed of channel flows, provide habitat for aquatic life, and they support bioremediation (a process that neutralizes chemical and biological waste through the interaction between aquatic plants and animals). Plantings in the channel bottom have the capacity to reduce the speed of initial stormwater flows; this slows the rate of downstream flooding and if planted strategically, can help contain silt transport from stormwater outfalls. Additionally, aquatic plants are essential to the support of birds and fish that consume pests; notably mosquitoes and other pest insects. Finally, bioremediation processes have the capacity to neutralize or trap harmful chemical and biological compounds found in stormwater. Bioremediation relies on the interaction plants and symbiotic microorganisms to convert or trap pollutants. If necessary, the event of heavy metal contamination, plants and soils can be removed during desiltation for off-site disposal.

- Amenity Benefits - Vegetated drainage channels also serve to transform infrastructure into a public amenity that increases land values by providing high quality open space and protecting development from inundation. People who have access to productive natural landscapes will be better stewards of land and water. The aesthetic benefits of vegetation based stormwater quality improvements gives local residents a living laboratory demonstrating the critical interaction between stormwater and the environment. Educational trail makers and way finding systems can further this goal to communicate the interaction between human development and natural systems.

4.9 Potential Pipeline and Utility Conflicts

A number of utilities exist along the project limits as identified in Section 2.5. Most of these utilities consist of water, sanitary and natural gas. No private petroleum product pipelines cross this project corridor. Utilities are shown on Exhibit 4 with the right of way map, and conflicts are noted on the plan and profile drawings provided with Exhibit 13. Water lines may be relocated below the lowered profile of Briar Branch, however; there are sanitary sewers that traverse the project near Witte Road that are above the proposed flowline of Briar Branch. Different options range from a bypass route, adding a lift station, or penetrating the storm sewer. Of these the most feasible solution is to reconstruct the sanitary sewer with pressure pipe with a joint sufficient to span through

the proposed storm sewer box culvert. This has the disadvantage of blocking the storm water flow area of the storm sewer, and 1-2-feet of opening will be under the sanitary pipe to allow for siphon flow, and provide depth to allow sedimentation. A manhole will be located at the crossing location so that sediment levels can be monitored by the City.

Adding a lift station may be another possible option that would require additional coordination with the City of Houston and would require additional right-of-way. Some additional coordination with the City of Houston is required to look into the possibility of a lift station, or a bypass route however these options would likely be costly considering the distances required as the 54-inch sanitary trunk at Gessner and IH-10 may be the closest location to tie-in, as this is where most sanitary flows drain to in this area. Rerouting flows by gravity to Gessner Road does not appear to be feasible since most areas east of Gessner drain away from Gessner north of Briar Branch currently and may not have additional capacity available.

4.10 Geotechnical Requirements

Please see Appendix B, Geotechnical Study of "Improvements of HCFCD W140-01-00 Channel North of I-10 & South of Westview Drive from Gessner Road to East of Bunker Hill Road" by Geotech Engineering and Testing May 2013. A summary of findings is included below for reference only. Soil boring profiles are provided on the plan and profile sheets shown on Exhibit 11.

- Ground water was encountered at depths between 15 and 24 feet
- The upper soil layers are predominately cohesive soils from 20-30 feet.
- Fat clay soils were found to have high plasticity with liquid limits from 52 to 61 and plasticity indices from 31 to 37.
- Silty sands are located at deeper levels between Gessner and Witte Roads
- 4:1 side slopes are recommended for earthen grass slopes; however 3:1 slopes generally meet minimum factors of safety.
- Crumb and Pin Hole test show no dispersive soils
- Gravity wall slope stability ranged from 1:7 to 1:10 and met short term, rapid draw down and long term slope stability factors of safety.
- Weep holes for slope paving or wall structures at 15-ft intervals.
- Net allowable bearing capacity for clay soils is 1,500 psi, and for silty soils 1,000 psi
- Groundwater control is recommended for the project, and well point systems are recommended in the silty sand areas.
- Trench excavations unsupported slopes should not be steeper that 1.5:1, benched excavations at 1:1 with steps not higher than five feet. Shoring is recommended for vertical soil cuts.

4.11 Environmental Issues

The current projects limits have been determined by the USACE to be non-jurisdictional, meaning that the USACE does not require any environmental permitting.

There are opportunities with the project to add features that enhance water quality as discussed under Section 4.7. With these in-place there would be a potential long term risk of the development of jurisdictional conditions within the channel, or if regulatory rules become stricter in the future. These potential conditions could impact maintenance of the channel long term. A long term maintenance plan for the selected channel alternative that is consistent with USACE regulatory guidance is recommended.

4.12 Maintenance Access Plan Requirements

Maintenance access is an important component of the project as the narrow easements do not provide sufficient space for a standard maintenance access berm. The proposed channel improvement alternatives all have a maintenance access component that is typically a minimum of 15-feet wide. This width is consistent with previous HCFCD projects and is sufficiently wide for most maintenance equipment used by the district and their maintenance contractors. An all-weather surface is proposed and a number of material options are possible that range in durability, permeability, and impact as discussed below. In general access would be along the south side of the Briar Branch channel between Gessner and Witte due to the additional drainage easements available on the southwest corner of Witte Road and Briar Branch. From Witte to the end of the project near STA 2+50 the access will be along the north side of the channel to take advantage of the tie-in locations at Windhover, Confederate and Oak Tree. Connections to the existing cross streets at Gessner, Witte and Bunker Hill will be constructed according to City of Houston driveway standards. For Alternative A the maintenance access will be slightly below grade, however for Alternatives B, C, D the access will be approximately 4-8 ft below the top of bank with Alternative C having the lowest access. Since these alternatives are primarily for storage, ramps will be provided, without impacting hydraulics, to lift the access roads up to meet the existing roadways. Some conceptual access concepts for Windhover and Bunker Hill are shown on renderings in **Appendix D**. A proposed maintenance access plan is shown on **Exhibit 12** and a layout consistent with Alternative A is shown on the Plan and Profile Drawings provided as **Exhibit 13.**

4.12.1 Maintenance Access Materials

Maintenance access is a very important component of the proposed channel improvements as currently access to the Briar Branch Channel is very limited. A 15-ft wide path is recommended, and can be a minimum of 14-ft with 1-ft of buffer on either side to have a 12-ft wide trail. Materials for the access path were considered that include:

- Compacted Fill – This is essentially fill material that meets HCFCD Spec 2315. The primary potential problem is rutting by vehicles during wet conditions, and the need to mow and periodically fix uneven areas along the access path. This option is not a preferred amenity trail as foot or bike traffic would cause damage to the surface in wet conditions as well. Repairs would be relatively simple as grading equipment could be used to clean and level damaged areas relatively easily.

- Concrete – Is preferred for the driveways at connections to existing roadways and would conform to City of Houston driveway requirements. Using concrete for all areas would add impervious area, and would not be permeable, or beneficial to water quality.
- Asphalt – This material has been used in a number of access paths and nature trails in the area such as Terry Hershey Park. It also is not a permeable surface, but is a relatively durable and less expensive than concrete.
- Gravel – Granular materials make a good all-weather surface and are easy to maintain. As the material is compacted into the underlying soils additional gravel can be added. Some containment of the granular material is preferable and this can be done with the retaining walls proposed. Loose material can migrate to the channel and other areas due to vehicular traffic or pedestrians.
- Permeable pavers – These are modular blocks that have openings that allow water to pass through. These are relatively more expensive per square foot than other options, but allow for a hard surface that would need periodic mowing, but should have minimal long term maintenance.
- Decomposed Granite – This is a finer material than gravel and would require a thick layer of gravel and possibly a geogrid to help support heavy traffic loads as it may be subject to rutting. This is a good material for pedestrian traffic as it is a softer surface than concrete or asphalt and is permeable.

4.12.2 Retaining Wall Alternatives

Most of the alternatives considered require vertical walls within the right-of-way. This section reviews the different types of retaining walls in order to discuss which are most desirable for this project.

4.11.2.1 Prefabricated Modular Walls

These walls use stacked or interconnected structural elements, some of which use soil or rock fill to resist earth pressures by acting as gravity retaining walls. Structural elements can consist of precast concrete blocks, treated timbers, or cellular systems that are filled with soil or granular materials such as GeoCells or gabion walls.

- Advantages

  Gravity walls utilize the weight of heavy materials to balance the overturning moment produced by the retained soil. They offer the advantage of having no tiebacks and only require enough excavation behind the wall to provide a drainage layer. This allows them to be placed as close to the right-of-way line as possible. Construction is relatively quick as the modular units can be easily transported and can usually be assembled without the need for large equipment in areas that have space restrictions. Most of these systems are porous using granular materials so water can pass through wall easily and hydrostatic loadings behind the wall are not a problem. Repair of these wall systems is usually localized.

- Disadvantages
  This type of wall is typically the most economical for low to medium wall heights that are less than 15-feet. Taller walls would typically require more reinforcement. A well compacted foundation or a custom designed foundation is required for these walls to minimize settlement. Granular material can be difficult to level, and cement stabilized can be used to speed construction. However with cement stabilized drainage elements through this layer would be required. Traffic railing is not supported by these walls and would require a separate foundation. Wall will only support low load pedestrian rails and may need reinforcement.

- Prefabricated Modular Wall Materials
  This type of wall can be made of many different materials, some of which include:
  - Stackable Blocks (RediRock and Others)
    RediRock is a brand of precast, stackable block gravity wall product that is engineered for use in shoreline protection, storm channels, and even bridge abutments. The product offers the advantages of improved aesthetics, improved constructability within limited right-of-way, lower than average required temporary shoring, and rapid set times resulting in quick construction. The setback of each block can be adjusted to a maximum of 9-inches and it is possible to have planters along the walls as well. This product has been used on Buffalo Bayou projects and has been used in similar situations.

  - Aggregate-Filled GeoCells
    GeoCells are a form of cellular confinement systems that are usually formed by polyethylene materials that are bonded together and form trapezoidal openings that can be filled with soil or granular material and the geocell acts to hold confine the materials together and helps aid soil stability. For this project these could be used along the flowline of the channel to provide a stable surface with granular material to allow for occasional channel cleanout. These can also be stacked on top of each other and used to form gravity walls. These cell layers can be 3-8-inches deep and 8-10-feet wide when expanded. Exposed parts of the cells can be used for planters.

  - Gabions
    Gabions are a granular rock material that is confined within either a woven or welded wire mesh. Each chamber is filled with material and then bonded together so all cells are interlocked and combined to formulate a combined gravity wall structure. The disadvantage of this wall is that the depth required for the expected wall heights may limit the available area for the channel. These walls are usually inclined at an angle to provide more resistance to overturning moments and

improve stability. Construction can be slower as the baskets usually need to be assembled and tied together then filled with material.

4.11.2.2 Rigid Gravity and Semi Gravity Walls

Rigid walls may be fabricated of stone, concrete, or reinforced concrete, and used in both cut and fill applications. They have narrow base width, and usually not used were deep foundations may be required. Semi-gravity walls are commonly cantilever walls.

- Advantages
  Small footprint and can be supported by shallow foundations. These walls can be constructed to support traffic rails or other structures such as lighting elements. Foundations can be individually designed based on local requirements.

- Disadvantages
  This type of wall is typically the most economical for low to medium wall heights that are less than 15-feet. Taller walls would typically require more reinforcement. A well compacted foundation is required for these walls to minimize settlement. Granular material can be difficult to level, and cement stabilized can be used to speed construction. However with cement stabilized drainage elements through this layer would be required.

- Cantilever Monolithic Concrete Walls
  These semi-gravity concrete gravity walls were also considered for use in each of the alternatives considered here. However, the formwork used to construct the wall would require significant over excavation, which may be difficult within the limited right-of-way. Due to site restrictions along the project concrete would likely need to be pumped in from off-site. The duration required to setup forms, pour, and set the concrete this wall requires significantly more temporary shoring when compared to the modular walls. In addition the cost is considered higher without any additional benefit, and it has less aesthetic appeal. Weep holes are required at a minimum of 15-foot intervals to minimize hydrostatic loads.

4.11.2.3 Non Gravity Cantilevered Walls

This type of wall consists of a vertical structure that is deep enough to use the passive resistance of the insitu materials and the moment resisting capacity of the vertical structural members. Height is dictated by the competence of the foundation material. Weep holes at 15-foot intervals will be required.

- Advantages
  Small footprint allows the use very close to the right-of-way. These walls can be constructed to support traffic rails or other structures such as lighting elements. The vertical wall would allow the largest channel storage volume.

- Disadvantages
  Access with the narrow right-of-way would make pile driving operations difficult. Noise for the operations may not be desirable to the local residences. Wall height is limited based on local soil conditions and would require a very deep pile for the expected wall heights. This option is considered a higher cost than a modular wall or cantilevered wall system.

4.11.2.4 Anchored Walls

These walls are similar to all of the above walls, and also include tie-backs into the soil to provide more resistance to overturning moments. These are used to provide steeper slopes, or to minimize the structural elements to reduce cost. Due to the limited right-of-way these options were not considered feasible except in localized conditions where there may be adequate space behind the wall.

4.11.3 Wall Maintenance

Retaining wall design is generally for a 50-year lifespan when engineered according to site conditions and using applicable safety factors. Wall maintenance varies with the types of wall materials. Inspection of the proposed wall systems will be done periodically by using the maintenance access path. Inspections should identify areas where walls may be sagging, bowing or look irregular compared to other portions of the wall. Excessive water seepage through the wall may be a sign of some off-site utility or drainage problem. Early identification of potential problems is beneficial, as issues can develop outside of the right-of-way and may be located on adjacent properties. In this case the adjacent land owners and/or utility companies would need to be notified to help investigate. Some potential maintenance issues are listed below for typical wall types.

- Modular Blocks – These gravity walls have some tolerance for settlement with modular blocks, and failures are usually localized. Repairs can usually be made with equipment that is sturdy enough to lift the individual blocks. An investigation of the failure would be required to determine the cause and to determine what bank stabilization measures may be necessary prior to rebuilding the wall. Usually the existing materials can be reused unless they are found to be broken and cracked so repairs can be made more quickly than poured in place concrete materials.

- Concrete Walls - These walls may show signs of cracking or bowing when stressed. Sometimes these failures can be more sudden cause damage over a longer distance depending on the locations of joints. Repairs are usually costly as the old concrete materials would have to be taken out. The bare earth would likely require some form of bank stabilization. Once complete new formwork would be required to set steel rebar and pour the new concrete wall in addition to the curing time to complete the repair process.

- Sheet Piles – In most cases this type of wall will show distortions at locations were the passive bearing capacity is not met and will start to rotate. Visual

inspection along the top of wall is usually the best way of identifying this issue. Correcting the problem can be the most difficult of the options presented. Some possible ways of addressing the issue may require the construction of a second wall behind the original, or to find ways to off-set the rotation by adding more resistance with tie-backs into the soil behind the wall where off-site conditions may allow.

4.12 Cost Estimates

The cost estimates for all of the alternatives were based a review of the primary costs for main cost items expected for each alternative. This includes mobilization, site preparation, excavation, backfill, special shoring, retaining wall, storm sewer, and storm sewer adjustments, headwalls, wingwalls, and limited revegetation with a contingency of 25%. Costs for retaining would vary based on the type of wall material, however the differences in these estimates use the same unit cost, and are compared based on an estimate of total wall required. A copy of these preliminary cost estimates is included in Appendix C for review.

4.13 Local Partnering and Amenity Benefit

The addition of enhanced landscaping and opening the maintenance access areas as a hike and bike option can create opportunities to partner with the surrounding community. Appendix D contains some amenity concepts that have been developed to demonstrate the potential for the Briar Branch channel corridor from the Briar Branch Basin to Gessner Road. These conceptual layouts are intended to serve as a starting point to evaluate conceptual ideas, as the primary purpose of the project is to reduce flood risk to the area.

The concepts show that the maintenance access road is generally north of the channel within the project downstream of Witte due to the access available from neighborhood roads that dead end into the channel. This is not continuous with the Briar Branch Basin under construction on the south side of the channel, and a bridge may be a potential option to allow passage to the south if desired. Access from Gessner to Witte is along the south side due to the available right-of-way access and drainage easements on the south side of the channel near Witte that allow for access from the existing driveway to the Spring Branch Bus Barn.

5.0 CONCLUSION

The proposed Briar Branch Channel Improvements are the second phase of a planned regional solution for the Briar Branch area. This project expands on the first phase Detention Basin improvements that are currently under construction, and prepares for the third phase of storm sewer improvements will help extend drainage benefits to the neighboring community.

This report reviewed five (5) different channel improvement alternatives.

Alternative	Description
A	Rectangular Concrete Low Flow
B	Dry Bottom Storage Channel
C	Wet Bottom Storage Channel
D	Hybrid Storage Channel
E	Storm Sewer Box Enclosure

All of these proposed alternatives would improve on current conditions; however TIRZ17 is concerned with the implementation of the most effective option that;

- meets hydraulic criteria with no adverse impacts downstream of the Briar Branch Stormwater Basin (currently under construction),
- provides significant reduction in flood risk to the area,
- improves maintenance access to the channel,
- structural elements are constructible, and easily maintained
- and also can the proposed improvements provide an amenity benefit to the area

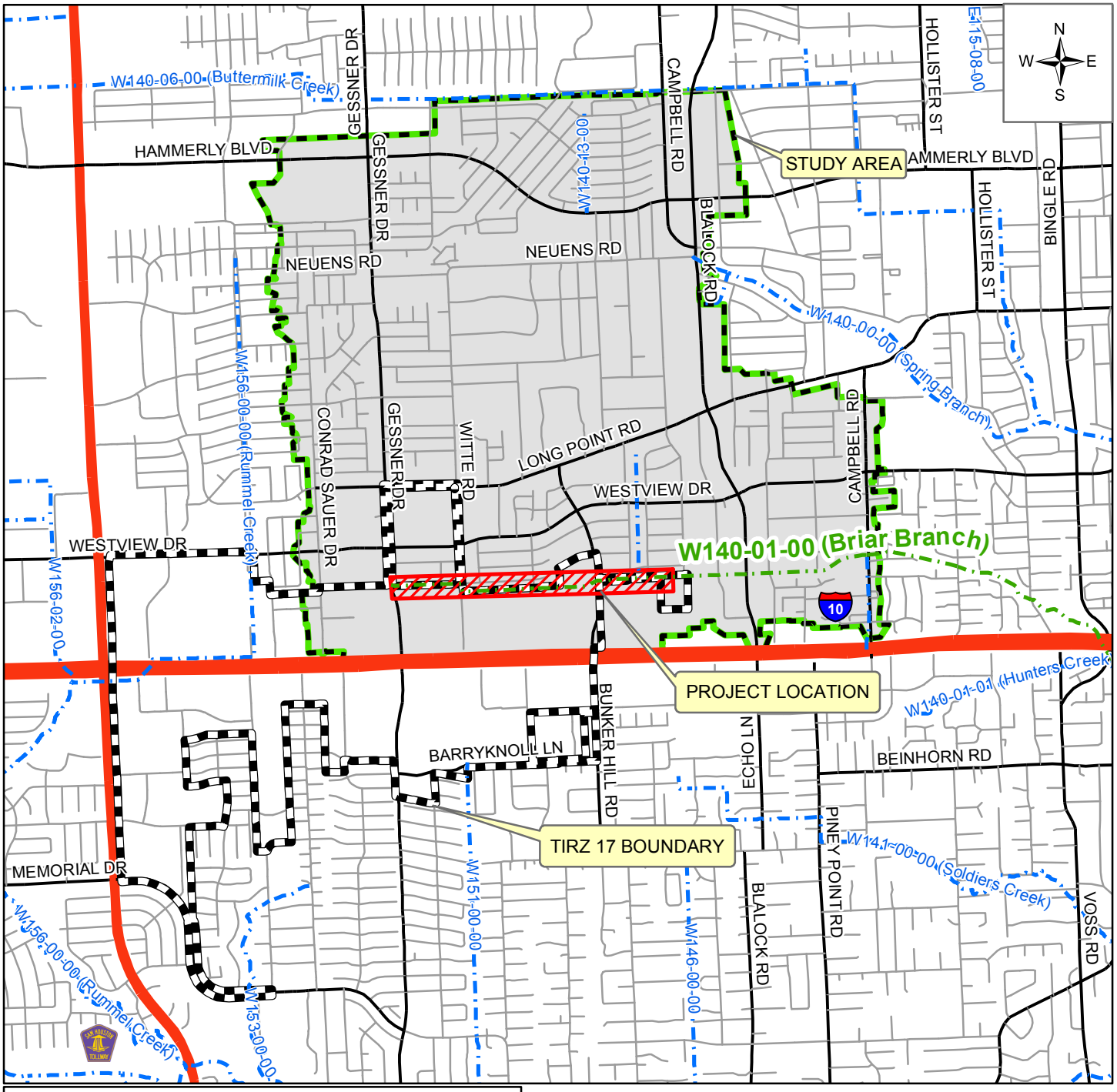
Of all the alternatives considered Alternative D the Hybrid Storage Channel is considered the best option for Briar Branch Channel Improvements. This option is able to provide a similar benefit to the area as the most beneficial Alternatives B and D. Alternative D also has slightly flatter side slopes, and can be constructed with shorter wall segments that make it more constructible than the other alternatives. Due to soil conditions in the area this is a better option for long term stability of the channel. In addition this alternative has the potential to provide an amenity benefit to the area through the use of water quality features and landscaping. The cost of this option is slightly lower due to less retaining wall area and less temporary shoring when compared to Alternatives B and D. The Briar Branch Channel has been determined to be non-jurisdictional; therefore the proposed improvements will not require any USACE permits.
All channel improvement alternatives will accomplish the key goal of lowering the water surface elevation in the channel to relieve the adjacent community without causing adverse impact. The different alternatives provide varying levels of benefit and include

advantages and disadvantages relative to each other. The purpose of this report is to present the alternatives to HCFCD to facilitate review and general approval of acceptable alternatives. TIRZ 17 is committed to working with HCFCD to select the alternative that provides the right balance of flooding relief and maintenance considerations.

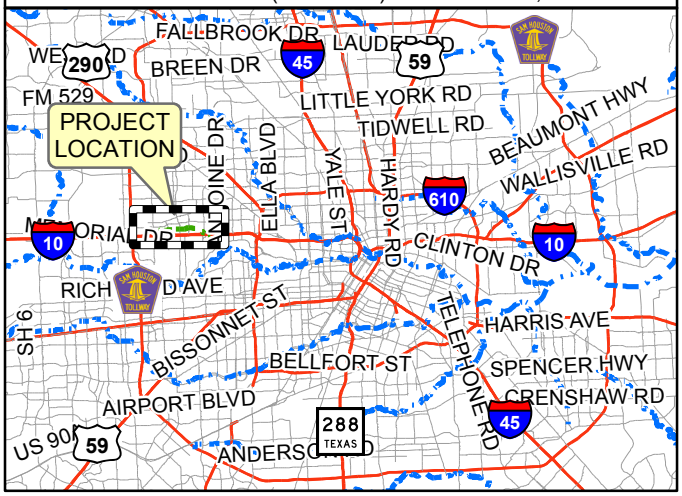
Alternatives B (Dry Bottom Storage) and D (Hybrid Channel Storage) have the best blend of potential benefits and other considerations, and are therefore recommended as the preferred alternatives. Alternatives B and D minimize potential maintenance issues relative to the other alternatives. All five alternatives include complete maintenance access per the HCFCD Policy Criteria manual. Maintenance access paths and routs are shown on **Exhibit 12**. Alternative C (Wet Bottom Storage) provides similar benefit to B and D but is more costly to construct and maintain. Alternatives A (Rectangular Concrete Low Flow) and E (Storm Sewer Box Enclosure) are considered the most conventional or traditional improvements but provide the least benefit of the five alternatives.

Upon acceptance of an approved alternative the design engineer will follow with a full Drainage Impact Analysis of the Selected Alternative. Alternative A was part of the Drainage Impact Analysis for the Briar Branch Detention Basin attached as **Appendix A**, and shows that the proposed channel improvements can be implemented to mitigate downstream impacts with the additional flood storage provided in the Briar Branch Detention Basin. Alternatives B and D have additional storage when compared to Alternative A and are expected to also meet this criterion.

EXHIBITS



VICINITY MAP (1" = 10 Mi) KEY MAP 450, 490



0 3,000 6,000 Feet

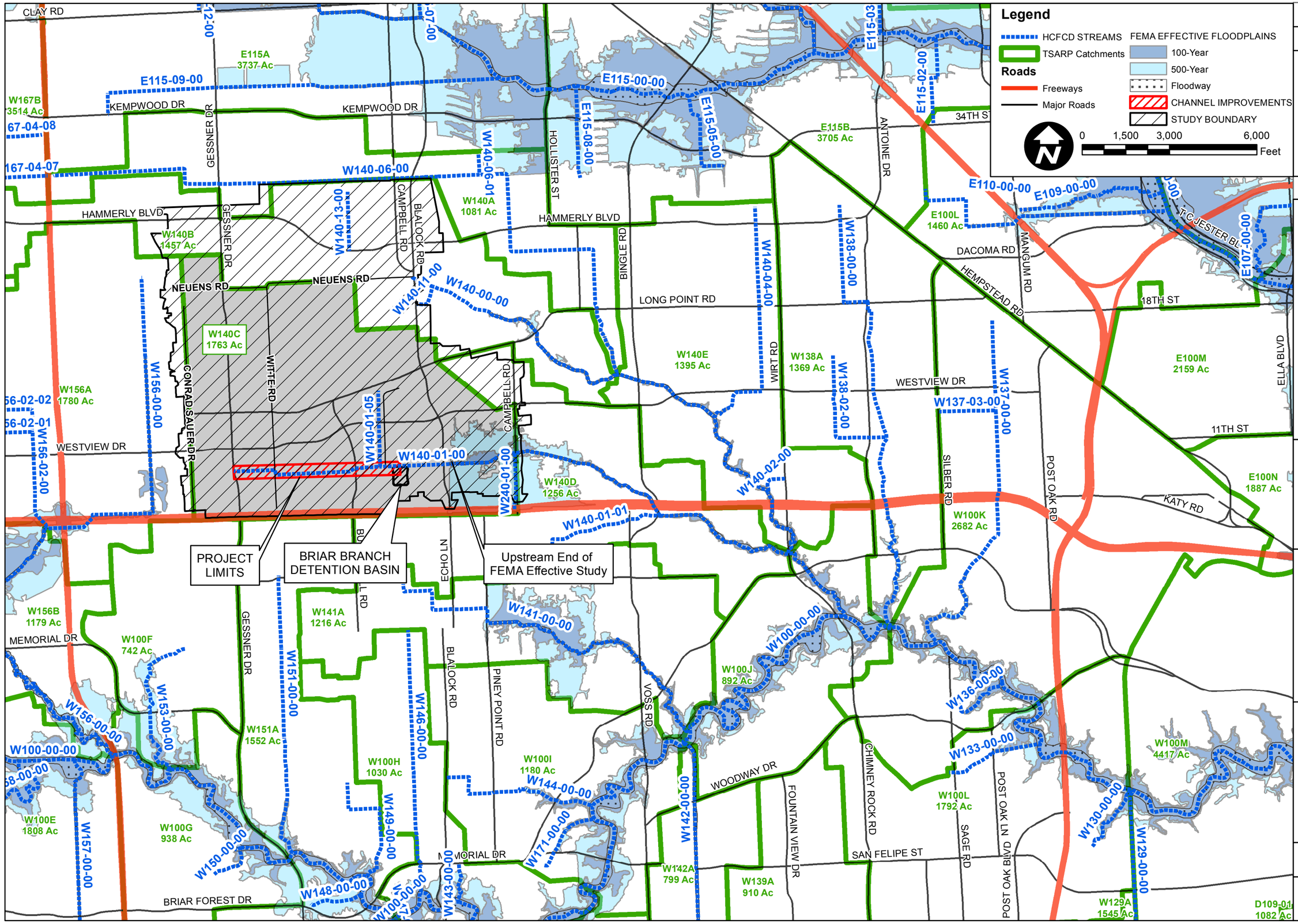
TIRZ 17
REDEVELOPMENT
AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

EXHIBIT 1 - PROJECT LOCATION MAP

Map Document: L:\130-10384-017\4-0-Production\4-08-GIS\MXD\W140-01 PER\01_Project_Location.mxd 9/5/2013 7:44:42 AM DGGreaney


Legend
HCFCD STREAMS
TSARP Catchments
Roads
Freeways
Major Roads
FEMA EFFECTIVE FLOODPLAINS
100-Year
500-Year
Floodway
CHANNEL IMPROVEMENTS
STUDY BOUNDARY
0 1,500 3,000 6,000
Feet
PROJECT LIMITS
BRIAR BRANCH DETENTION BASIN
Upstream End of FEMA Effective Study
CLAY RD
KEMPWOOD DR
HAMMERLY BLVD
NEUENS RD
LONG POINT RD
WESTVIEW DR
MEMORIAL DR
BRIAR FOREST DR
34TH ST
DACOMA RD
HEMPSTEAD RD
18TH ST
11TH ST
WOODWAY DR
SAN FELIPE ST
KATY RD
GESSNER DR
HOLLISTER ST
ANTOINE DR
BINGLE RD
WIRT RD
CAMPBELL RD
BLALOCK RD
WITTE RD
CONRADSAUER DR
PINEY POINT RD
VOSS RD
CHIMNEY ROCK RD
FOUNTAIN VIEW DR
SILBER RD
POST OAK RD
POST OAK LN BLVD
SAGE RD
MANGUM RD
ELLA BLVD
T C JESTER BLVD
E115A 3737 Ac
E115B 3705 Ac
E100L 1460 Ac
E100M 2159 Ac
E100N 1887 Ac
W167B 3514 Ac
W140A 1081 Ac
W140B 1457 Ac
W140C 1763 Ac
W140D 1256 Ac
W140E 1395 Ac
W138A 1369 Ac
W156A 1780 Ac
W156B 1179 Ac
W141A 1216 Ac
W151A 1552 Ac
W100F 742 Ac
W100G 938 Ac
W100H 1030 Ac
W100I 1180 Ac
W100J 892 Ac
W100K 2682 Ac
W100L 1792 Ac
W100M 4417 Ac
W100E 1808 Ac
W142A 799 Ac
W139A 910 Ac
W129A 1545 Ac
D109-01 1082 Ac
E115-09-00
E115-00-00
E115-08-00
E115-05-00
E115-03
E115-02-00
E110-00-00
E109-00-00
E107-00-00
W140-06-00
W140-06-01
W140-13-00
W140-11-00
W140-00-00
W140-04-00
W138-00-00
W140-02-00
W140-01-00
W140-01-01
W140-01-05
W240-01-00
W137-03-00
W137-00-00
W141-00-00
W100-00-00
W136-00-00
W133-00-00
W130-00-00
W129-00-00
W151-00-00
W146-00-00
W153-00-00
W156-00-00
W149-00-00
W144-00-00
W171-00-00
W142-00-00
W143-00-00
W148-00-00
W150-00-00
W157-00-00
W156-02-00
W156-02-01
W156-02-02
67-04-08
167-04-07
EFFECTIVE FLOODPLAIN AND W140C DRAINAGE AREA MAP
BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS
DESCRIPTION
DATE
APPR
REV
PREPARED: DGG
CHECKED: BRW
APPROVED: DST
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
HRZ 17 REDEVELOPMENT AUTHORITY
DATE: SEP 2013
SCALE: AS NOTED
EXHIBIT NUMBER
2 OF 16
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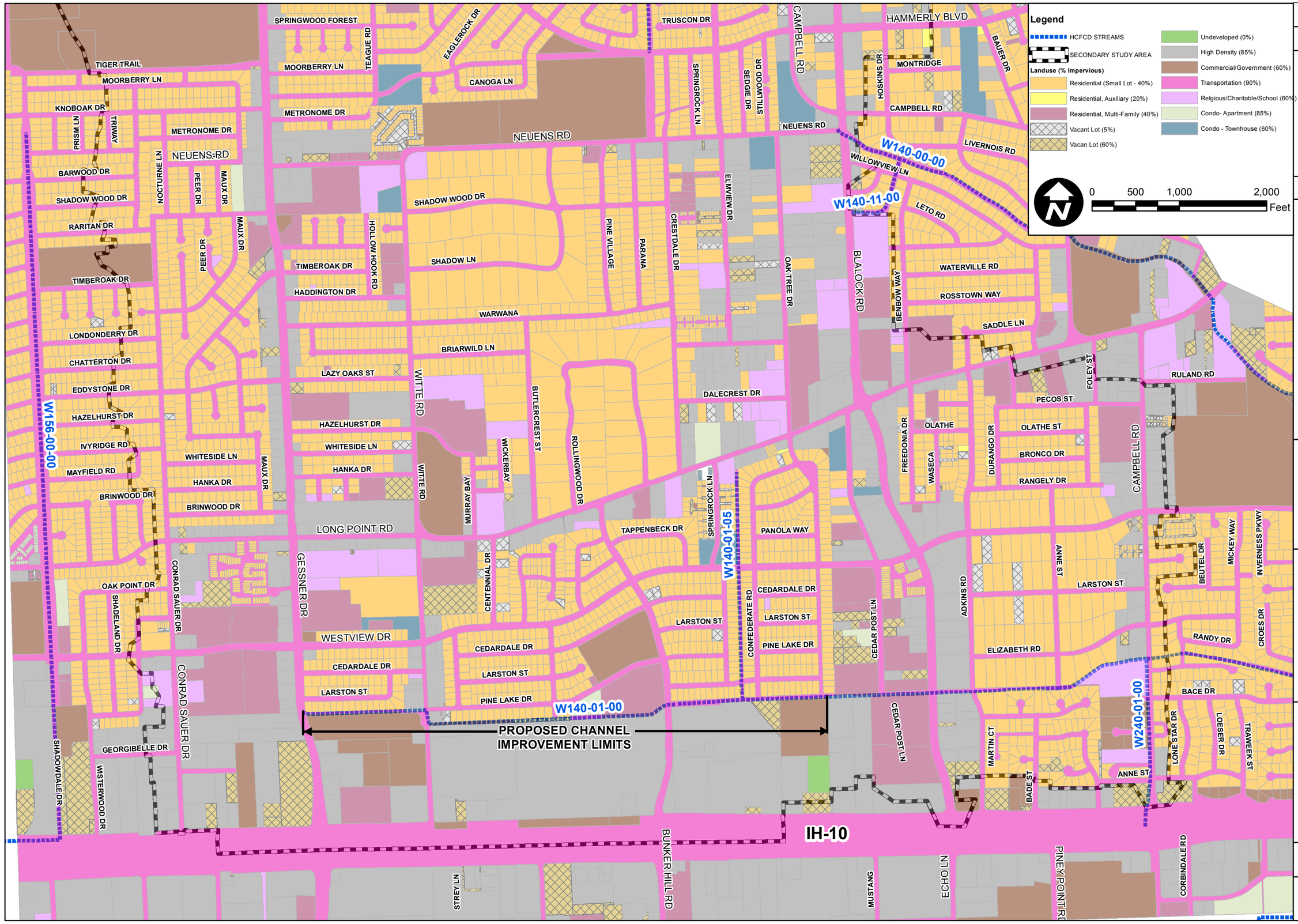


REV	DESCRIPTION	DATE	APPR

LANDUSE MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

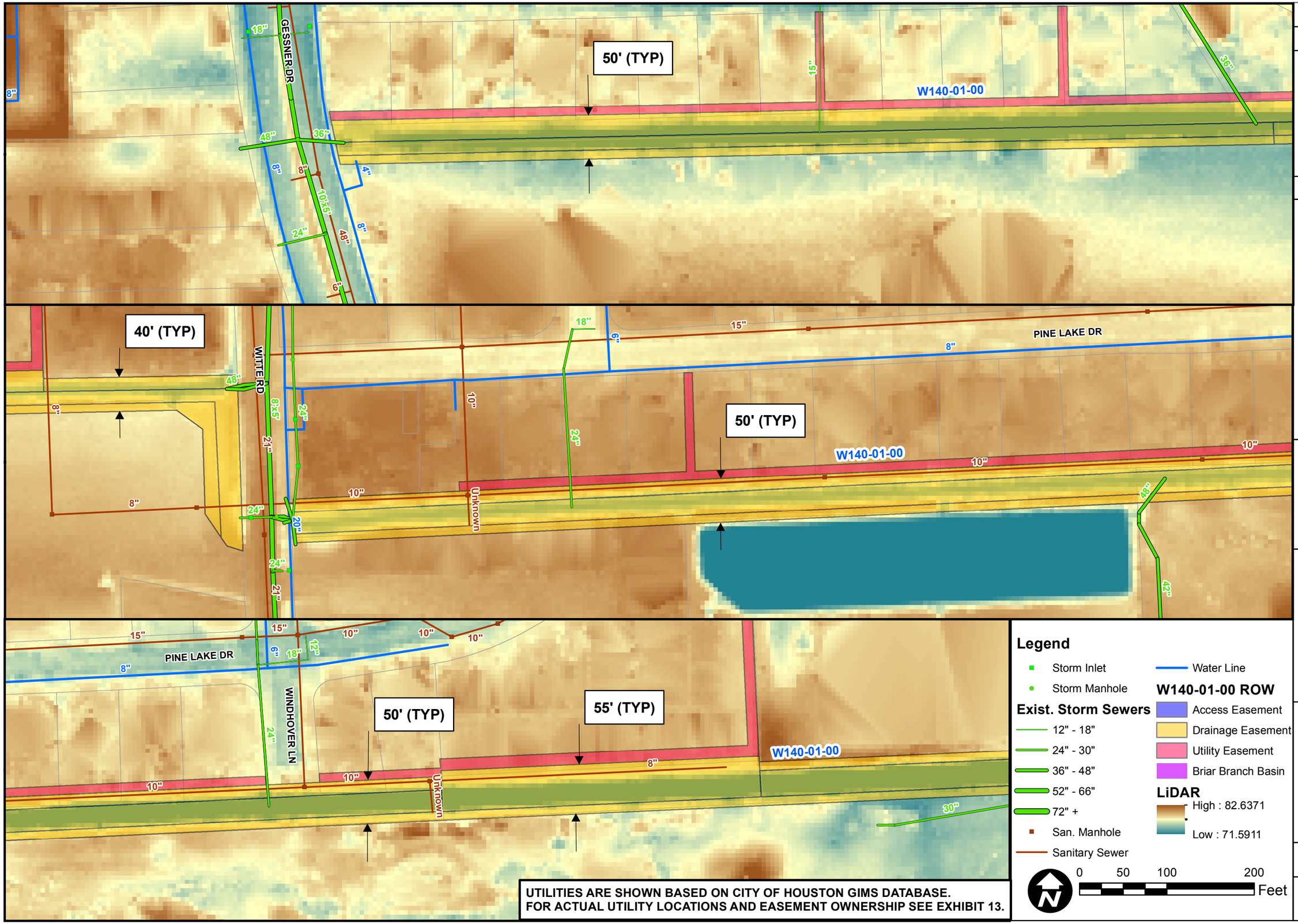
PREPARED:	CHECKED:	APPROVED:
DGG	BRW	DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
3 OF 16



Legend

- Storm Inlet
- Storm Manhole
- Water Line

Exist. Storm Sewers

- 12" - 18"
- 24" - 30"
- 36" - 48"
- 52" - 66"
- 72" +
- San. Manhole
- Sanitary Sewer

W140-01-00 ROW

- Access Easement
- Drainage Easement
- Utility Easement
- Briar Branch Basin

LiDAR

High : 82.6371

Low : 71.5911

0 50 100 200 Feet

UTILITIES ARE SHOWN BASED ON CITY OF HOUSTON GIMS DATABASE. FOR ACTUAL UTILITY LOCATIONS AND EASEMENT OWNERSHIP SEE EXHIBIT 13.

REV	DESCRIPTION	DATE	APPR

RIGHT OF WAY MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG
CHECKED: BRW
APPROVED: DST

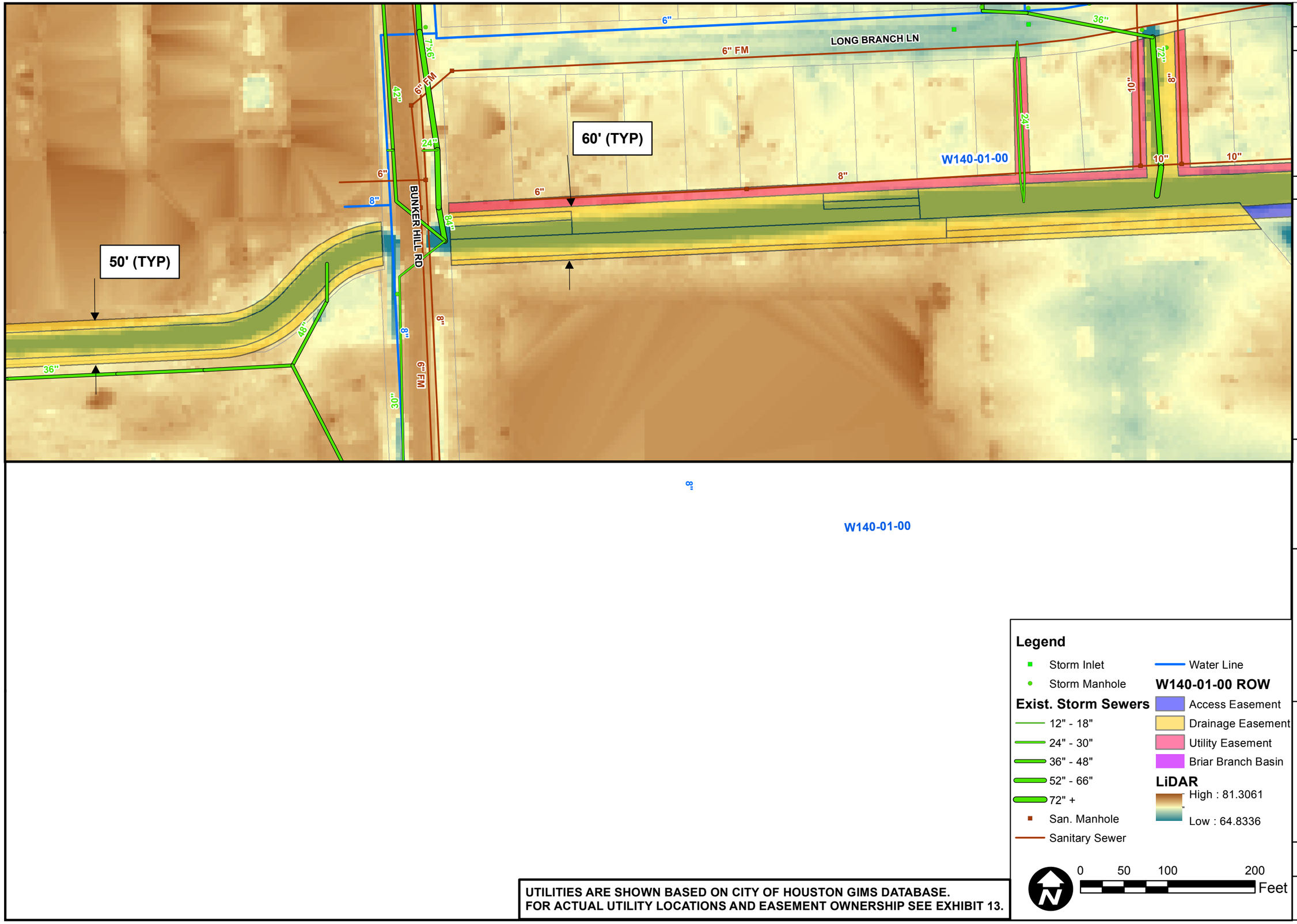
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
4a OF 16

Map Document: L:\130-10384-017\4-0-Production\4-08-GIS\MXD\W140-01 PER\04a_Right-of-Way_Map.mxd 9/16/2013 1:13:26 PM DGGreaney



Legend

- Storm Inlet
- Storm Manhole

Exist. Storm Sewers

- 12" - 18"
- 24" - 30"
- 36" - 48"
- 52" - 66"
- 72" +
- San. Manhole
- Sanitary Sewer
- Water Line

W140-01-00 ROW

- Access Easement
- Drainage Easement
- Utility Easement
- Briar Branch Basin

LiDAR

High : 81.3061

Low : 64.8336

0 50 100 200 Feet

**UTILITIES ARE SHOWN BASED ON CITY OF HOUSTON GIMS DATABASE.
FOR ACTUAL UTILITY LOCATIONS AND EASEMENT OWNERSHIP SEE EXHIBIT 13.**

REV	DESCRIPTION	DATE	APPR

RIGHT OF WAY MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG

CHECKED: BRW

APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
4b OF 16

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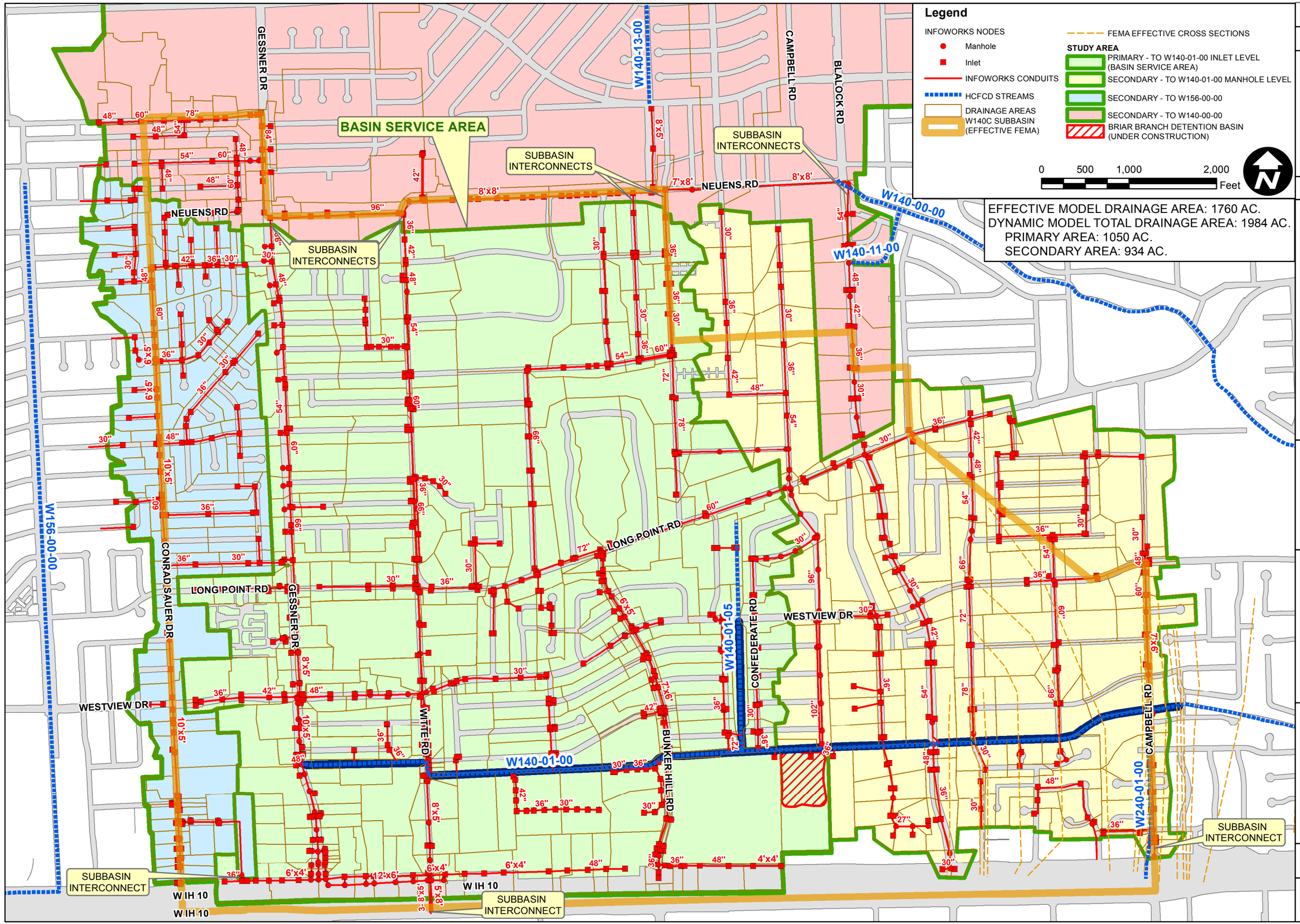


DYNAMIC MODEL
DRAINAGE SYSTEM MAP

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

REV	DESCRIPTION	DATE	APPR

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

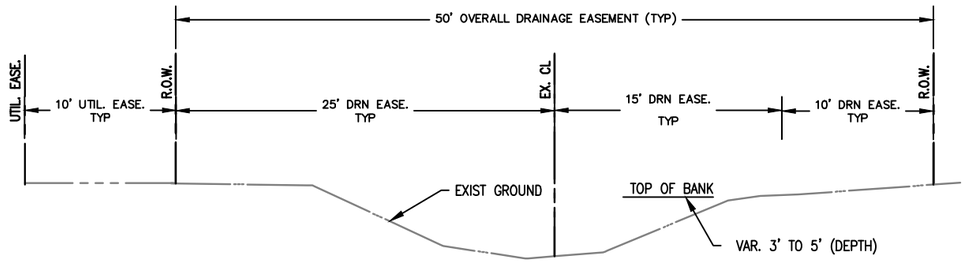
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

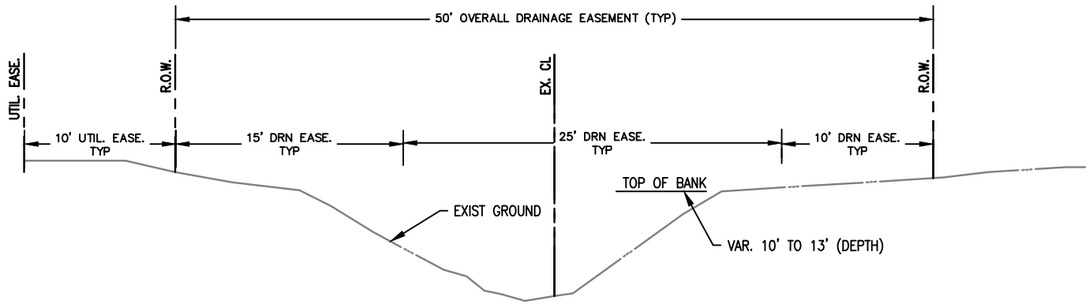
DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
5 OF 16

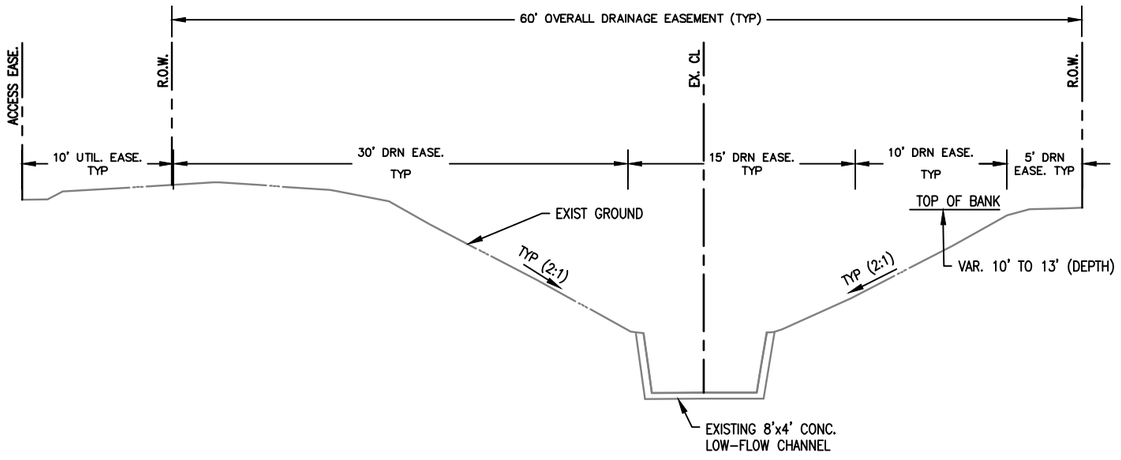
Map Document: L:\130-10384-017\4-0-Production\4-08-GIS\MXD\W140-01 PER\05_Dynamic_Model_System_Map.mxd 9/16/2013 1:15:20 PM DGGreaney



EXISTING W140-01-00 CHANNEL
AVG CHANNEL AREA = 55 SF
FROM GESSNER TO WITTE RD.



EXISTING W140-01-00 CHANNEL
AVG CHANNEL AREA = 120 SF
FROM WITTE RD. TO BUNKER HILL RD.



EXISTING W140-01-00 CHANNEL
8'x4' RECT CHANNEL w/ (2:1) GRASS SS
AVG CHANNEL AREA = 220 SF
EAST OF BUNKER HILL RD.

0 5 10

1"=10'-0"

INTERIM REVIEW ONLY
Document incomplete, not intended for regulatory approval, permit, or construction.

BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date

Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

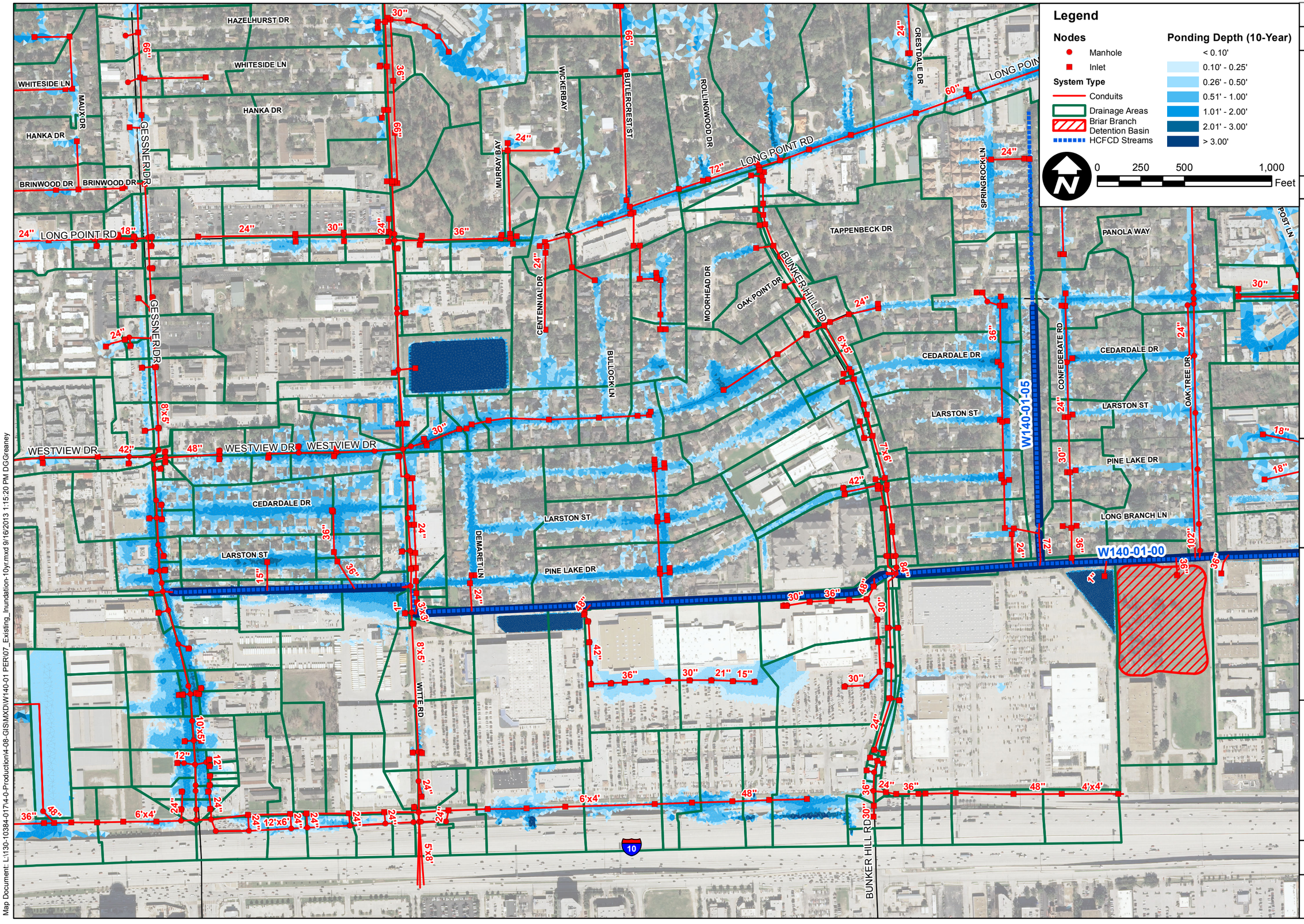
BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS
EXHIBIT 6
EXISTING BRIAR BRANCH TYPICAL SECTIONS

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET: 6 OF 16	

C:\PROJECTWISE\DGGREANEY\00138346\06-EXISTING BRIAR BRANCH XS.DWG 8/27/2013 1:08:07 PM Greaney, David G.



REV						
DESCRIPTION						
DATE						
APPR						

EXISTING CONDITIONS 10-YEAR INUNDATION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG

CHECKED: BRW

APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

HRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

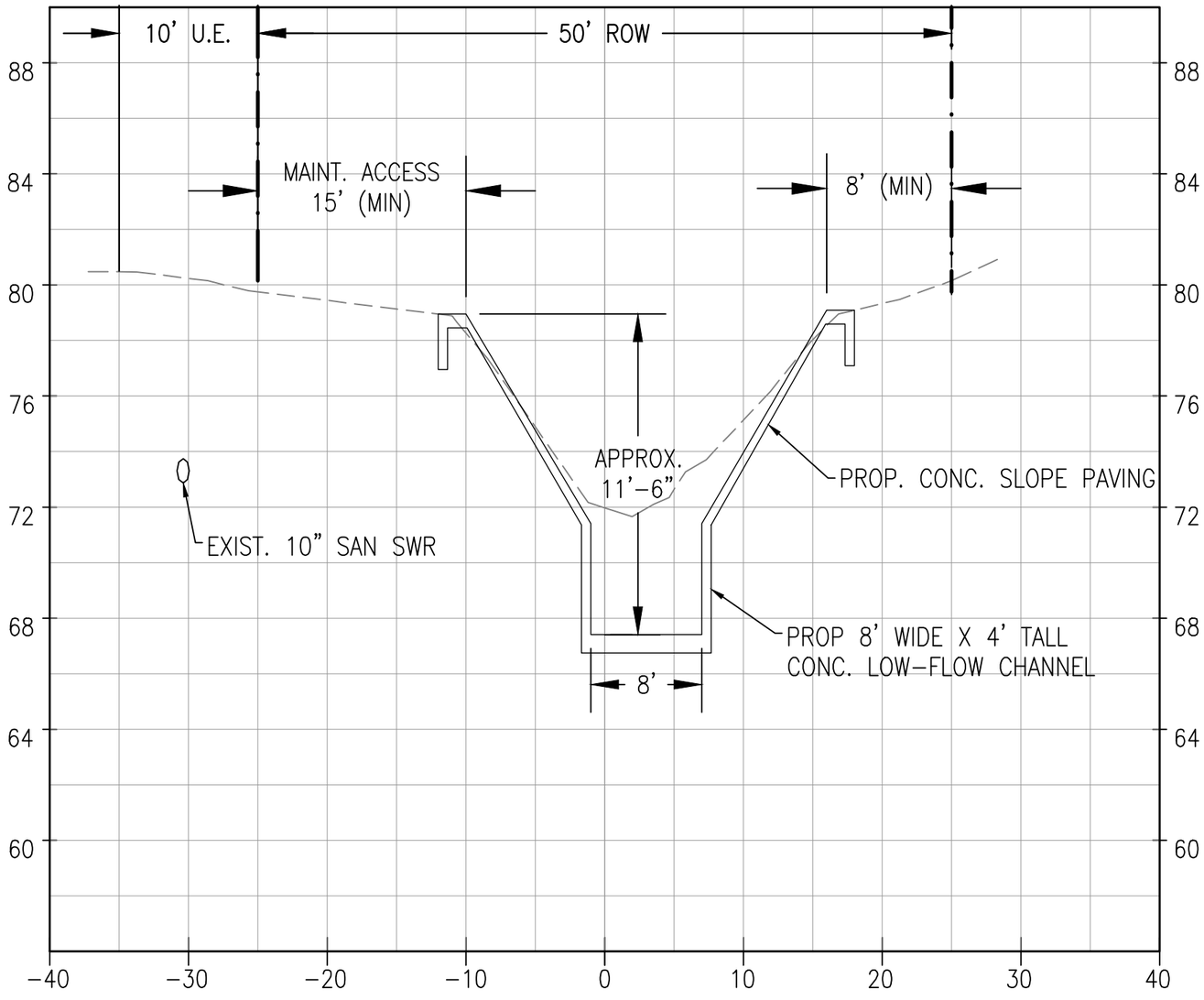
EXHIBIT NUMBER
7 OF 16

Map Document: L:\130-10384-01744-0-Production\4-08-GIS\MXD\W140-01 PER\07_Existing_Inundation-10yr.mxd 9/16/2013 1:15:20 PM DGGreaney

0 5' 10' 15'

SCALE: 1"=10' HORIZ
1"=5' VERT

ALT A: CONCRETE LOW-FLOW (EXTENSION OF EXISTING SECTION D.S. OF BUNKER HILL)



NOTES:

1. CONCRETE SLOPE PAVING AND LOW-FLOW CHANNEL PER HCFCD CHANNEL LINING DETAILS.

INTERIM REVIEW ONLY
Document incomplete, not intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 8a
ALTERNATIVE A:
CONCRETE LOW-FLOW

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

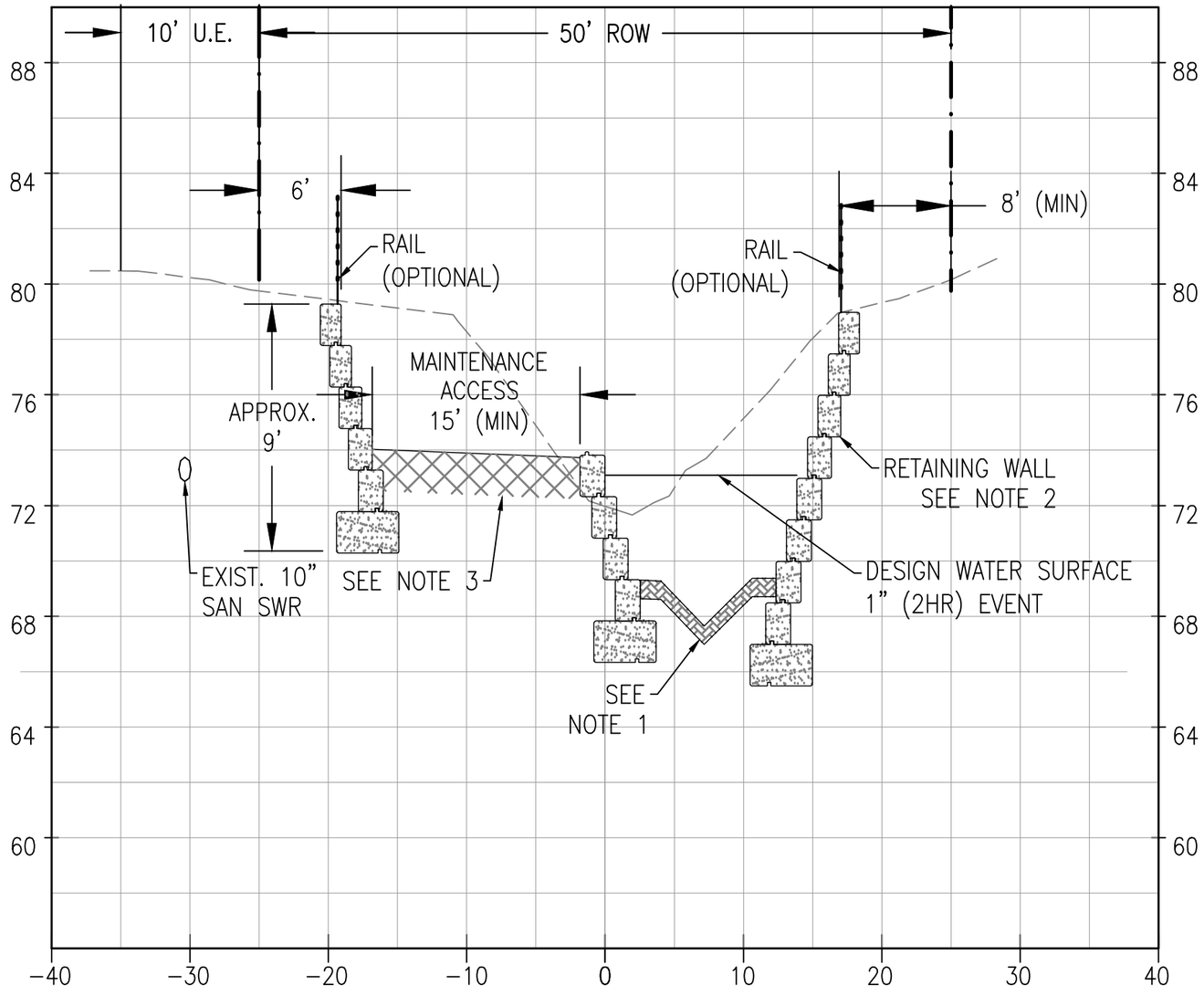
FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DGREANEY\D0139346\08-PROPOSED BRIAR BRANCH CROSS SECTION ALT-BRW.DWG 9/9/2013 9:05:30 AM Greaney, David G.

0 5' 10' 15'

SCALE: 1"=10' HORIZ
1"=5' VERT

ALT B: DRY BOTTOM STORAGE CHANNEL



NOTES:

1. BOTTOM OF CHANNEL COULD BE A MIXTURE OF RIPRAP, GEOCELL WITH GRANULAR MATERIAL AND/OR OTHER MATERIALS TO PROVIDE EROSION PROTECTION, ALLOW FOR ESTABLISHMENT OF VEGETATION, AND TO DEFINE THE FLOWLINE OF THE CHANNEL FOR EASIER LONG-TERM MAINTENANCE. IF NECESSARY A HAZARD CAN BE CONSIDERED.

2. MODULAR BLOCK GRAVITY WALLS ARE SHOWN, DIFFERENT RETAINING WALL OPTIONS ARE CONSIDERED IN THE REPORT.

3. MAINTENANCE ACCESS PATH TO BE AN (APPROVED) ALL WEATHER SURFACE AND ELEVATED ABOVE DESIGN STORM EVENT. ELEVATION SHOWN TO AN APPROXIMATE 1" (2HR) EVENT.

INTERIM REVIEW ONLY
Document incomplete; not intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 8b
ALTERNATIVE B:
DRY BOTTOM STORAGE CHANNEL

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

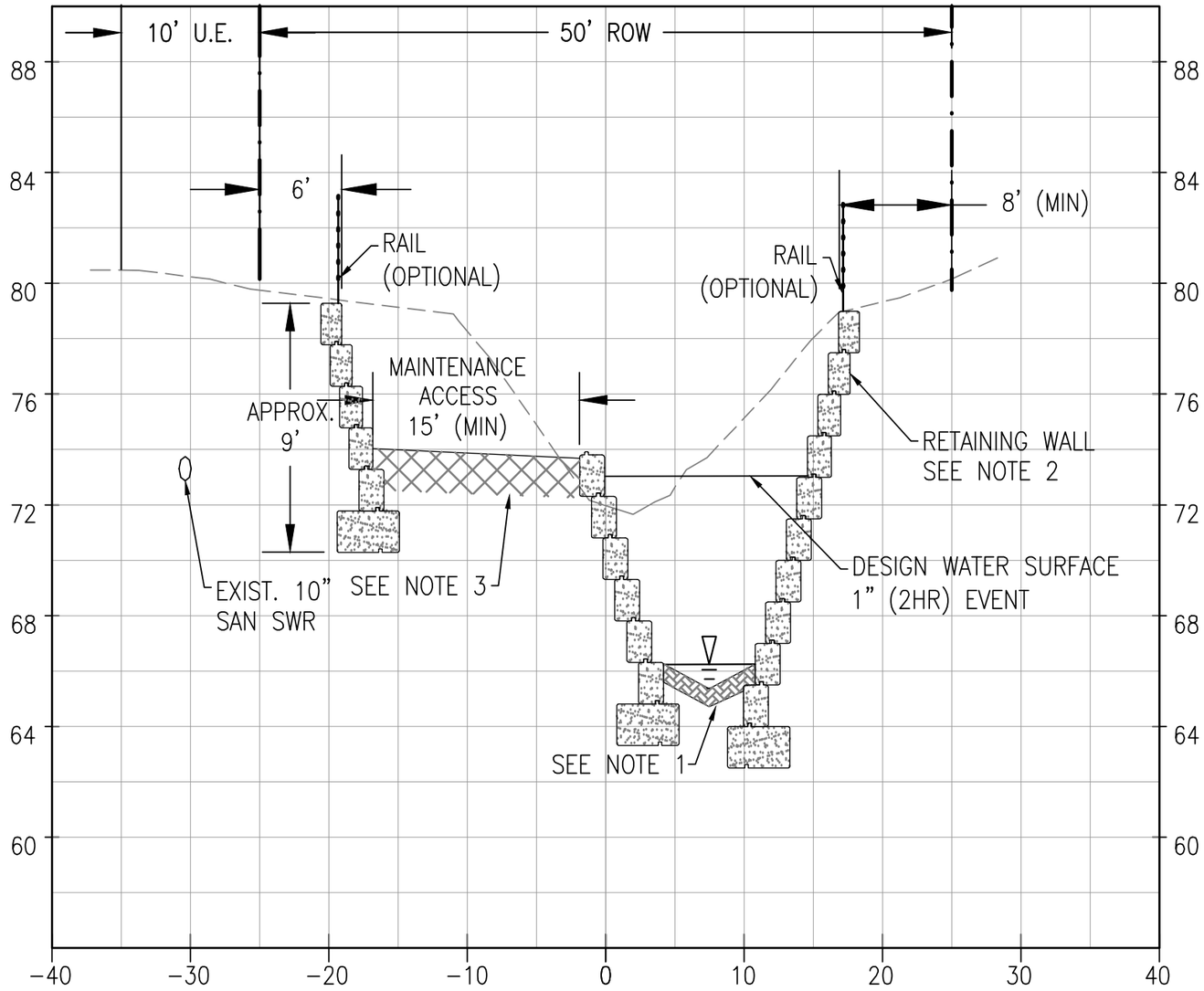
FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DOGREANEY\D0139346\08-PROPOSED BRIAR BRANCH CROSS SECTION ALT-BRW.DWG 9/9/2013 9:05:30 AM Greaney, David G.

0 5' 10' 15'

SCALE: 1"=10' HORIZ
1"=5' VERT

ALT C: WET BOTTOM STORAGE CHANNEL



NOTES:

1. BOTTOM OF CHANNEL WILL BE A MIXTURE OF RIPRAP, GEOCELL WITH GRANULAR MATERIAL AND/OR OTHER MATERIALS TO PROVIDE EROSION PROTECTION, ALLOW FOR ESTABLISHMENT OF VEGETATION, AND TO DEFINE THE FLOWLINE OF THE CHANNEL FOR EASIER LONG-TERM MAINTENANCE.

2. MODULAR BLOCK GRAVITY WALLS ARE SHOWN, DIFFERENT RETAINING WALL OPTIONS ARE CONSIDERED IN THE REPORT.

3. MAINTENANCE ACCESS PATH TO BE AN (APPROVED) ALL WEATHER SURFACE AND ELEVATED ABOVE DESIGN STORM EVENT. ELEVATION SHOWN TO AN APPROXIMATE 1" (2HR) EVENT.

INTERIM REVIEW ONLY
Document Incomplete; not Intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 8c
ALTERNATIVE C:
WET BOTTOM STORAGE CHANNEL

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

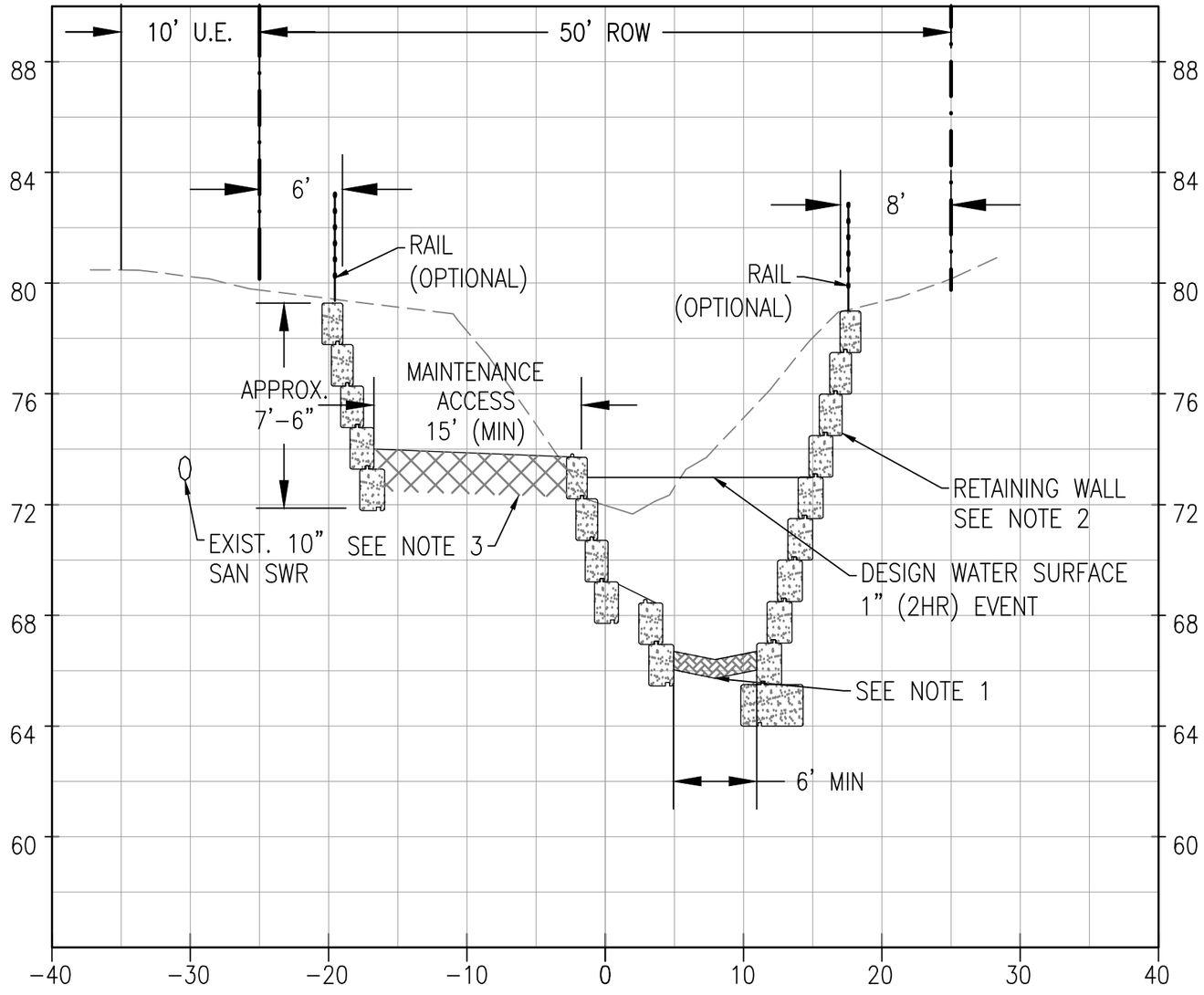
FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DGGREANEY\D0139346\08-PROPOSED BRIAR BRANCH CROSS SECTION ALT-BRW.DWG 9/9/2013 9:05:30 AM Greaney, David G.

0 5' 10' 15'

SCALE: 1"=10' HORIZ
1"=5' VERT

ALT D: HYBRID STORAGE CHANNEL



NOTES:

1. BOTTOM OF CHANNEL COULD BE A MIXTURE OF RIPRAP, GEOCELL WITH GRANULAR MATERIAL AND/OR OTHER MATERIALS TO PROVIDE EROSION PROTECTION, ALLOW FOR ESTABLISHMENT OF VEGETATION, AND TO DEFINE THE FLOWLINE OF THE CHANNEL FOR EASIER LONG-TERM MAINTENANCE. IF NECESSARY A HARDENED CONCRETE SURFACE CAN BE CONSIDERED.

2. MODULAR BLOCK GRAVITY WALLS ARE SHOWN, DIFFERENT RETAINING WALL OPTIONS ARE CONSIDERED IN THE REPORT.

3. MAINTENANCE ACCESS PATH TO BE AN APPROVED ALL WEATHER SURFACE AND ELEVATED ABOVE A DESIGN STORM EVENT. ELEVATION SHOWN IS AN APPROXIMATE 1" (2HR) EVENT.

INTERIM REVIEW ONLY
Document Incomplete; not intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 8d
ALTERNATIVE D:
HYBRID STORAGE CHANNEL

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

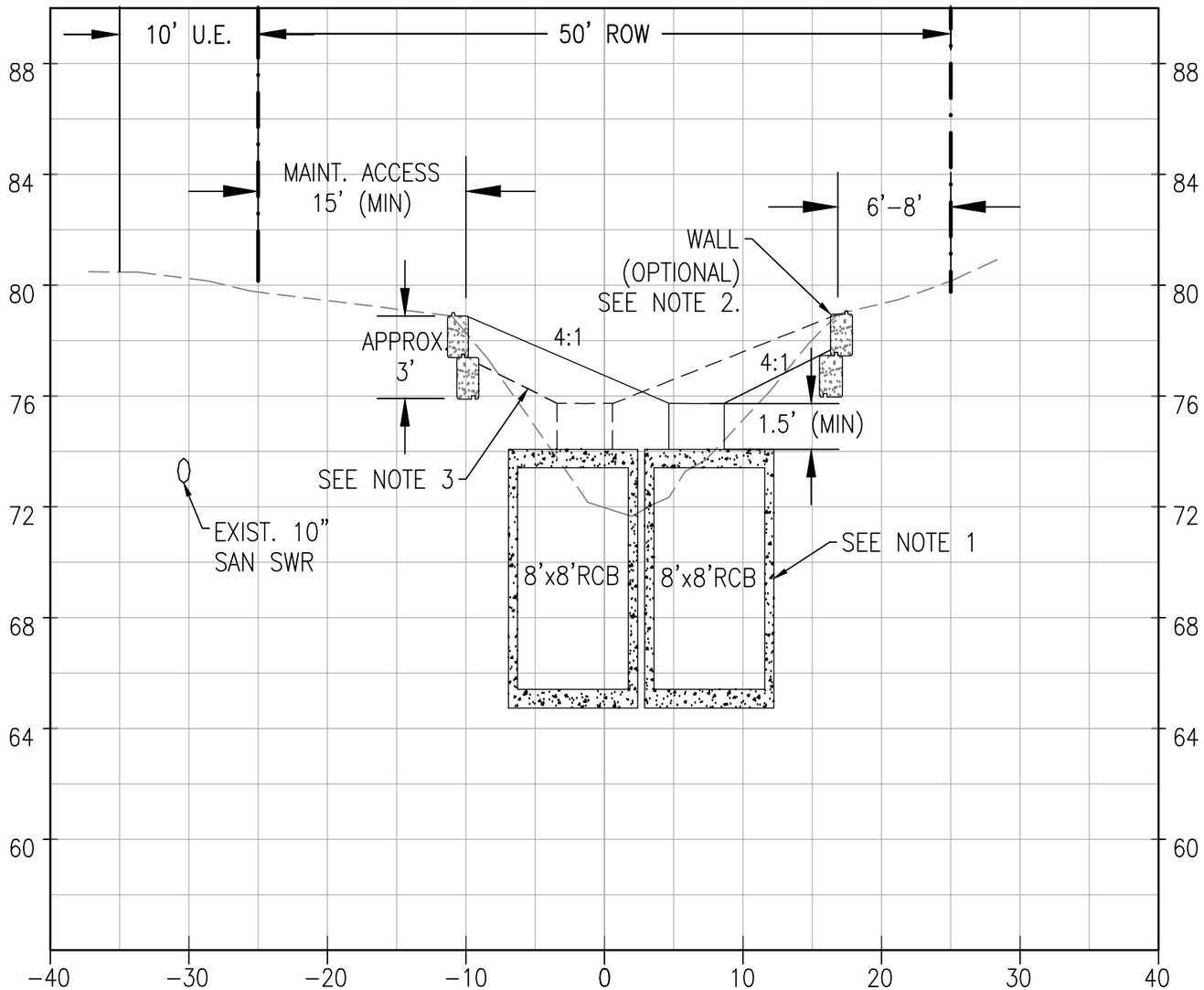
FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DGREANEY\D0139346\08-PROPOSED BRIAR BRANCH CROSS SECTION ALT-BRW.DWG 9/9/2013 9:05:30 AM Greeney, David G.

0 5' 10' 15'

SCALE: 1"=10' HORIZ
1"=5' VERT

ALT E: STORM SEWER BOX ENCLOSURE



NOTES:

1. ESTIMATED BOX SIZE BASED ON PRELIMINARY ANALYSIS AND SUBJECT TO CHANGE WITH ADDITIONAL IMPACT STUDY.

2. CHANNEL BOTTOM MAY MEANDER FROM LEFT TO RIGHT. LOW GRAVITY WALLS MAY BE NECESSARY.

3. MAY BE NECESSARY TO MAINTAIN 4:1 SLOPE (MAX) AND TO PROVIDE AMENITY BENEFITS.

INTERIM REVIEW ONLY
Document Incomplete, not Intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

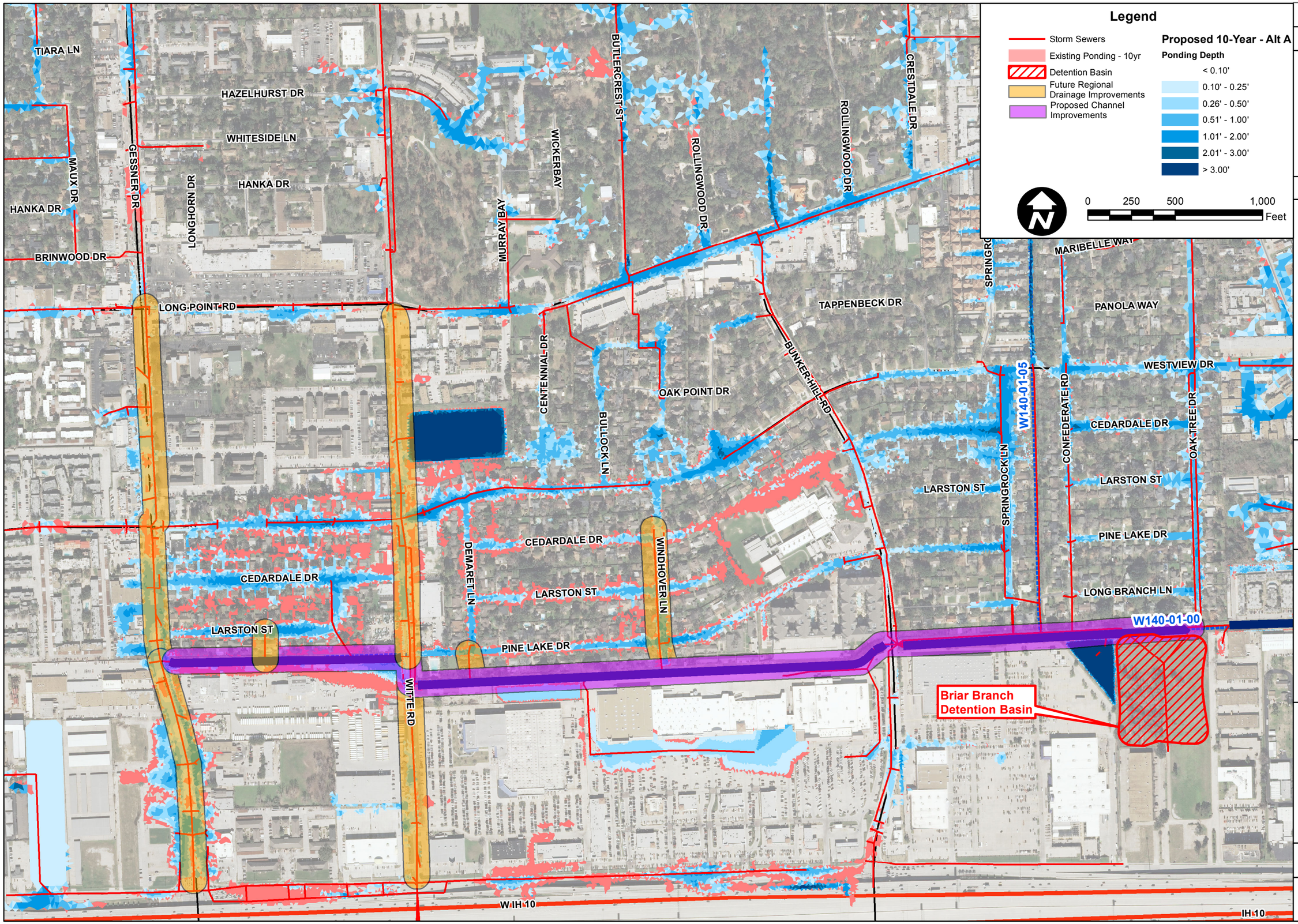
BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 8e
ALTERNATIVE E:
STORM SEWER BOX ENCLOSURE

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DGGREANEY\D0139346\08-PROPOSED BRIAR BRANCH CROSS SECTION ALT-BRW.DWG 9/9/2013 9:05:30 AM Greaney, David G.



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REV	DESCRIPTION	DATE	APPR

PROPOSED ALTERNATIVE A 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

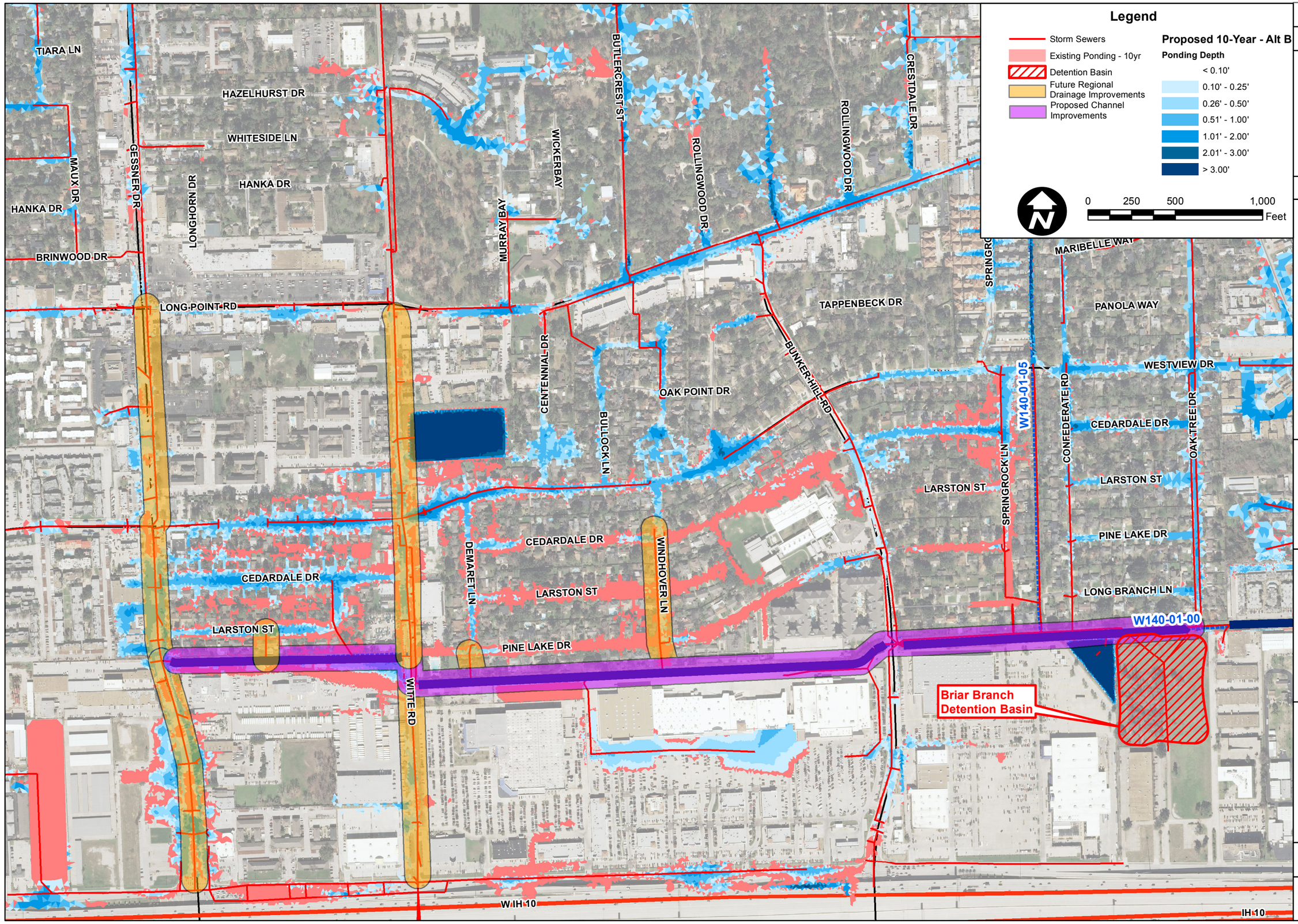
PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9a OF 16



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REV	DESCRIPTION	DATE	APPR

PROPOSED ALTERNATIVE B 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

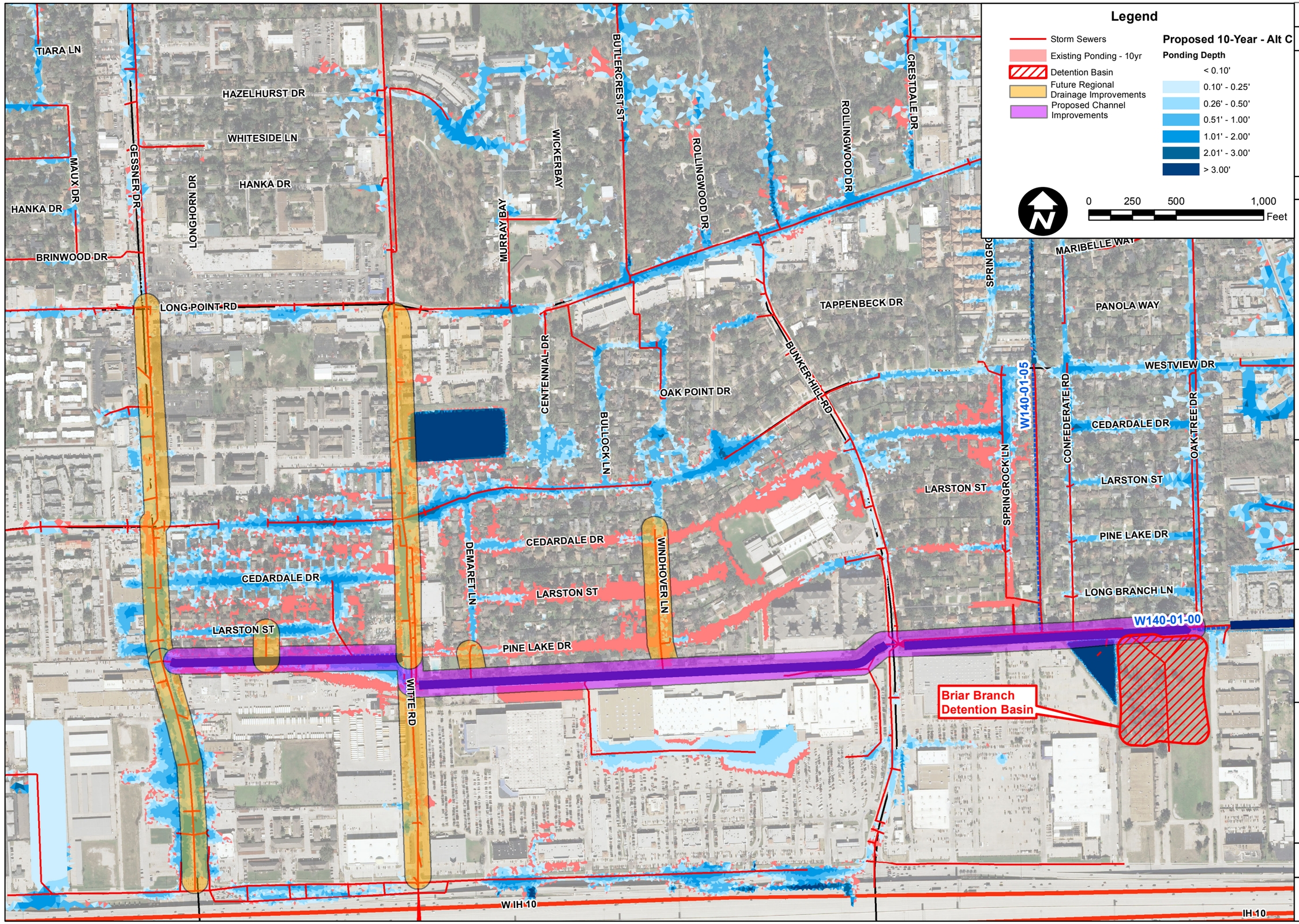
PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9b OF 16



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REV	DESCRIPTION	DATE	APPR

PROPOSED ALTERNATIVE C 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

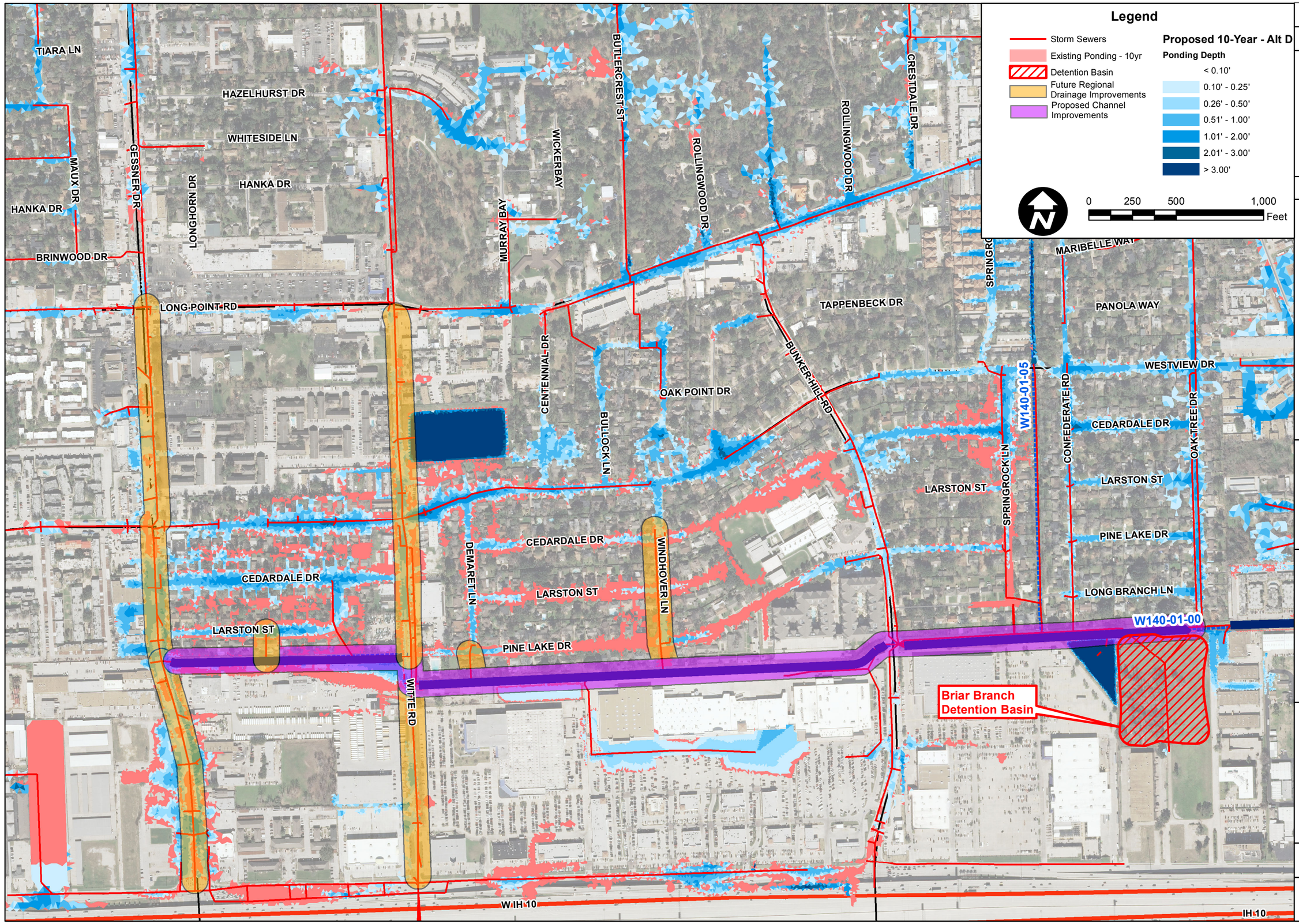
PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9c OF 16



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REV	DESCRIPTION	DATE	APPR

PROPOSED ALTERNATIVE D 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

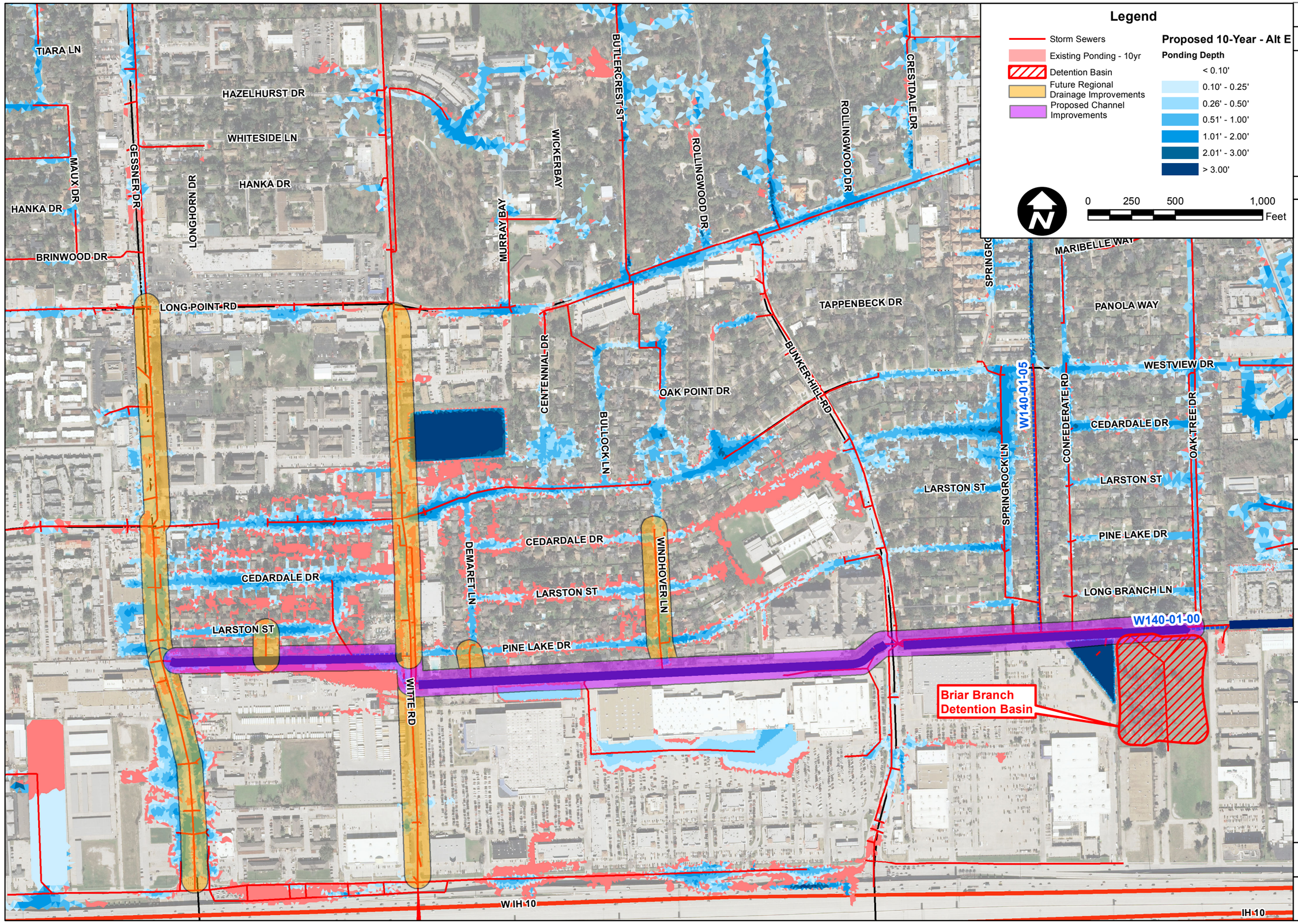
PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9d OF 16



REV	DESCRIPTION	DATE	APPR

PROPOSED POND-ONLY 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9e OF 16

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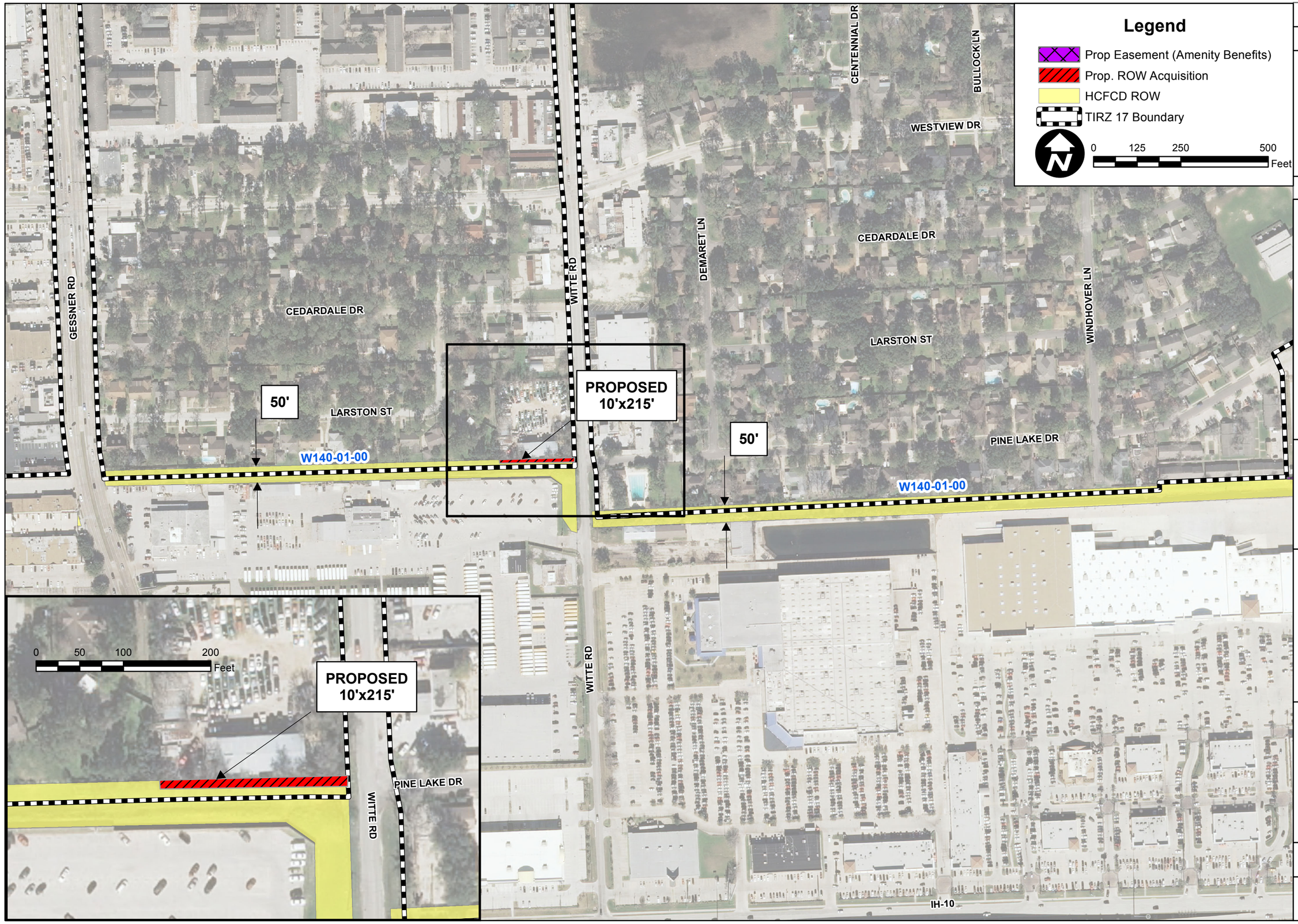

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REV	DESCRIPTION	DATE	APPR

RIGHT OF WAY REQUIREMENTS

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

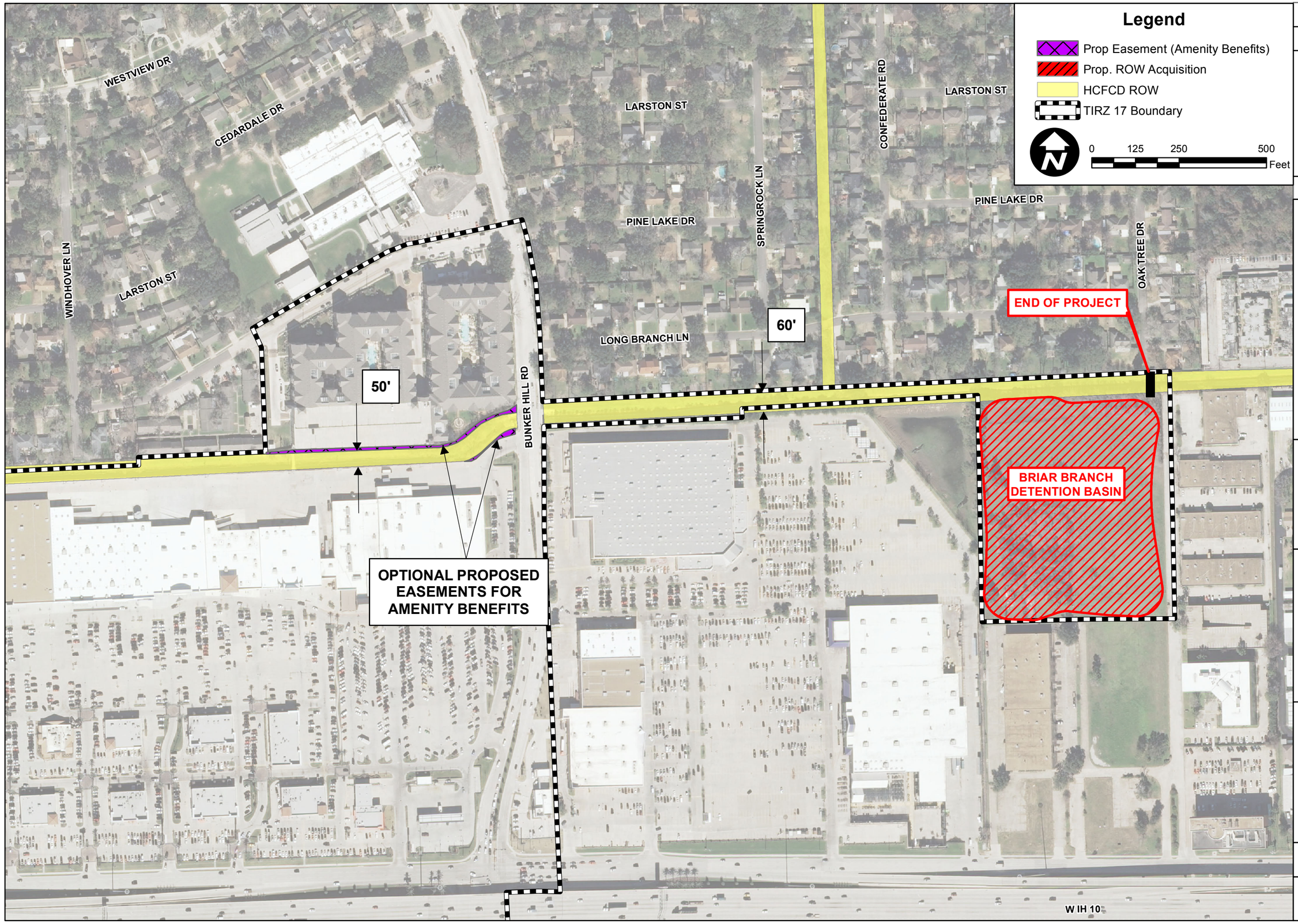
PREPARED: DGG
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
10a OF 16



REV	DESCRIPTION	DATE	APPR

RIGHT OF WAY REQUIREMENTS

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG
CHECKED: BRW
APPROVED: DST

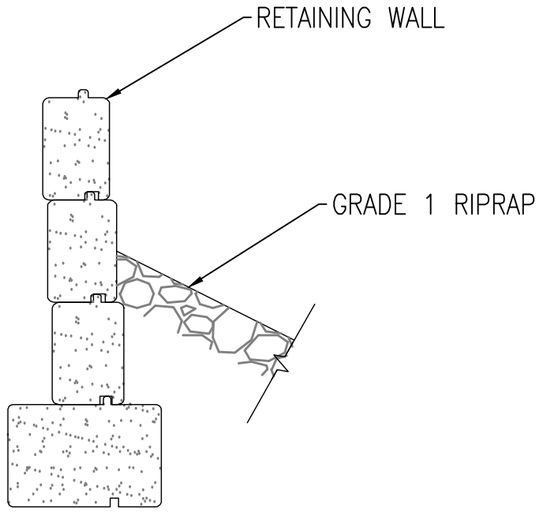
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

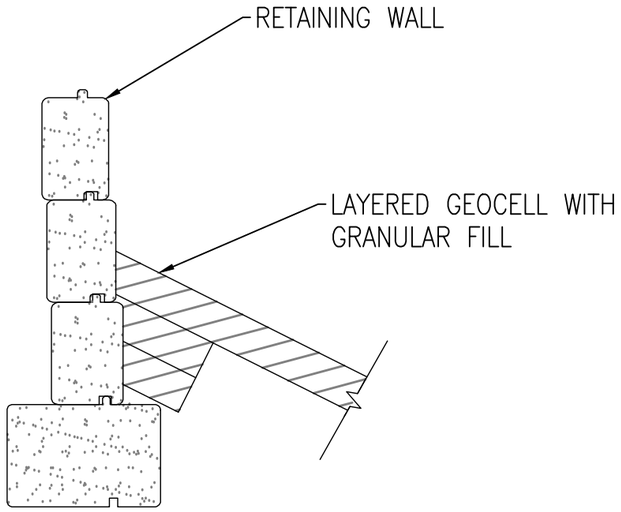
DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
10b OF 16

Map Document: L:\130-10384-01?4-0-Production\4-08-GIS\MXD\W140-01 PER\10b_ROW_Requirements.mxd 9/16/2013 1:21:07 PM DGGreaney



OPTION 1: RIPRAP



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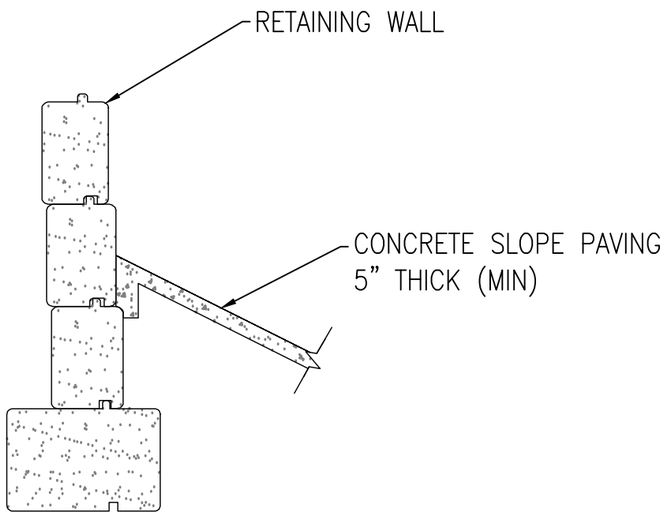
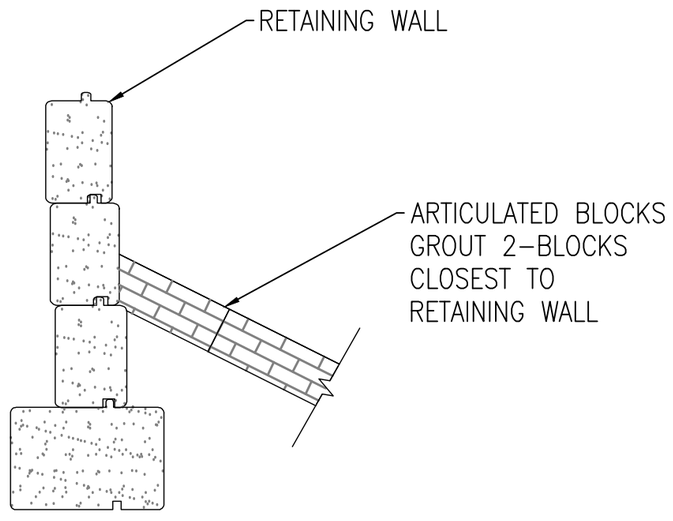


OPTION 3: CONCRETE SLOPE PAVING



OPTION 4: ARTICULATED BLOCK

INTERIM REVIEW ONLY
Document Incomplete; not intended for regulatory approval, permit, or construction.
BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

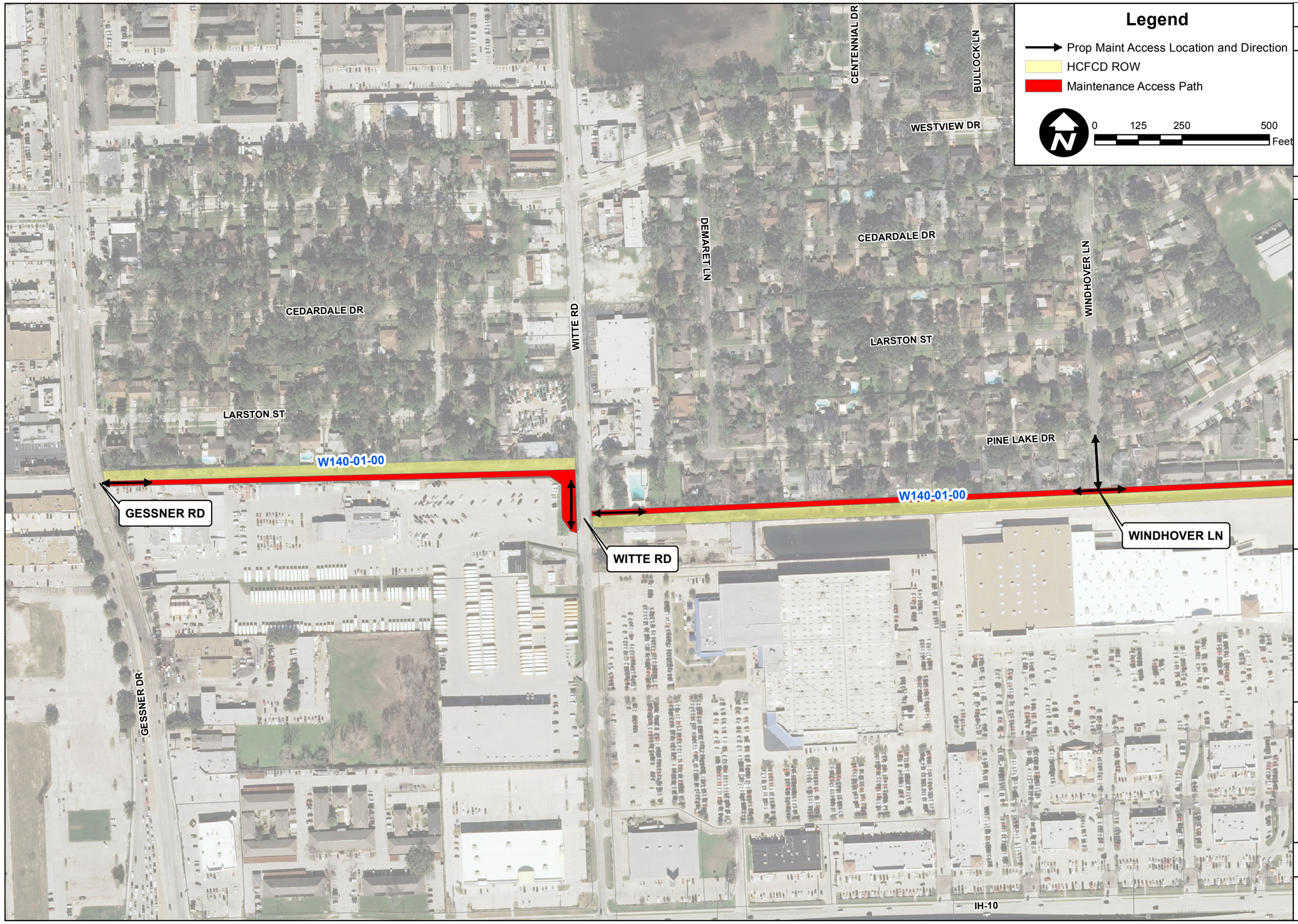
BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 11
TYPICAL EROSION CONTROL FEATURES

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:
FACILITY
DRAWING SCALE: NTS
CITY DWG NO.
VERT:
HORZ:
SHEET: 11 OF 13

C:\PROJECTWISE\DGSREANEY\D0139348\11-TYPICAL EROSION CONTROL FEATURES.DWG 9/3/2013 1:10:12 PM Greaney, David G.



REV	DESCRIPTION	DATE	APPR

PROPOSED MAINTENANCE ACCESS PLAN

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

PREPARED: DGG
CHECKED: BRW
APPROVED: DST

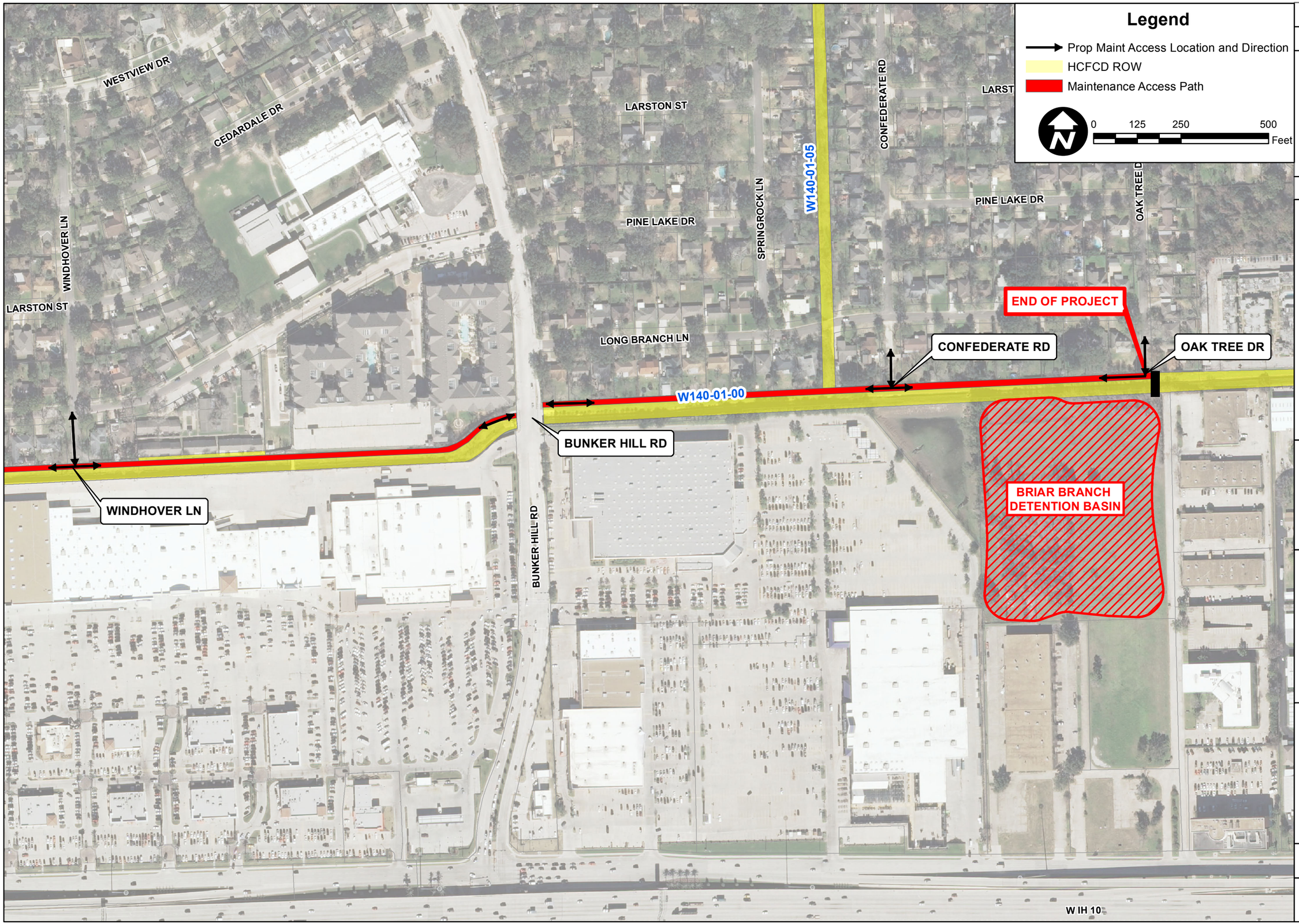
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
12a OF 16

Map Document: L:\130-10384-01?4-0-Production\4-08-GIS\MXD\W140-01 PER\12a_Maintenance Access.mxd 9/16/2013 1:22:37 PM DGGreaney



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REV	DESCRIPTION	DATE	APPR

PROPOSED MAINTENANCE ACCESS PLAN

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

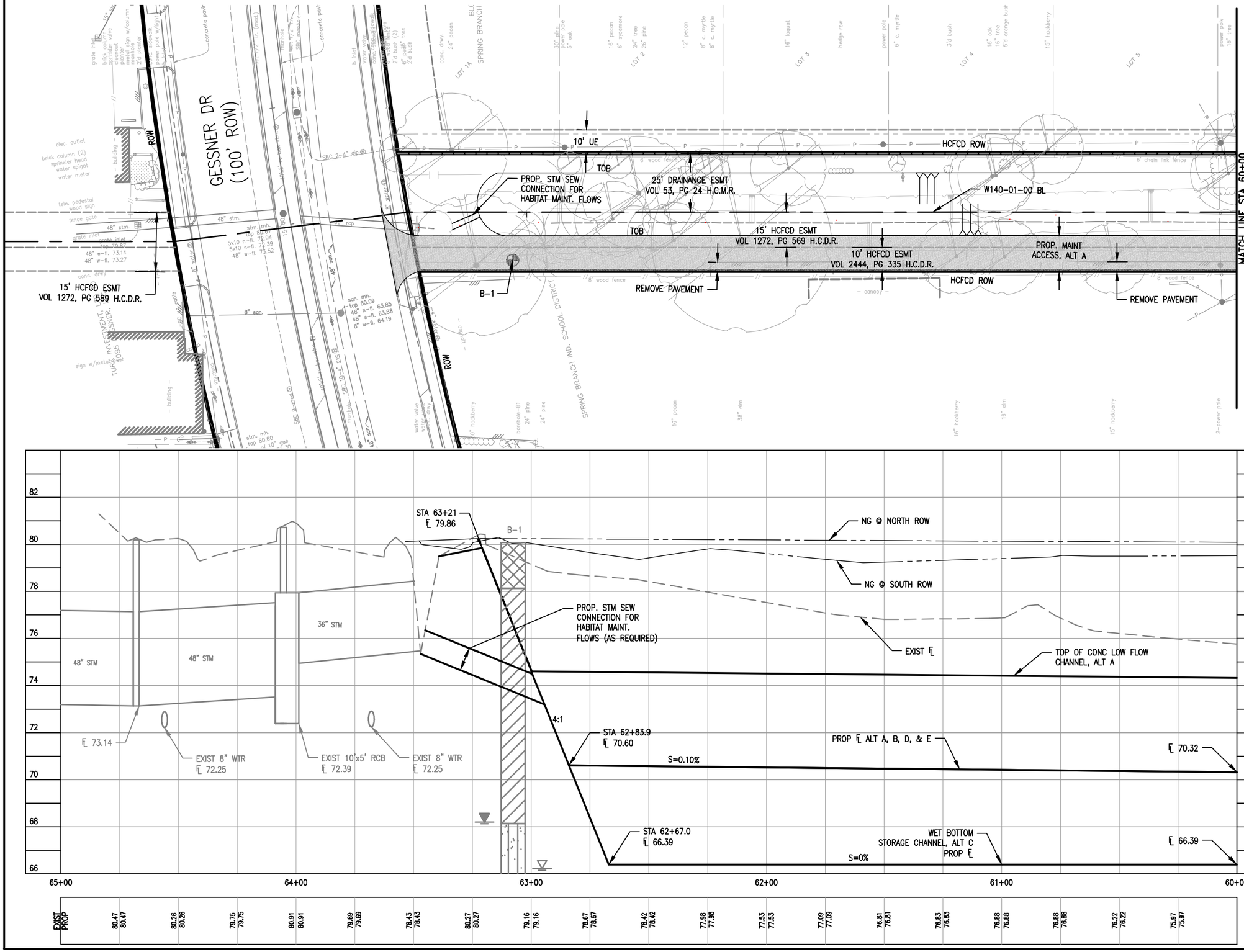
PREPARED:	CHECKED:	APPROVED:
DGG	BRW	DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REINVESTMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
12b OF 16



0 20 40

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

LEGEND

- ROW ACQUISITION
- WATER LEVEL READING AFTER TIME OF DRILLING
- WATER LEVEL READING AT TIME OF DRILLING
- FILL
- LEAN CLAY
- FAT CLAY
- SILTY SAND
- MAINTENANCE ACCESS

No.	Date	Revisions	App.

PRIVATE UTILITY LINES SHOWN

CENTERPOINT ENERGY, GAS FACILITIES

AT&T TEXAS/SBC UTILITY LINES SHOWN DATE
APPROVED FOR AT&T TEXAS/SBC UNDERGROUND CONDUIT FACILITIES ONLY.
SIGNATURE VALID FOR ONE YEAR

CENTERPOINT ENERGY, ELECTRIC FACILITIES
APPROVED ONLY FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED. VALID AT TIME OF REVIEW ONLY.

CABLE COMPANY DATE

INTERIM REVIEW ONLY
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BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 01 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

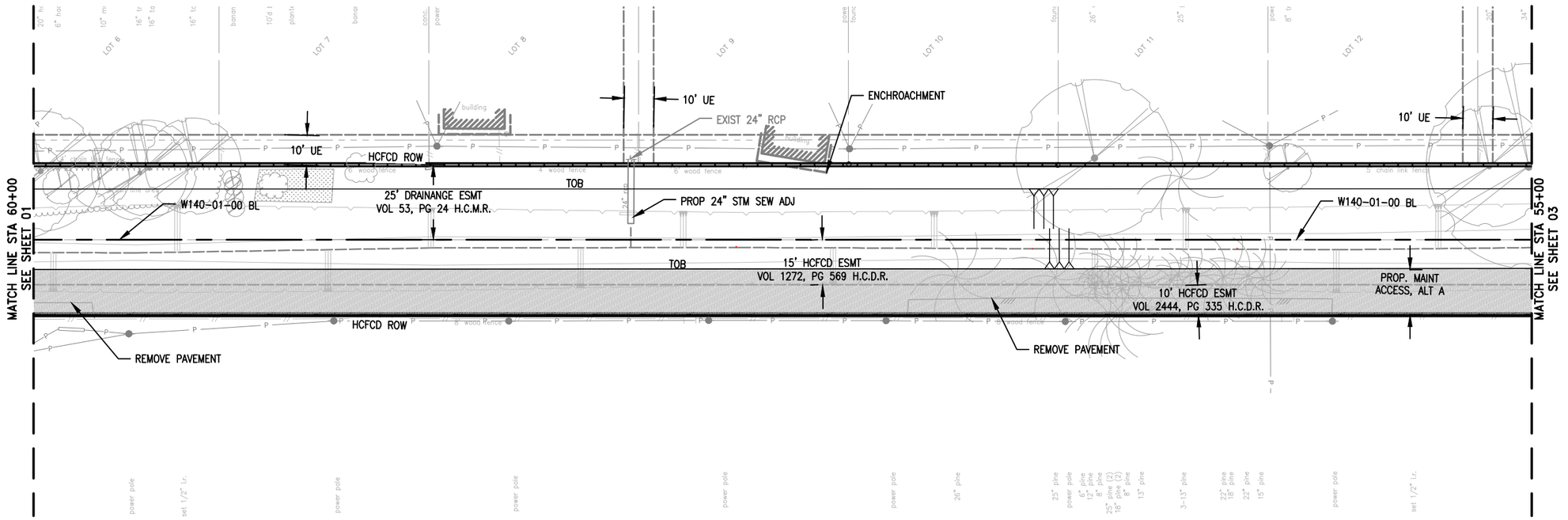
FILE NO.: FACILITY

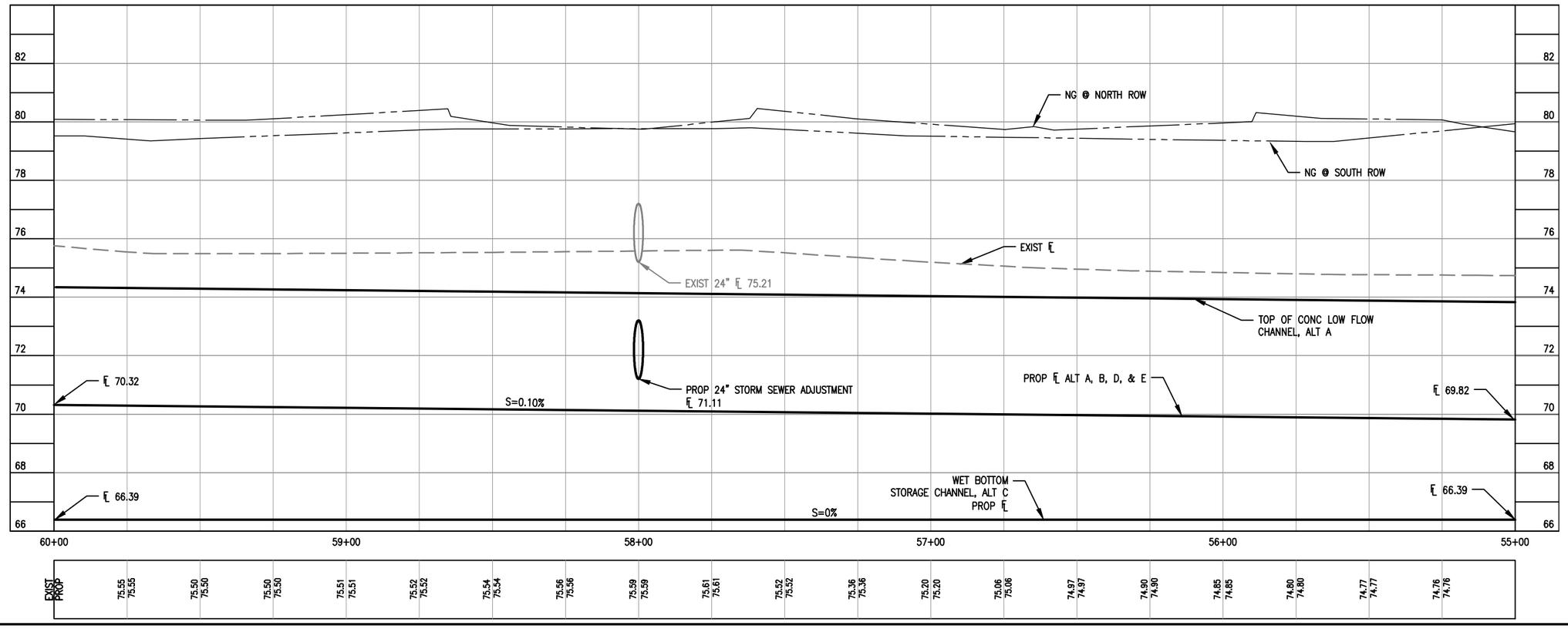
DRAWING SCALE: CITY DWG NO.

VERT:
HORZ:

SHEET:

C:\PROJECTWISE\DGGREANEY\DMS70434\103B4-PLPR-CHAN-01-07.DWG 8/27/2013 3:25:30 PM Greaney, David G.





0 20 40

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

LEGEND
- ROW ACQUISITION
- WATER LEVEL READING AFTER TIME OF DRILLING
- WATER LEVEL READING AT TIME OF DRILLING
- FILL
- LEAN CLAY
- FAT CLAY
- SILTY SAND
- MAINTENANCE ACCESS

No.	Date	Revisions	App.

PRIVATE UTILITY LINES SHOWN

CENTERPOINT ENERGY, GAS FACILITIES

AT&T TEXAS/SBC UTILITY LINES SHOWN DATE
APPROVED FOR AT&T TEXAS/SBC UNDERGROUND CONDUIT FACILITIES ONLY.
SIGNATURE VALID FOR ONE YEAR

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BRIAN R. WHITNEY
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MEMORIAL CITY REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

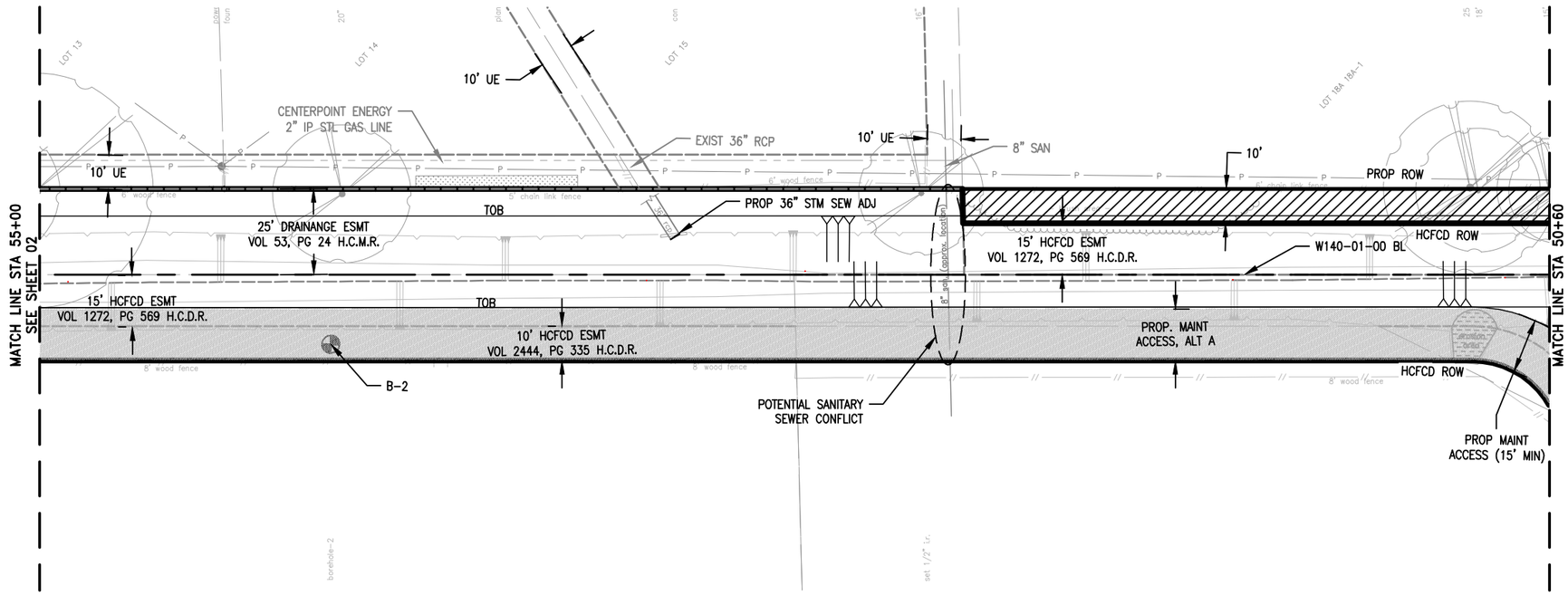
BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS
EXHIBIT 13
30% CHANNEL PLAN & PROFILE SHEET 02 OF 13

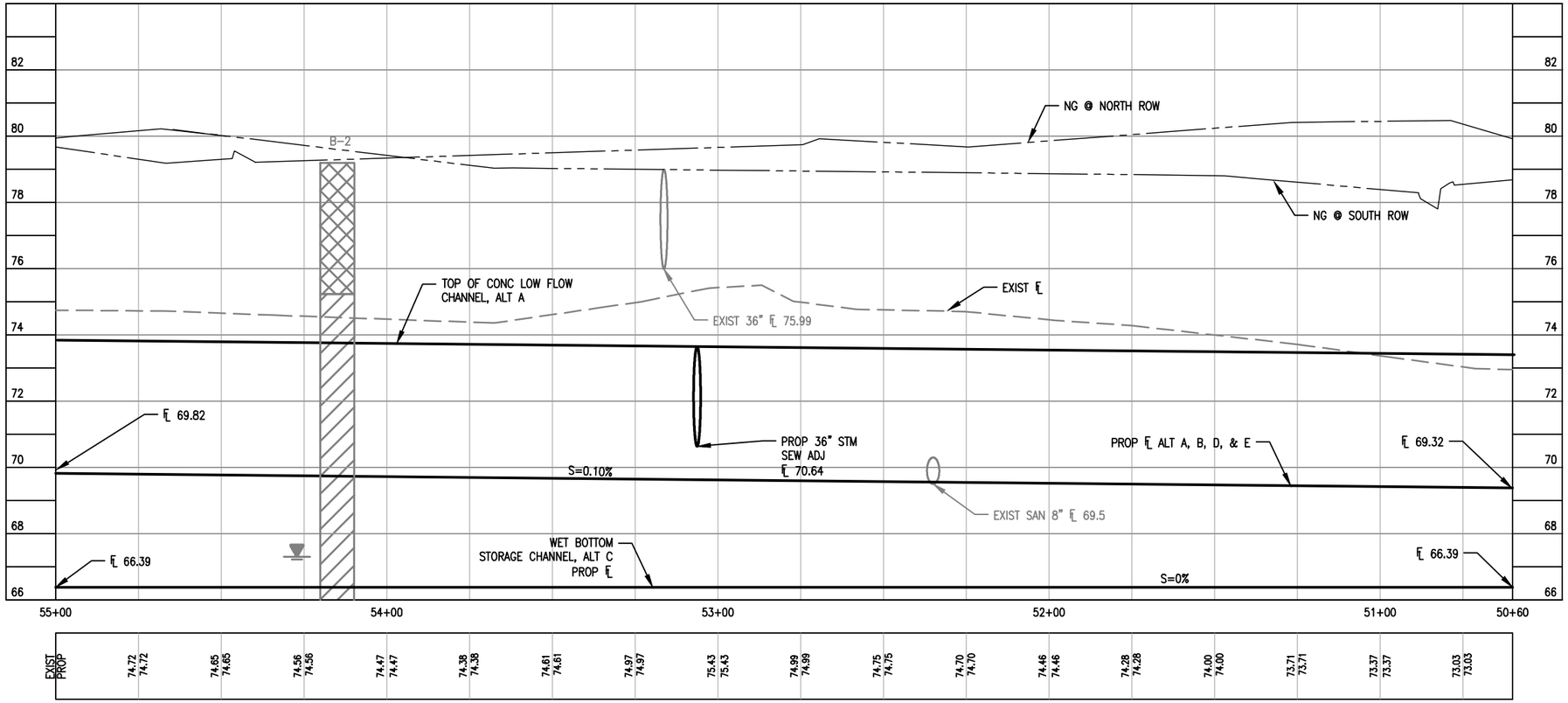
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT: HORZ:	
SHEET:	

C:\PROJECTWISE\DGGREANEY\DMS70434\10384-PLPR-CHAN-01-07.DWG 8/27/2013 3:25:30 PM Greaney, David G.





0 20 40

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

LEGEND
- ROW ACQUISITION
- WATER LEVEL READING AFTER TIME OF DRILLING
- WATER LEVEL READING AT TIME OF DRILLING
- FILL
- LEAN CLAY
- FAT CLAY
- SILTY SAND
- MAINTENANCE ACCESS

No.	Date	Revisions	App.

PRIVATE UTILITY LINES SHOWN

CENTERPOINT ENERGY, GAS FACILITIES

AT&T TEXAS/SBC UTILITY LINES SHOWN DATE
APPROVED FOR AT&T TEXAS/SBC UNDERGROUND CONDUIT FACILITIES ONLY.
SIGNATURE VALID FOR ONE YEAR

CENTERPOINT ENERGY, ELECTRIC FACILITIES
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ID # 2614

MEMORIAL CITY
REDEVELOPMENT AUTHORITY

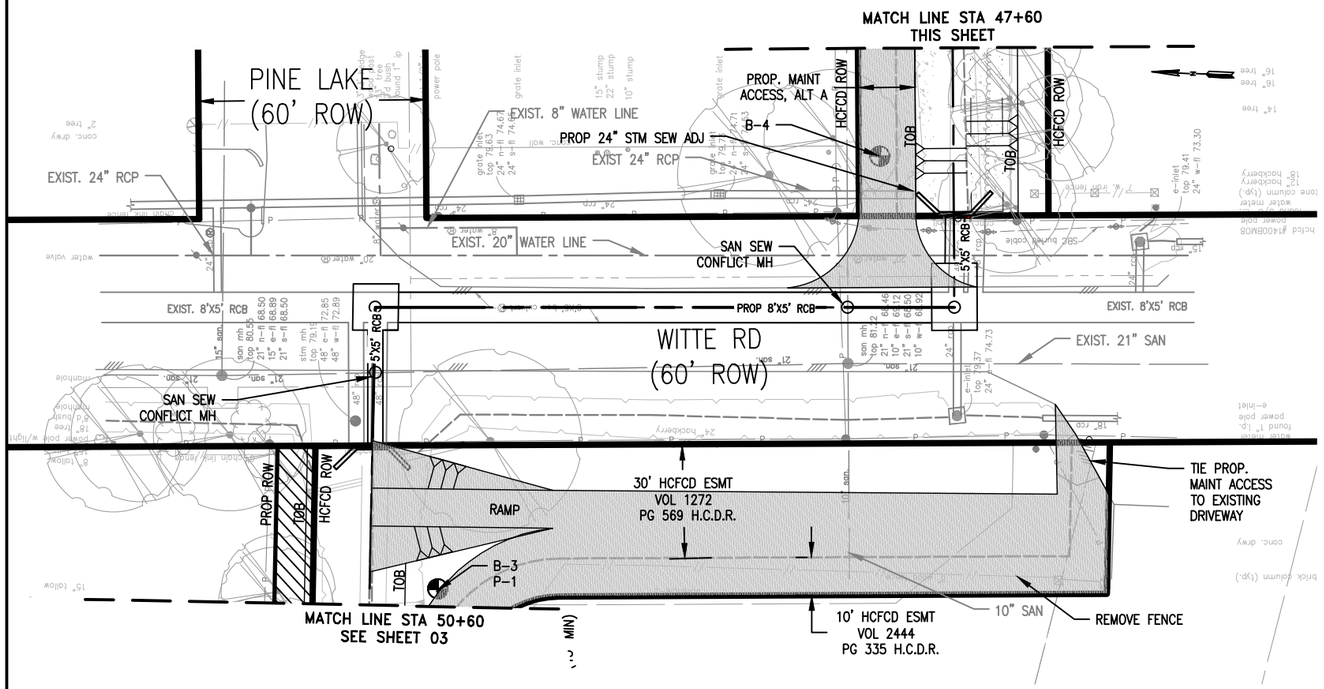
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

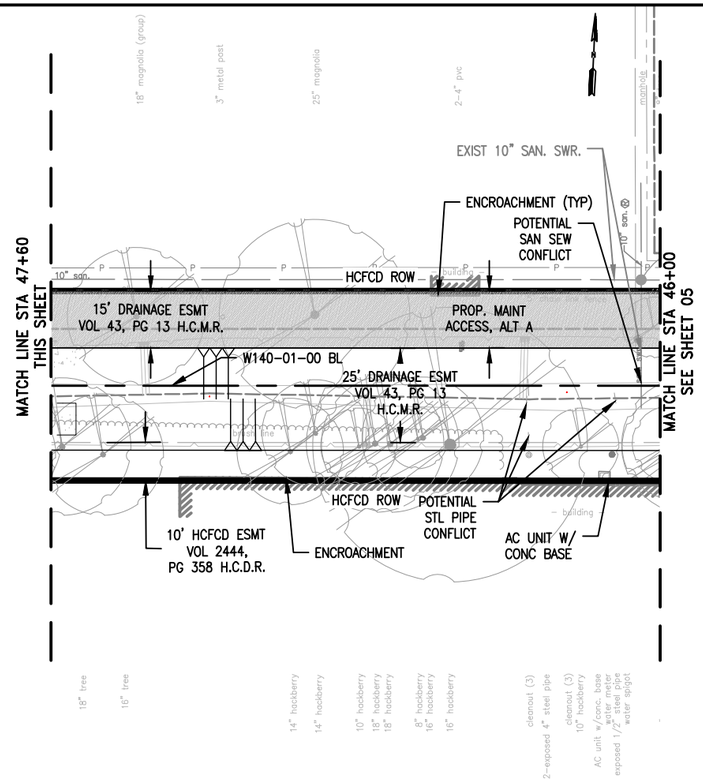
BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 03 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT:	
HORZ:	
SHEET:	



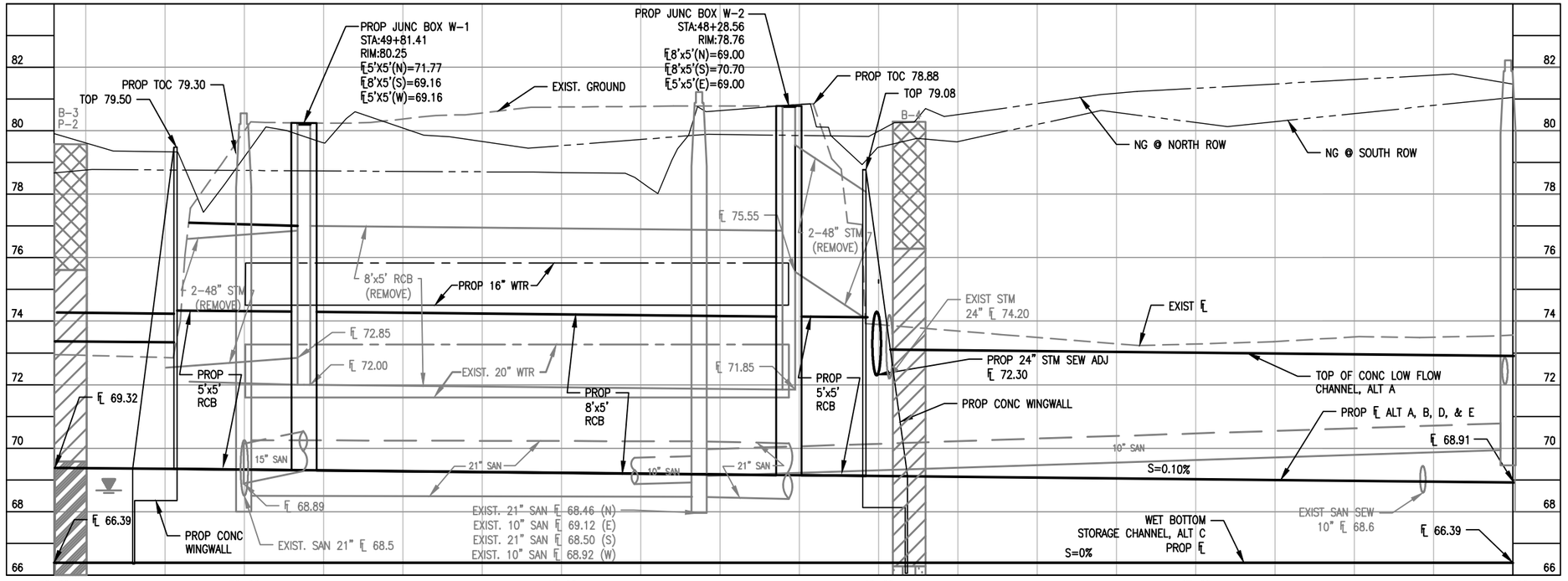


0 20 40

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

LEGEND

- ROW ACQUISITION
- WATER LEVEL READING AFTER TIME OF DRILLING
- WATER LEVEL READING AT TIME OF DRILLING
- FILL
- LEAN CLAY
- FAT CLAY
- SILTY SAND
- MAINTENANCE ACCESS



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No.	Date	Revisions	App.

PRIVATE UTILITY LINES SHOWN

CENTERPOINT ENERGY, GAS FACILITIES

AT&T TEXAS/SBC UTILITY LINES SHOWN DATE
APPROVED FOR AT&T TEXAS/SBC UNDERGROUND CONDUIT FACILITIES ONLY.
SIGNATURE VALID FOR ONE YEAR

CENTERPOINT ENERGY, ELECTRIC FACILITIES
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CABLE COMPANY DATE

INTERIM REVIEW ONLY
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BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY
REDEVELOPMENT AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 04 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT:	
HORZ:	
SHEET:	

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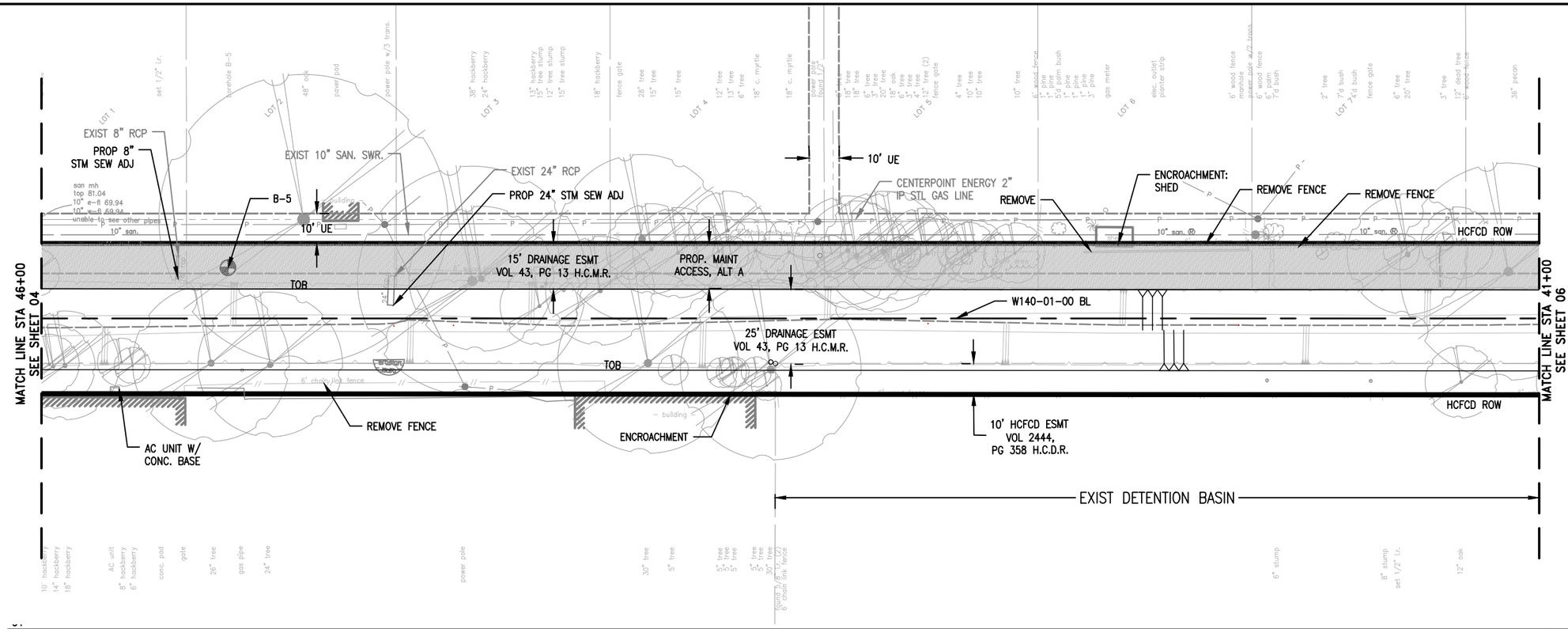

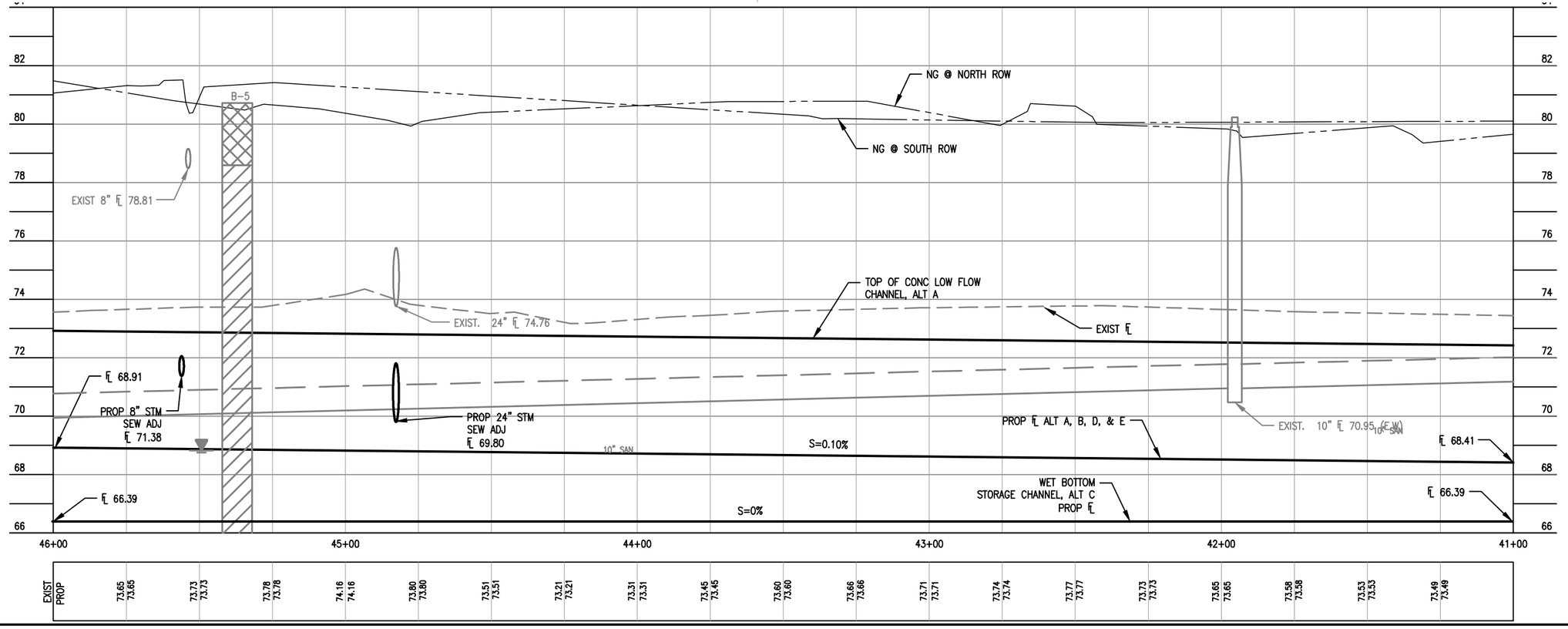

0 20 40

SCALE: 1" = 20' HORIZ.
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LEGEND

- ROW ACQUISITION
- WATER LEVEL READING AFTER TIME OF DRILLING
- WATER LEVEL READING AT TIME OF DRILLING
- FILL
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- SILTY SAND
- MAINTENANCE ACCESS

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CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
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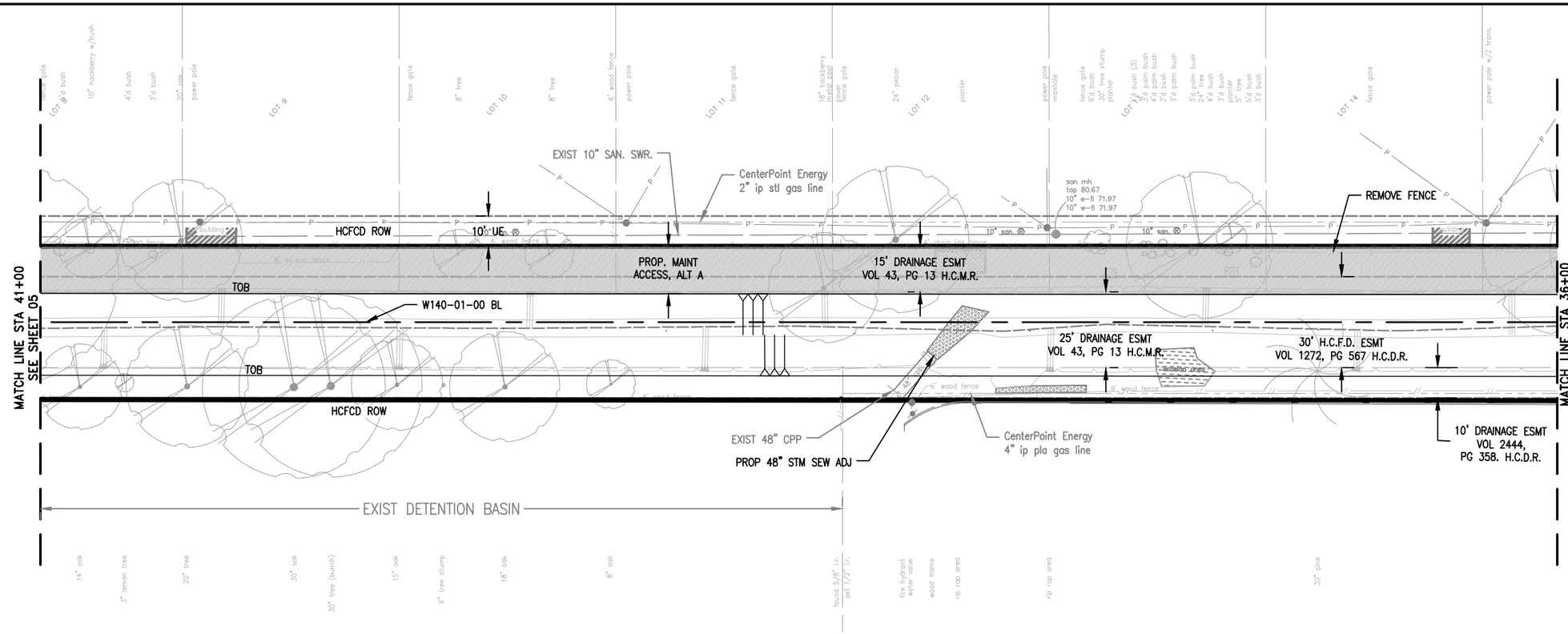

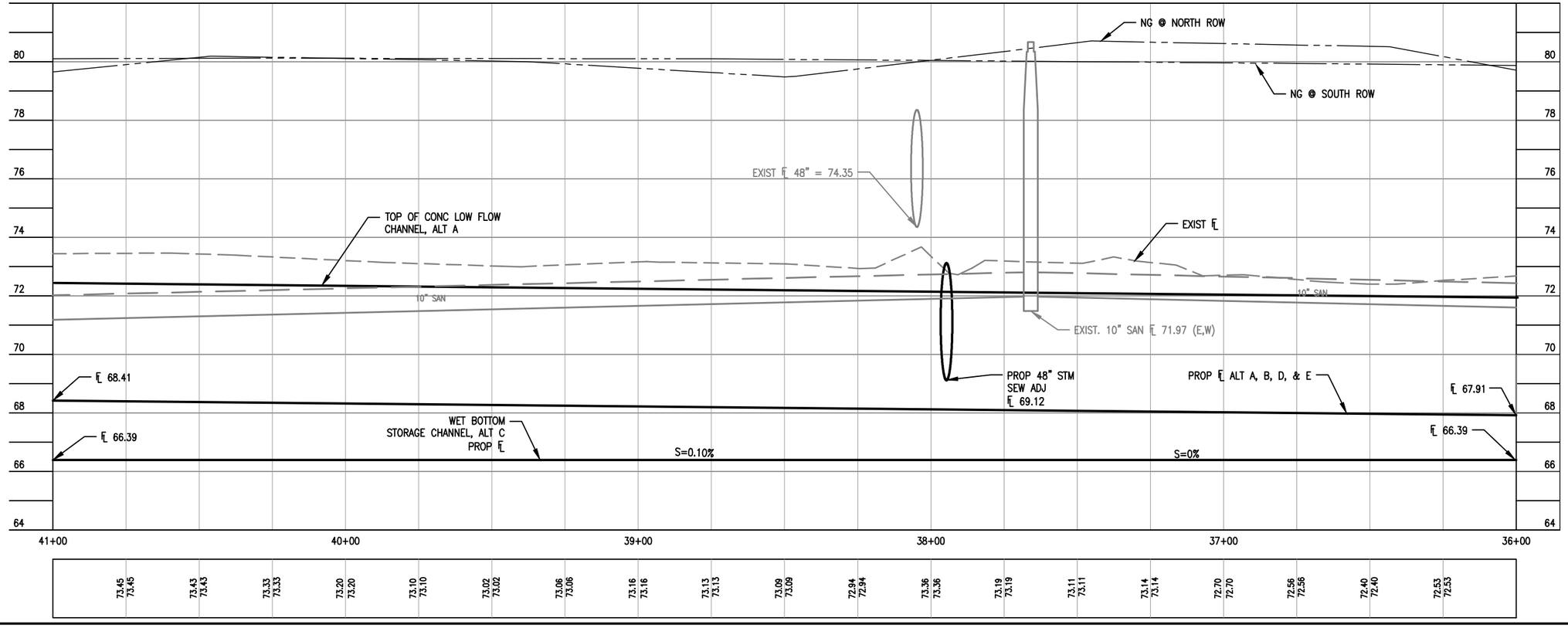

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BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 06 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.: FACILITY

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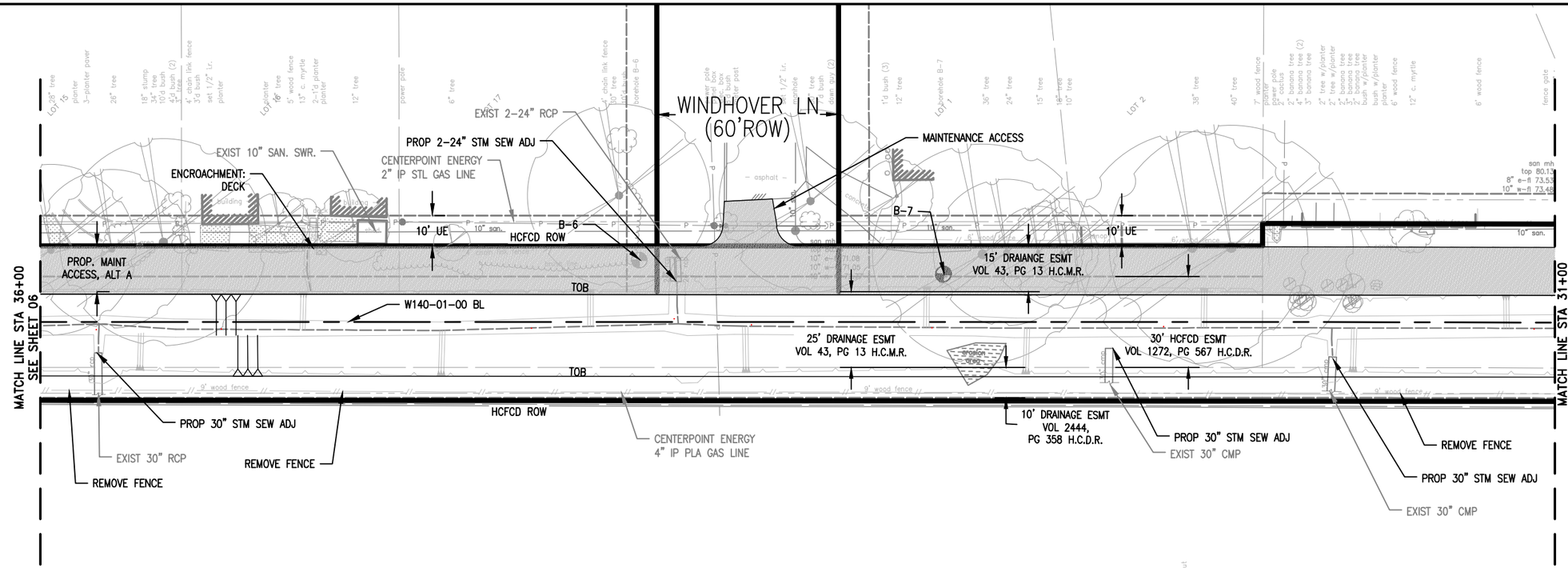
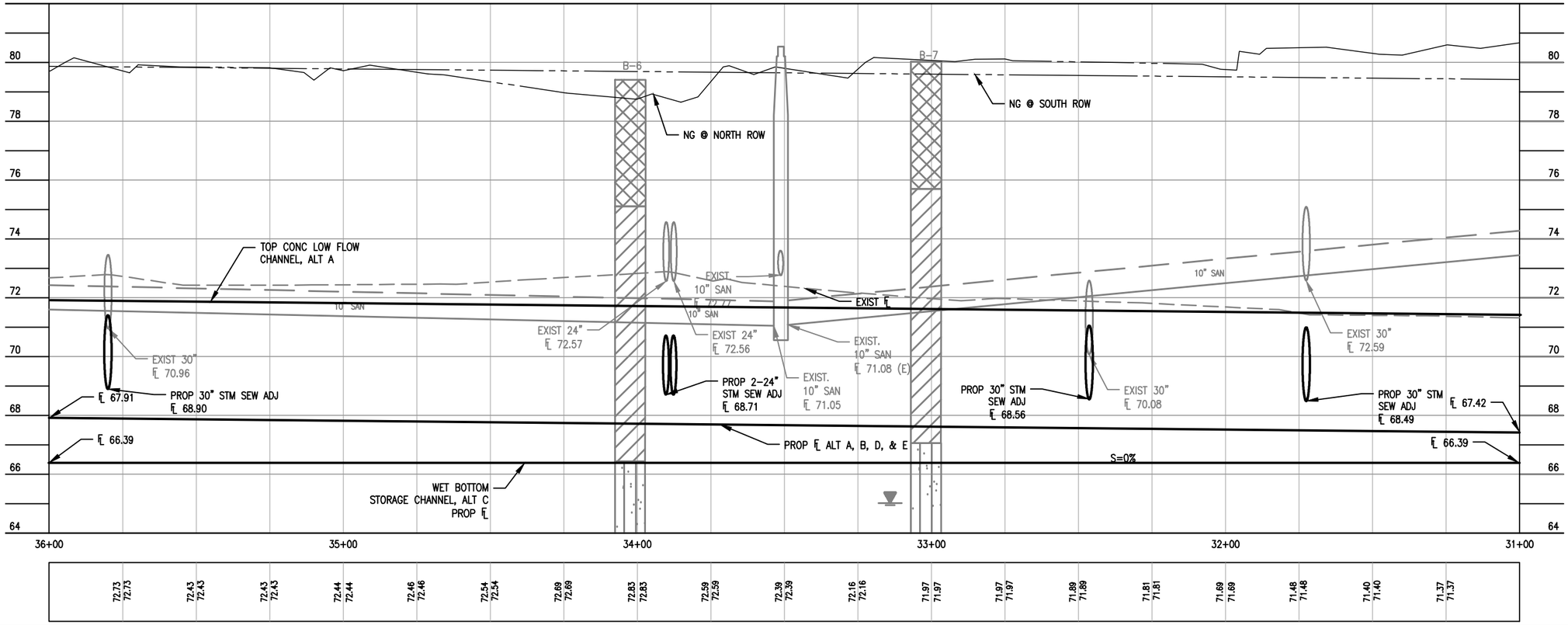
HORZ:

SHEET:





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LEGEND

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BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 07 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
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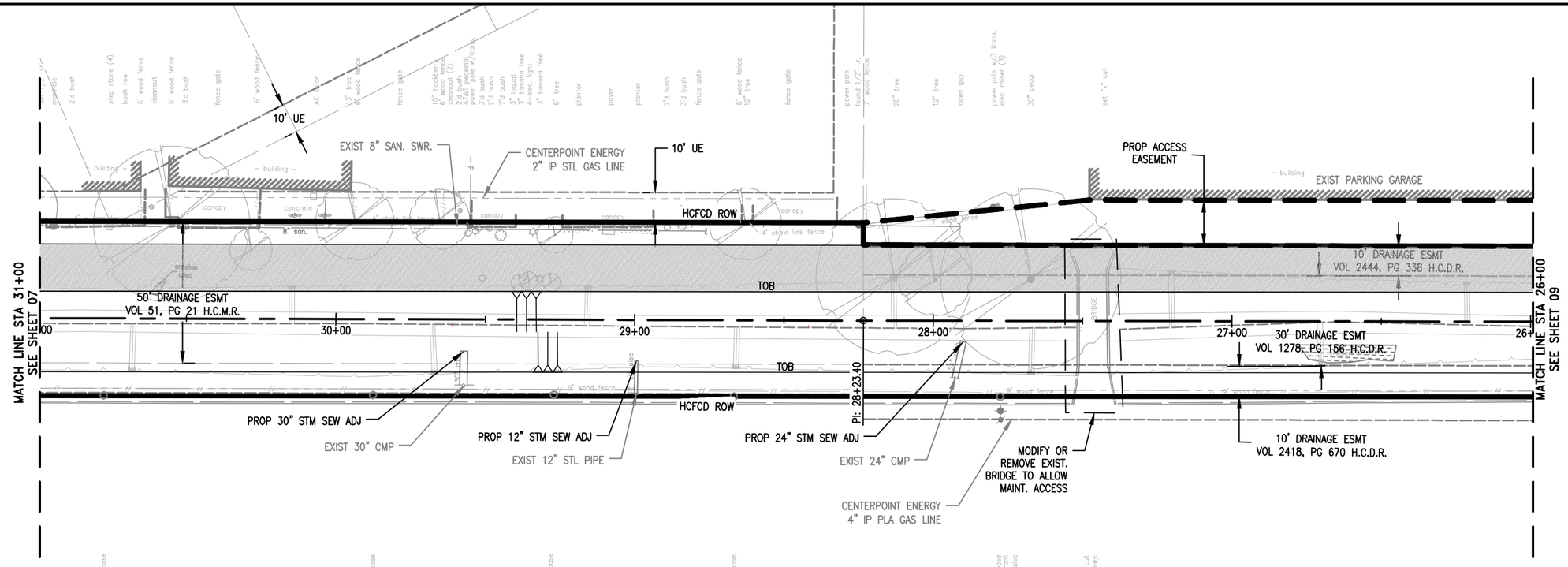
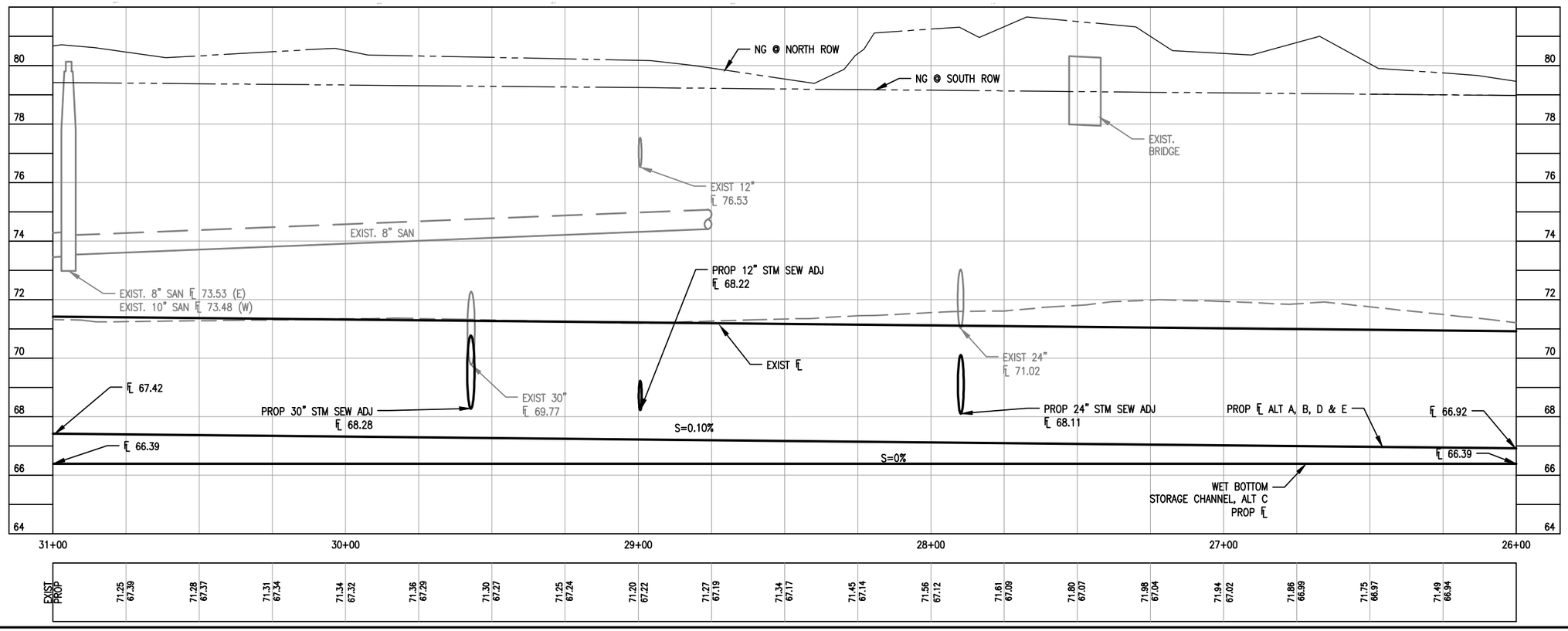
SHEET:	





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LEGEND

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BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 08 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

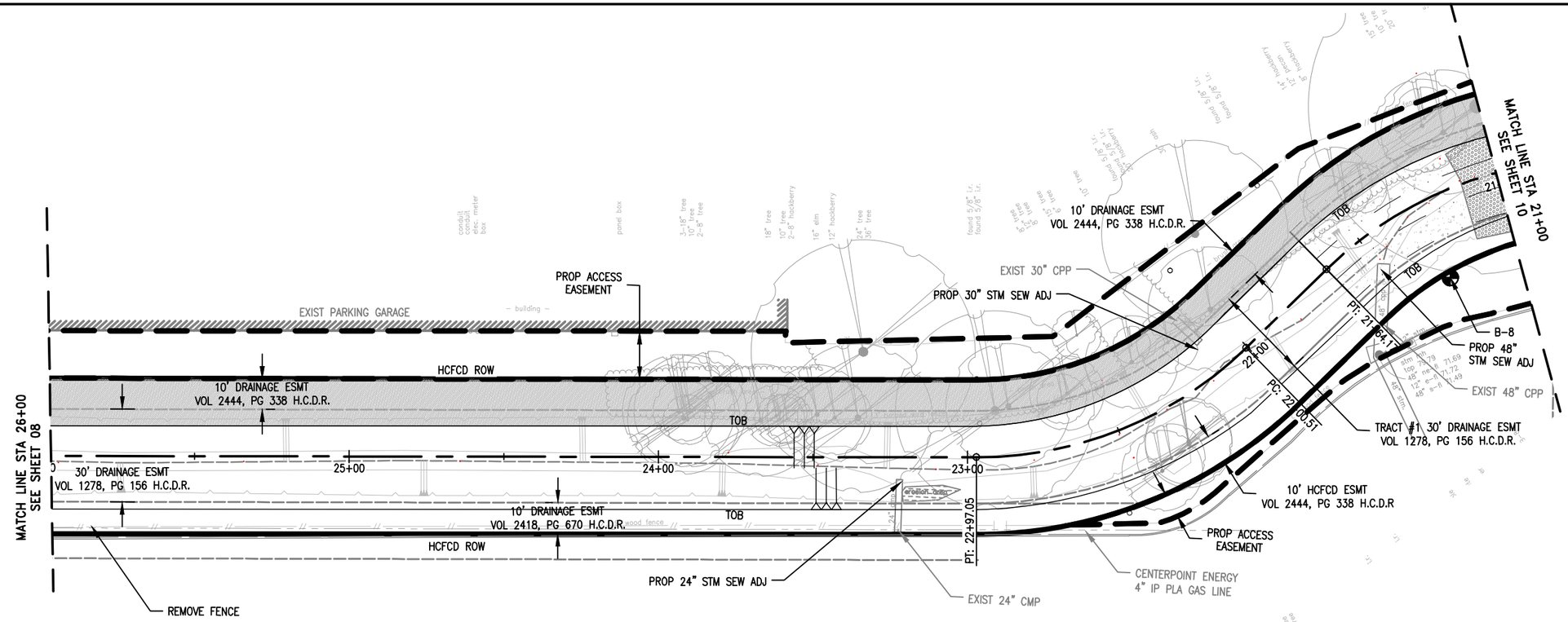
WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

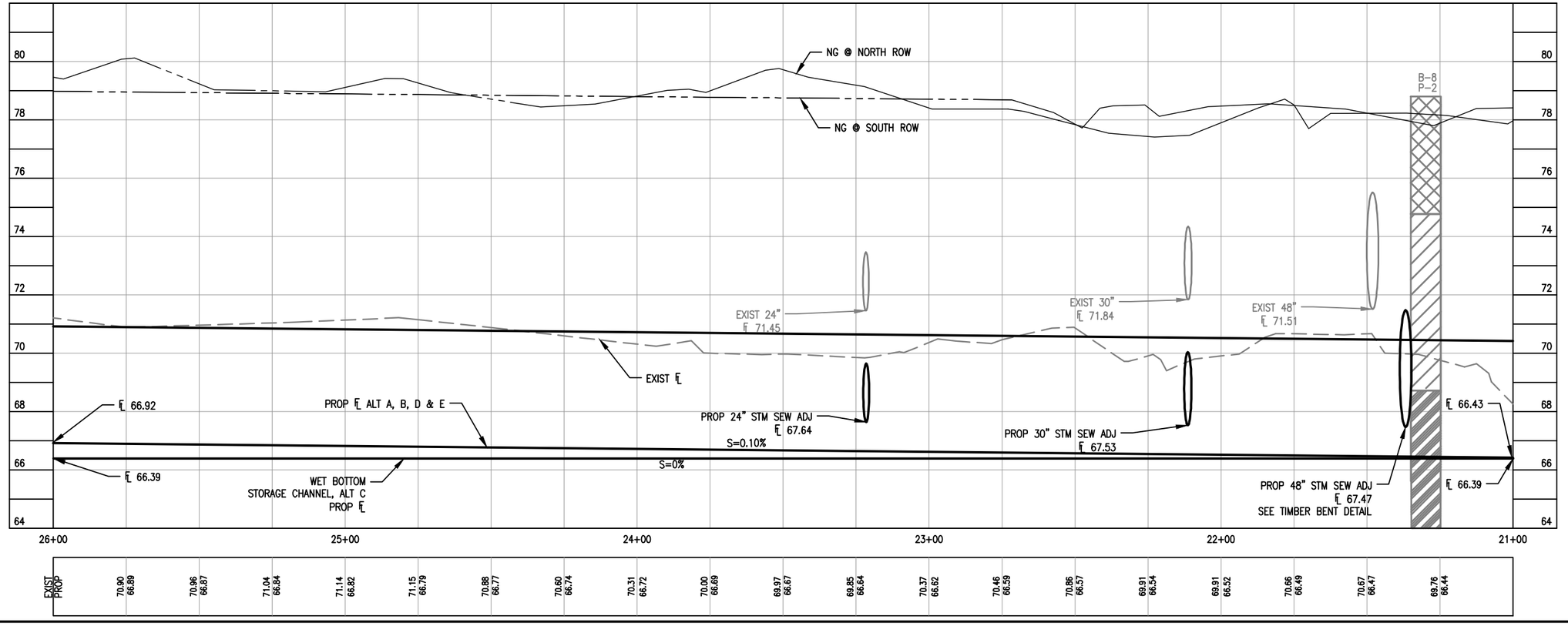
FILE NO.: FACILITY

DRAWING SCALE: CITY DWG NO.

VERT:
HORZ:

SHEET:





0 20 40

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LEGEND
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No.	Date	Revisions	App.

PRIVATE UTILITY LINES SHOWN

CENTERPOINT ENERGY, GAS FACILITIES

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A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 09 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT:	
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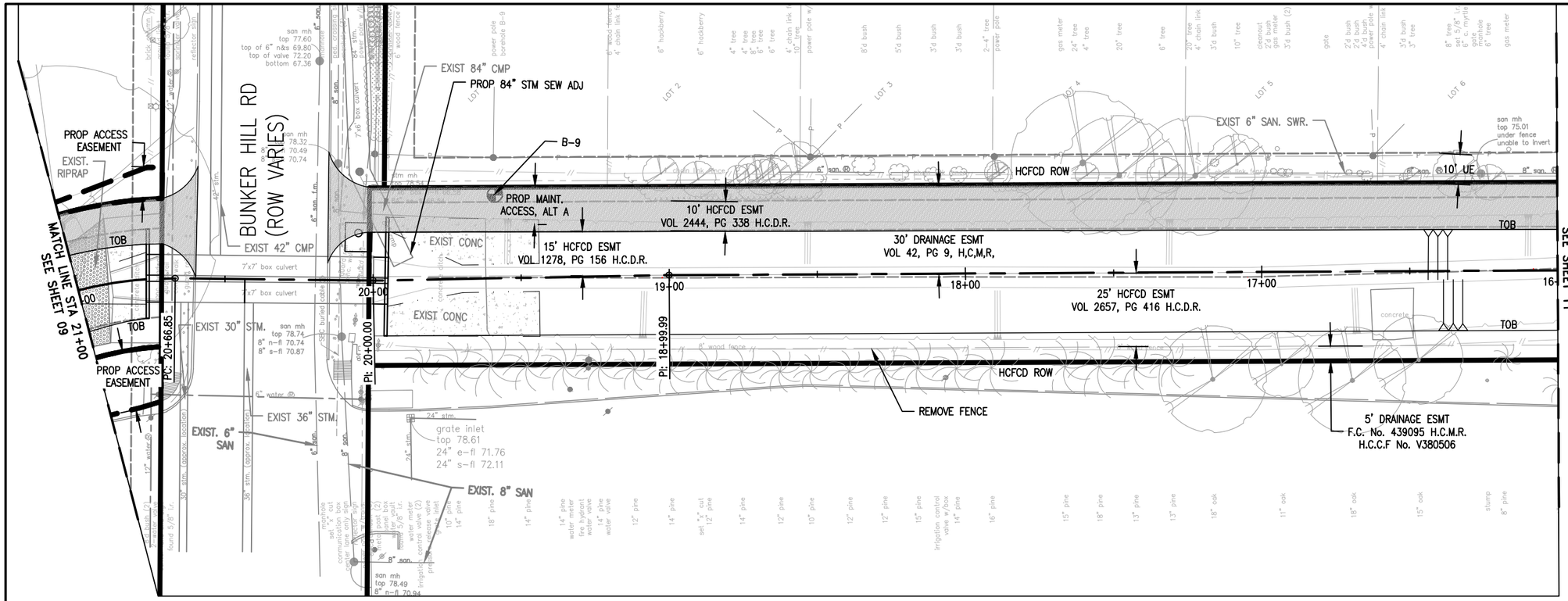

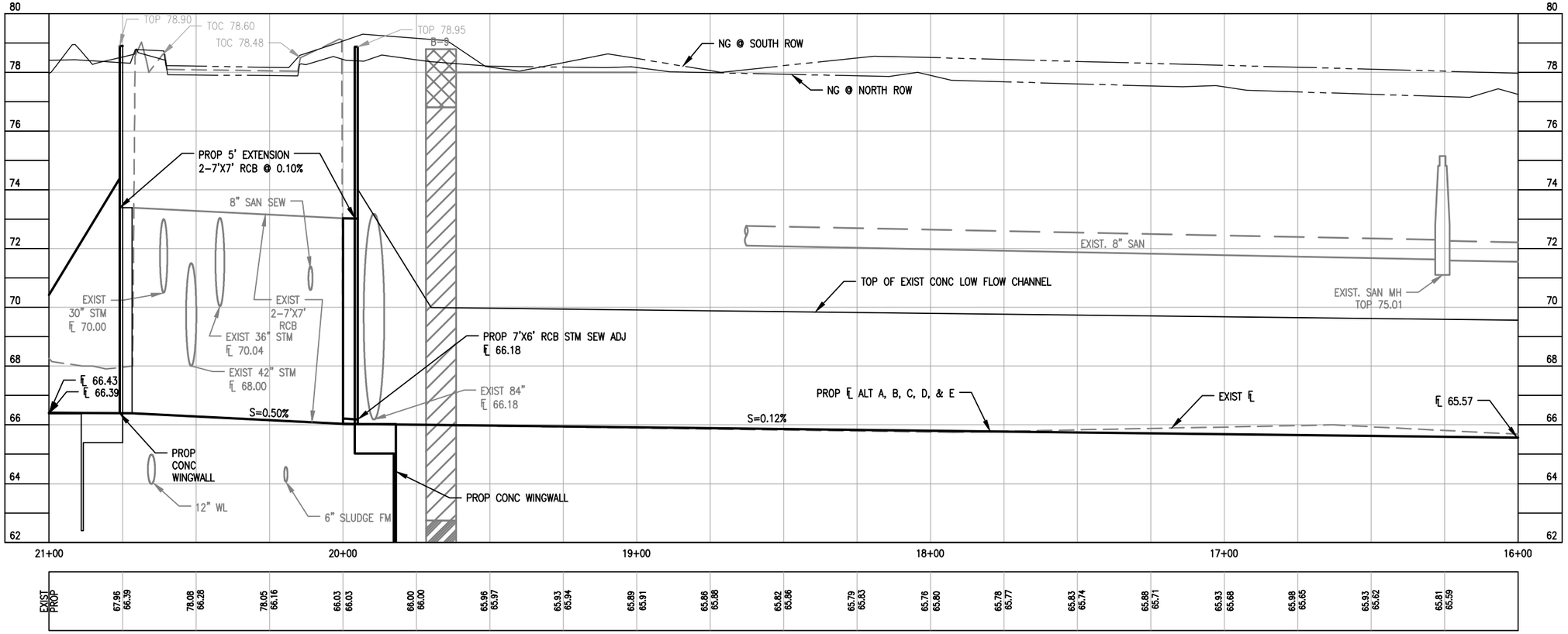

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LEGEND

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No.	Date	Revisions	App.

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BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 10 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.: FACILITY

DRAWING SCALE: CITY DWG NO.

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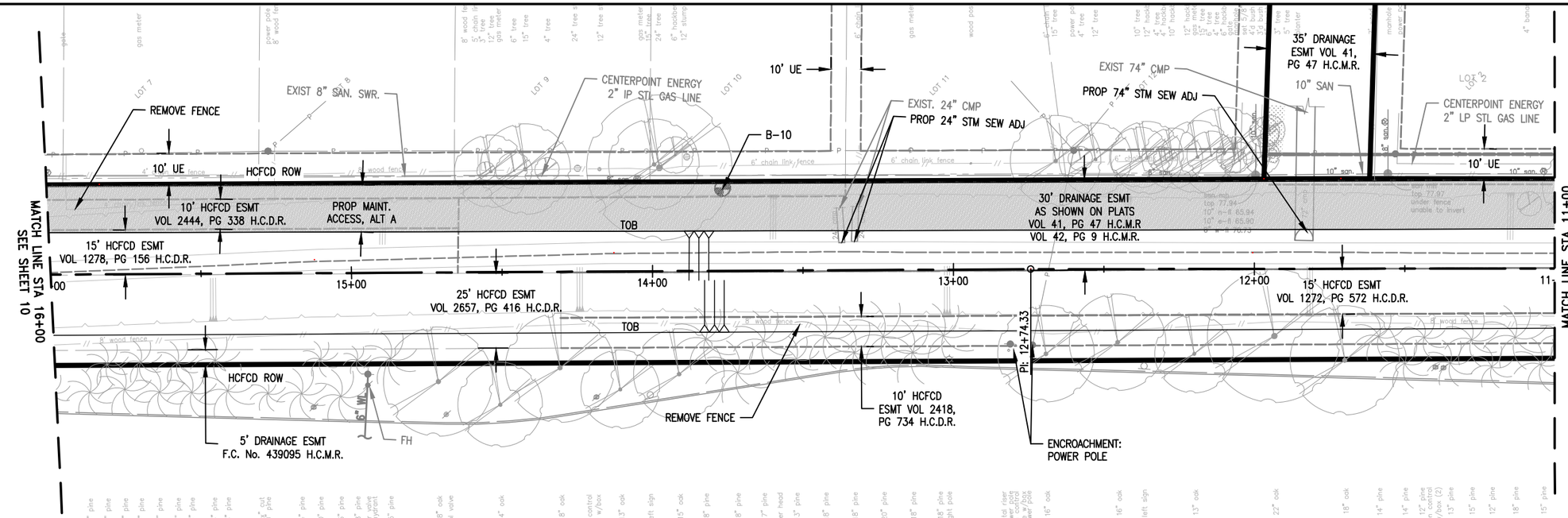
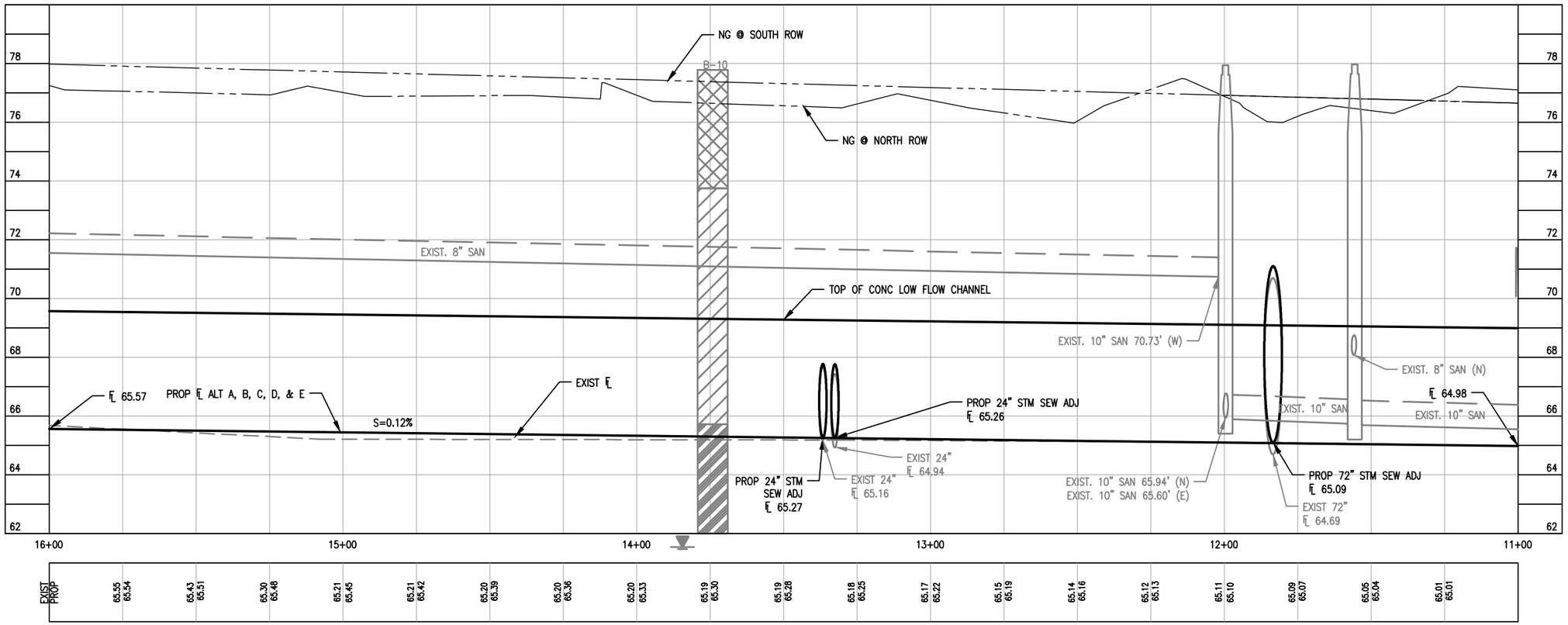
HORZ:

SHEET:





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BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS
EXHIBIT 13
30% CHANNEL PLAN &
PROFILE SHEET 11 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

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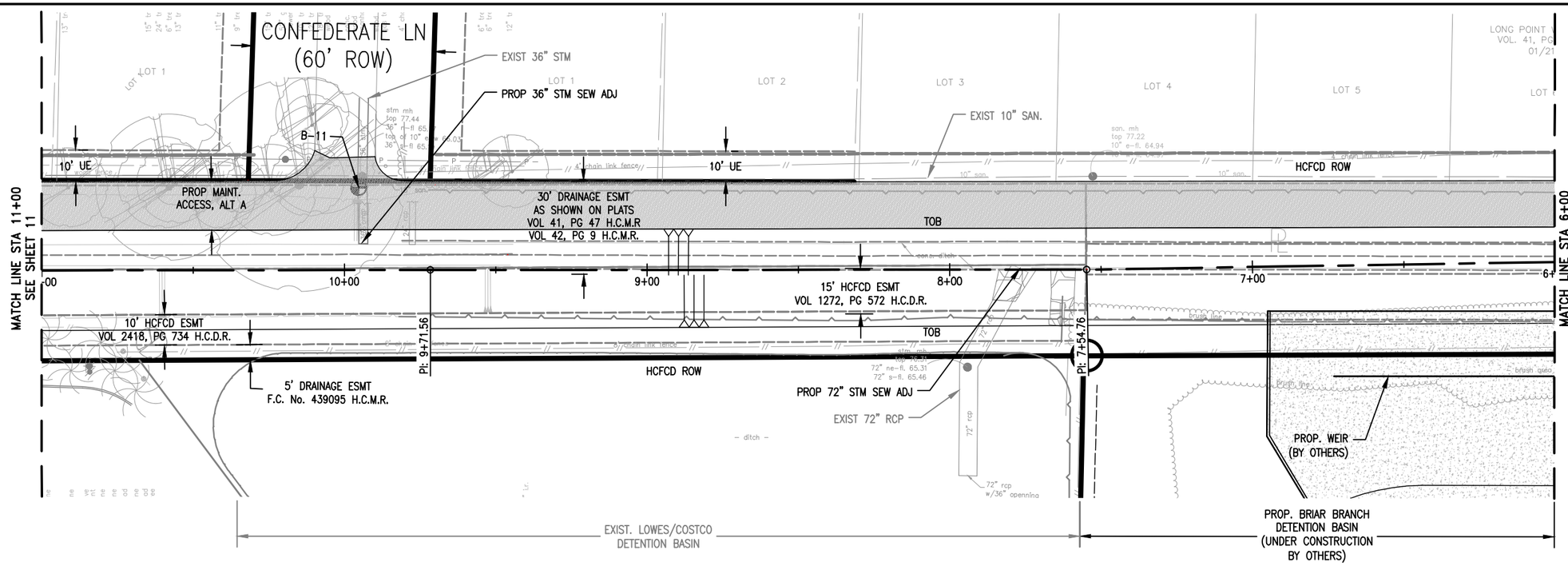

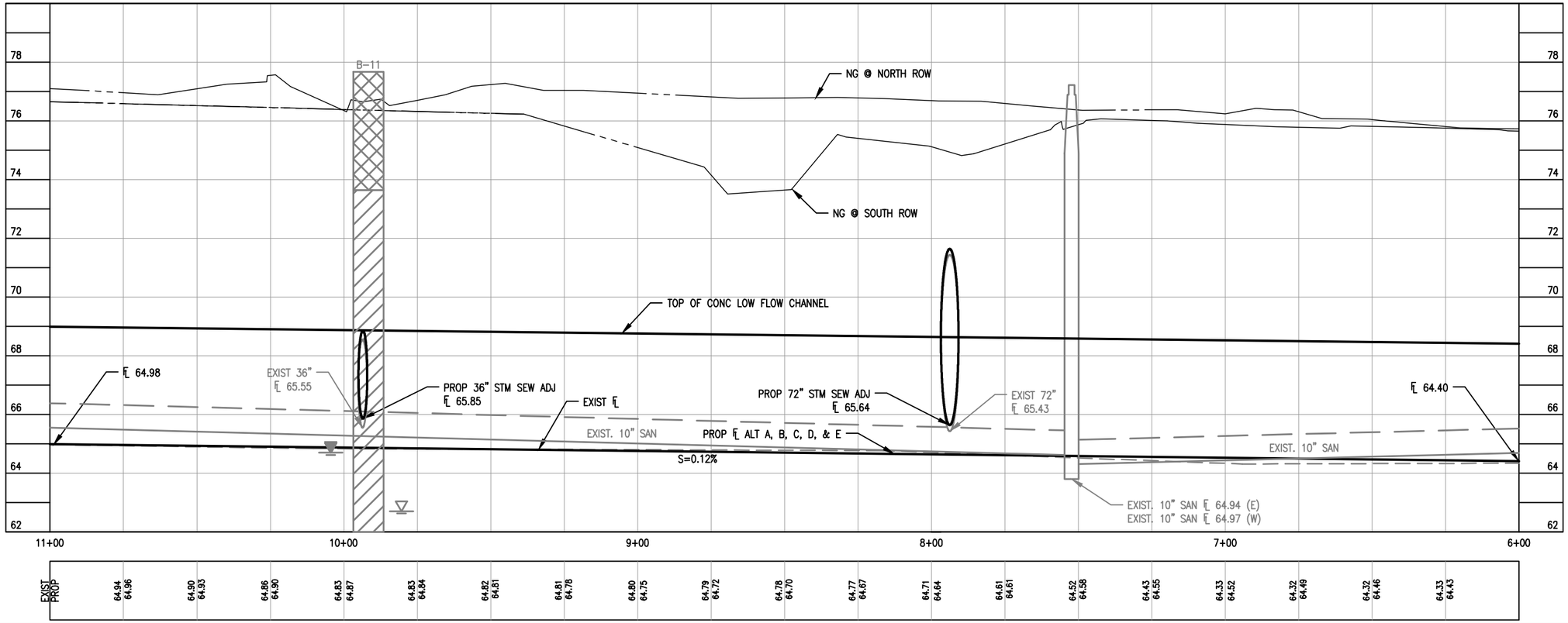

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BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13
30% CHANNEL PLAN & PROFILE SHEET 12 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.: FACILITY

DRAWING SCALE: CITY DWG NO.

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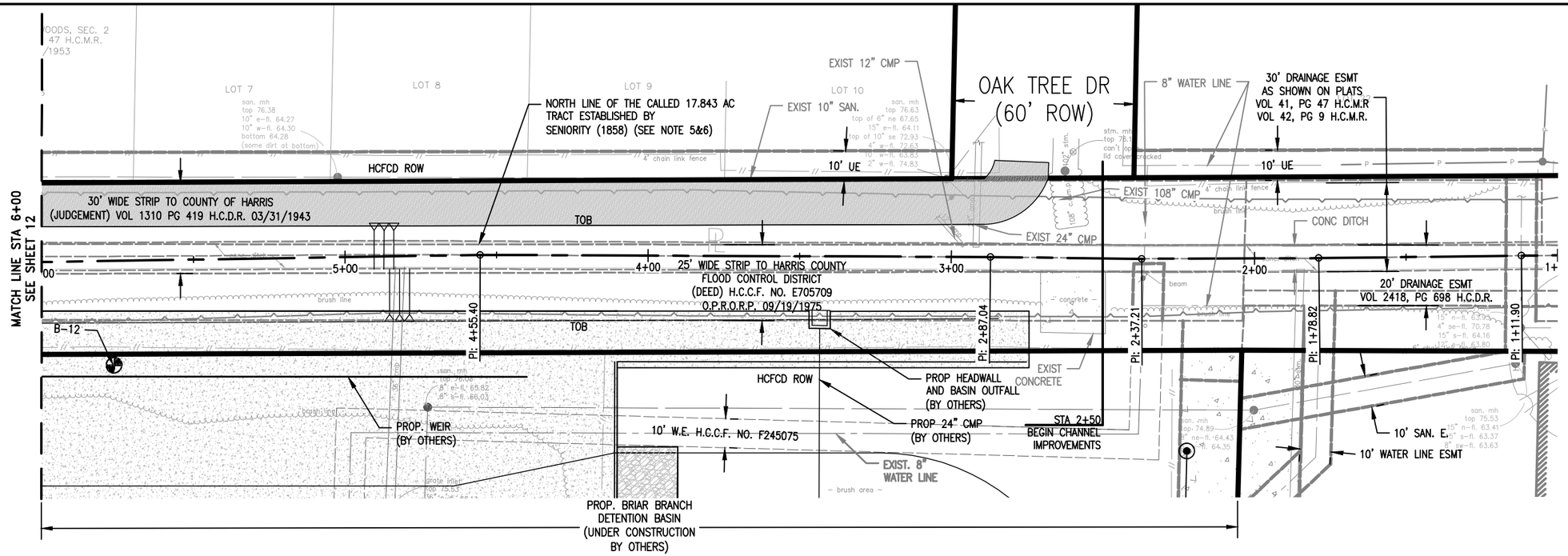

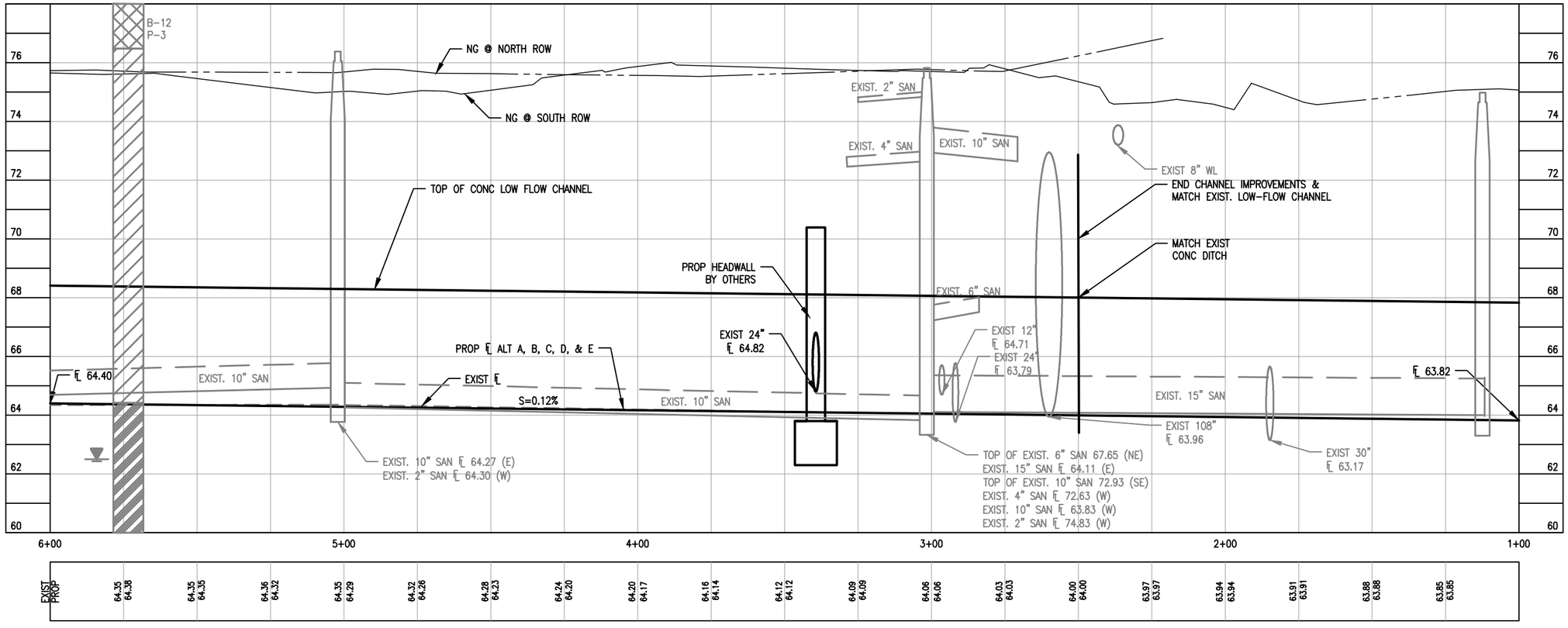

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BRIAN R. WHITNEY
Engineer
81591
Registration Number
9/16/2013
Date
Lockwood, Andrews & Newnam, Inc.
ID # 2614

MEMORIAL CITY REDEVELOPMENT AUTHORITY

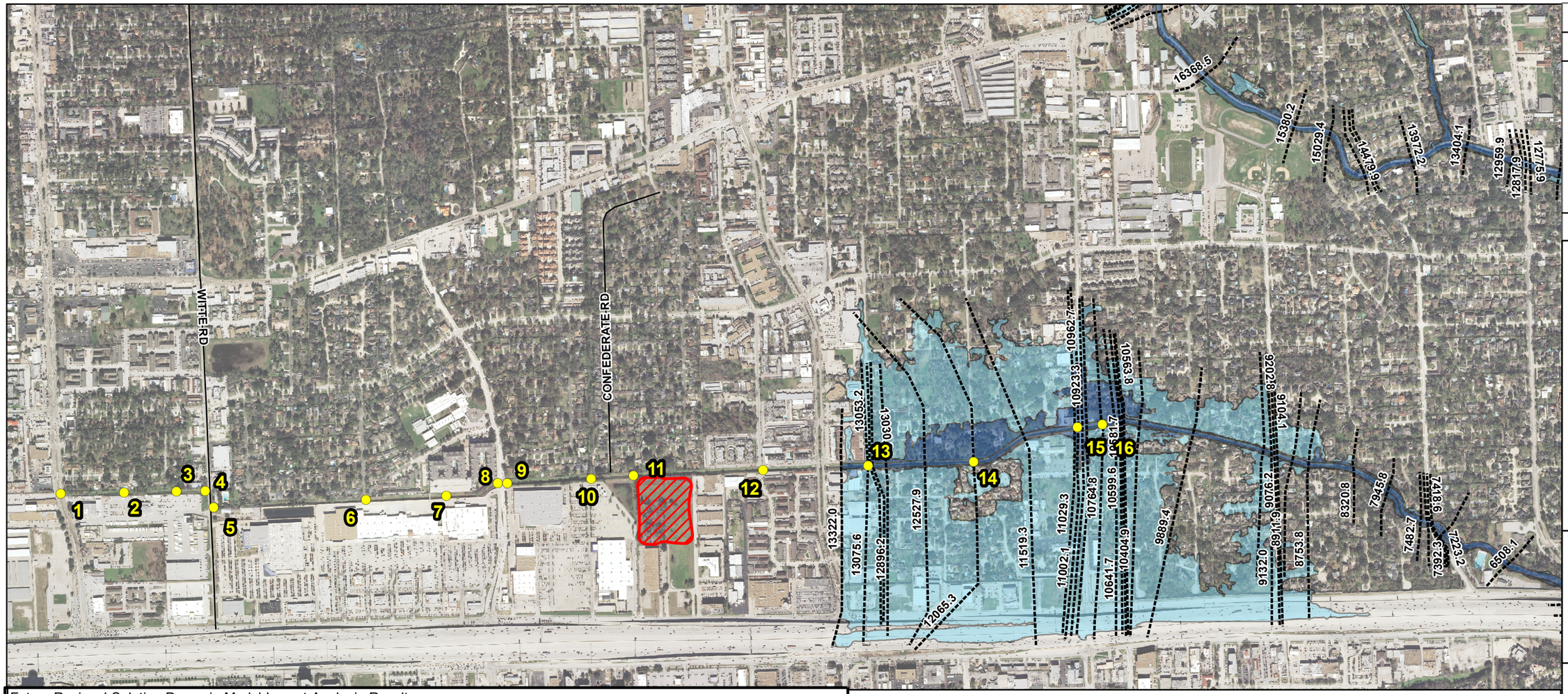
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS EXHIBIT 13 30% CHANNEL PLAN & PROFILE SHEET 13 OF 13

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER	WASTEWATER	TRAFFIC
ST. & BRIDGE	STORMWATER	SWQ

FILE NO.:	FACILITY
DRAWING SCALE:	CITY DWG NO.
VERT:	
HORZ:	
SHEET:	



Future Regional Solution Dynamic Model Impact Analysis Results											
		10-YEAR WSEL RESULTS					100-YEAR WSEL RESULTS				
Node	Station	Existing	Phase 2	Difference (ft)	Future Phase 3	Difference (ft)	Existing	Phase 2	Difference (ft)	Future Phase 3	Difference (ft)
1	21026	80.25	79.95	-0.29	79.81	-0.43	80.87	80.68	-0.19	80.38	-0.49
2	20481	80.09	79.84	-0.25	79.27	-0.82	80.99	80.65	-0.34	80.29	-0.70
3	19981	80.07	79.84	-0.23	79.26	-0.81	80.92	80.64	-0.28	80.30	-0.62
4	19701	80.12	79.87	-0.25	79.29	-0.83	80.97	80.67	-0.30	80.38	-0.59
5	19481	79.42	77.94	-1.48	77.40	-2.02	80.02	78.62	-1.40	78.54	-1.48
6	18066	77.48	77.11	-0.37	77.32	-0.16	78.47	78.13	-0.34	78.45	-0.03
7	16821	75.27	75.05	-0.22	75.04	-0.23	76.65	76.25	-0.39	76.34	-0.31
8	16756	75.26	75.17	-0.09	75.16	-0.10	76.64	76.33	-0.31	76.44	-0.20
9	16681	75.25	75.01	-0.24	75.00	-0.25	76.63	76.19	-0.44	76.29	-0.33
10	15863	74.86	74.74	-0.12	74.72	-0.14	76.42	76.05	-0.37	76.11	-0.30
11	15381	74.73	74.63	-0.10	74.60	-0.12	75.93	75.93	0.00	75.98	0.04
12	14232	73.96	73.72	-0.24	73.69	-0.27	75.03	74.81	-0.22	74.87	-0.17
13	13031	73.03	72.86	-0.17	72.83	-0.20	73.87	73.69	-0.17	73.74	-0.13
14	12065	72.15	72.02	-0.13	71.99	-0.16	72.92	72.77	-0.15	72.80	-0.12
15	11029	69.62	69.54	-0.07	69.51	-0.10	70.27	70.10	-0.17	70.12	-0.15
16	10765	69.27	69.21	-0.06	69.18	-0.09	69.83	69.69	-0.14	69.71	-0.13

ALTERNATIVE A – RECTANGULAR CONCRETE LOW FLOW WAS EVALUATED IN DETAIL TO DEMONSTRATE NO ADVERSE IMPACTS. ALTERNATIVE A IS THE MOST RESTRICTIVE SECTION AND PRESENTS THE GREATEST CHALLENGE FOR DEMONSTRATING NO ADVERSE IMPACT RELATIVE TO THE OTHER ALTERNATIVES. A DETAILED IMPACT ANALYSIS WILL BE PERFORMED ON THE SELECTED ALTERNATIVE AS PART OF THE DESIGN PROCESS.

Legend

- Analysis Nodes
- Proposed Detention Pond
- Effective Model Cross Sections

FEMA Effective Floodplains

- 100-Year
- 500-Year

0 500 1,000 2,000 Feet

REV	DESCRIPTION	DATE	APPR

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

CHANNEL IMPROVEMENTS DYNAMIC MODEL IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00) CHANNEL IMPROVEMENTS

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER 14 OF 16

Map Document: L:\130-10384-017\4-0-Production\4-08-GIS\MXD\W140-01 PER\14_Future_Dynamic_Model_Results.mxd
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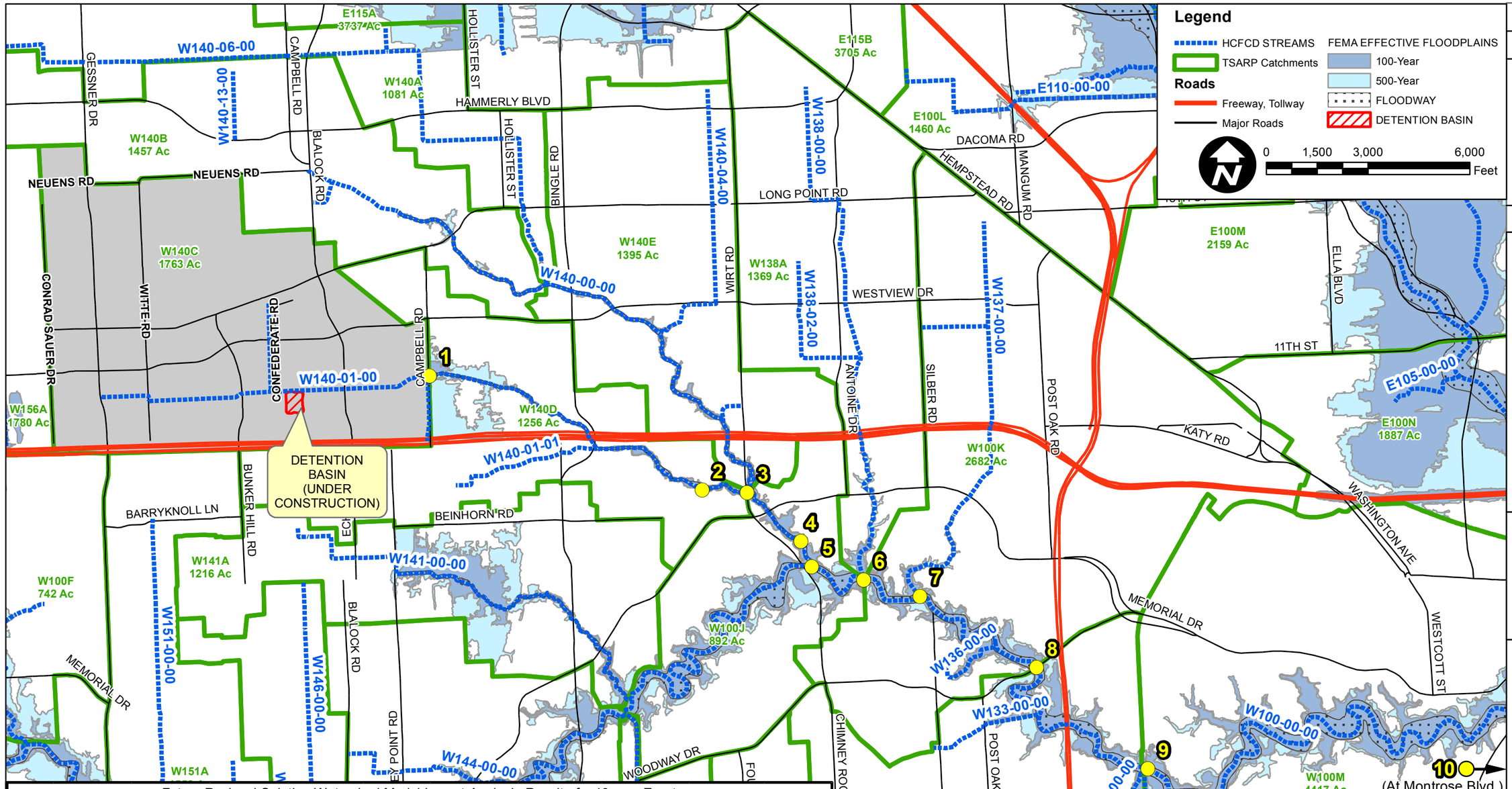


Future Regional Solution Watershed Model Impact Analysis Results for 10-year Event

Node	Exist. Cond Flow (CFS)	Future Phase 2 Flow (CFS)	Difference (CFS)	Future Phase 3 Flow (CFS)	Difference (CFS)	Exist. Cond 10-Year WSEL	Future Phase 2 WSEL (ft)	Difference (ft)	Future Phase 3 WSEL (ft)	Difference (ft)
1	589	577	-12	569	-20	69.80	69.73	-0.07	69.69	-0.11
2	1158	1144	-14	1137	-21	32.76	32.71	-0.05	32.68	-0.08
3	3846	3827	-19	3778	-68	39.62	39.59	-0.03	39.50	-0.12
4	3853	3836	-17	3776	-77	26.11	26.09	-0.02	26.02	-0.09
5	7953	7953	0	7952	-1	39.16	39.15	-0.01	39.15	-0.01
6	8155	8155	0	8154	-1	38.74	38.73	-0.01	38.73	-0.01
7	8152	8152	0	8151	-1	36.73	36.72	-0.01	36.72	-0.01
8	8431	8431	0	8429	-2	35.96	35.95	-0.01	35.95	-0.01
9	8840	8830	-10	8824	-16	33.03	33.03	0.00	33.02	-0.01
10	8535	8533	-2	8530	-5	30.59	30.59	0.00	30.59	0.00
11	38563	38557	-6	38555	-8	22.33	22.33	0.00	22.33	0.00
12	39606	39600	-6	39598	-8	0.08	0.08	0.00	0.08	0.00

Alternative A – Rectangular Concrete Low Flow was evaluated in detail to demonstrate no adverse impacts. Alternative A is the most restrictive section and presents the greatest challenge for demonstrating no adverse impact relative to the other alternatives. A detailed impact analysis will be performed on the selected alternative as part of the design process.

REV	DESCRIPTION	DATE	APPR

CHANNEL IMPROVEMENTS
WATERSHED LEVEL 10-YEAR
IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

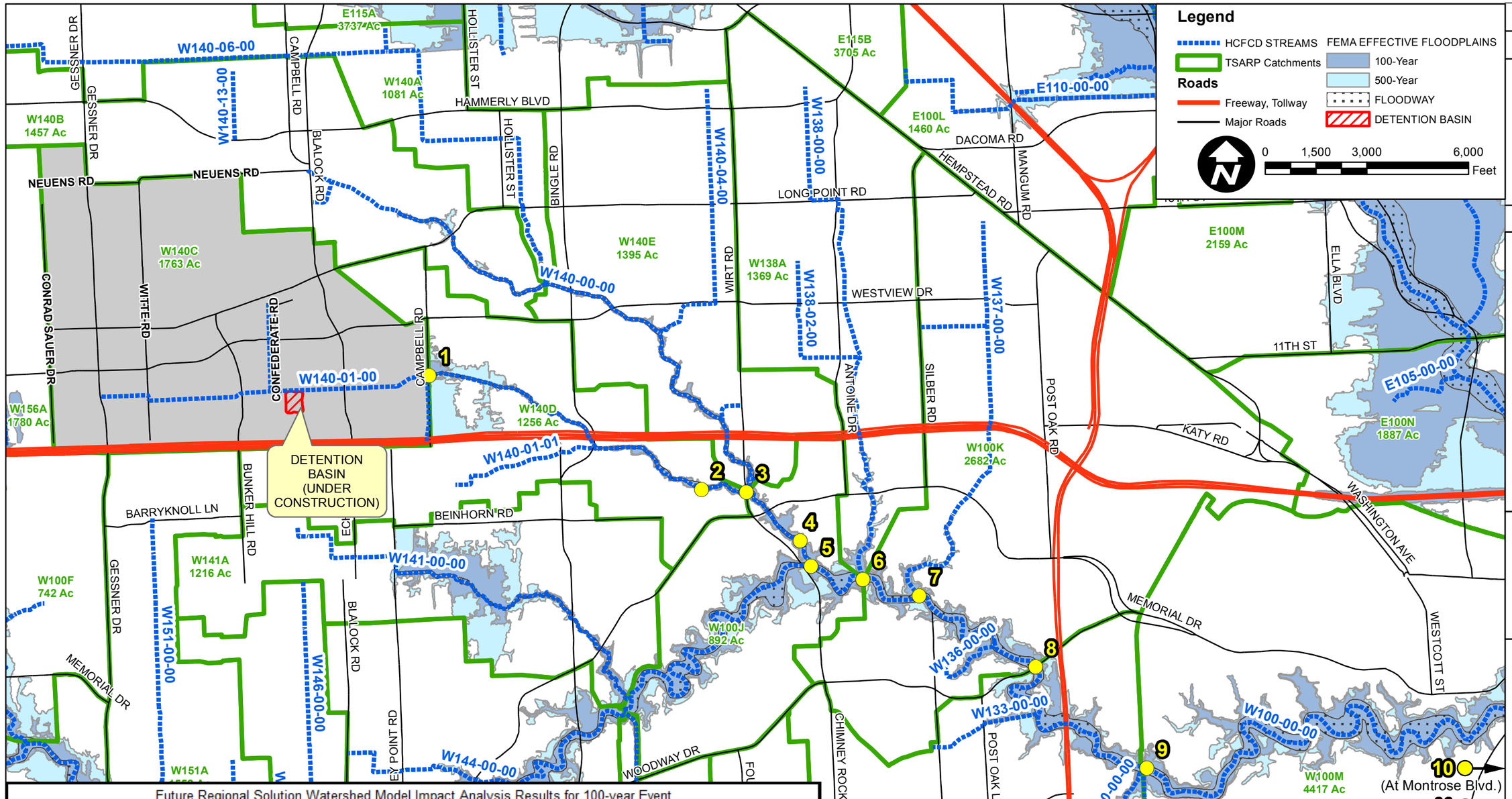
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
15A OF 16

Map Document: L:\130-10384-0174-0-Production\4-08-GIS\MXD\W140-01 PER\15a_Future_Watershed_Model_Results.mxd 9/16/2013 3:01:56 PM
DCGregory



Future Regional Solution Watershed Model Impact Analysis Results for 100-year Event

Node	Exist. Cond Flow (CFS)	Future Phase 2 Flow (CFS)	Difference (CFS)	Future Phase 3 Flow (CFS)	Difference (CFS)	Exist. Cond 100-Year WSEL	Future Phase 2 WSEL (ft)	Difference (ft)	Future Phase 3 WSEL (ft)	Difference (ft)
1	1088	1038	-50	1037	-51	72.25	72.17	-0.08	72.16	-0.09
2	2142	2089	-53	2088	-54	35.82	35.68	-0.14	35.67	-0.15
3	7125	7071	-54	7070	-55	44.09	44.02	-0.07	44.02	-0.07
4	7104	7050	-54	7048	-56	29.35	29.30	-0.05	29.30	-0.05
5	15423	15414	-9	15414	-9	47.14	47.13	-0.01	47.13	-0.01
6	15905	15896	-9	15896	-9	46.75	46.74	-0.01	46.74	-0.01
7	15903	15893	-10	15893	-10	44.52	44.51	-0.01	44.51	-0.01
8	16676	16666	-10	16666	-10	43.68	43.67	-0.01	43.67	-0.01
9	17497	17485	-12	17485	-12	40.68	40.67	-0.01	40.67	-0.01
10	17393	17376	-17	17375	-18	37.66	37.65	-0.01	37.65	-0.01
11	59499	59465	-34	59464	-35	30.44	30.43	-0.01	30.43	-0.01
12	61636	61603	-33	61602	-34	7.09	7.08	-0.01	7.08	-0.01

Alternative A – Rectangular Concrete Low Flow was evaluated in detail to demonstrate no adverse impacts. Alternative A is the most restrictive section and presents the greatest challenge for demonstrating no adverse impact relative to the other alternatives. A detailed impact analysis will be performed on the selected alternative as part of the design process.

REV	DESCRIPTION	DATE	APPR

CHANNEL IMPROVEMENTS
WATERSHED LEVEL 100-YEAR
IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

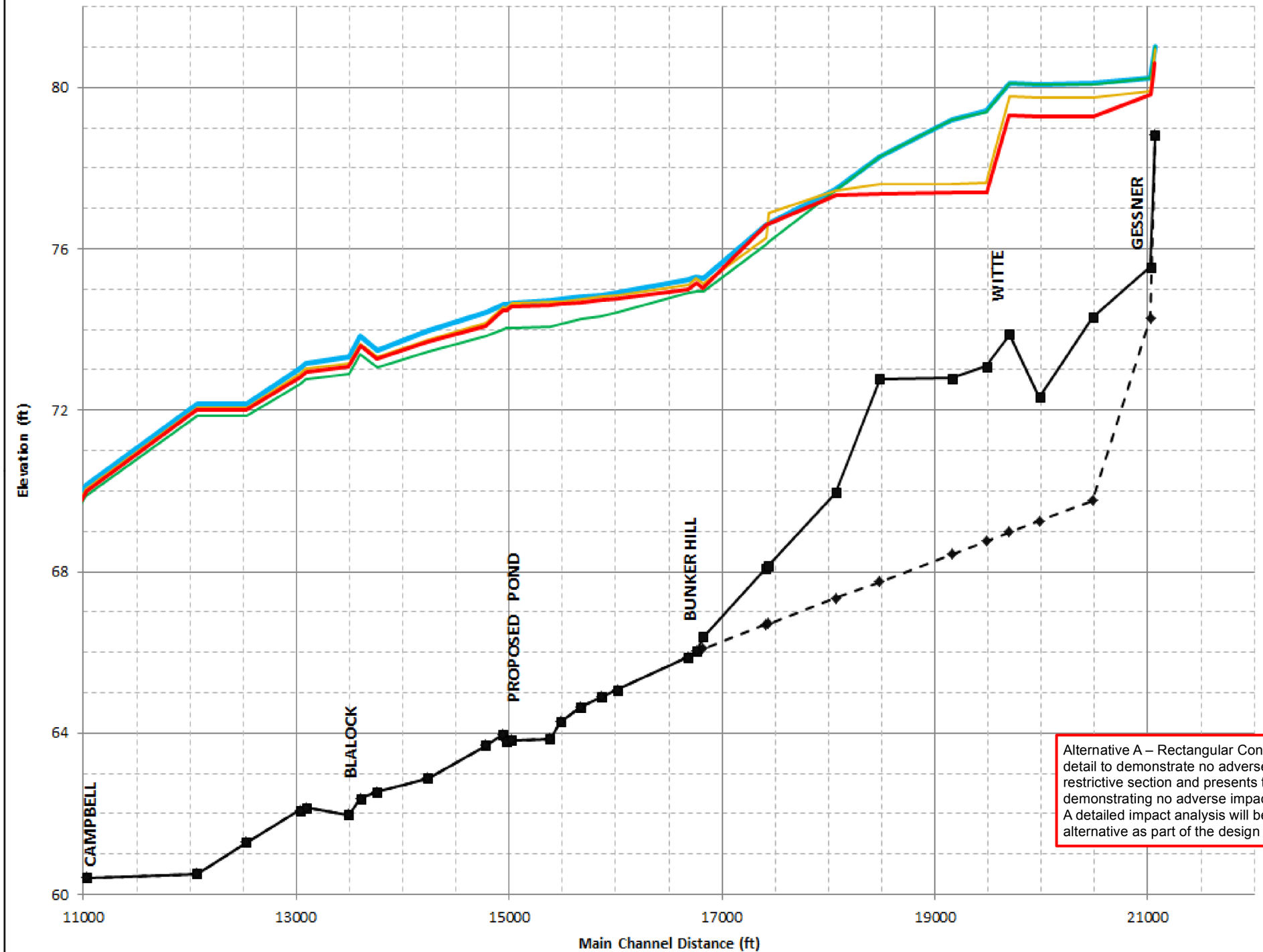
TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
15B OF 16

Map Document: L:\130-10384-0174-0-Production\4-08-GIS\MXD\W140-01 PER\15b_Future_Watershed_Model_Results_100yr.mxd 9/16/2013 2:58:33 PM DGGreaney

W140-01-00 - Results for 10-Year (10%AC) Event



Alternative A – Rectangular Concrete Low Flow was evaluated in detail to demonstrate no adverse impacts. Alternative A is the most restrictive section and presents the greatest challenge for demonstrating no adverse impact relative to the other alternatives. A detailed impact analysis will be performed on the selected alternative as part of the design process.

Coordinate System and Datum:
Texas State Plane Coordinate System, South Central Zone, NAD 83.
Elevations shown are not for floodplain mapping.

REV	DESCRIPTION	DATE	APPR

CHANNEL IMPROVEMENTS
10-YEAR RESULTS PROFILE

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

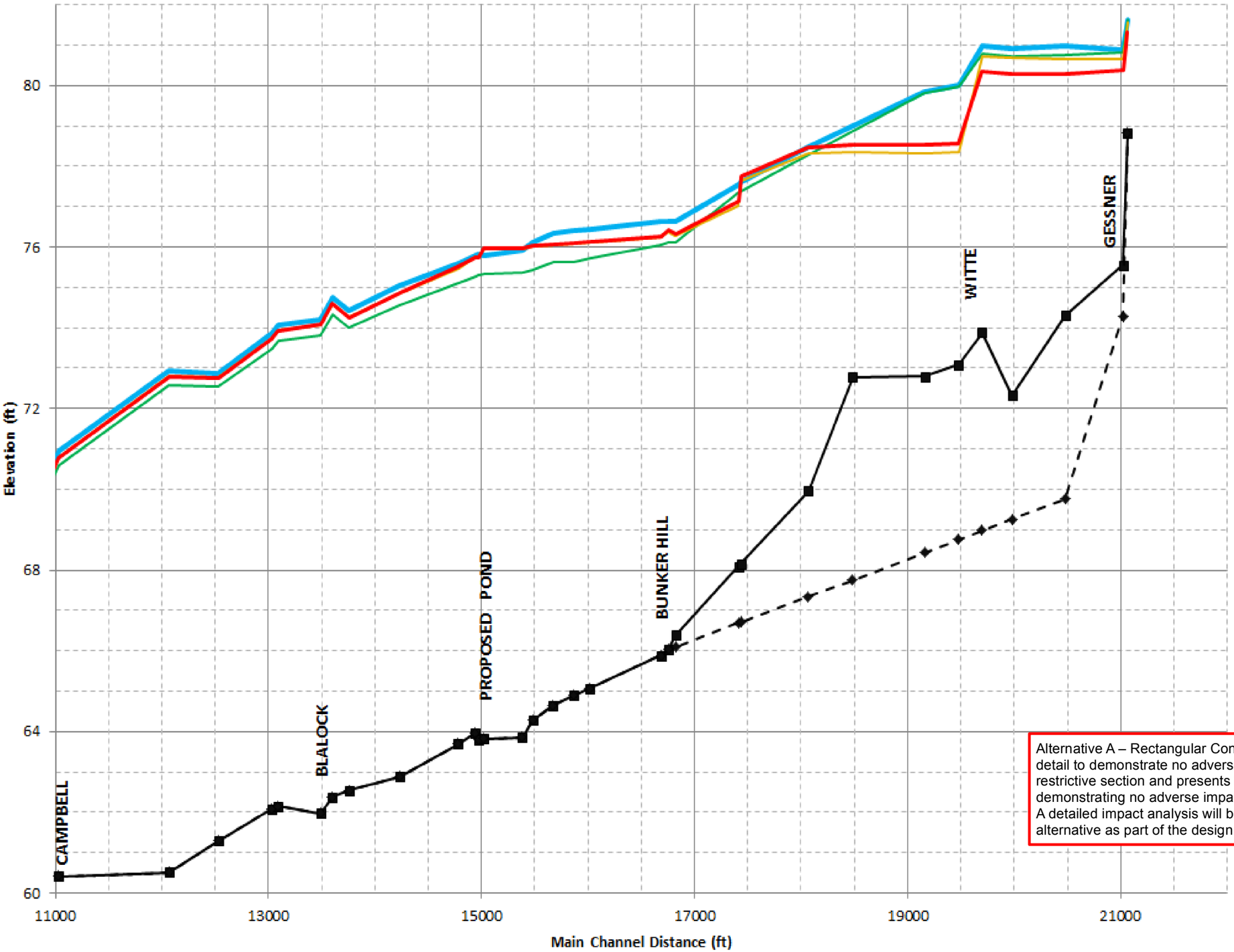
TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
16A OF 16

Map Document: L:\130-10384-01774-0-Production\4-08-GIS\MXD\W140-01 PER\16a_10yr_Profile.mxd 9/16/2013 3:01:25 PM DGGreaney

W140-01-00 - Results for 100-Year (1%AC) Event



Alternative A – Rectangular Concrete Low Flow was evaluated in detail to demonstrate no adverse impacts. Alternative A is the most restrictive section and presents the greatest challenge for demonstrating no adverse impact relative to the other alternatives. A detailed impact analysis will be performed on the selected alternative as part of the design process.

Coordinate System and Datum:
Texas State Plane Coordinate System, South Central Zone, NAD 83.
Elevations shown are not for floodplain mapping.

REV	DESCRIPTION	DATE	APPR

CHANNEL IMPROVEMENTS
100-YEAR RESULTS PROFILE

BRIAR BRANCH (W140-01-00)
CHANNEL IMPROVEMENTS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: SEP 2013
SCALE: AS NOTED

EXHIBIT NUMBER
16B OF 16

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APPENDICES

Appendix A: Briar Branch Stormwater Detention Basin Impact Analysis Report (Electronic Copy Only)

Appendix B: Geotechnical Report

Appendix C: Cost Estimates

Appendix D: Amenity Concepts

Appendix A: Briar Branch Stormwater Detention Basin Impact Analysis Report

Briar Branch Stormwater Detention Basin
(Units W140-01-00)

Impact Analysis Report

Prepared for:
Memorial City Redevelopment Authority

TIRZ 17
REDEVELOPMENT
AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Texas Registered Engineering Firm
F-2614

April 29, 2013

STATE OF TEXAS
DEREK ST. JOHN
96623
LICENSED
PROFESSIONAL ENGINEER

5-1-2013

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EXECUTIVE SUMMARY

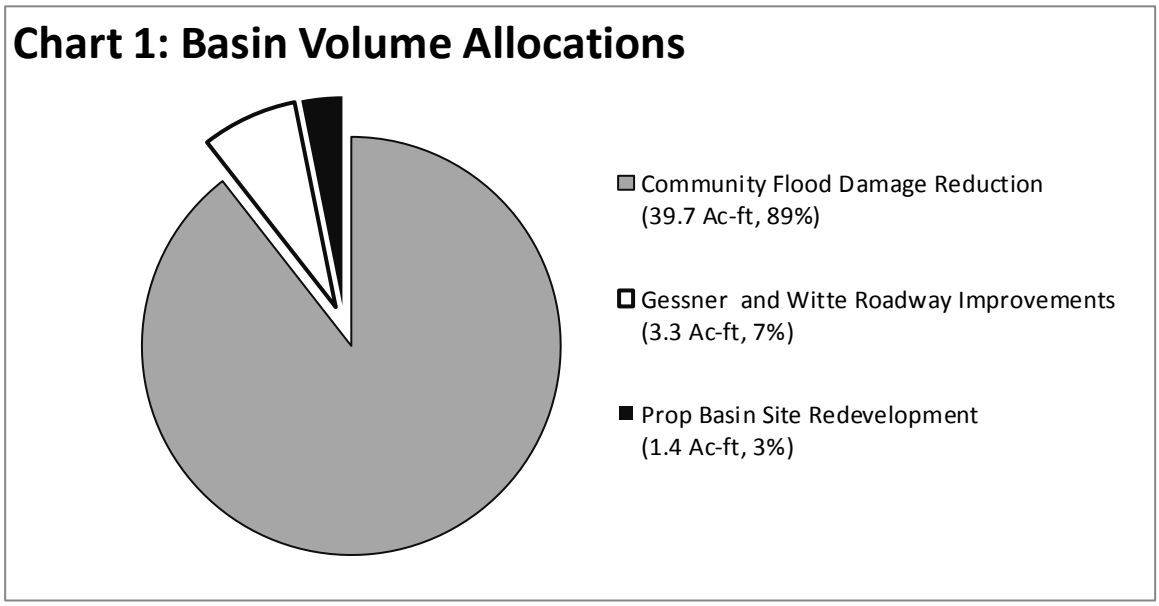
Lockwood, Andrews & Newnam, Inc. (LAN) was authorized by the Tax Increment Reinvestment Zone No. 17 (TIRZ 17) to prepare an Impact Analysis for a proposed detention basin located adjacent to W140-01-00 (Briar Branch), between Bunker Hill Road and Blalock Road.

The Briar Branch drainage area covers a relatively flat region just north of IH-10 and south of Neuens Road. The region has been documented through City of Houston flooding complaints as well as evidence from the April 2009 storm event as being susceptible to flooding, with an emphasis on the areas located immediately north of Briar Branch and south of the Long Point Fault line that traverses this area.

TIRZ 17 recently completed a Regional Drainage Study (RDS) for the purpose of identifying regional solutions to existing storm water problems. The upstream most subbasin of Briar Branch (W140C) was analyzed as part of the regional drainage study along with W151-00-00 and W153-00-00. The recommended solution for the Briar Branch Watershed included channel improvements to Briar Branch between the proposed basin site and Gessner Road to lower the water surface elevation in the channel, storm sewer improvements also between the proposed basin and Gessner Road to improve the interior drainage to Briar Branch, and a regional detention basin to mitigate for the channel and storm sewer improvements. This impact analysis is for the regional detention basin recommended from the RDS that is part of the regional solution for the Briar Branch watershed.

The improvements for the Briar Branch watershed are planned in three phases. The first phase is the proposed detention basin which, as described above, serves as mitigation for channel improvements (Phase 2) and storm sewer conveyance improvements (Phase 3). This impact analysis demonstrates no adverse impact for the basin only phase (Phase 1) and the complete regional solution (Phases 1, 2 & 3). Preliminary engineering is currently underway for the channel improvement phase (Phase 2). The Phase 2 and Phase 3 improvements will submit a separate impact analyses as part of their preliminary engineering or detailed design efforts that will build on this report and further document the final regional solution.

The proposed basin is intended to mitigate for the areas draining to Briar Branch upstream of the basin only. Specifically, benefits from the proposed basin are intended to mitigate for the Phase 2 and 3 improvements including necessary roadway improvements and increases in impervious cover associated with the recommended storm sewer improvements. Additionally, the proposed basin will serve as mitigation for the future development of the adjacent tract of land located between the basin and IH-10. **Chart 1** summarizes the allocation of basin storage:



Multiple alternative designs for the basin were originally prepared and through the design review process with HCFCD a preferred alternative was selected which features a dry bottom, tapered side slopes, a maintenance access ramp, and concrete pilot channels. This design meets all maintenance criteria outlined by HCFCD and does not require a variance.

The preferred basin alternative was analyzed for potential impacts both as an isolated improvement (without the future regional solution) as well as together with a future regional solution. Analysis was performed using an updated version of the InfoWorks 2 dimensional (2D) dynamic model developed as part of the RDS. To demonstrate no downstream impacts beyond the limits of the 2D model for both the detention basin only scenario as well as the future regional solution, a HEC-HMS and HEC-RAS analysis was performed utilizing information from the InfoWorks improvement models and the effective models.

The analysis of the basin as a standalone project demonstrates that the proposed basin lowers water surface elevations in the Briar Branch channel by up to 0.8 feet for the 100-year event. The standalone basin project project will have no adverse impacts up to and including the 100-year event. Zero rise in water surface elevation is demonstrated on Exhibits 7 and 8.

The future regional solution will lower water surface elevations in Briar Branch channel by up to 1.5 feet for the 100-year event. The combined regional solution will have no adverse impacts up to and including the 100-year event. Zero rise in water surface elevation is demonstrated on Exhibits 11 and 12.

1.0 INTRODUCTION

1.1 Project Description

In March 2011, Lockwood, Andrews & Newnam, Inc. (LAN) was authorized by the Tax Increment Reinvestment Zone No. 17 (TIRZ 17) to prepare a drainage impact analysis for a regional detention basin that was originally identified as an improvement in the TIRZ 17 Regional Drainage Study (RDS). The RDS included W151, W153, and portions of the W140-01-00 subwatershed. The focus of the RDS was on the identification and or confirmation of drainage problems in the RDS study area, and the identification of efficient and effective solutions. The regional detention basin that is the focus of this report is in the W140-01-00 (Briar Branch) subwatershed and is part of a regional solution identified in the RDS that includes channel improvements to Briar Branch as well as storm sewer improvements for systems draining to Briar Branch.

1.2 Project Limits

The proposed regional detention site is located 1300 feet east of Bunker Hill Road and on the south side of Briar Branch. The basin site is immediately adjacent to and east of a major shopping center located at the northeast corner of Bunker Hill Road and IH-10. The primary study area limits used to evaluate the basin are along Briar Branch, beginning at Gessner Road and extending approximately 4000 feet east of the proposed basin site. The study area is shown on **Exhibit 1**, Project Location Map. The study limit extents are largely consistent with the FEMA effective contributing area for subbasin W140C.

1.3 Project Objectives

The objective of this project is to reduce flooding and flood damages for the area contributing to Briar Branch between Gessner Rd and the proposed basin site with a focus on the area south of the Long Point Fault and north of IH-10. This area is shown on **Exhibit 2**, Effective Floodplain and W140C Drainage Area Map. The proposed detention basin is the first phase of a regional solution that will benefit the target area. The objective of the basin is to serve as mitigation for future channel improvements to Briar Branch between the proposed basin and Gessner Road and storm sewer improvements for key systems that drain to the channel improvements. Collectively, the storm sewer and channel improvements together meet the project objectives and are mitigated for through the proposed regional detention basin.

1.4 Report Objectives

This report serves to demonstrate no adverse impact for the preferred basin alternative as a standalone project. Additionally, this report serves to define the potential benefits of the future regional solution as a means to justify the basin construction and to demonstrate no adverse impact for the future regional solution. Because this detention basin is intended to benefit upstream properties, this report serves to reserve the capacity of the proposed detention basin for the future regional solution. While the subject will be discussed here, this report is not intended for regulatory approval of the future regional solution. It is anticipated that separate impact analysis will be submitted for future regional solution improvements.

1.5 Assumptions and Constraints

1.5.1 Modeling Approach

The hydrologic and hydraulic analysis for this project primarily utilizes the Infoworks ICM model platform to evaluate improvements and to demonstrate no adverse impact within the limits of the model. Beyond the limits of the Infoworks model, the use of conventional HEC-HMS and HEC-RAS models was employed to evaluate and demonstrate no adverse impacts. The use of a dynamic and two-dimensional (2D) overland flow model such as Infoworks ICM was implemented to help understand the interaction of the full drainage system including the many interconnected drainage systems, how and when water accesses the channel, what benefit the various improvement alternatives result in, and understanding the potential for impacts as a result of the proposed improvements.

The Infoworks ICM 2D model that was used to evaluate both the proposed regional detention basin and the full regional improvements builds on the dynamic model developed for the TIRZ 17 RDS. To meet the goals and objectives of this analysis the RDS model was extended downstream 4000 feet to Campbell Road. This model extension allowed for 2700 feet of overlap with the FEMA effective HEC-RAS model and terminates the project specific dynamic model with the termination point for the FEMA effective subbasin W140C.

For the purpose of evaluating project impacts resulting from hydraulic changes to the channel, the dynamic model was used to compare existing water surface elevations to proposed water surface elevations to insure no increases occur. As a method for further evaluating the dynamic model, the existing water surface elevations were also compared to the corresponding FEMA effective water surface elevations for the 2700 feet of Briar Branch that overlap between the two models. The results demonstrate a close relationship between the FEMA effective water surface elevation and those of the dynamic model for the 100-year event, and demonstrate no increase in water surface elevation. Modeling results are further discussed and documented in subsequent report sections.

To evaluate the effects of the proposed basin on the Buffalo Bayou watershed, the pre- and post-basin conditions and the future regional solution model were evaluated in the FEMA effective HEC-HMS model. As discussed above, the dynamic model extents match the extents for the HMS subbasin W140C. In order to accurately compare the effects of the proposed basin on the full watershed, a proposed conditions HEC-HMS model was developed that modified TC and R values from the effective model for subbasin W140C such that the resulting difference in the timing and peak flow rate from the existing to the proposed analysis closely resemble the change in peak flow rate and time to peak produced by the existing and proposed dynamic models. This modeling procedure was performed for the both the proposed basin-only model and the future regional solution model. Peak flows at junctions downstream were compared between the existing conditions (effective) HEC-HMS model, the proposed conditions (pond-

only) HEC-HMS model, and the future regional solutions HEC-HMS model. The resulting flows were inserted into the FEMA-effective HEC-RAS models for W140-01-00, W140-00-00, and W100-00-00. The results demonstrate no increase in water surface elevation. Modeling results are further discussed and documented in subsequent report sections.

1.5.2 Design Criteria

The proposed detention basin was analyzed and preliminarily designed to meet the requirements and technical guidance provided in the December 2010 HCFCD Policy, Criteria & Procedure Manual and the HCFCD Hydrology and Hydraulics Guidance Manual. The design event established for determining benefit for the basin and for the associated regional improvements is the 10-year event. This is consistent with the TIRZ 17 RDS and other related reports including the 2009 HCFCD W151 report.

1.6 Project Survey and Datum

All project data sources, engineering and analysis results reference the TSARP Benchmark Network and the NAV Datum 1988 with 2001 Adjustment. The following sources were used for topographic information:

- The proposed design and existing survey data for the HCFCD Briar Branch Sediment Removal project, constructed in late 2010 and early 2011, was used as a basis for the existing channel conditions.
- A survey done in 2007 by Martinez, Guy, and Maybik Inc. for the area along Briar Branch within the limits of this study. This survey detailed data collection and channel cross-sections at the existing culverts and bridge crossings.
- For overbank cross section information where survey data was unavailable, the HCFCD 2008 LiDAR data was utilized.

1.7 Prior Studies

The following studies have been completed in this area and were utilized in the development of the RDS and/or specifically for this analysis effort:

- Katy Freeway Program – 2002 - TxDOT – An XP-SWMM model was developed for the drainage system that connects to W151 and drains N. Gessner and Witte Roads. A series of oversized box culverts were used under the IH-10 frontage roads to mitigate the impacts of the IH-10 highway expansion.
- Tropical Storm Allison Recovery Project (TSARP) – HCFCD/FEMA – Completed effective models for the entire Harris County area, with effective maps updated June 18, 2007. This study included Briar Branch up to Adkins Road and did not include Blalock Road just upstream of this bridge structure.
- Drainage Study of Briar Branch – August 2007 – Memorial City Redevelopment Authority (TIRZ 17) – This study extended Briar Branch effective models to Gessner Road, and looked at the level of service for this channel, and investigated potential improvements in the area.
- W151 Implementation Study – 2009 – HCFCD – This study focused on areas in the W151-00-00 watershed downstream of IH-10; however it included the TxDOT Katy Freeway Program drainage models and improvements to the IH-10

corridor. This included the large Briar Branch drainage areas north of IH-10, but did not look at the hydraulics of Briar Branch. The assumptions used in the TxDOT – Katy Freeway Program analysis of the IH-10 area were kept in this modeling.

- TIRZ 17 Regional Drainage Study (RDS) – 2010 – Memorial City Redevelopment Authority (TIRZ 17) – studied portions of the W140-01-00, W151-00-00 and W153-00-00 watersheds that drain the TIRZ 17 area that were heavily impacted by the April 2009 storm event. This model is an inlet-level, 2D analysis of more than 3,000 acres, using InfoWorks .

2.0 EXISTING CONDITIONS

The Briar Branch watershed covers a relatively flat area north of IH-10, south of Neuens Road, east Conrad Sauer Road, and west of Campbell Road. Portions of the area have been documented as being susceptible to flooding, especially the areas located immediately north of Briar Branch and south of the Long Point Fault line that traverses this area. This report section reviews the existing conditions of the area.

2.1 Location and Topography

This study reviews the portion of Briar Branch within the W140C subbasin as defined for the FEMA Effective Model for the Buffalo Bayou watershed. Subbasin W140C has an area of 2.75 sq. miles at a slope of approximately 0.14% from the northwest corner of the subbasin down to the southeast corner. Redevelopment has occurred on much of the land between Briar Branch and IH-10, and areas along N. Gessner are currently under development. The most distinguishing characteristic of the area is the Long Point Fault that runs from the southwest corner to the northeast corner of W140C, just north of Briar Branch. There is approximately 3-5 feet of drop across the fault in this area.

Many of the roadways north of Briar Branch within the Spring Branch Woods and Long Point Woods subdivisions are at elevations lower than the top of bank at Briar Branch, which limits conveyance into Briar Branch. Storm sewer systems drain these areas to Briar Branch, but there are not many effective overland pathways and elevation to effectively drain the surface water overflows into Briar Branch.

2.2 Land Use

The northern portion of the study area is mostly residential, while the portion along IH-10 is mostly commercial. The FEMA Effective model determined that this area is 58.8% impervious cover and is considered fully developed. The existing conditions dynamic model uses data from the Harris County Appraisal District (HCAD and aerial imagery to determine that the area draining to Briar Branch is approximately 61.3% impervious. The current land use is shown on **Exhibit 3**, Land Use Map.

2.3 HCFCD Facilities and Unit Numbers

Briar Branch is HCFCD Unit #W140-01-00 and is the focus of this analysis and the proposed improvements. Briar Branch drains to Spring Branch (HCFCD Unit #W140-00-00) near Wirt Road, and eventually Buffalo Bayou (HCFCD Unit #W100-00-00) near Chimney Rock Road. Other channels that drain to Briar Branch within the vicinity of the proposed improvements include an existing drainage channel between Springrock Lane and Confederate Road named W140-01-05 connects to Briar Branch via a 72" CMP.

2.4 Right-of-Way

The purchase of the proposed regional detention facility by the Memorial City Redevelopment Authority is final. The proposed basin is adjacent to Briar Branch, which at this location has two drainage easements, owned by HCFCD, which total 50' wide.

2.5 Pipelines and Utilities

The proposed detention site is crossed by an 8-inch AC water line and an 8-inch sanitary sewer line, which are currently being relocated to a 20' City of Houston utility easement in order to accommodate construction of the detention basin.

3.0 HYDROLOGY & HYDRAULICS

3.1 Analysis Objectives

The primary analysis objective was to evaluate the benefit of improvement alternatives for Briar Branch and to demonstrate the lack of adverse impacts. Two separate models were created to achieve these objectives: A dynamic model consisting of detailed calculations of inlet-level areas for the purpose of evaluating improvement benefit and reviewing potential impacts, and a watershed-level model to assist with evaluating the potential for downstream adverse impacts. The dynamic and watershed-level models are further described below.

For the dynamic model, the Infoworks 2D model from the TIRZ 17 Regional Drainage Study (RDS) was extended east by approximately 4000 feet, from the proposed detention basin site to Campbell Road, to match the limits of the FEMA Effective Model subbasin W140C. Infoworks was also used to calculate flow rates and water surface elevations within Briar Branch channel, using an inlet-level analysis. The dynamic model gives an analysis of the effective model's subbasin W140C in greater detail than is possible with a watershed level model. The FEMA Effective Model and the existing conditions dynamic model have approximately equivalent total drainage area sizes, and their outflow is measured at the same location, just downstream of Campbell Road.

The existing conditions watershed hydrologic model is identical to the FEMA effective model. The overall analysis objective for this model is to analyze the regional benefit of improvements and provide a means to evaluate and demonstrate no adverse impacts.

3.2 Hydrologic Modeling Methodology

3.2.1 Dynamic Model Hydrology

Hydrology for the dynamic model was developed using an inlet level analysis between Conrad Sauer Rd and Campbell Rd. See **Table 1** for a summary of contributing drainage areas for Subbasin W140C.

Drainage area boundaries were delineated utilizing 2008 LiDAR data in combination with field visit verification. Boundaries from previous studies, as-built drawings, or models were confirmed prior to inclusion in the study. Percent impervious values were calculated for each drainage area based on the most recent land use data available from Harris County Appraisal District (HCAD), and reviewed with aerial imagery and updated as necessary. For the proposed conditions, planned storm sewer improvements that are part of the regional solution were considered. These roadways include both Gessner and Witte from IH-10 to Long Point Road. The slope for each drainage area was calculated using GIS and the 2008 LiDAR data. A drainage width parameter for each drainage area was assigned based on its physical dimensions. Drainage area boundaries are shown on **Exhibit 4**, Dynamic Model Drainage System Map.

Losses were computed using the Green & Ampt method with loss rates set according to the values in the TSARP white paper titled "Recommendation for: Replacing HEC-1 Exponential Loss Function in HEC-HMS." Note that this is different from the FEMA effective model for Buffalo Bayou, which used calibrated values outside the ranges recommended in the TSARP white paper; the differences between these values is shown in **Table 2**.

Total subcatchment runoff volume was determined using initial abstractions for impervious surfaces and Green & Ampt infiltration for pervious surfaces. Subcatchment runoff routing was determined using Storm Water Management Model (SWMM) routing utilizing two of the three normally used surfaces; impervious area with initial abstraction, and pervious area with initial abstraction. To be consistent with the HCFCD W151-00-00 implementation study methods, impervious area without initial abstraction was not determined.

A comparison of FEMA effective and existing conditions dynamic model peak flows for subbasin W140C can be found in **Table 3** below. The differences between the FEMA effective flows and the dynamic model flows can be attributed to several factors including the Green & Ampt values differences, contributing drainage area differences, average drainage area size, and fundamental modeling methodology differences. A summary of modeling methods including a comparison of methods between the FEMA effective model and the dynamic model can be found in **Appendix A**.

3.2.2 HEC-HMS Model Hydrology

The FEMA effective hydrologic model was utilized to analyze the downstream effects of the proposed regional detention basin. The dynamic model extents match the extents of the W140C subbasin to allow comparisons between the dynamic model and the FEMA effective model. The revised existing conditions model is entirely identical to the effective model.

Table 3 compares the peak flow differences for key junctions along Buffalo Bayou, Spring Branch, and Briar Branch. The comparison is between the FEMA effective model and the revised existing conditions model.

3.3 Hydraulic Modeling Methodology

Hydraulic models were developed at an inlet-level for the dynamic model of the W140C subbasin and at a watershed-level using HEC-RAS for the purpose of evaluating the potential for impacts.

3.3.1 Dynamic Model Hydraulics

Hydraulics calculations for the W140C subbasin are performed with the Infoworks ICM model. The model consists of an inlet-level analysis between Conrad Sauer Road and Campbell Road. The study area between the proposed basin location and Campbell Road was added to the dynamic model study area to better match the

extents of the W140C subbasin of the FEMA effective model. Hydraulic parameters for storm sewers and box culverts were assigned according to the Manning's roughness "n" values set forth in the City of Houston Infrastructure Design Manual. Harris County Flood Control drainage channels are modeled with roughness values according to those outlined in the HCFCD *Hydrology & Hydraulics Guidance Manual* and the HCFCD *Policy Criteria & Procedure Manual*. Briar Branch is modeled using one dimensional (1D) river reaches that are similar to HEC-RAS sections, in order to more accurately define channel cross sections. Overbank flows are handled with the Infoworks ICM 2D computation engine, as are inlet ponding and overland flow computations.

Pipe and channel hydraulic calculations are handled using dynamic pipe flow calculations and a 2D mesh surface for storage and surface flow routing. The InfoWorks ICM software utilizes a combination of numeric methods for solving the Saint Venant equations to determine hydraulic states within the model. Once subsurface storm sewer capacity is exceeded, water will overflow onto the 2D mesh surface (ground surface) of the model.

The 2D surface was developed using the 2008 Harris County LiDAR supplemented with survey data in areas where topographic changes were known to have occurred. Vertical structures within the study area are modeled as void spaces to prevent flow through or storage within structures. Overland roughness values for the 2D surface were developed from land use data, Harris County Appraisal District information, aerial imagery, and field visits. The river sections for Briar Branch are linked to the 2D surface along the banks of the channel in order to represent over bank flow entering and leaving Briar Branch.

The dynamic model has several discharge or outflow locations. Dynamic tailwater conditions were developed where these systems are backwater-controlled. The system outfalls include:

- W140-01-00 at Campbell Road. For the Briar Branch outfall, a tailwater condition was developed by adjusting the timing of a stage-time rate table developed with the FEMA effective model to match the timing of the dynamic model.
- W151-00-00 underneath IH-10 near Witte Road. For the W151-00-00 system, the entire storm sewer and overland flow drainage system was modeled as part of the RDS. This model was utilized to create a dynamic water surface elevation at the outfall.
- W156-00-00 via multiple small storm sewers east of Conrad Sauer Road. These systems do not appear to be backwater controlled so a dynamic tailwater was not used.
- W140-00-00 via a 96" RCP under Nuens Road. This system also did not use a dynamic tailwater.

3.3.2 HEC-RAS Model Hydraulics

There is an overlap between the dynamic model and the watershed-level models which is approximately 2700 feet in length, between Blalock Road and Campbell Road. While these two models vary greatly in their methods and calculations, there is a high degree of correlation between their computed water surface elevations, as shown in **Table 4**.

A set of Revised Existing Conditions HEC-RAS Models were created for Briar Branch, Spring Branch, and Buffalo Bayou by updating the flow distributions in the FEMA effective models per the Effective HEC-HMS model. Flow tables from the effective HEC-RAS model did not match the peak flow values from the FEMA effective HEC-HMS model. No changes to the SVSQ tables, channel geometry, or computational parameters were made.

3.4 Existing Conditions

The results of the existing conditions dynamic model are shown in **Exhibit 5**, Existing Conditions 10-Year Inundation Map. This model indicates several limitations of the existing drainage system.

4.0 PROPOSED DRAINAGE PLAN

4.1 Description

Improvements to the Briar Branch watershed are proposed to be constructed in three phases. First, a detention basin is proposed to provide a mitigation bank for a future regional solution. The second phase would include channel conveyance improvements upstream of the proposed detention basin to increase conveyance into the basin and lower water surface elevations in Briar Branch. A third phase would include storm sewer conveyance improvements to increase conveyance to the channel and lower the water surface elevations in the neighborhoods adjacent to Briar Branch between Gessner Road and Bunker Hill Road.

Only the first of these three phases, the proposed detention basin, is planned for construction at this time. This impact analysis refers to the first phase as the "proposed conditions" and to all subsequent phases as the "future regional solution". Only the proposed detention basin is discussed in this section; the future regional solution is discussed in chapter 5, below.

4.2 Hydrologic Analysis

A storage node representing the proposed basin was added to the existing conditions dynamic model, as were links representing the inflow and outflow structures. The node was given a stage-storage curve, which was calculated using the areas bounded by the contours generated with AutoCAD Civil3D.

The proposed conditions dynamic model outflow results were then modeled in HEC-HMS to by modifying the TC & R values for subbasin W140C such that the resulting difference peak flow rate from the existing to the proposed analysis closely resemble the change in peak flow rate produced by the existing and proposed dynamic models. No other changes were made to the HEC-HMS models. **Table 5** shows the hydrologic results; the comparison is between the revised existing conditions model and the proposed conditions (Basin-Only) model.

Exhibit 6, Proposed Basin-Only 10-Year Inundation Reduction Map shows the flood-reduction benefits of the proposed basin for the target area.

4.3 Hydraulic Analysis

The proposed basin was analyzed for upstream and downstream impact. **Exhibit 7**, Proposed Basin-Only Dynamic Model Impact Analysis Results shows the changes in water surface elevation in the channel for the area nearest the pond, as calculated by the proposed conditions dynamic model.

A proposed conditions HEC-RAS model was developed using the geometry of the FEMA effective model and the flow rates of the proposed conditions HEC-HMS model. This model was used to evaluate hydraulic impacts downstream of the basin, which are shown in **Exhibit 8**, Proposed Basin-Only Watershed Level Impact Analysis Results. **Table 6** shows the calculated hydraulic impacts at corresponding HEC-HMS junctions

downstream of the proposed detention basin. It demonstrates that the basin has no adverse hydraulic impact on Briar Branch, Spring Branch, or Buffalo Bayou for the 100-year event.

4.4 Detention Basin Layout

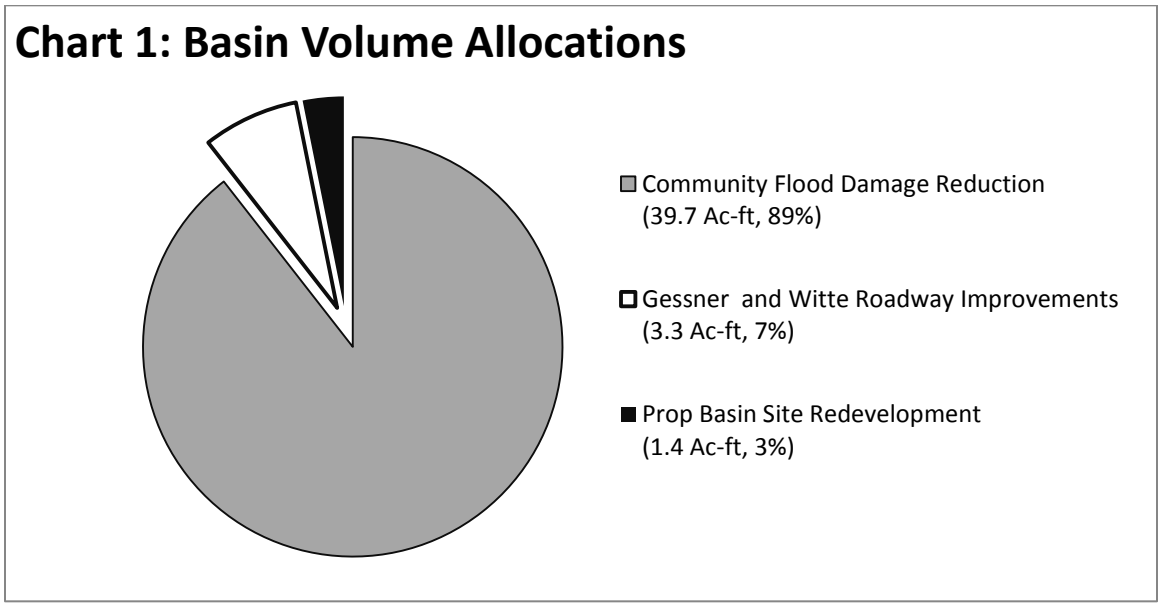
4.4.1 Detention Layout

Due to the highly developed characteristic of the watershed, minimal undeveloped land is available for detention. An 8.23-acre tract was identified and obtained by TIRZ 17 for use in providing drainage improvements to areas neighboring TIRZ 17 north of IH-10. A regional detention basin on this tract is the focus of this report.

Multiple alternatives for the basin were designed, evaluated, and considered. Through the design review process with the Harris County Flood Control District, a preferred alternative was selected which features a dry bottom, tapered side slopes, a maintenance access ramp, and concrete pilot channels. This design meets all maintenance criteria outlined in the District's Policy, Criteria & Procedure Manual. The proposed basin stage-storage curve is shown in **Appendix E**, Preferred Basin Layout Volume Analysis.

4.4.2 Basin Volume Allocation

The proposed basin is designed to function as a component of a regional flood damage reduction project that includes channel improvements to lower the water surface elevation in the channel and storm sewer improvements to efficiently convey runoff from the adjacent neighborhood to the channel. The approximate volume of the basin is 44.4 ac-ft during the 100-yr event. Additionally, the basin will serve as mitigation for the future development of the adjacent tract of land located between the basin and IH-10 (Identified as Future Detention Tract on **Exhibit 6**). This report documents that the proposed basin provides mitigation for the entire 6.78 acre tract being improved from 64% impervious to 100% impervious. Using the most recent City of Houston criteria for detention volumes, the basin volume allocated for the tract of land is approximately 1.4 acre-feet, as shown in Appendix E. 3.3 acre-feet is dedicated for the TIRZ 17 Capital Improvement Projects Gessner and Witte. The remaining 39.7 Ac-ft, or approximately 89% of the 100-year basin volume, is dedicated for flood damage reduction. This information is summarized in Chart 1: Basin Volume Allocation.



4.5 Right-of-Way Requirements

The proposed detention basin site has already been purchased by TIRZ 17. No additional right-of-way is required for this phase of the project.

4.6 Special Erosion Control Features

The proposed detention basin will utilize concrete low-flow channels in the basin bottom, as well as armored slope protection at the inflow weir.

4.7 Stormwater Quality Enhancements

Stormwater quality enhancements were considered for the basin. Per direction by HCFCD, off-line detention basin water quality features are not considered effective and have not been added.

Stormwater quality enhancements will be considered for future regional drainage improvements during the preliminary engineering phase.

4.8 Potential Pipeline and Utility Conflicts

An existing 8" waterline and an existing 8" sanitary sewer line cross the proposed detention basin site. These will be relocated to run along the south and east property edges within a dedicated 20' utility easement. Utility relocation efforts are currently under way.

4.9 Geotechnical Requirements

A geotechnical investigation was commissioned by LAN on behalf of the Memorial City Redevelopment Authority on June 13, 2011, and performed by Geotest Engineering, Inc. The report of findings, titled "Geotechnical Investigation" and dated August 19, 2011, is attached as **Appendix G.** This investigation included drilling and sampling six soil borings to depths from 20 to 30 feet and performing appropriate laboratory tests on

recovered soil samples. The geotechnical report was reviewed and approved by HCFCD on August 2nd, 2012. The principal findings include:

- Soils include Addicks-Urban land complex and Gessner-Urban land complex, based on USDA NRCS database information.
- The subsurface soils consist predominately of cohesive soils to the termination depths, with intermittent cohesionless soils encountered in three borings.
- Groundwater was encountered during drilling at depths ranging between 15.3 feet and 24 feet.
- Recommended stable slope, based on the results of slope stability analysis and HCFCD requirements, is 3:1 along the north and west banks and 4:1 along the east and south banks.
- Based on the presence of cohesionless soils, it is recommended that at the toe and bottom of the eastern and southern banks of the detention basin be covered with a low permeability clay liner or geotextile fabric to prevent erosion.
- Dewatering may be required to lower and maintain the groundwater level at least five feet below the level of excavation prior to and during the excavation.

4.10 Environmental Issues

A Phase I Environmental Site Assessment (ESA) for the W140 Detention Basin was conducted as part of the feasibility study prior to the TIRZ 17 RDA's purchase of the property (LAN, August 2011). This ESA is included as **Appendix H** to this report. The ESA identified three (3) potential Recognized Environmental Conditions and recommended further investigation of only one of these sites to determine soil handling and disposal requirements.

Subsequent soil sampling and analyses indicate that the soil at the site does not require any special protective measures during excavation other than normal dust suppression and is not a waste requiring regulated means of disposal. These analyses further indicate that the soils at the site pose no threat of adverse environmental impact (GSI Environmental, December 2011 and Geotest Engineering, October 2011). These reports are included as **Appendix I** and **Appendix J** to this report.

4.11 Maintenance Access Plan Requirements

Maintenance access to the proposed detention basin is via a 20' wide permanent joint access easement on the east side of the property, which connects the site to the west-bound IH-10 frontage road. Maintenance access paths within the site include:

- A 50' maintenance access berm between the western property line and the detention basin top bank
- A 30' maintenance access berm between the northern property line and the detention basin top bank
- A 45' maintenance access berm, including 20' of which are concrete-paved, between the eastern property line and the detention basin top bank
- A 30' maintenance access berm between the southern property line and the detention basin top bank

- A 20’ maintenance access ramp in the southeast corner of the site to allow access from the paved access drive into the basin bottom.

4.12 Operation Plan for Pumped Detention basins

This facility will not be pumped, so no operation plan is required. Pumped detention was considered as an option for the proposed basin, but was not pursued given a lifecycle cost that was unacceptably higher than a traditional basin and a volume increase of only 27%.

5.0 FUTURE REGIONAL DRAINAGE SOLUTION

5.1 Description

Improvements to the Briar Branch watershed are proposed to be constructed in three phases. The first phase includes the detention basin discussed in Chapter 4, above. The next phase will include channel conveyance improvements upstream of the proposed detention basin to lower water surface elevations in Briar Branch. A third phase would include storm sewer conveyance improvements to increase conveyance to the channel and lower the water surface elevations in the neighborhoods adjacent to Briar Branch between Gessner Road and Bunker Hill Road. This section details the last two phases, which are referred to here as the "Future Regional Solution".

5.2 Hydrologic Analysis

Just as the proposed conditions dynamic model discussed in section 4.2 above was created from the existing conditions dynamic model, the Future Phase 2 (Channel Improvements) and Future Phase 3 (Storm Sewer Improvements) dynamic models build on the Proposed Phase 1 (Pond-Only) dynamic model. All dynamic modeling was performed in Infoworks ICM. The future regional solutions models include changes to the Briar Branch channel sections as well as the storm sewers which convey storm flows into the channel. These components are shown on **Exhibit 9**, Future Regional Solution Components Map.

It is important to note that these improvements are not intended for construction or permitting at this time. All sizes are subject to change as part of the Briar Branch Channel Improvements Preliminary Engineering Report, which is currently under production. The sizes and sections shown represent a potential scenario but are intended only for general information. All future projects must prove no-impact status independently from this report. The flood damage reduction benefits that the future projects offer is shown on **Exhibit 10**, Future Regional Solution 10-Year Inundation Reduction Map. The future regional solution will offer substantial flood damage reduction benefit for the areas upstream of Bunker Hill Drive. Although the results are preliminary and not intended for construction or permitting at this time, the water surface elevations for the nodes which are shown on **Exhibit 10** are quantified in **Table 7**, Future Regional Solutions Node Results.

The future phase 2 and future phase 3 dynamic model outflow results were then modeled in HEC-HMS in a similar fashion as the basin only analysis by modifying the TC & R values for subbasin W140C such that the resulting difference peak flow rate from the existing to the future analysis closely resemble the change in peak flow rate produced by the existing and future dynamic models. No other changes were made to the HEC-HMS models. **Table 8** shows the hydrologic results; the comparison is between the Revised Existing Conditions model, the Future Phase 2 (Channel Improvements) model, and the Future Phase 3 (Storm Sewer Improvements) model.

5.3 Hydraulic Analysis

As discussed in section 4.3, above, the future regional solutions hydraulic models were developed from the FEMA effective geometry and the future regional solutions HEC-HMS flows. The results of this model are also displayed in **Table 9**; the comparison is between the Revised Existing Conditions model, the Future Phase 2 (Channel Improvements) model, and the Future Phase 3 (Storm Sewer Improvements) model.

Results of the future regional solution impact analysis efforts are shown on **Exhibit 11**, Future Regional Solution Dynamic Model Impact Analysis Results and **Exhibit 12**, Future Regional Solution Watershed Level Impact Analysis Results.

5.4 Detention & Channel Layout

5.4.1 Detention Layout

Detention will be required to mitigate the impacts of any future regional solution. Detention is the first phase of the regional plan, and is discussed in detail in chapter 4, above.

Modifications to the basin inflow weir will be necessary as part of construction of channel conveyance improvements. The basin inflow weir has been designed so that steel sheet piling can be cut off or welded onto the basin inflow weir in such a way that the major concrete structures need not be modified.

5.4.2 Channel Layout

Future channel improvements will be necessary to meet the project objectives discussed in Section 1.3 and fully utilize the detention basin discussed in this study. The channel improvements which were modeled include a rectangular concrete low flow channel (8’ wide x 4’ high) and trapezoidal concrete channel similar to the existing channel downstream of Bunker Hill. Storm sewer improvements are also planned to increase conveyance into the channel; preliminary information on these improvements, including outfall size, location, and flowrate, are shown on **Exhibit 9**, Future Regional Solution Components Map. The future regional solution was modeled with InfoWorks ICM in order to quantify potential future water surface elevation (WSEL) decreases and ensure that future projects can feasibly achieve no-impact. Results are shown on **Exhibit 13**, Proposed and Future Briar Branch Channel Profile Results.

5.5 Right of Way

The future regional solution construction will be designed to fit in the existing ROW and easements where possible. No significant ROW acquisitions are planned.

5.6 Other Requirements

5.6.1 USACE Jurisdictional Determination

LAN, on behalf of TIRZ 17, requested a U.S. Army Corps of Engineers (ASACE) jurisdictional determination on February 3rd, 2012. USACE responded on February 20th, 2013 that Briar Branch between Gessner Road and 1730 LF downstream of

Bunker Hill Rd "does not contain waters of the United States. Therefore, any work, structures, or the discharge of fill material on the project site is not subject to Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act (CWA) and does not require a Department of the Army permit." The letter of jurisdictional determination has been attached as Appendix J.

5.6.2 W151-00-00 Interaction

The intent of this impact analysis report is to demonstrate no adverse impact to the contributing drainage area to the basin, the area downstream of the basin, and to the W151-00-00 watershed. W151-00-00 experiences ancillary benefits from the W140-01-00 regional solution in the form of reduced flows contributing to W151. Benefits to W151-00-00 as a result of the W140-01-00 regional solution are dependent on the chosen channel configuration. There are no intentions of utilizing flow reductions to W151-00-00 to mitigate for any flow increases to W151-00-00. The ancillary benefits to W151-00-00 are to remain as benefits to W151-00-00.

6.0 CONCLUSION

The proposed regional detention basin located 1300 feet east of Bunker Hill Road and south of Briar Branch is the first phase of a planned regional solution that includes future channel improvement and storm sewer improvement phases. The future improvement phases are located upstream of the proposed basin between the basin and Gessner Road.

The proposed basin meets all maintenance criteria outlined by HCFCD. TIRZ 17 will maintain the proposed basin for up to three years. Upon completion of the standard 1-year establishment period, TIRZ 17 will file for maintenance responsibility transfer to HCFCD. The proposed basin includes 44.4 acre feet of total volume, of which 39.7 acre feet will be used for flood damage reduction.

The proposed basin as a standalone project was reviewed for impacts to the immediate and adjacent areas, and to the region downstream of the basin. The basin was analyzed using a dynamic 2D model. Results from this analysis were reviewed at an inlet level and at a watershed level for potential impacts. The preferred basin alternative has no adverse hydraulic impact up to and including the 100-year event.

In addition to the basin as a standalone project, the future regional solution was also analyzed. The future regional solution will lower water surface elevations in Briar Branch channel up to 2.0 feet for the 10-yr event and up to 1.5 feet for the 100-year event. The analysis demonstrates that the future regional solution will have no adverse hydraulic impact up to and including the 100-yr event. The channel and storm sewer improvements are not intended for construction at this time. The basin as a standalone project is recommended for approval, permitting, and construction.

TABLES

Table 1: Drainage Area Information for Subbasin W140C		
Model	Drainage Area (Ac)	Impervious (%)
FEMA Effective	1760	58.2%
Dynamic Model	1984	61.3%

Table 2: Loss Rate Information for Subbasin W140C							
Model	Method	Impervious (%)	TC (hrs)	R (hrs)	Parameters	100-Year Q (CFS)	100-Year Runoff
FEMA Effective	Green & Ampt	58.2	0.55	9.93	Calibrated	1088	13.2" - 3.61" = 9.59"
Revised Existing (HMS)	Green & Ampt	58.2	0.55	9.93	Calibrated	1088	13.2" - 3.61" = 9.59"
Revised Existing (Infoworks)	Green & Ampt	61.3	n/a	n/a	TSARP Whitepaper	1989	13.2" - 1.11" = 12.09"

Table 3: Existing Peak Flow Comparisons						
Location	10-yr FEMA Effective Flow (CFS)	10-yr Existing Conditons Flow (CFS)	Difference (%)	100-yr FEMA Effective Flow (CFS)	100-yr Existing Conditons Flow (CFS)	Difference (%)
Briar Branch @ Campbell Rd	589	589	0.00%	1088	1088	0.00%
Briar Branch @ Spring Branch	1158	1158	0.00%	2142	2142	0.00%
Spring Branch @ Buffalo Bayou	3853	3853	0.00%	7104	7104	0.00%
Buffalo Bayou @ W138-00-00	8093	7953	-1.73%	15757	15423	-2.12%
Buffalo Bayou @ W137-00-00	8390	8152	-2.84%	16564	15903	-3.99%
Buffalo Bayou @ Woodway Dr	8437	8431	-0.07%	16690	16676	-0.08%
Buffalo Bayou @ W129-00-00	8840	8840	0.00%	17497	17497	0.00%
Buffalo Bayou @ Montrose Blvd.	8535	8535	0.00%	17393	17393	0.00%
Buffalo Bayou @ White Oak Bayou	38563	38563	0.00%	59499	59499	0.00%
Buffalo Bayou @ End	39606	39606	0.00%	61636	61636	0.00%

Table 4: Existing Water Surface Elevation Comparisons					
Location	RAS Station	Existing HEC-RAS WSEL* (10-yr)	Existing Infoworks WSEL* (10-yr)	Existing HEC-RAS WSEL* (100-yr)	Existing Infoworks WSEL* (100-yr)
Adkins Rd.	13075.6	72.69	73.18	72.50	74.07
	13030.8	72.52	73.03	72.33	73.87
	12896.2	72.31	72.91	72.12	73.74
	12527.9	72.00	72.64	71.81	73.44
Anne St.	12065.3	71.48	72.15	71.30	72.92
	11519.3	70.75	71.09	70.57	71.88
	11029.3	70.13	70.14	69.95	70.94
Campbell Rd.	11002.1	70.11	70.01	69.93	70.77
	10923.3	69.87	69.62	69.71	70.27
End of W140C	10764.8	69.80	69.27	69.63	69.83

*WSEL = Water Surface Elevation

Table 5: Proposed Peak Flow Comparisons

Location	10-Year			100-Year		
	Existing Conditons Flow (CFS)	Prop Phase 1 (Pond-Only) Flow (CFS)	Difference (%)	Existing Conditons Flow (CFS)	Prop Phase 1 (Pond-Only) Flow (CFS)	Difference (%)
Briar Branch @ Campbell Rd	589	557	-5.35%	1088	999	-8.20%
Briar Branch @ Spring Branch	1158	1124	-2.93%	2142	2047	-4.42%
Spring Branch @ Buffalo Bayou	3853	3814	-1.00%	7104	7008	-1.35%
Buffalo Bayou @ W138-00-00	7953	7951	-0.03%	15423	15405	-0.11%
Buffalo Bayou @ W137-00-00	8152	8150	-0.03%	15903	15884	-0.12%
Buffalo Bayou @ Woodway Dr	8431	8428	-0.04%	16676	16656	-0.12%
Buffalo Bayou @ W129-00-00	8840	8813	-0.31%	17497	17475	-0.12%
Buffalo Bayou @ Montrose Blvd.	8535	8527	-0.09%	17393	17361	-0.19%
Buffalo Bayou @ White Oak Bayou	38442	38427	-0.04%	59250	59189	-0.10%
Buffalo Bayou @ End	39606	39592	-0.04%	61636	61576	-0.10%

Table 6: Proposed Water Surface Elevation Comparisons

Location	10-Year			100-Year		
	Exist WSEL*	Prop Phase 1 (Pond-Only) WSEL*	Diff. (ft)	Exist WSEL*	Prop Phase 1 (Pond-Only) WSEL*	Diff. (ft)
Briar Branch @ Campbell Rd	69.80	69.71	-0.09	72.25	72.15	-0.10
Briar Branch @ Spring Branch	32.76	32.63	-0.13	72.25	72.15	-0.10
Spring Branch @ Buffalo Bayou	26.11	26.07	-0.04	29.35	29.26	-0.09
Buffalo Bayou @ W138-00-00	39.16	39.15	-0.01	47.14	47.12	-0.02
Buffalo Bayou @ W137-00-00	36.73	36.72	-0.01	44.52	44.50	-0.02
Buffalo Bayou @ Woodway Dr	35.96	35.94	-0.02	43.68	43.66	-0.02
Buffalo Bayou @ W129-00-00	33.03	33.02	-0.01	40.68	40.66	-0.02
Buffalo Bayou @ Montrose Blvd.	30.59	30.59	0.00	37.66	37.64	-0.02
Buffalo Bayou @ White Oak Bayou	22.33	22.32	-0.01	30.44	30.42	-0.02
Buffalo Bayou @ End	0.08	0.08	0.00	7.09	7.07	-0.02

*WSEL = Water Surface Elevation

Table 7: Future Regional Solution Node Results

Node	Label (See Exhibit 10)	10-Year WSEL (ft)							100-Year WSEL (ft)						
		Existing	Proposed Phase 1 (Pond-Only)	Future Phase 2 (Channel Impvs)	Future Phase 3 (Storm Sew Impvs)	Proposed Phase 1 (Pond-Only) Diff.	Future Phase 2 (Channel Impvs) Diff.	Future Phase 3 (Storm Sew Impvs) Diff.	Existing	Proposed Phase 1 (Pond-Only)	Future Phase 2 (Channel Impvs)	Future Phase 3 (Storm Sew Impvs)	Proposed Phase 1 (Pond-Only) Diff.	Future Phase 2 (Channel Impvs) Diff.	Future Phase 3 (Storm Sew Impvs) Diff.
C092	A	85.28	85.28	85.27	84.82	0.00	-0.01	-0.46	86.27	86.27	86.27	85.96	0.00	0.00	-0.31
C065	B	82.38	82.38	82.34	81.13	0.00	-0.04	-1.24	83.01	83.01	82.98	81.91	0.00	-0.03	-1.10
C055	C	81.59	81.59	81.53	80.83	0.00	-0.06	-0.76	82.19	82.19	82.14	81.57	0.00	-0.05	-0.63
C047	D	81.01	81.01	80.93	80.60	0.00	-0.07	-0.41	81.62	81.62	81.55	81.32	0.00	-0.07	-0.30
C035	E	80.77	80.77	80.71	80.45	0.00	-0.06	-0.32	81.38	81.38	81.32	81.17	0.00	-0.06	-0.21
C004	F	80.35	80.35	80.32	80.23	0.00	-0.03	-0.12	80.91	80.87	80.84	80.91	-0.04	-0.07	0.00
3146769	G	80.25	80.24	80.12	79.94	-0.01	-0.13	-0.30	80.83	80.79	80.71	80.58	-0.04	-0.12	-0.25
D12	H	80.45	80.45	80.26	79.84	0.00	-0.19	-0.62	81.04	81.04	80.95	80.73	0.00	-0.09	-0.31
3146601	I	80.37	80.37	80.24	80.04	0.00	-0.13	-0.33	80.92	80.91	80.84	80.65	-0.01	-0.08	-0.26
B48	J	83.54	83.52	83.38	82.99	-0.02	-0.16	-0.55	84.95	84.94	84.80	84.54	-0.01	-0.15	-0.41
B36	K	81.43	81.43	81.05	80.02	0.00	-0.39	-1.41	83.00	82.93	82.85	82.52	-0.07	-0.15	-0.48
B29	L	80.64	80.64	80.28	79.30	0.00	-0.36	-1.34	81.70	81.67	81.52	80.96	-0.04	-0.19	-0.74
B18	M	79.89	79.86	79.35	78.89	-0.03	-0.54	-1.00	80.67	80.56	80.23	80.23	-0.11	-0.44	-0.44
IH-10_JUNCTION_E01	N	79.52	79.51	79.48	78.44	-0.01	-0.04	-1.08	80.27	80.27	80.25	80.08	0.00	-0.02	-0.18
20116	O	79.58	79.55	79.58	79.12	-0.03	-0.01	-0.46	80.14	80.10	80.13	80.10	-0.03	-0.01	-0.03
6029708	P	80.06	80.06	80.02	79.91	0.00	-0.04	-0.15	80.51	80.51	80.44	80.34	0.00	-0.07	-0.18
20132	Q	79.44	79.44	79.31	79.05	-0.01	-0.13	-0.39	79.97	79.97	79.86	79.79	0.00	-0.11	-0.18
20142	R	79.48	79.48	79.33	78.96	-0.01	-0.15	-0.52	79.95	79.95	79.82	79.74	0.00	-0.13	-0.21
5005	S	78.53	78.48	78.53	78.51	-0.05	0.00	-0.02	78.84	78.81	78.82	78.81	-0.02	-0.02	-0.03
W14001_sta16681	T	75.25	74.92	75.10	75.00	-0.33	-0.15	-0.25	76.63	76.06	76.24	76.27	-0.57	-0.38	-0.35
4165583	U	77.21	76.96	77.03	76.98	-0.25	-0.18	-0.23	78.78	78.76	78.71	78.60	-0.02	-0.07	-0.18
6029809	V	77.03	76.87	76.93	76.91	-0.16	-0.10	-0.12	77.67	77.55	77.63	77.61	-0.12	-0.04	-0.05
5816	W	75.40	75.06	75.40	75.39	-0.34	0.00	-0.01	77.21	76.93	77.22	77.19	-0.28	0.00	-0.02
W1400105_sta0213	X	74.99	74.54	75.00	74.99	-0.45	0.00	-0.01	76.92	76.32	76.87	76.92	-0.60	-0.06	0.00
5861	Y	75.64	75.62	75.63	75.61	-0.01	-0.01	-0.03	76.31	76.15	76.31	76.25	-0.16	0.00	-0.07
5826	Z	75.12	74.81	75.12	75.10	-0.31	0.00	-0.02	76.19	75.97	76.18	76.17	-0.22	-0.01	-0.03

Table 8: Future Regional Solution Peak Flow Comparisons

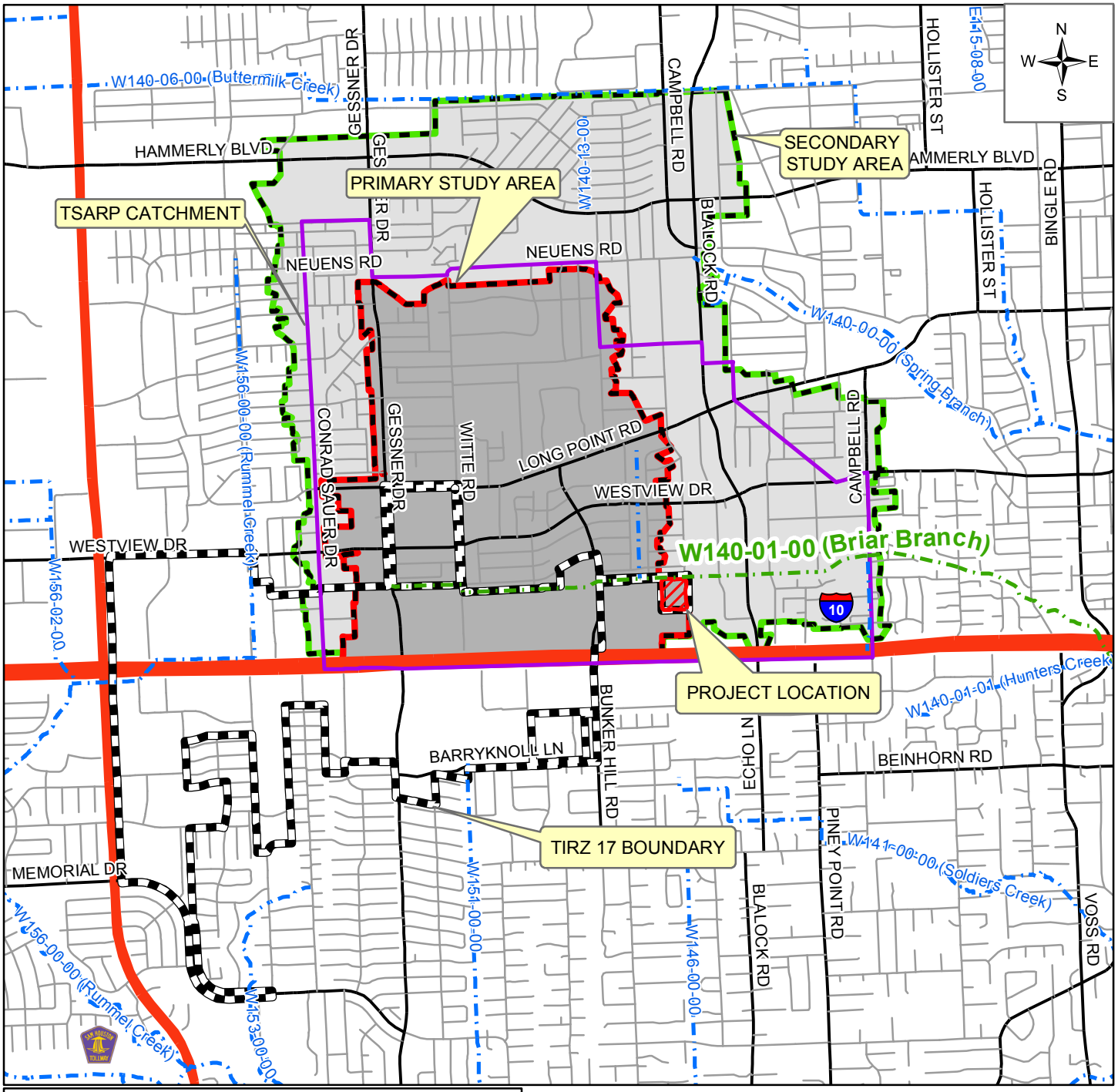
Location	10-Year					100-Year				
	Existing Conditons Flow (CFS)	Future Phase 2 (Channel Impvs) Flow (CFS)	Diff. (%)	Future Phase 3 (Storm Sew Impvs) Flow (CFS)	Diff. (%)	Existing Conditons Flow (CFS)	Future Phase 2 (Channel Impvs) Flow (CFS)	Diff. (%)	Future Phase 3 (Storm Sew Impvs) Flow (CFS)	Diff. (%)
Briar Branch @ Campbell Rd	589	557	-5.35%	577	-1.94%	1088	1038	-4.59%	1037	-4.72%
Briar Branch @ Spring Branch	1158	1124	-2.93%	1144	-1.16%	2142	2089	-2.44%	2088	-2.51%
Spring Branch @ Buffalo Bayou	3853	3814	-1.00%	3836	-0.44%	7104	7050	-0.77%	7048	-0.79%
Buffalo Bayou @ W138-00-00	7953	7951	-0.03%	7953	0.00%	15423	15414	-0.06%	15414	-0.06%
Buffalo Bayou @ W137-00-00	8152	8150	-0.03%	8152	0.00%	15903	15893	-0.06%	15893	-0.06%
Buffalo Bayou @ Woodway Dr	8431	8428	-0.04%	8431	-0.01%	16676	16666	-0.06%	16666	-0.06%
Buffalo Bayou @ W129-00-00	8840	8813	-0.31%	8830	-0.12%	17497	17485	-0.07%	17485	-0.07%
Buffalo Bayou @ Montrose Blvd.	8535	8527	-0.09%	8533	-0.03%	17393	17376	-0.10%	17375	-0.10%
Buffalo Bayou @ White Oak Bayou	38442	38427	-0.04%	38436	-0.02%	59250	59216	-0.06%	59215	-0.06%
Buffalo Bayou @ End	39606	39592	-0.04%	39600	-0.01%	61636	61603	-0.05%	61602	-0.06%

Table 9: Future Regional Solution Water Surface Elevation Comparisons

	10-Year					100-Year				
Location	Exist WSEL*	Future Phase 2 (Channel Impvs) WSEL (ft)	Diff. (ft)	Future Phase 3 (Storm Sew Impvs) WSEL (ft)	Diff. (ft)	Exist WSEL*	Future Phase 2 (Channel Impvs) WSEL (ft)	Diff. (ft)	Future Phase 3 (Storm Sew Impvs) WSEL (ft)	Diff. (ft)
Briar Branch @ Campbell Rd	69.80	69.73	-0.07	69.69	-0.11	72.25	72.17	-0.08	72.16	-0.09
Briar Branch @ Spring Branch	32.76	32.71	-0.05	32.68	-0.08	35.82	35.68	-0.14	35.67	-0.15
Spring Branch @ Buffalo Bayou	26.11	26.09	-0.02	26.09	-0.02	29.35	29.30	-0.05	29.30	-0.05
Buffalo Bayou @ W138-00-00	39.16	39.15	-0.01	39.15	-0.01	47.14	47.13	-0.01	47.13	-0.01
Buffalo Bayou @ W137-00-00	36.73	36.72	-0.01	36.72	-0.01	44.52	44.51	-0.01	44.51	-0.01
Buffalo Bayou @ Woodway Dr	35.96	35.95	-0.01	35.95	-0.01	43.68	43.67	-0.01	43.67	-0.01
Buffalo Bayou @ W129-00-00	33.03	33.03	0.00	33.02	-0.01	40.68	40.67	-0.01	40.67	-0.01
Buffalo Bayou @ Montrose Blvd.	30.59	30.59	0.00	30.59	0.00	37.66	37.65	-0.01	37.65	-0.01
Buffalo Bayou @ White Oak Bayou	22.33	22.33	0.00	22.33	0.00	30.44	30.43	-0.01	30.43	-0.01
Buffalo Bayou @ End	0.08	0.08	0.00	0.08	0.00	7.09	7.08	-0.01	7.08	-0.01

*WSEL = Water Surface Elevation

EXHIBITS



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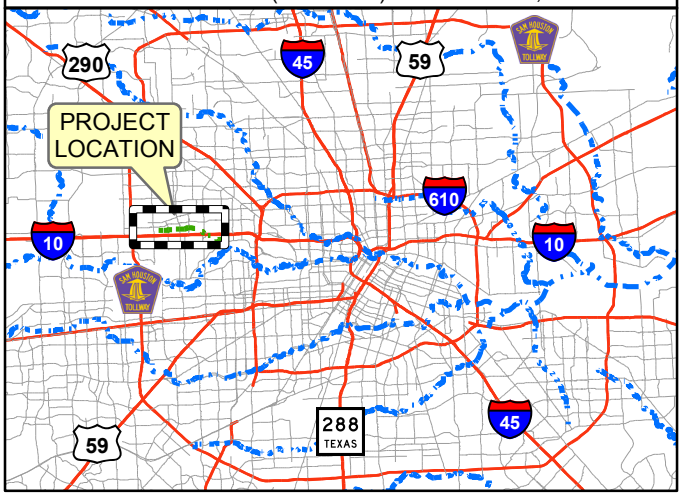


0 3,000 6,000 Feet

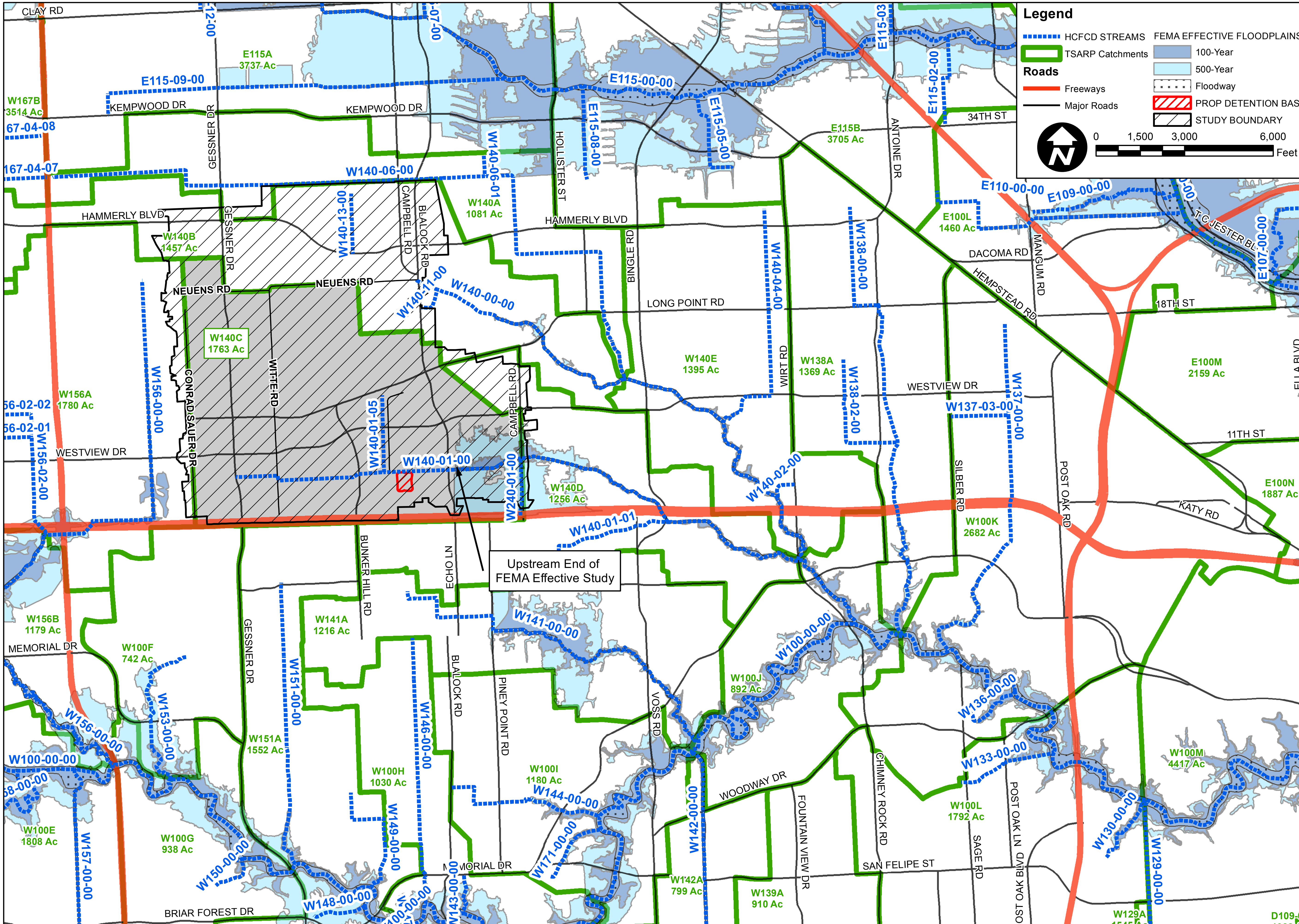
TIRZ 17
REDEVELOPMENT
AUTHORITY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

BRIAR BRANCH (W140-01-00)
IMPACT ANALYSIS

EXHIBIT 1 - PROJECT LOCATION MAP

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\01_Project_Location1.mxd 4/8/2013 10:18:53 AM DGGreaney



EFFECTIVE FLOODPLAIN AND W140C DRAINAGE AREA MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

REV	DESCRIPTION	DATE	APPR

PREPARED: CPF

CHECKED: BRW

APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
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TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
2 OF 13

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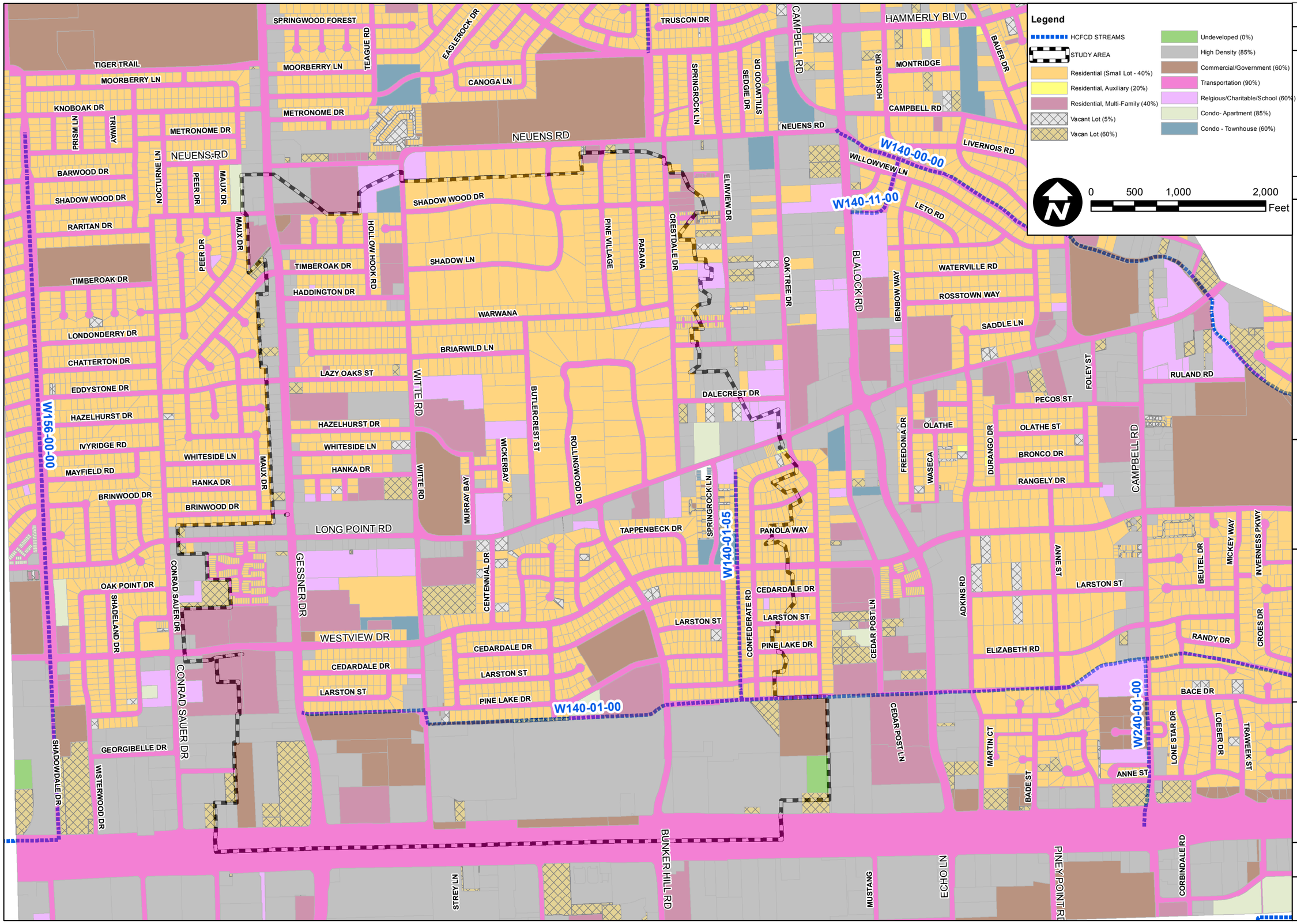

REV	DESCRIPTION	DATE	APPR

LANDUSE MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

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TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
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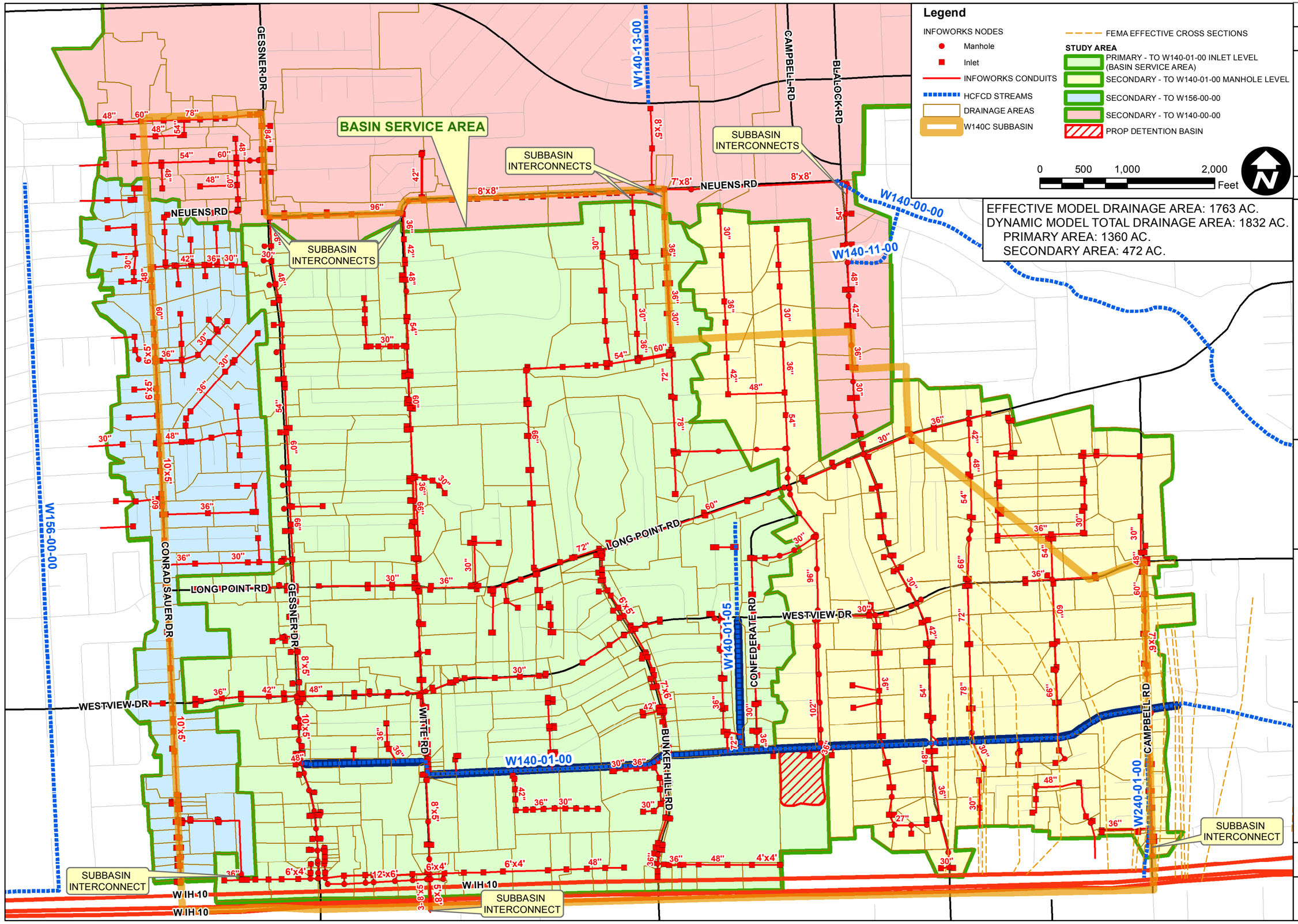

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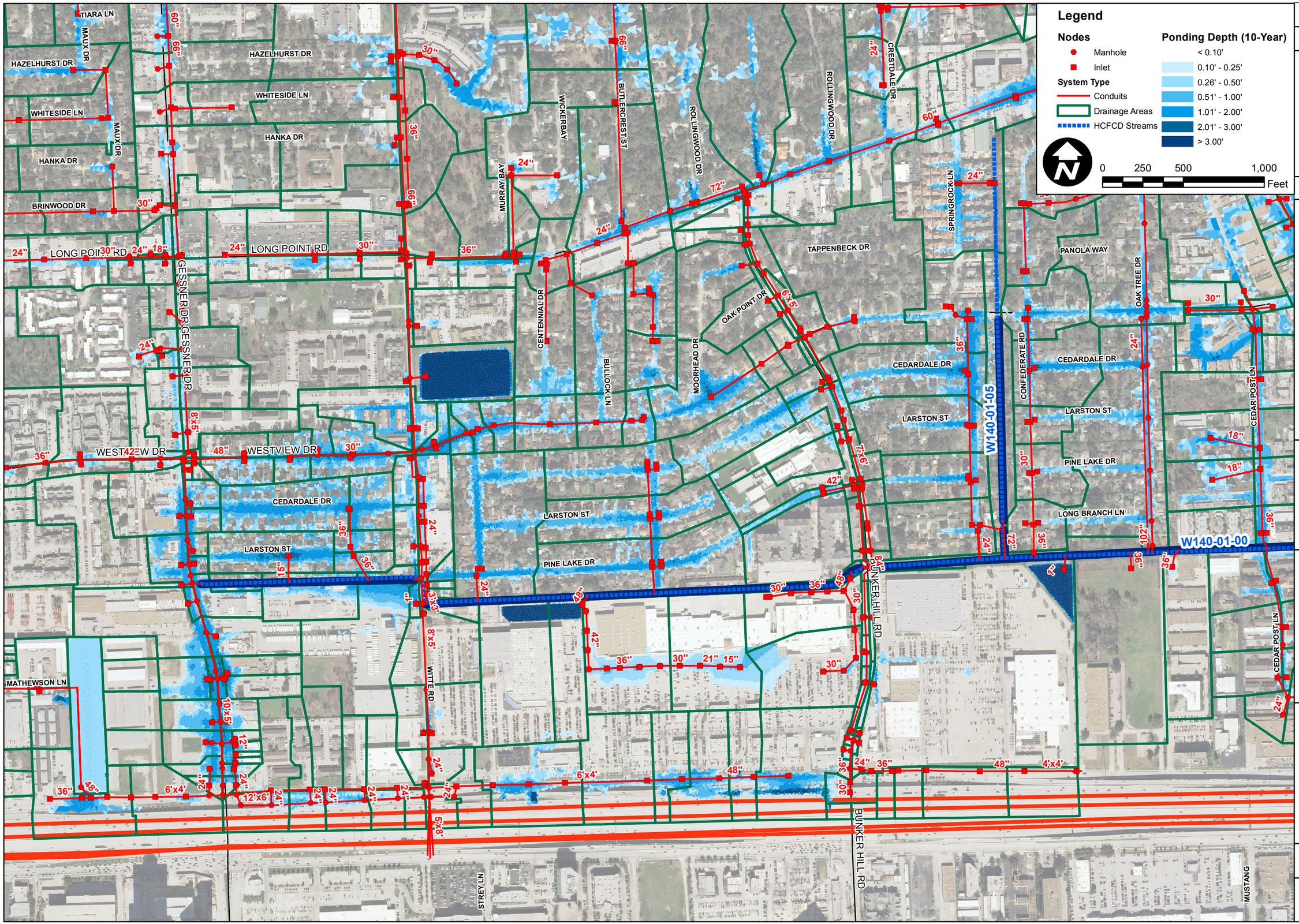

REV	DESCRIPTION	DATE	APPR

EXISTING CONDITIONS 10-YEAR INUNDATION MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

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DATE: APR 2013
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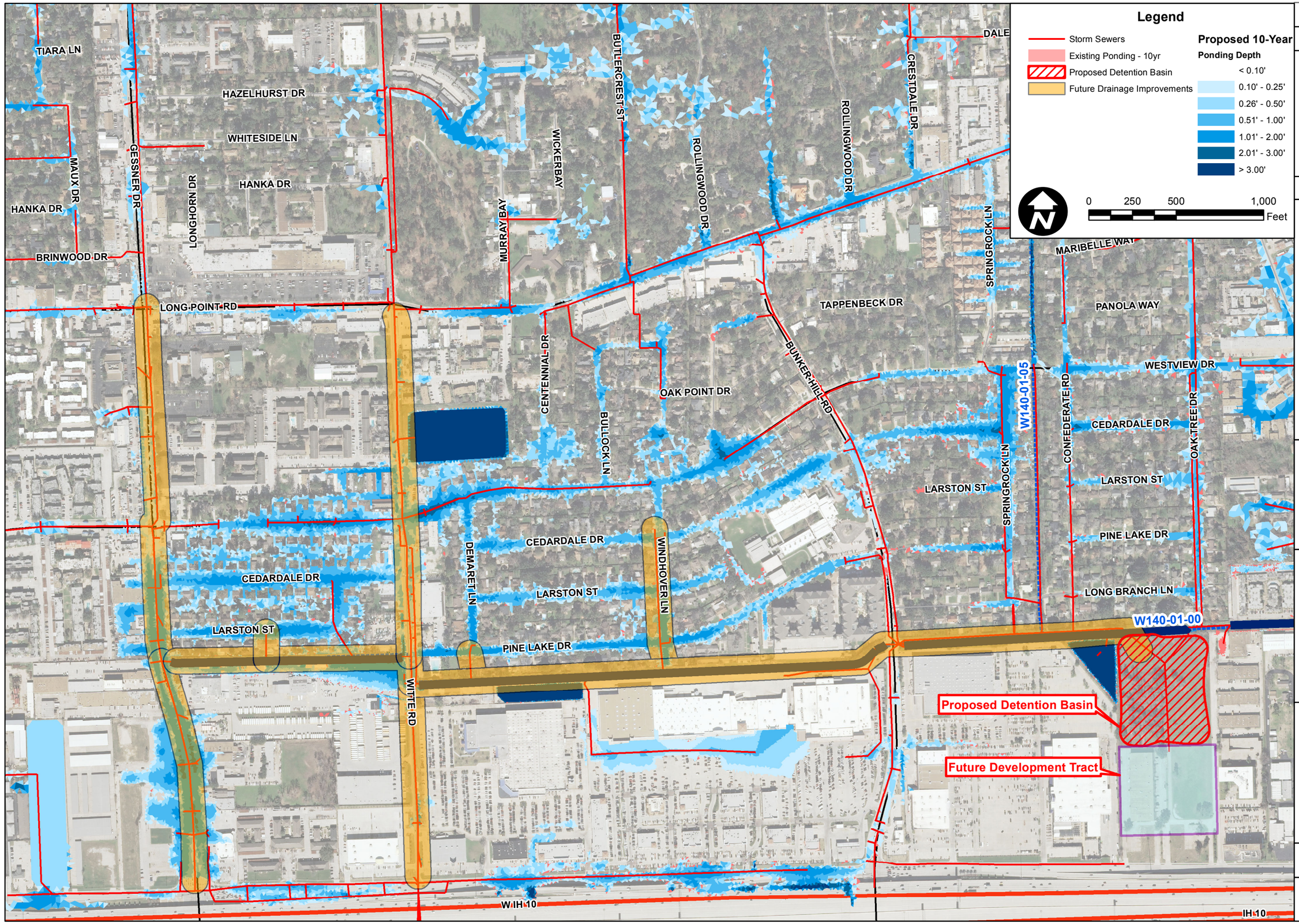
Map Document: L:\130-10384-01\14-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\05_Existing_Inundation.mxd 4/8/2013 10:26:45 AM DGGreaney



REV	DESCRIPTION	DATE	APPR

PROPOSED POND-ONLY 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

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TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
6 OF 13

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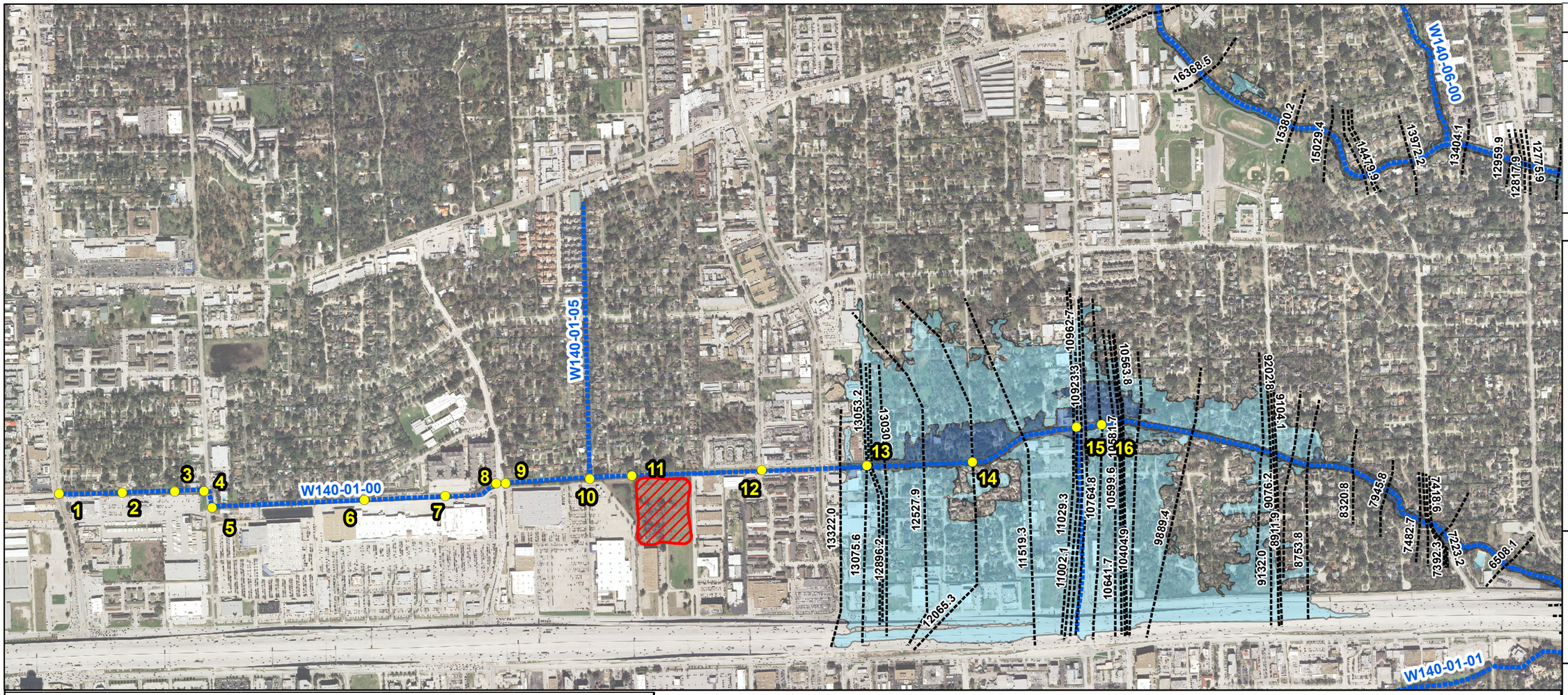

Proposed Dynamic Model Impact Analysis Results									
		10-Year Water Surface Elevations				100-Year Water Surface Elevations			
Node	Station	FEMA Effective	Existing	Prop Phase 1	Difference (ft)	FEMA Effective	Existing	Prop Phase 1	Difference (ft)
1	21026	-	80.25	80.25	0.00	-	80.87	80.81	-0.06
2	20481	-	80.09	80.06	-0.03	-	80.99	80.74	-0.25
3	19981	-	80.07	80.07	0.00	-	80.92	80.73	-0.19
4	19701	-	80.12	80.10	-0.02	-	80.97	80.78	-0.19
5	19481	-	79.42	79.38	-0.04	-	80.02	79.97	-0.05
6	18066	-	77.48	77.45	-0.04	-	78.47	78.28	-0.19
7	16821	-	75.27	74.93	-0.34	-	76.65	76.10	-0.55
8	16756	-	75.26	74.93	-0.33	-	76.64	76.10	-0.54
9	16681	-	75.25	74.92	-0.33	-	76.63	76.06	-0.57
10	15863	-	74.86	74.32	-0.54	-	76.42	75.64	-0.78
11	15381	-	74.73	74.08	-0.65	-	75.93	75.37	-0.56
12	14232	-	73.96	73.47	-0.49	-	75.03	74.55	-0.48
13	13031	72.52	73.03	72.65	-0.38	72.33	73.87	73.50	-0.37
14	12065	71.48	72.15	71.85	-0.31	71.30	72.92	72.59	-0.33
15	11029	70.13	69.62	69.44	-0.18	69.95	70.27	69.96	-0.30
16	10765	69.80	69.27	69.11	-0.17	69.63	69.83	69.57	-0.26

PROPOSED CONDITIONS INCLUDE ONLY THE PROPOSED DETENTION BASIN WITHOUT CHANNEL OR STORM SEWER IMPROVEMENTS.

Legend

- Analysis Nodes
- Proposed Detention Pond
- Effective Model Cross Sections

FEMA Effective Floodplains

- 100-Year
- 500-Year

0 500 1,000 2,000 Feet

REV	DESCRIPTION	DATE	APPR

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

PROPOSED POND-ONLY DYNAMIC MODEL IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
7 OF 13

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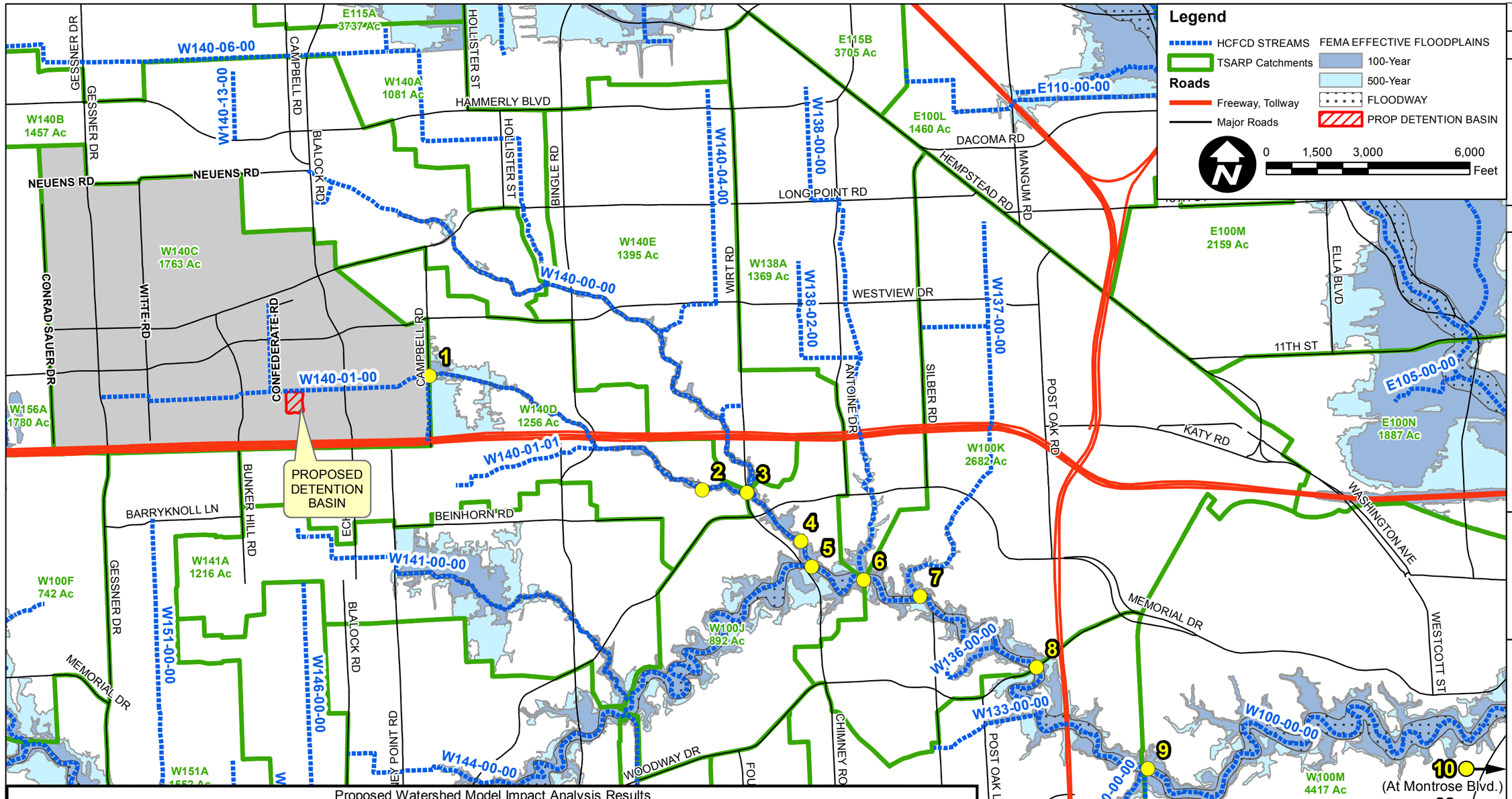

Proposed Watershed Model Impact Analysis Results

Node	Exist. Cond 10-Year Flow (CFS)	Prop. Cond 10-Year Flow (CFS)	Difference (CFS)	Exist. Cond 10-Year WSEL	Prop. Cond 10-Year WSEL	Difference (ft)	Exist. Cond 100-Year Flow (CFS)	Prop. Cond 100-Year Flow (CFS)	Difference (CFS)	Exist. Cond 100-Year WSEL	Prop. Cond 100-Year WSEL	Difference (ft)
1	589	557	-32	69.80	69.63	-0.17	1088	999	-89	72.25	72.15	-0.1
2	1158	1124	-34	32.76	32.63	-0.13	2142	2047	-95	35.82	35.56	-0.26
3	3846	3807	-39	39.62	39.55	-0.07	7125	7031	-94	44.09	43.98	-0.11
4	3853	3814	-39	26.11	26.07	-0.04	7104	7008	-96	29.35	29.26	-0.09
5	7953	7951	-2	39.16	39.15	-0.01	15423	15405	-18	47.14	47.12	-0.02
6	8155	8153	-2	38.74	38.73	-0.01	15905	15888	-17	46.75	46.73	-0.02
7	8152	8150	-2	36.73	36.72	-0.01	15903	15884	-19	44.52	44.50	-0.02
8	8431	8428	-3	35.96	35.94	-0.02	16676	16656	-20	43.68	43.66	-0.02
9	8840	8813	-27	33.03	33.02	-0.01	17497	17475	-22	40.68	40.66	-0.02
10	8535	8527	-8	30.59	30.59	0.00	17393	17361	-32	37.66	37.64	-0.02
11	38563	38549	-14	22.33	22.32	-0.01	59499	59438	-61	30.44	30.42	-0.02
12	39606	39592	-14	0.08	0.08	0.00	61636	61576	-60	7.09	7.07	-0.02

PROPOSED CONDITIONS INCLUDE ONLY THE PROPOSED DETENTION BASIN WITHOUT CHANNEL OR STORM SEWER IMPROVEMENTS.

REV | DESCRIPTION | DATE | APPR

PROPOSED POND-ONLY WATERSHED LEVEL IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF | CHECKED: BRW | APPROVED: DST

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER 8 OF 13

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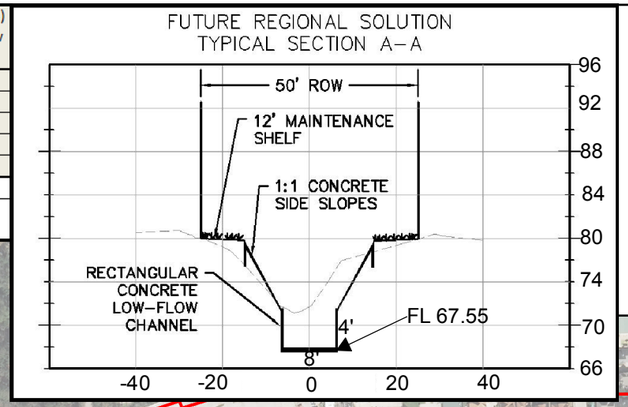
Num.	Project Name	Outfall Location (Briar Branch Station)	Exist Outfall Size	Prop Outfall Size*	Future Regional Solution Outfall Size**	Exist 10yr Peak Flow Rate (CFS)	Prop 10yr Peak Flow Rate (CFS)*	Future (Phase 3) 10yr Peak Flow Rate (CFS)**	Exist 100yr Peak Flow Rate (CFS)	Prop 100yr Peak Flow Rate (CFS)*	Future (Phase 3) 100yr Peak Flow Rate (CFS)**
1	North Gessner Road	21026	36" RCP	36" RCP	36" RCP	72.7	72.7	69.9	78.6	78.4	83.2
2	Larston Inlets	20481	15" RCP	15" RCP	36" CMP	7.7	7.6	15.9	7.8	7.8	16.6
3	Witte Road	19481	2-48" RCP	2-48" RCP	5'x4' RCB	203.8	198.7	314.2	243.1	234.4	359.6
4	Demaret Lane	19161	24" CMP	24" CMP	30" CMP	12.1	12.1	26.9	12.0	12.0	26.8
5	Windhover Lane	18066	2-24" CMP	2-24" CMP	36" CMP	30.2	30.1	42.7	30.1	29.9	41.2

* Proposed Project includes only the basin. Only the basin is intended for permitting, approval, and construction at this time.

**Future Regional Solution is preliminary. All sizes and flow rates are subject to change. Separate impact analyses will be submitted for future projects at a future date.



Legend

- Existing Storm Sewers
- Proposed Detention Basin (Phase 1)
- Future Channel Improvements (Phase 2)
- Future Storm Sewer Improvements (Phase 3)

0 250 500 1,000 Feet

PROPOSED PIPE SIZES ARE SUBJECT TO CHANGE. MODIFICATIONS TO THE OUTFALL SIZES WILL REQUIRE A SEPARATE IMPACT ANALYSIS.

W140-01-05

W140-01-00

1 2 3 4 5

Section A-A

Proposed Detention Basin

Future Development Tract

REV	DESCRIPTION	DATE	APPR

FUTURE REGIONAL SOLUTION COMPONENTS MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: MAY 2013
SCALE: AS NOTED

EXHIBIT NUMBER
9 OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\09_Future_Regional_Solution_Components1.mxd 5/13/2013 1:31:43 PM cpferich

Model	Inundated Structures
Existing Conditions 10-Year	160
Future Phase 3 (Storm Sew Impvs) 10-Year	72
Difference	-88

Legend

- Analysis Nodes
- Storm Sewers
- Existing Ponding - 10yr
- Proposed Detention Basin (Phase 1)
- Future Channel Improvements (Phase 2)
- Future Storm Sewer Improvements (Phase 3)

Future 10-Year Ponding Depth

- < 0.10'
- 0.10' - 0.25'
- 0.26' - 0.50'
- 0.51' - 1.00'
- 1.01' - 2.00'
- 2.01' - 3.00'
- > 3.00'

0 250 500 1,000 Feet

HAZELHURST DR
WHITESIDE LN
HANKA DR
GESSNER DR
MAUX DR
LONGHORN DR
BRINWOOD DR
LONG POINT RD
MURRAY BAY
WICKERBAY
BUTLERCREST ST
ROLLINGWOOD DR
CENTENNIAL DR
BULLOCK LN
OAK POINT DR
TAPPENBECK DR
BUNKER HILL RD
PANOLA WAY
CONFEDERATE RD
OAK TREE DR
CEDARDALE DR
LARSTON ST
SPRINGROCK LN
PINE LAKE DR
LONG BRANCH LN
WESTVIEW DR
DEMARET LN
WINDHOVER LN
WITTE RD
W IH 10
IH 10
W140-01-00
Proposed Detention Basin

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

NOTE: SEE TABLE 7 OF THE REPORT FOR EXISTING, PROPOSED, AND FUTURE WATER SURFACE ELEVATION RESULTS.

REV	DESCRIPTION	DATE	APPR

FUTURE REGIONAL SOLUTION 10-YEAR INUNDATION REDUCTION MAP

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

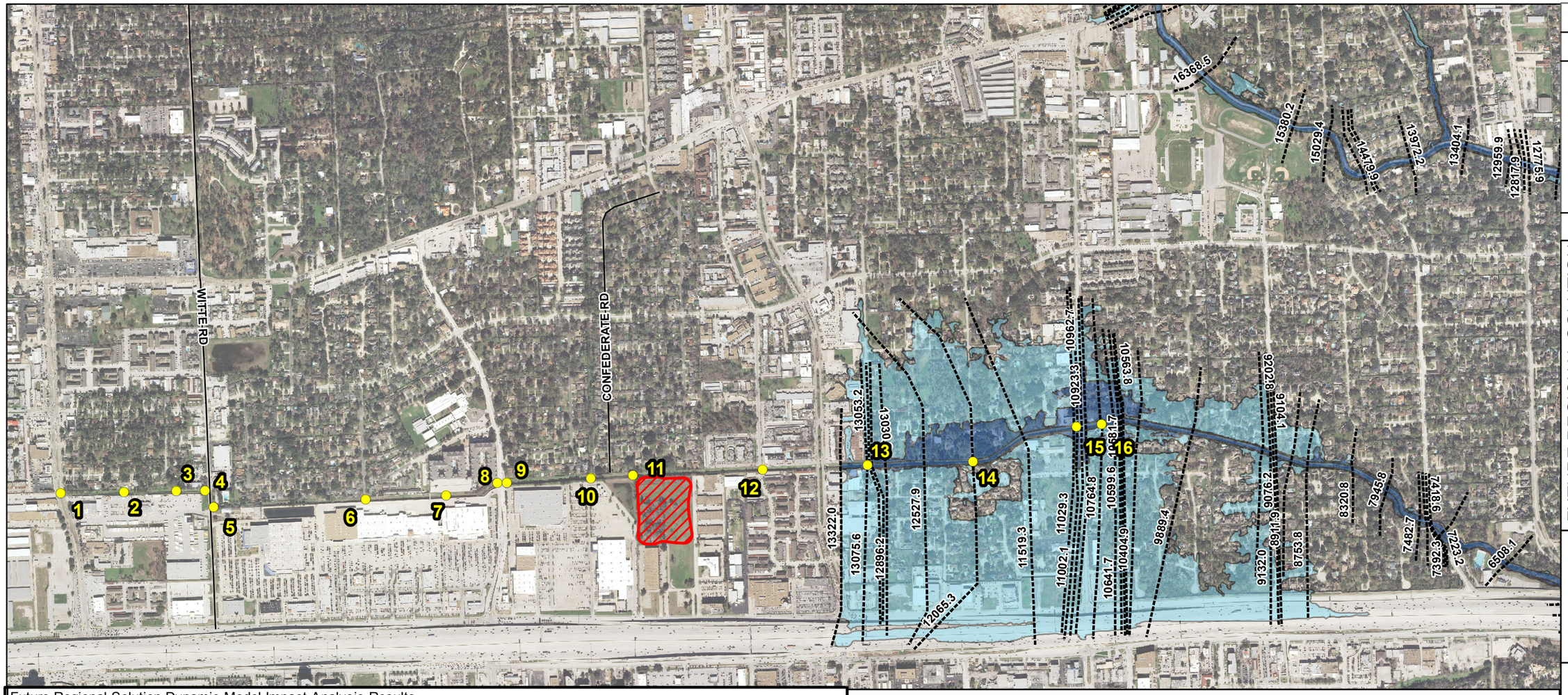
Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: MAY 2013
SCALE: AS NOTED

EXHIBIT NUMBER
10 OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\10_Future_Inundation.mxd 5/1/2013 3:41:00 PM cpfrerich



Future Regional Solution Dynamic Model Impact Analysis Results											
Node	Station	Existing	Future Phase 2	Difference (ft)	Future Phase 3	Difference (ft)	Existing	Future Phase 2	Difference (ft)	Future Phase 3	Difference (ft)
1	21026	80.25	79.95	-0.29	79.81	-0.43	80.87	80.68	-0.19	80.38	-0.49
2	20481	80.09	79.84	-0.25	79.27	-0.82	80.99	80.65	-0.34	80.29	-0.70
3	19981	80.07	79.84	-0.23	79.26	-0.81	80.92	80.64	-0.28	80.30	-0.62
4	19701	80.12	79.87	-0.25	79.29	-0.83	80.97	80.67	-0.30	80.38	-0.59
5	19481	79.42	77.94	-1.48	77.40	-2.02	80.02	78.62	-1.40	78.54	-1.48
6	18066	77.48	77.11	-0.37	77.32	-0.16	78.47	78.13	-0.34	78.45	-0.03
7	16821	75.27	75.05	-0.22	75.04	-0.23	76.65	76.25	-0.39	76.34	-0.31
8	16756	75.26	75.17	-0.09	75.16	-0.10	76.64	76.33	-0.31	76.44	-0.20
9	16681	75.25	75.01	-0.24	75.00	-0.25	76.63	76.19	-0.44	76.29	-0.33
10	15863	74.86	74.74	-0.12	74.72	-0.14	76.42	76.05	-0.37	76.11	-0.30
11	15381	74.73	74.63	-0.10	74.60	-0.12	75.93	75.93	0.00	75.98	0.04
12	14232	73.96	73.72	-0.24	73.69	-0.27	75.03	74.81	-0.22	74.87	-0.17
13	13031	73.03	72.86	-0.17	72.83	-0.20	73.87	73.69	-0.17	73.74	-0.13
14	12065	72.15	72.02	-0.13	71.99	-0.16	72.92	72.77	-0.15	72.80	-0.12
15	11029	69.62	69.54	-0.07	69.51	-0.10	70.27	70.10	-0.17	70.12	-0.15
16	10765	69.27	69.21	-0.06	69.18	-0.09	69.83	69.69	-0.14	69.71	-0.13

PROPOSED CONDITIONS INCLUDE ONLY THE PROPOSED DETENTION BASIN WITHOUT CHANNEL OR STORM SEWER IMPROVEMENTS.

FUTURE REGIONAL SOLUTION INCLUDES CHANNEL AND STORM SEWER IMPROVEMENTS THAT ARE NOT PROPOSED AT THIS TIME.

Legend

- Analysis Nodes
- Proposed Detention Pond
- Effective Model Cross Sections

FEMA Effective Floodplains

- 100-Year
- 500-Year

0 500 1,000 2,000 Feet

REV	DESCRIPTION	DATE	APPR

FUTURE REGIONAL SOLUTION DYNAMIC MODEL IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

HRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
11 OF 13

Map Document: \\hou\Production\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\11_Future_Dynamic_Model_Results.mxd
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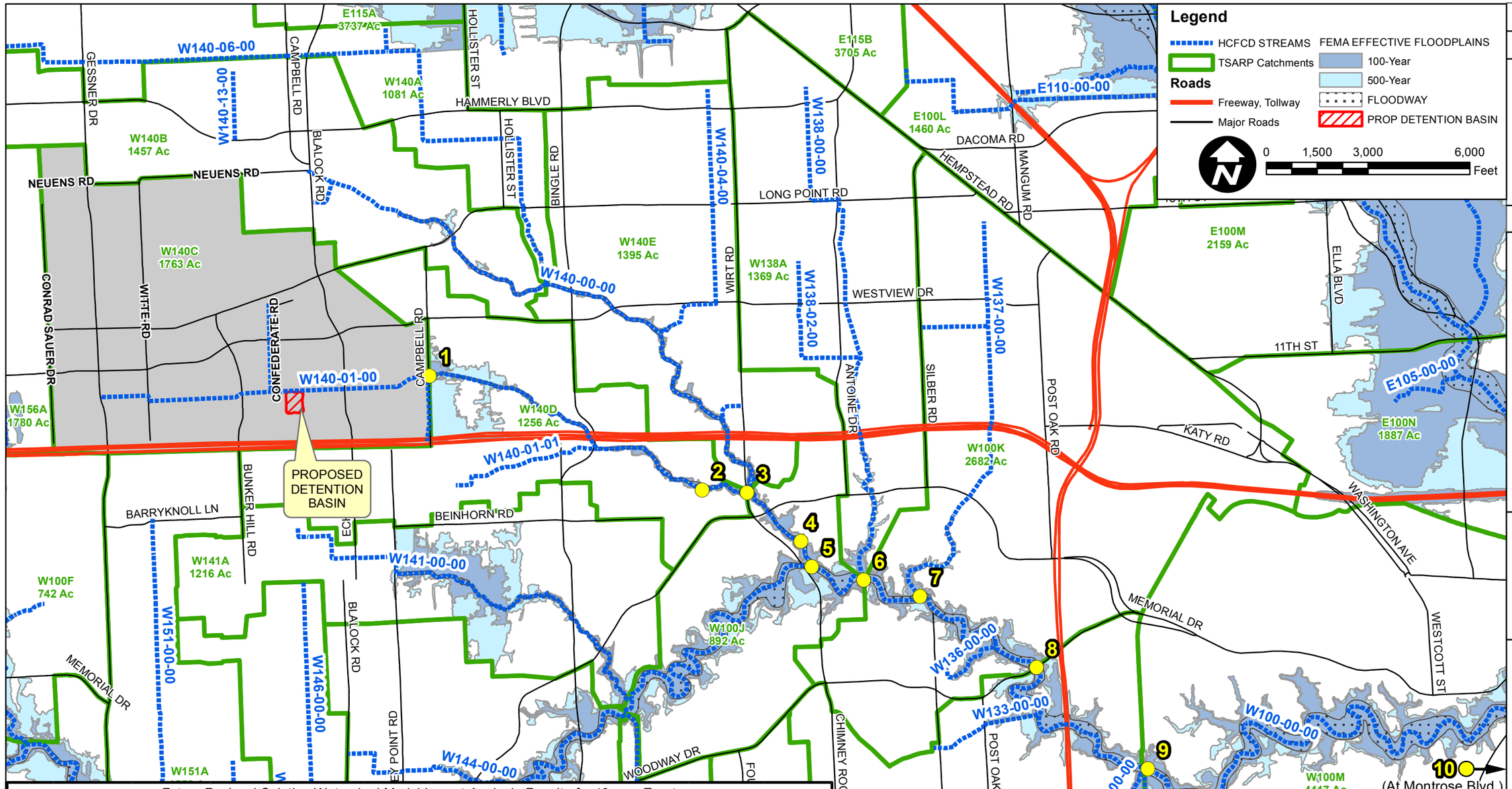


Future Regional Solution Watershed Model Impact Analysis Results for 10-year Event

Node	Exist. Cond Flow (CFS)	Future Phase 2 Flow (CFS)	Difference (CFS)	Future Phase 3 Flow (CFS)	Difference (CFS)	Exist. Cond 10-Year WSEL	Future Phase 2 WSEL (ft)	Difference (ft)	Future Phase 3 WSEL (ft)	Difference (ft)
1	589	577	-12	569	-20	69.80	69.73	-0.07	69.69	-0.11
2	1158	1144	-14	1137	-21	32.76	32.71	-0.05	32.68	-0.08
3	3846	3827	-19	3778	-68	39.62	39.59	-0.03	39.50	-0.12
4	3853	3836	-17	3776	-77	26.11	26.09	-0.02	26.02	-0.09
5	7953	7953	0	7952	-1	39.16	39.15	-0.01	39.15	-0.01
6	8155	8155	0	8154	-1	38.74	38.73	-0.01	38.73	-0.01
7	8152	8152	0	8151	-1	36.73	36.72	-0.01	36.72	-0.01
8	8431	8431	0	8429	-2	35.96	35.95	-0.01	35.95	-0.01
9	8840	8830	-10	8824	-16	33.03	33.03	0.00	33.02	-0.01
10	8535	8533	-2	8530	-5	30.59	30.59	0.00	30.59	0.00
11	38563	38557	-6	38555	-8	22.33	22.33	0.00	22.33	0.00
12	39606	39600	-6	39598	-8	0.08	0.08	0.00	0.08	0.00

PROPOSED CONDITIONS INCLUDE ONLY THE PROPOSED DETENTION BASIN WITHOUT CHANNEL OR STORM SEWER IMPROVEMENTS.

FURURE REGIONAL SOLUTION INCLUDES CHANNEL AND STORM SEWER IMPROVEMENTS THAT ARE NOT PROPOSED AT THIS TIME.

REV	DESCRIPTION	DATE	APPR

FUTURE REGIONAL SOLUTION
WATERSHED LEVEL 10-YEAR
IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00)
IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

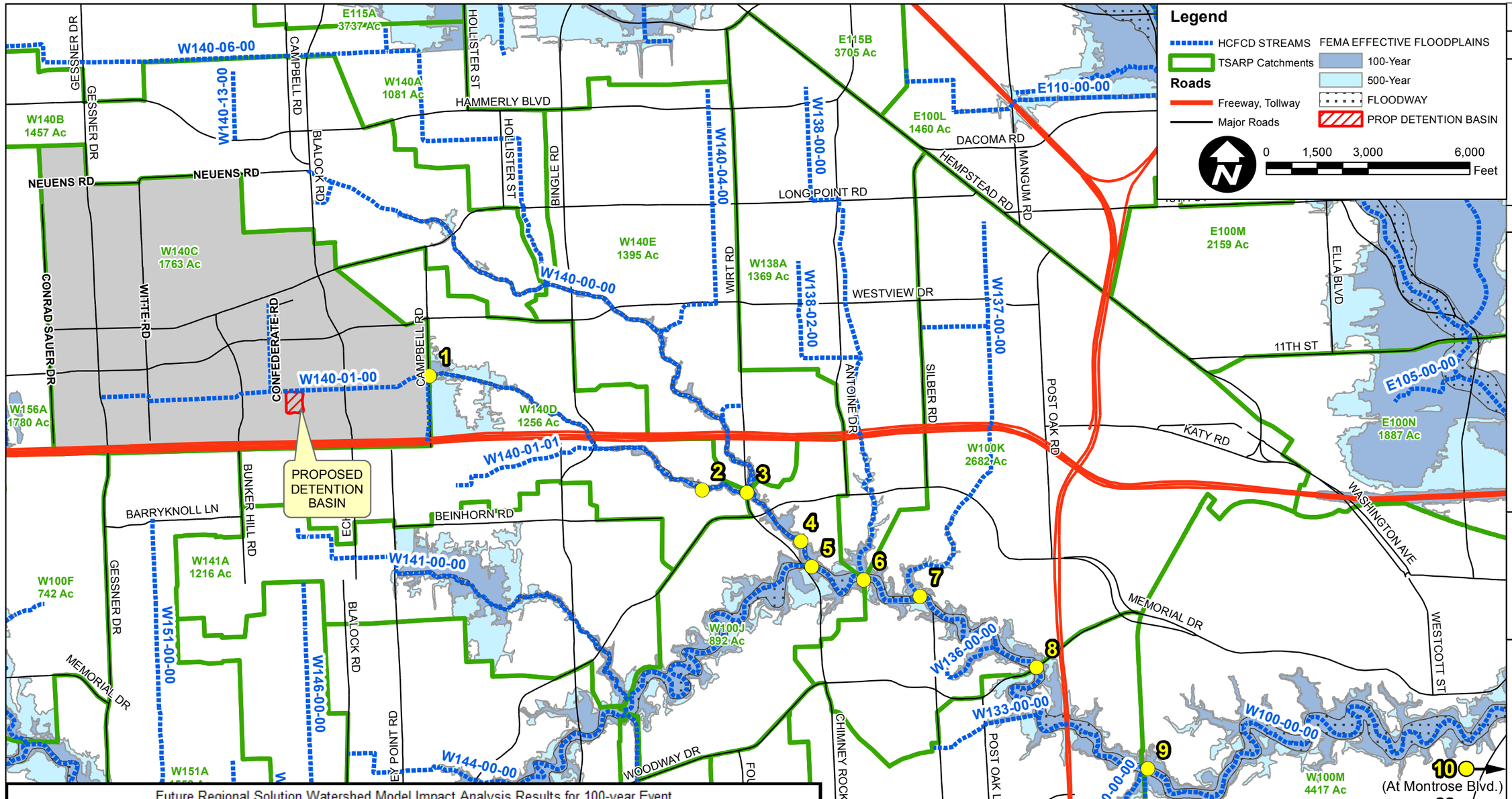
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
12A OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\12a_Future_Watershed_Model_Results.mxd 4/30/2013 2:41:21 PM



Future Regional Solution Watershed Model Impact Analysis Results for 100-year Event										
Node	Exist. Cond Flow (CFS)	Future Phase 2 Flow (CFS)	Difference (CFS)	Future Phase 3 Flow (CFS)	Difference (CFS)	Exist. Cond 100-Year WSEL	Future Phase 2 WSEL (ft)	Difference (ft)	Future Phase 3 WSEL (ft)	Difference (ft)
1	1088	1038	-50	1037	-51	72.25	72.17	-0.08	72.16	-0.09
2	2142	2089	-53	2088	-54	35.82	35.68	-0.14	35.67	-0.15
3	7125	7071	-54	7070	-55	44.09	44.02	-0.07	44.02	-0.07
4	7104	7050	-54	7048	-56	29.35	29.30	-0.05	29.30	-0.05
5	15423	15414	-9	15414	-9	47.14	47.13	-0.01	47.13	-0.01
6	15905	15896	-9	15896	-9	46.75	46.74	-0.01	46.74	-0.01
7	15903	15893	-10	15893	-10	44.52	44.51	-0.01	44.51	-0.01
8	16676	16666	-10	16666	-10	43.68	43.67	-0.01	43.67	-0.01
9	17497	17485	-12	17485	-12	40.68	40.67	-0.01	40.67	-0.01
10	17393	17376	-17	17375	-18	37.66	37.65	-0.01	37.65	-0.01
11	59499	59465	-34	59464	-35	30.44	30.43	-0.01	30.43	-0.01
12	61636	61603	-33	61602	-34	7.09	7.08	-0.01	7.08	-0.01

PROPOSED CONDITIONS INCLUDE ONLY THE PROPOSED DETENTION BASIN WITHOUT CHANNEL OR STORM SEWER IMPROVEMENTS.

FURURE REGIONAL SOLUTION INCLUDES CHANNEL AND STORM SEWER IMPROVEMENTS THAT ARE NOT PROPOSED AT THIS TIME.

APPR | DATE | DESCRIPTION | REV

FUTURE REGIONAL SOLUTION WATERSHED LEVEL 100-YEAR IMPACT ANALYSIS RESULTS

BRIAR BRANCH (W140-01-00) IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

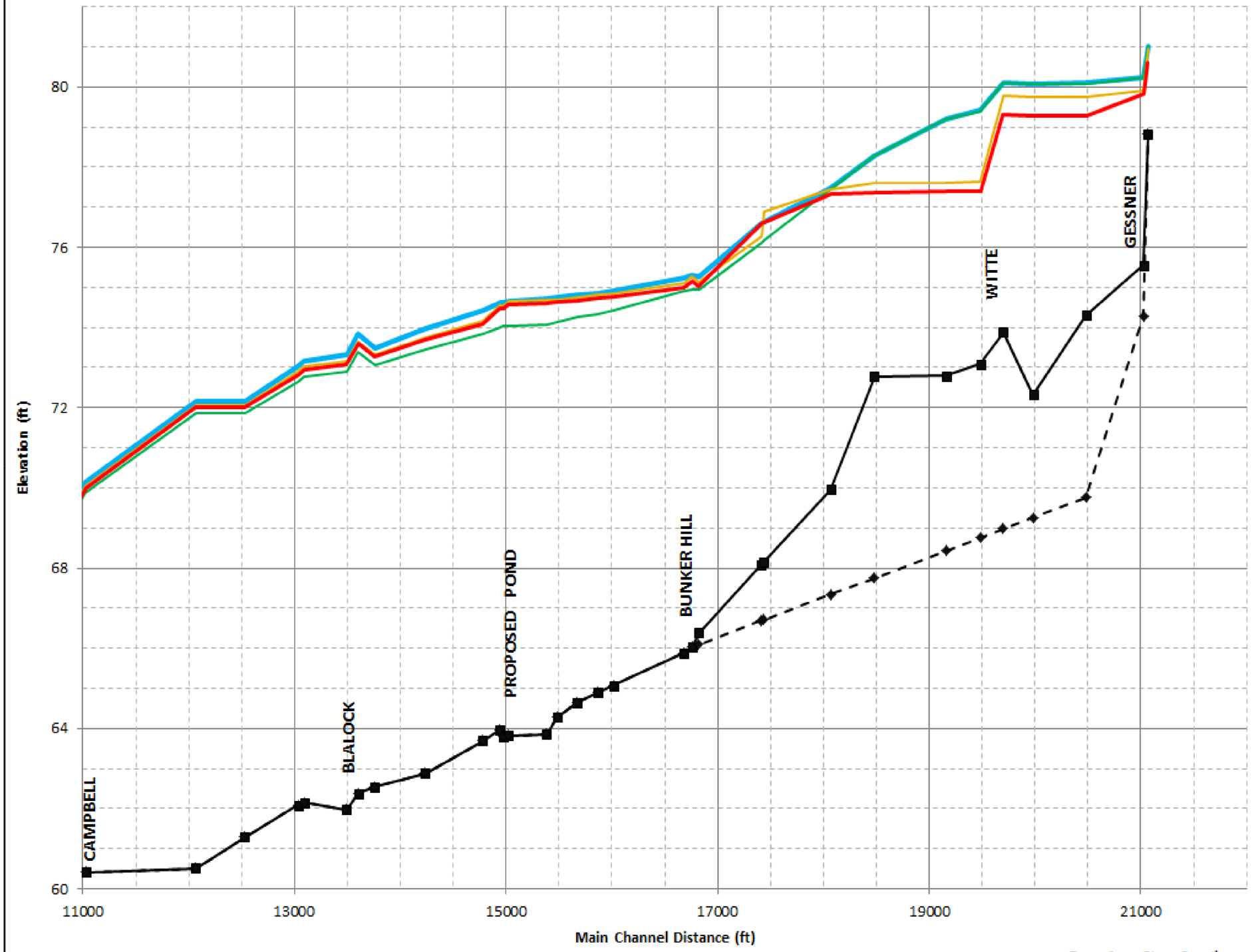
TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: APR 2013
SCALE: AS NOTED

EXHIBIT NUMBER
12B OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\12b_Future_Watershed_Model_Results_100yr.mxd 4/30/2013 2:46:59 PM cpferich

W140-01-00 - Results for 10-Year (10%AC) Event



NOTE: ONLY PHASE 1 IS PROPOSED AT THIS TIME.

Coordinate System and Datum:
Texas State Plane Coordinate System, South Central Zone, NAD 83.
Elevations shown are not for floodplain mapping.

REV	DESCRIPTION	DATE	APPR

BRIAR BRANCH (W140-01-00)
10-YEAR RESULTS PROFILE

BRIAR BRANCH (W140-01-00)
IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

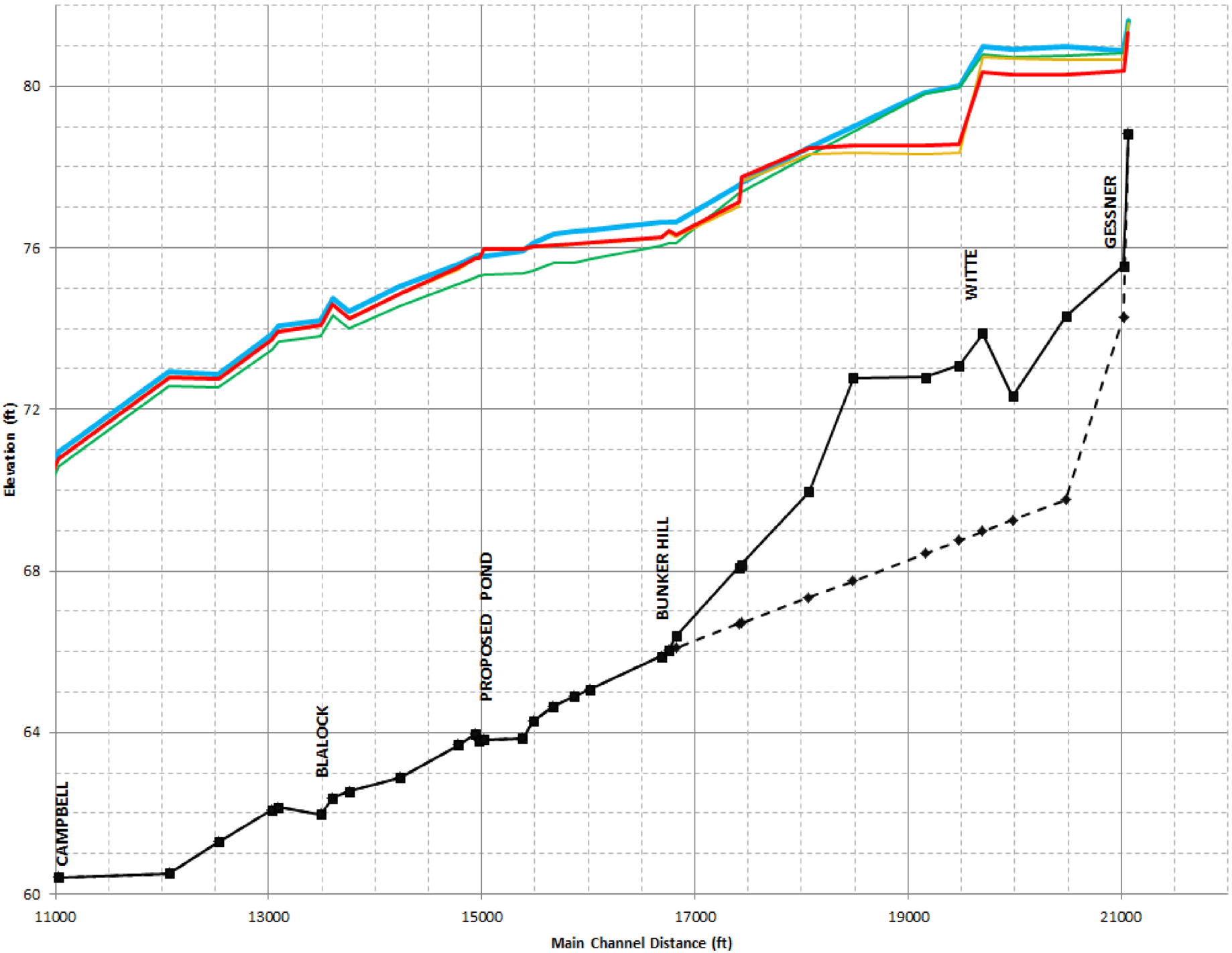
TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: MAY 2013
SCALE: AS NOTED

EXHIBIT NUMBER
13A OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\13a_10yr_Profile.mxd 5/13/2013 1:35:23 PM cpfrerich

W140-01-00 - Results for 100-Year (1%AC) Event



NOTE: ONLY PHASE 1 IS PROPOSED AT THIS TIME.

Coordinate System and Datum:
Texas State Plane Coordinate System, South Central Zone, NAD 83.
Elevations shown are not for floodplain mapping.

REV	DESCRIPTION	DATE	APPR

BRIAR BRANCH (W140-01-00)
100-YEAR RESULTS PROFILE

BRIAR BRANCH (W140-01-00)
IMPACT ANALYSIS

PREPARED: CPF
CHECKED: BRW
APPROVED: DST

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

TIRZ 17 REDEVELOPMENT AUTHORITY

DATE: MAY 2013
SCALE: AS NOTED

EXHIBIT NUMBER
13B OF 13

Map Document: L:\130-10384-011\4-0-Production\4-08-GIS\MXD\Impact Analysis\Impact Analysis Resubmittal - Apr 2013\13b_100yr_Profile.mxd 5/13/2013 1:37:47 PM cpfrerich

APPENDICES

APPENDIX A
SUMMARY OF HYDROLOGY AND HYDRAULICS METHODOLOGY

A. Rainfall
   1. Effective model: TSARP Whitepaper 10-yr & 100-yr rainfall values.
   2. Dynamic model: TSARP Whitepaper 10-yr & 100-yr rainfall values.

B. Losses
   1. Effective model: G&A, Calibrated parameters
      a) Results for W140C:
         1. 100-yr Q = 1088 CFS
         2. Total Runoff = 13.2”-3.61”=9.59”
   2. Dynamic model: G&A, Values from TSARP whitepaper
      a) Results for W140C:
         1. 100-yr Q = 1984 CFS
         2. Total Runoff = 13.2”-1.11”=12.09”

C. Land Use:
   1. Effective model: 58.8% impervious
   2. Dynamic model: 61.3% impervious
      a) Uses subdivided areas with values derived from aerial imagery and land use data from HCAD.

D. Contributing Drainage Area:
   1. Effective model: 1763 acres
   2. Dynamic model
      a) Total: 1832 acres
      b) Primary: 1360 acres
      c) Secondary: 472 acres

E. Hydrograph Translation:
   1. Effective model: Clark unit hydrograph
   2. Dynamic model: SWMM Routing – consistent with 2004 and 2009 HCFCD W151 report

F. Tail Water for Dynamic Model:
   1. Used normal depth at end of dynamic model (Edge of W140C subcatchment)

APPENDIX
B-1

PREPARED BY:
REVIEWED BY:
APPROVED BY:

DYNAMIC MODEL
DEVELOPMENT REPORT
APPENDICES - INFORMATION
BRIDGE MODELLING APPROACH FOR
IMPACT ANALYSIS

Legend
- STUDY AREA BOUNDARIES
- MAJOR DETENTION BASIN
- OTHER WATER STORAGE
- TRIBUTARY Boundary
- STUDY AREA BOUNDARIES
- MAJOR LAKES AND RESERVOIRS
- RIVERS (BY TYPE)
  - MAJOR
  - MINOR
  - INTERMITTENT
  - CANAL
- ROADS
  - FREEWAY
  - MAJOR
  - LOCAL
  - UNDER PRODUCTION
- RAILROAD
- CONTROL VERTICES

Drainage Area	Size (Ac)	Impervious (%)	Slope (%)	Width (ft)	Peak 10-yr Runoff (CFS)	Peak 100-yr Runoff (CFS)
-1018	36.943	83.73	3.2	715.7	154.2	280.9
10008	0.241	89.89	3	58	1.1	2.0
10009	6.84	41.19	3.2	425.2	31.5	55.6
10010	2.884	61.92	3.2	130	13.3	23.5
10011	0.897	60.62	3.4	133	4.3	7.4
10033	2.762	81.54	2.7	195.7	13.0	22.8
10034	0.41	86.16	3.9	75.4	2.0	3.4
10035	1.181	85.52	1.8	128	5.6	9.8
10036	0.692	85.44	3.8	98	3.3	5.8
10044	0.97	58.98	3.4	118	4.6	8.0
10048	0.087	90	3.4	176.5	0.4	0.7
10049	0.504	73.65	3.4	70	2.4	4.2
10051	0.66	59.06	3.2	168	3.1	5.5
10052	0.58	77.28	3.2	70	2.8	4.8
10053	0.539	63.17	3.2	160	2.6	4.4
10054	1.023	63.59	3.2	289	4.9	8.4
10055	0.177	72.76	3.2	85	0.8	1.5
10056	0.644	55.95	3.2	85	3.1	5.3
10057	0.208	55.42	3.2	52	1.0	1.7
10058	0.114	57.01	3.2	85	0.5	0.9
10059	0.284	89.26	3	60	1.4	2.3
10115	46.246	45.48	5.6	800.8	196.0	355.5
10121	4.894	50.71	8.6	260.5	23.0	40.2
10245	7.156	85.04	3.3	315.1	32.9	58.3
10247	7.766	83.6	4	400	36.3	63.9
10258	1.919	80.04	1.9	219.1	9.1	15.9
10260	0.188	89.82	3	60	0.9	1.6
10261	0.118	89.52	3	56	0.6	1.0
10262	0.769	90	12	103.3	3.7	6.4
10263	0.133	90	1.4	42.9	0.6	1.1
10264	3.083	89.46	10.4	206.8	14.6	25.4
10265	3.813	89.87	10.9	229.9	18.0	31.4
10266	1.273	89.98	12	132.9	6.1	10.5
10289	0.089	90	1.4	35.1	0.4	0.7
10290	0.078	89.05	3	55	0.4	0.6
20107	8.681	84.87	12	769.6	41.6	72.3
20113	8.402	84.99	12	769.6	40.3	69.9
20117	11.255	51.75	0.2	514.5	43.1	80.4
20121	4.84	84.87	12	769.6	23.1	40.0
20128	6.699	85	12	769.6	31.9	55.4
20132	5.998	52.66	0.8	329	26.6	47.7
20137	6.817	53.63	0.3	258.1	25.9	48.4
20141	10.46	79.61	0.2	384.6	38.6	72.5
30016	16.245	51.52	1	540	67.6	123.3
30021	10.346	53.81	1	550	45.8	82.1
30023	7.33	60.64	1	300	31.7	57.3
30029	129.378	64.77	1	1265	411.8	794.1
30032	1.072	85.67	3.3	120	5.1	8.8
30033	0.933	69.53	8.6	75	4.4	7.7
30034	0.779	86.59	8.6	175	3.7	6.4
30035	0.698	87.91	8.6	70	3.3	5.8
30036	0.435	89.35	3.4	25	2.0	3.5

30037	2.67	52.05	3.3	290	12.6	22.0
3143189	4.903	61.15	4.1	260.7	23.1	40.5
3143195	2.676	51.29	5.5	192.6	12.7	22.2
3143196	1.856	86.59	4.5	160.4	8.8	15.4
3143206	2.722	85.65	1.8	194.3	12.7	22.3
3143209	2.607	85.71	2	190.1	12.2	21.4
3143214	3.67	77.92	2.5	257.5	17.3	30.3
3143216	3.02	76.17	1.9	204.6	14.1	24.9
3143228	9.848	67.43	0.2	602.8	40.6	74.4
3144582	18.055	53.27	3.5	500.3	79.7	142.9
3144583	1.039	66.42	8.3	120	5.0	8.6
3144584	5.205	53.73	6.3	268.6	24.6	43.0
3144586	3.887	49.64	5.3	232.2	18.2	31.9
3144598	5.986	55.76	5.7	288.1	28.2	49.4
3144600	7.527	60.53	5	323.1	35.0	61.5
3144603	14.526	49.65	8.6	482.2	67.1	118.3
3144610	3.856	63.55	9.4	231.2	18.4	32.0
3144613	12.702	68.07	8.8	419.7	59.2	104.0
3144627	1.369	68.35	3.7	137.8	6.5	11.3
3144628	5.076	64.27	3	265.3	23.7	41.8
3144631	2.382	50.52	3.2	181.7	11.2	19.6
3144642	3.46	53.87	4.2	219	16.2	28.4
3144643	5.212	50.34	3.6	268.8	24.1	42.5
3144647	2.407	48.42	6.7	182.7	11.4	19.8
3144648	5.732	40.48	3.3	281.9	26.3	46.6
3144912	3.462	77.68	3.2	219.1	16.3	28.6
3144913	3.285	85.42	4.9	213.4	15.6	27.2
3144914	1.754	86.18	3.6	155.9	8.3	14.6
3144915	1.287	85.51	4.4	133.6	6.1	10.7
3144916	0.716	86.06	3.6	99.6	3.4	6.0
3144917	1.613	86.11	4.4	149.6	7.7	13.4
3144931	1.682	64.55	5.9	152.7	8.0	14.0
3144932	2.385	67.2	4.2	182	11.4	19.8
3144962	19.501	42.81	11	520	88.9	157.4
3146012	1.736	73.48	2.5	219.2	8.3	14.4
3146014	1.573	80.06	2.4	227.1	7.5	13.1
3146601	2.18	57.46	0.4	273.4	10.1	17.8
3146604	1.132	60.67	0.5	138.7	5.3	9.3
3146605	1.077	55.28	0.6	131.7	5.0	8.9
3146608	0.432	84.28	3.1	116.2	2.1	3.6
3146737	0.184	71.83	3.2	57.2	0.9	1.5
3146738	0.216	65.43	2.6	60.2	1.0	1.8
3146767	5.593	49.86	0.1	300	22.1	40.9
3146769	4.58	51.96	0.4	256	19.5	35.5
3175098	1.193	87.21	4.7	128.6	5.7	9.8
3175100	0.847	87.63	2.9	108.4	4.0	7.0
3175104	2.689	86.79	4.2	193.1	12.6	22.1
3175109	0.958	83.05	5.3	115.3	4.6	7.9
3175112	3.449	86.45	7.6	218.7	16.4	28.6
3175113	3.792	85.97	2.7	229.3	17.7	31.1
3175115	3.909	67.75	2.6	232.8	18.3	32.2
3175121	2.822	58.07	2.9	197.8	13.3	23.3
3176094	51.98	59.8	1	1600	215.8	394.3
3176100	6.846	36.26	1	590	30.8	54.8

3176102	5.3	63.74	7.1	271.1	25.0	43.6
3176104	12.237	54.28	7.2	411.9	56.5	99.7
3176110	10.38	50.37	5.9	379.4	47.7	84.3
3176112	12.409	58.44	5.4	414.8	57.0	100.7
3176247	14.621	51.23	2.5	450.3	64.0	115.1
3176275	4.237	48.83	8.8	242.4	20.0	34.9
3177638	7.902	54.51	5.9	331	37.0	65.0
3177642	5.184	63.47	4.6	268.1	24.4	42.8
3177646	3.153	58.67	5.1	209.1	15.0	26.1
3177653	6.757	68.98	6	306.1	31.9	55.9
3177664	8.32	70.46	3.4	339.6	38.5	68.0
3177675	5.031	53.23	7	264.1	23.8	41.6
3177677	2.754	87.37	3.4	195.4	13.0	22.8
3177683	6.736	55.05	2.8	305.6	31.0	54.9
3178751	6.568	52.37	6.7	301.8	30.7	53.8
3178753	5.584	49.45	6.9	278.3	26.1	45.8
3178754	8.623	45.25	5.6	345.8	39.6	70.0
3178755	4.012	52.68	4.9	235.9	18.8	32.9
3178758	2.975	63.77	3.1	203.1	14.0	24.4
3178763	3.543	51.79	6.9	221.6	16.7	29.2
3178767	12.285	47.93	9.3	412.7	56.8	100.1
3178775	8.38	47.12	9.9	340.9	39.1	68.6
3178778	5.838	52.35	8.4	284.5	27.4	48.0
3178779	8.882	50.84	5.7	350.9	41.3	72.8
3178783	15.61	47.66	3.3	465.2	68.8	123.3
3178785	5.631	48.59	7.2	279.4	26.3	46.2
3178787	4.875	52.3	6.5	260	23.0	40.3
3178791	11.373	47.7	6.2	397.1	52.1	92.1
3178794	9.642	71.19	5.3	365.6	45.0	79.3
3218806	2.559	55.58	12	188.4	12.2	21.1
3218819	5.273	66.38	3.5	270.4	24.5	43.1
3218829	17.242	52.82	7.1	487.1	78.7	139.4
3218832	10.962	54.96	5.5	389.9	50.4	89.1
3218873	0.296	50.29	3.4	75	1.4	2.4
3219152	2.11	85	2	171	9.8	17.3
3219153	9.122	84.44	1.8	355.6	40.2	72.0
3221259	0.271	71.75	3.4	70	1.3	2.2
3234001	249.358	54.29	1	3000	834.1	1594.2
3234049	6.922	51.91	10.4	309.8	32.5	56.9
3234051	5.126	55.27	7	266.6	24.1	42.1
3234054	3.436	51.84	5.3	218.3	16.2	28.2
3234059	4.681	52.16	10.5	254.8	22.1	38.6
3234315	4.114	78.43	12	238.8	19.5	34.0
3236559	2.862	52.22	9.1	199.2	13.6	23.6
3236585	9.72	50.01	11.1	367.1	45.4	79.7
3236593	2.47	56.83	9.1	185.1	11.7	20.4
3236615	14.995	47.88	6.2	456	68.0	120.8
3236632	8.429	82.5	3.8	341.9	38.6	68.3
35021	2.463	63.79	3.4	135	11.5	20.2
35029	0.145	60.62	3.4	176.5	0.7	1.2
4161810	1.13	86.06	3.3	114.2	5.4	9.4
4161812	0.251	68.82	4.5	59	1.2	2.1
4165583	0.148	88.96	3	55	0.7	1.2
4165604	0.324	89.88	3	52	1.5	2.7

4165605	0.307	90	2.2	65.2	1.5	2.5
4165607	0.258	90	1.7	59.8	1.2	2.1
4165610	0.045	90	1.4	25	0.2	0.4
4165616	1.272	90	1.7	132.8	6.0	10.4
4165616-2	0.352	90	1.1	98.9	1.7	2.9
4165616-3	0.364	90	12	100.6	1.7	3.0
5009	1.127	80.39	5.8	276.4	5.4	9.4
5013	8.281	66.19	5	338.9	38.8	68.2
5023	0.405	85.3	3.4	60	1.9	3.3
5027	0.541	73.91	3.4	25	2.5	4.4
5029	1.106	63.79	3.4	434.7	5.3	9.1
5030	1.887	60	3.4	176	8.9	15.6
5057	0.756	90	3.2	50	3.5	6.2
5058	4.816	57.47	3.4	265	22.4	39.4
5225	4.345	52.96	3.1	245.5	20.1	35.5
5665	6.029	87	3.3	289.2	27.9	49.3
5671	4.576	81.27	2.3	251.9	21.2	37.4
5708686	6.47	48.87	2.8	299.5	29.5	52.2
5708689	6.847	48.68	3	308.1	31.2	55.3
5763	6.802	83.41	2.9	460	32.0	56.1
5765	2.9	82.01	2.9	224	13.7	24.0
5770	4.521	83.43	5.5	240	21.3	37.4
5771	2.911	82.87	4	188	13.8	24.1
5784	4.694	60.17	5.3	255.1	11.6	12.2
5788-1	0.488	83.35	0.4	100	2.3	4.0
5805	6.139	58.66	2	291.8	27.9	49.5
5817	5.199	50.61	3.9	290	24.2	42.5
5825	3.204	52.42	2.8	210.8	14.9	26.2
5826	2.488	57.28	3.9	185.7	11.7	20.5
5839	0.812	87.23	0.6	86.5	3.7	6.6
5854	1.795	57.68	2.9	157.8	8.5	14.8
5860	5.483	50.96	4.4	275.7	25.5	44.8
5861	4.212	56.09	4.6	241.7	19.7	34.6
5874	4.29	50.71	9.2	243.9	20.2	35.3
5876	8.121	51.01	5.3	335.6	37.5	66.1
5879	4.732	50.12	3.3	350	22.2	38.8
5906134	1.937	72.14	2.2	163.9	9.2	16.0
5906136	1.767	54.2	3.2	156.5	8.4	14.6
5906138	4.434	52.44	2.3	248	20.5	36.3
5906139	5.035	51.25	1.6	264.2	22.9	40.7
5906141	1.772	54.94	2	156.7	8.4	14.7
5906143	4.238	49.5	2	242.4	19.5	34.5
5906183	3.075	51.16	2.5	206.5	14.4	25.3
5906232	5.562	51.32	1.8	277.7	25.3	45.0
5906234	5.765	51.92	1.7	282.7	26.2	46.6
5906250	4.665	51.78	2.6	254.3	21.6	38.2
5906258	3.687	53.25	2.8	226.1	17.3	30.3
5906313	3.534	52.95	2	221.4	16.4	28.9
5906318	5.001	53.65	2	263.3	23.0	40.7
5906321	3.647	52.09	2	224.9	16.9	29.8
5906330	3.265	52.47	4.6	212.8	15.4	27.0
5906331	3.474	56.39	3.3	219.5	16.4	28.7
5906359	3.451	54.21	3.5	218.7	16.3	28.5
5906361	3.825	53.21	3	230.3	17.9	31.5

5906410	4.924	53.72	2.9	261.3	22.9	40.4
5906481	3.304	58.96	2.3	214	15.5	27.2
6013	1.645	61.71	1.4	151	7.7	13.5
6016	72.411	54.88	1	1000	251.8	478.1
6029677	0.645	63.98	0.5	117.5	3.1	5.3
6029685	1.109	53.08	3.6	124	5.3	9.2
6029695	1.242	52.21	4.7	131.2	5.9	10.3
6029697	2.976	55.22	2.1	203.1	13.9	24.5
6029708	2.259	55.53	2.2	177	10.6	18.7
6029724	6.374	53.21	3.8	297.3	29.4	51.9
6029730	1.356	51.43	3.4	137.1	6.4	11.2
6029738	1.37	57.59	2.2	137.8	6.5	11.3
6029751	1.025	52.76	3.4	176.5	4.9	8.5
6029762	1.655	53.5	3.4	165	7.8	13.6
6029772	14.369	49.86	3.4	481.2	64.3	114.8
6029809	4.971	60.42	3.9	262.5	23.2	40.7
6052590	4.585	45.35	2.5	252.1	21.1	37.4
6052591	1.022	62.83	8.5	140.7	4.9	8.5
6052608	5.858	47.21	2.3	285	26.7	47.4
6052609	1.147	72.12	4.9	155.2	5.5	9.5
6052620	7.106	70.6	3.5	308.5	33.0	58.3
6061230	2.537	50.41	2.1	187.6	11.9	20.9
6061276	5.129	49.37	2.6	266.7	23.7	41.8
6061295	4.628	52.75	3.2	253.3	21.6	38.0
6061308	3.016	53.66	2.5	204.5	14.1	24.8
6061320	1.33	59.91	2.6	135.8	6.3	11.0
6061322	4.506	45.35	3.1	250	20.9	36.9
6061338	1.811	54.01	2.6	158.5	8.6	15.0
6061347	2.192	48.74	2.2	174.3	10.3	18.1
6061355	2.092	54.38	2.3	170.3	9.9	17.3
6061365	1.223	54.95	3.4	130.2	5.8	10.2
6061377	2.695	51.03	2.6	193.3	12.7	22.2
6061387	2.902	49.19	2.2	200.6	13.5	23.8
6061405	1.319	55.26	3.3	135.2	6.3	11.0
6061415	4.181	59	3.6	240.8	19.7	34.5
6061431	2.38	56.4	2.3	181.7	11.2	19.7
6061441	4.012	53.14	2	235.9	18.6	32.8
6061468	0.271	89.85	1.8	61.3	1.3	2.3
6061471	1.017	53.4	2.1	118.7	4.8	8.4
6061479	3.12	51.93	2	208	14.5	25.6
6061497	5.792	51.42	1.5	283.4	26.1	46.6
6062507	1.603	55.34	2.3	149.1	7.6	13.3
6062515	2.108	49.56	2.4	171	9.9	17.4
6062528	2.394	49.29	2.3	182.2	11.2	19.7
6062544	2.227	52.61	3.7	175.7	10.6	18.5
6062552	0.234	89.95	2.9	57	1.1	1.9
6062554	1.865	49.04	3.9	160.8	8.9	15.5
6062570	1.224	58.34	3.4	130.3	5.8	10.2
6062580	2.022	50.19	2.2	167.4	9.5	16.7
6062588	2.829	81.22	2.7	198.1	13.3	23.4
6062598	0.889	84.3	3.4	111	4.3	7.4
6073349	1.483	57.28	2.2	143.4	7.0	12.3
6073352	1.518	54.85	2.1	145.1	7.2	12.6
6073420	3.401	50.72	2.3	217.2	15.8	27.9

6073424	1.11	57.9	3.9	124.1	5.3	9.2
6073433	4.404	52.45	1.8	247.1	20.2	35.9
6073436	7.094	60.32	1	450	32.4	57.5
6073447	4.207	61.75	4.2	241.5	19.9	34.8
6073447-2	9.682	61.75	1	586	44.0	78.4
6073451	3.097	60.49	5.9	207.2	14.7	25.7
6073459	2.255	64.41	3.9	176.8	10.7	18.7
6073463	2.693	54.54	1.1	193.2	12.4	22.0
6073491	1.367	61.94	3.6	137.7	6.5	11.4
6075003	2.995	55.28	2.9	203.8	14.1	24.7
6075006	1.204	63.25	1.5	129.2	5.7	10.0
6075008	2.746	52.51	1.6	195.1	12.8	22.5
6075011	2.497	54.19	2.3	186.1	11.7	20.6
6075013	2.504	56.61	1.8	186.3	11.7	20.6
6075019	4.644	52.8	2.9	253.8	21.6	38.1
6075024	2.206	53.25	2.4	174.9	10.4	18.2
6075027	1.738	83.1	1.7	155.2	8.1	14.2
6075045	3.925	49.87	2.2	233.3	18.2	32.1
6075097	1.174	84.4	2.8	127.6	5.6	9.7
6075103	1.534	55.25	2.5	145.8	7.3	12.7
6075121	1.764	53.14	2.4	156.4	8.3	14.6
6075451	2.234	62.8	1.9	176	10.5	18.3
6075463	97.362	69.63	1	3100	407.6	743.0
6075465	2.019	76.43	2.2	167.3	9.5	16.6
6076632	2.887	52.73	2.2	200.1	13.5	23.8
6198711	10.318	69.34	3.7	378.2	47.5	84.2
6198730	4.267	52.09	2.1	243.2	19.7	34.9
6198788	2.563	51.42	2.5	175.2	12.0	21.1
6198792	6.705	47.02	3.3	304.9	30.8	54.6
6198793	1.973	78.12	3.8	165.4	9.4	16.4
6198800	7.27	85.03	3.9	317.5	33.6	59.4
6198813	1.109	86.23	4.1	124	5.3	9.2
6198814	1.28	86.15	10.2	133.2	6.1	10.7
6198825	0.4	85.56	2.5	74.5	1.9	3.3
6198826	0.34	85.46	2.4	68.7	1.6	2.8
6198837	1.093	85.47	2.8	123.1	5.2	9.1
6198838	0.253	87.36	3.6	59.2	1.2	2.1
6198839	0.287	87.31	3.3	63.1	1.4	2.4
6198853	2.564	85.74	2	188.6	12.0	21.1
6198854	0.29	85	3	63.4	1.4	2.4
6198859	2.235	85.29	2.2	176	10.5	18.4
6198860	2.163	74.22	2.3	173.2	10.2	17.9
6198873	0.361	86.29	3.3	70.7	1.7	3.0
6198874	1.017	85.46	2.2	118.7	4.8	8.4
6198885	1.169	77.31	2.2	127.3	5.6	9.7
6198886	0.669	85.53	2.3	96.3	3.2	5.6
7204174	8.677	65.28	12	346.9	40.9	71.4
A10	3.272	52.26	0.2	413.7	14.6	26.0
A11	2.283	55.34	0.1	289.4	10.2	18.2
A13	4.632	45.57	0	404.5	19.5	35.4
A15	4.659	45.52	0	378.4	19.4	35.4
A17	4.583	50	0.3	388.8	19.8	35.7
A18	3.568	45.18	0.3	402	15.9	28.4
A2	10.817	47.14	0	656.9	43.1	79.4

A20	0.436	58.09	1.4	142.4	2.1	3.6
A21	2.269	54.05	0.2	160.9	9.5	17.3
A22	1.937	50.08	0.3	160.3	8.5	15.2
A25	1.619	50.83	0.3	183.4	7.3	13.0
A26	1.624	51.12	2.3	160.4	7.6	13.4
A28	1.631	50.78	0.4	171.3	7.4	13.1
A29	1.657	50.65	0.4	166.3	7.4	13.2
A3	3.953	48.42	0.3	311.9	17.1	30.8
A31	1.682	50.76	0.2	189.5	7.4	13.3
A32	4.562	50.35	0.2	477.8	20.0	35.9
A34	0.445	68.95	0.1	39	1.9	3.5
A35	2.716	44.86	0.3	332.4	12.1	21.6
A41	1.87	50.66	0.8	163.3	8.5	15.1
A42	1.869	45.32	0.3	159.7	8.1	14.6
A43	1.85	50.34	0.7	168.3	8.4	14.9
A46	4.974	75.58	0.7	387.2	22.5	40.1
A47	1.869	51.06	0.4	178.4	8.4	14.9
A48	1.204	86.77	0.4	188.2	5.6	9.8
A5	2.14	50.51	0.1	224.8	9.3	16.8
A6	3.509	48.81	0.2	292.6	15.0	27.1
A8	12.573	43.61	0	473.9	44.8	84.4
A9	5.62	39.86	0.3	362.4	22.8	41.8
AM19	0.865	51.3	0.4	201.1	4.1	7.1
AM23	2.156	54.1	0	160.8	9.0	16.4
AM24	1.095	49.48	1.2	166.5	5.2	9.0
AM27	1.041	55.85	0.1	179.8	4.8	8.4
AM30	1.696	52.81	0.1	185.3	7.4	13.4
AM37	1.044	50.53	0.7	144.6	4.9	8.5
AM38	1.536	72.23	0	191.8	6.9	12.3
AM39	0.981	58.26	0.6	171.1	4.6	8.1
AM40	1.871	49.66	0.4	160.7	8.3	14.9
AM44	1.149	55.66	0	169.5	5.2	9.2
AM45	0.482	63.28	0.1	129.8	2.3	4.0
AM49	5.206	83.95	0.1	345.9	21.2	38.8
B01	1.111	80.72	2.2	129.1	5.3	9.2
B03	0.72	86.23	0.5	191	3.4	6.0
B05	0.985	85.74	0.3	218.3	4.6	8.1
B06	1.772	75.55	0.3	182.6	8.0	14.3
B08	3.116	85.28	0.3	340.5	14.1	25.1
B12	0.3	82.13	1.7	65.6	1.4	2.5
B13	0.174	83.28	0.1	42.3	0.8	1.4
B15	4.893	80.59	0	343.2	20.4	37.2
B19	1.275	83.33	0.7	150.1	6.0	10.5
B20	3.52	85.71	0	219.4	14.2	26.2
B26	0.994	86.66	0.1	144.9	4.5	8.0
B30	3.697	59.18	0.6	220.8	16.4	29.4
B31	0.97	86.7	0.2	159.5	4.5	7.9
B35	18.037	51.33	0.3	673.5	68.5	127.9
B36	5.24	62.33	0.4	351.7	23.1	41.6
B38	0.253	88.18	0.2	30.8	1.1	2.0
B39	5.055	44.01	0.2	347.5	20.6	37.8
B46	0.286	88.23	0.5	58.5	1.4	2.4
B50	0.916	86.42	0.6	145.7	4.3	7.6
BM29	1.649	87.3	0.5	248.1	7.6	13.5

BM40	2.057	87.44	0.1	242.6	9.0	16.2
BM7	2.102	79.05	0.1	167.4	8.9	16.1
C006	0.428	77.86	0.5	153.5	2.0	3.6
C008	0.276	89.17	0.1	122.4	1.3	2.3
C009	0.657	70.42	0.5	75.2	3.1	5.4
C011	0.357	87.13	1	77.4	1.7	3.0
C013	0.16	85.07	0.9	39.5	0.8	1.3
C014	0.135	85.03	0.2	35.2	0.6	1.1
C019	1.642	64.57	0.5	224.1	7.7	13.5
C022	0.333	89.89	0.6	69.6	1.6	2.8
C023	0.245	85	0.7	59.2	1.2	2.0
C024	0.281	85	0.8	73.1	1.3	2.3
C028	1.595	64.55	0.3	190.7	7.3	12.9
C030	1.085	86.14	0.7	196.1	5.1	9.0
C036	0.306	90	0.9	53.6	1.5	2.5
C036A	1.846	60.32	0.5	262.1	8.7	15.2
C038	0.3	89.62	0.5	52	1.4	2.5
C038A	1.529	85	0.6	143.3	7.0	12.4
C038B	1.357	83.63	0.4	123.9	6.1	10.9
C040	6.154	81.52	0.1	310.7	24.1	44.7
C041	3.038	68.9	0.1	242.1	13.0	23.6
C044	0.302	89.93	0.5	63.8	1.4	2.5
C045	1.746	63.47	0.5	161.9	8.0	14.2
C046	6.961	42.5	0.5	236.9	26.8	49.8
C048	1.739	85.88	0.4	247.3	8.1	14.3
C051B	0.304	68.56	1.1	117.2	1.5	2.5
C054	0.425	64.61	1	129.1	2.0	3.5
C057	0.755	61.05	0.6	150.7	3.6	6.3
C060	4.308	64.61	0.8	398.1	20.0	35.3
C062	0.897	64.46	0.4	224	4.3	7.4
C064	0.141	90	1	58.8	0.7	1.2
C067	0.081	90	0.1	31.4	0.4	0.7
C068	0.203	85.84	1.2	78.9	1.0	1.7
C070	0.135	82.73	1.9	53.3	0.6	1.1
C072	2.714	46.64	0.1	153.5	10.7	19.9
C073	1.175	86.16	0.9	207.4	5.6	9.7
C080	1.21	86.02	0.5	211.5	5.7	10.0
C082	2.578	46.03	0.1	256	11.1	20.1
C083	2.155	59.4	0.5	246.4	10.0	17.7
C084	0.296	88.07	0.7	125	1.4	2.5
C086	0.519	87.13	0.5	168.1	2.5	4.3
C088	1.044	83.53	1.2	163.4	5.0	8.7
C090	0.994	67.78	0.8	212.5	4.7	8.3
C092B	0.553	76.3	0.4	115.3	2.6	4.6
C093	1.471	86.36	0.5	262.7	6.9	12.2
C095	0.499	87.43	0.1	102	2.3	4.1
C096	0.425	89.86	0.5	51.2	2.0	3.5
C098	0.671	86.81	0.7	157.6	3.2	5.6
C103	0.711	84.76	0	165	3.3	5.8
CP00	1.199	55.34	0.4	462.3	5.7	9.9
CP03	3.315	41.79	1.5	354.9	15.4	27.1
CP04	3.322	64.48	0.6	376.6	15.4	27.1
CP06	2.608	59.57	0.2	294.6	11.6	20.7
CP07	2.716	40	0	327.2	11.8	21.2

CP10	0.831	40	0.3	120.1	3.8	6.7
CP114	2.656	65.77	0.6	393.4	12.4	21.8
CP16	1.847	40.02	0.9	212.1	8.5	15.0
CP17	3.163	41.1	0.3	310.1	13.8	24.8
CP18	1.849	66.68	0.5	340.9	8.7	15.2
CP20	3.81	51.82	0.3	330.9	16.7	30.0
CP22	3.805	82.95	0.7	325.1	17.3	30.7
CP24	3.125	47.47	0.1	262.2	13.1	23.9
CP25	1.48	52.74	0.5	298.1	7.0	12.2
CP27	3.81	41.12	0.6	449.4	17.3	30.7
CP28	0.555	89.99	0.6	61.7	2.5	4.5
CP33	0.424	86.75	0.6	125.2	2.0	3.5
CP35	1.233	85.24	0.1	172.8	5.5	9.8
CPM12	1.388	58.02	0.1	249.5	6.4	11.3
CPM19	2.166	51.42	0.4	368.8	10.1	17.7
CPM21	2.222	65.16	0.4	362.7	10.4	18.2
CPM30	0.434	89.99	0.1	105.8	2.0	3.5
CPM31	14.602	61.54	0.6	486.4	58.6	108.0
CPM32	0.395	90	0.2	41.2	1.7	3.1
CPM9	2.78	61	0.1	297.2	12.3	22.0
D02	1.488	56.46	0.5	91.5	6.5	11.8
D04	0.514	85.42	0.6	79.7	2.4	4.2
D05	1.443	57.53	1.1	148.9	6.8	11.9
D07	1.621	57.44	0	173.3	7.2	12.9
D08	0.974	53.92	1.6	157.1	4.6	8.1
D10	0.822	52.35	0.2	157.3	3.8	6.7
D11	1.002	59.03	2	119.2	4.8	8.3
D13	1.583	57.83	0.8	271.9	7.5	13.1
D15	1.645	60.23	0.2	140.5	7.1	12.9
E04	0.736	81.69	0.7	172.9	3.5	6.1
E06	0.783	86.32	0.9	218.1	3.7	6.5
E13	5.142	73.56	0.4	506.8	23.2	41.2
E14	3.56	51.45	0.2	291.2	15.2	27.5
E16	3.376	59.82	0.2	360.4	14.9	26.8
E17	2.714	63.2	0.3	332.9	12.4	22.0
E21	3.674	85.21	0.6	442.3	17.0	29.9
E22	3.586	47.15	0.4	444.9	16.2	28.8
E25	2.215	50.88	0.5	298.3	10.2	18.0
E26	4.293	85.56	0.7	387.9	19.5	34.6
E4	2.468	81.17	0.3	178.7	10.6	19.2
E5	2.686	63.84	0.5	305	12.3	21.8
E8	7.497	61.27	0.1	530.2	31.3	57.1
E9	5.037	83.68	0.1	454.5	21.5	38.9
F1	5.032	66.09	2.7	554.5	23.8	41.5
F2	2.328	85.83	0.2	350.8	10.5	18.7
F3	3.328	65.64	0.2	381	14.8	26.5
G2	2.846	50.68	0.2	173.6	11.4	21.0
GM1	6.765	85	0	288.7	25.1	47.0
GM3	3.996	48.2	0.4	516.8	18.2	32.3
GM4	3.495	51.26	0.1	226.5	14.2	26.1
GM5	4.203	50.07	0.2	490.2	18.7	33.4
GM6	1.276	52.14	0.4	200.2	5.9	10.4
GM7	3.201	51.52	0.2	231.3	13.5	24.5
H1	2.641	46.77	0.7	353.4	12.3	21.6

H3	1.517	63.01	0	167.8	6.7	12.0
IH-10_JUNCTION_E116	1.89	80.62	1.6	188.9	8.9	15.6
IH-10_MH_C1	2.376	84.97	0.1	186	10.0	18.2
IH-10_MH_C105A	1.519	53.68	0.5	128.2	6.9	12.2
IH-10_MH_C107	2.968	57.72	0.4	177.9	12.8	23.2
IH-10_MH_C121	1.578	63.51	0.1	146.5	6.9	12.5
IH-10_MH_C2A	1.237	90	4.3	247.2	5.9	10.3
IH-10_MH_C7	3.03	48.67	0.5	196.4	13.2	23.8
IH-10_MH_WD13	0.728	90	3.4	246.6	3.5	6.1
IH-10_MH_WD3	2.269	90	5.7	244.7	10.9	18.9
IH-10_MH_WD4	1.292	90	9	250	6.2	10.8
IH-10_MH_WD7	1.57	90	5.5	249.9	7.5	13.1
J1	2.109	49.87	1	305.6	9.9	17.3
J3	3.585	53.3	0.2	332	15.4	27.9
L01	1.464	80.72	0.3	228.4	6.8	11.9
L03	1.419	87.8	0.2	207.9	6.4	11.3
L06	2.218	72.06	0.3	153.8	9.6	17.3
L08	2.913	83.91	0.3	264	12.7	22.8
L09	0.997	66.91	0.8	96.5	4.6	8.1
L11	0.382	68.04	5.8	101.9	1.8	3.2
L12	1.107	86.67	4	218.4	5.3	9.1
L15	5.362	86.1	0.3	303.5	22.0	40.3
L16	5.827	66.48	0.3	312.2	23.9	43.9
L19	1.613	85.92	0.2	296.2	7.4	13.1
L21	1.781	85.72	0.4	256.4	8.2	14.5
L22	2.844	60.59	0.4	287	12.8	22.9
L23	1.916	85.82	0.8	308	9.0	15.7
L26	2.184	85.63	0	299.4	9.8	17.4
L27	2.052	68.6	0.3	226.2	9.3	16.5
L35	1.106	86.16	0.4	234.2	5.2	9.1
L36	9.888	62.33	0.2	377.7	36.6	68.7
L37	1.014	86.23	0.2	198.7	4.7	8.2
L39	8.826	53.28	0.3	313.5	33.4	62.3
M03	1.345	55.54	2.4	239.7	6.4	11.1
M04	5.658	60.61	0.2	321.7	22.7	41.9
M06	4.739	62.79	0.3	424	21.0	37.6
M07	1.949	54.95	0.3	209	8.7	15.6
M09	3.39	67.13	0.2	280.7	14.5	26.3
M10	1.365	64.83	0.1	237.7	6.3	11.1
M12	4.465	60.84	0	346	18.9	34.3
M13	1.579	86.55	0	184.7	6.9	12.4
M16	0.165	90	0.2	33.4	0.8	1.3
M18	0.347	89.9	0.1	32	1.5	2.7
M20	0.493	63.26	0.6	143.2	2.3	4.1
M21	0.654	69.45	0.2	97.5	3.0	5.3
M23	0.926	68.7	0.3	218	4.4	7.6
M24	0.474	72.42	0	109	2.2	3.9
MM15	0.147	90	0.1	32.6	0.7	1.2
MM17	0.264	90	0.1	32.3	1.2	2.1
N02	5.326	68.79	0.2	406.7	22.7	41.2
N03	1.677	53.2	0.7	191.9	7.8	13.7
N06	9.098	58.84	0.3	435.3	36.6	67.4
N07	1.466	51.48	0.7	205.2	6.8	12.0
N09	2.876	84.97	0.5	378	13.3	23.4

N10	3.095	52.68	0.2	226.6	13.0	23.7
N13	1.53	43.34	0.1	122.2	6.3	11.5
N14	1.187	42.23	0.2	154.2	5.2	9.4
N16	0.601	81.26	0.1	78.7	2.7	4.8
N17	0.628	60.08	0	96.6	2.9	5.1
N19	0.708	86.88	0.3	116.6	3.2	5.7
N20	2.474	65.34	0.1	225.6	10.7	19.4
N21	0.471	88.58	0.2	83.6	2.2	3.8
N22	0.626	87.11	0	138.7	2.9	5.1
N24	3.194	85.54	0.1	279.9	13.5	24.5
N25	8.199	47.77	0.6	527.9	35.8	64.3
N26	0.646	85.83	0.4	122.2	3.0	5.3
N27	6.04	77.46	0.5	244.7	24.5	45.0
OM0	12.828	58.96	0	639.7	50.2	93.1
OM1	10.385	70.46	0.1	769.2	43.7	79.6
OM10	8.094	70.35	0	664.8	34.6	62.7
OM11	6.53	66.78	0.2	677.8	28.8	51.6
OM2	6.774	72.64	0.3	568.5	29.7	53.4
OM3	6.096	80.38	0	455.8	25.5	46.4
OM4	3.366	64.1	0.4	412.6	15.4	27.3
OM5	6.188	71.99	0.1	504.3	26.4	47.9
OM6	10.104	78.36	0	478.1	39.0	72.4
OM7	5.377	68.6	0.1	376.5	22.5	41.0
OM8	4.706	73.7	0	403.6	20.2	36.6
OM9	3.426	56.48	0.1	269.9	14.5	26.3
P04	3.153	85.93	0.4	199.5	13.3	24.1
P05	2.478	40.64	0.1	162.1	9.8	18.1
P06	3.037	85.81	0.5	191.1	13.1	23.7
P08	1.534	86.31	0.5	195.7	7.1	12.5
P09	2.167	37.58	0	267.9	9.4	16.9
P12	3.764	66.46	0.7	205.1	16.5	29.7
P13	3.605	53.42	0.1	270.8	15.1	27.5
P17	2.647	43.83	0.8	273.5	12.1	21.4
P18	1.902	50.21	0.8	167.6	8.7	15.4
P23	4.15	49.89	0.7	490.8	19.2	33.8
P24	2.242	76.12	0.4	231	10.2	18.1
P27	0.796	84.7	1.2	173.3	3.8	6.6
P28	2.709	42.76	0.6	262	12.2	21.7
P30	4.748	64.3	0.6	320.8	21.1	37.8
P31	1.873	78.54	0.9	249.2	8.8	15.4
P33	1.595	79.09	0.4	215.3	7.3	13.0
P34	0.409	90	0	55.7	1.8	3.2
P36	3.347	61.02	0.3	388.1	15.1	26.8
P38	1.524	86.06	0	145.7	6.5	11.8
P40	0.697	77.8	0.5	91.5	3.2	5.7
P41	1.714	85.36	0.2	274.3	7.8	13.8
P43	2.992	85.74	0.2	252.2	12.6	22.9
P44	1.702	87.07	0.1	181.2	7.4	13.3
P46	1.379	86.34	0.3	193.1	6.3	11.1
P47	1.422	86.22	0.8	215	6.7	11.7
P49	1.705	64.53	1.7	219.3	8.1	14.1
P50	1.131	86.4	0.9	160.2	5.3	9.3
PM2	4.555	50.28	0.2	287.9	18.4	33.8
PM20	4.787	50.57	0.4	320.5	20.4	37.0

PM21	1.559	49.94	0	160.7	6.8	12.2
PM26	1.506	41.54	0.3	236.8	6.9	12.2
W14001_sta15863	0.51	83.89	12	84.1	2.4	4.2
W14001_sta16671	1.49	88.29	5	70	6.9	12.2
W14001_sta16821	1.633	54.84	5	45	7.4	13.2
W14001_sta18481	4.324	55	0.5	208.9	18.2	33.2
W14001_sta19161	9.556	55	0.5	440.6	39.9	72.9
W14001_sta19981	9.478	62.38	0.4	315.7	37.3	69.2
W14001_sta20481	3.995	60.33	2	294.2	18.8	33.0
W14001_sta20781	0.825	58.33	1.6	112.7	3.9	6.9
W54001	14.962	56.31	0	548.8	54.5	102.6

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
-1018	Manhole	2D	67.03	67.04	75.25	74.97	75.77	75.72	77.31	77.23	77.40	77.45
-1018_Outfall	Outfall	Stored	66.99	67.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-1027	Manhole	2D	78.09	78.19	79.95	79.93	79.25	78.42	80.76	80.56	80.12	79.46
-1027_Outfall	Outfall	Stored	80.99	81.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10002	Manhole	2D	80.43	81.41	83.06	83.06	83.07	83.01	83.44	83.44	83.45	83.38
10003	Manhole	2D	80.43	81.57	82.73	82.72	82.73	82.68	83.05	83.05	83.06	83.01
10008	Manhole	Sealed	72.54	79.00	76.94	76.68	76.79	76.69	78.54	78.41	78.31	78.15
10008!_2D	Manhole	2D	78.14	78.17	78.59	78.59	78.60	78.57	78.87	78.83	78.76	78.71
10009	Manhole	Sealed	73.23	77.80	77.70	77.67	77.66	77.61	78.57	78.55	78.39	78.28
10009!_2D	Manhole	2D	76.94	76.97	77.87	77.85	77.87	77.86	78.66	78.65	78.53	78.45
10010	Manhole	Sealed	73.23	77.87	77.55	77.50	77.31	77.15	78.50	78.49	78.11	77.90
10010!_2D	Manhole	2D	77.00	77.04	77.75	77.74	77.49	77.34	78.54	78.53	78.12	77.88
10011	Manhole	2D	71.50	78.19	78.62	78.61	78.63	78.62	78.85	78.85	78.84	78.84
10032	Manhole	Sealed	76.24	80.65	81.01	81.01	81.01	81.00	81.53	81.53	81.52	81.46
10032!_2D	Manhole	2D	80.62	80.65	80.83	80.83	80.83	80.81	81.52	81.51	81.51	81.44
10033	Manhole	2D	75.88	81.44	81.35	81.35	81.35	81.35	81.83	81.83	81.84	81.85
10034	Manhole	2D	75.76	80.60	80.82	80.82	80.83	80.83	81.90	81.90	81.91	81.92
10035	Manhole	2D	75.64	80.83	80.85	80.85	80.85	80.85	81.87	81.87	81.89	81.88
10036	Manhole	2D	76.32	81.82	78.88	78.88	78.80	78.22	82.11	82.12	82.14	82.17
10037	Manhole	2D	75.41	81.10	78.89	78.89	78.82	78.23	81.84	81.84	81.85	81.85
10044	Manhole	2D	69.72	82.30	82.16	82.18	82.16	82.13	83.14	83.15	83.12	83.10
10046	Manhole	2D	68.98	82.18	80.71	80.72	80.71	80.70	81.59	81.60	81.57	81.56
10048	Manhole	2D	68.09	78.12	78.81	78.80	78.81	78.81	79.09	79.09	79.08	79.08
10049	Manhole	2D	67.65	78.60	78.17	78.10	78.21	78.18	78.65	78.60	78.62	78.60
10051	Manhole	2D	67.20	77.24	77.30	77.18	77.39	77.36	78.14	78.02	78.04	77.95
10052	Manhole	2D	70.00	77.29	77.31	77.19	77.39	77.36	78.06	77.96	77.97	77.87
10053	Manhole	Sealed	66.95	76.84	76.87	76.72	76.99	76.95	77.91	77.71	77.81	77.72
10054	Manhole	2D	66.72	78.00	76.41	76.20	76.54	76.49	77.66	77.35	77.54	77.45
10055	Manhole	Sealed	72.70	78.01	76.39	76.22	76.33	76.18	77.96	77.85	77.73	77.67
10055!_2D	Manhole	2D	77.15	77.18	77.25	77.25	77.22	77.22	77.88	77.77	77.39	77.37
10056	Manhole	Sealed	72.67	77.96	76.03	75.82	75.96	75.82	77.86	77.68	77.65	77.55
10056!_2D	Manhole	2D	77.10	77.13	77.27	77.27	77.27	77.27	77.94	77.82	77.80	77.72
10057	Manhole	2D	73.84	78.39	75.87	75.61	76.03	75.96	77.21	76.80	77.13	77.07
10058	Manhole	Sealed	73.84	77.99	75.46	75.19	75.36	75.24	76.91	76.53	76.63	76.63
10059	Manhole	Sealed	73.10	78.72	77.18	76.93	77.00	76.95	78.59	78.54	78.48	78.36
10059!_2D	Manhole	2D	77.86	77.89	78.22	78.22	78.21	78.22	78.65	78.62	78.57	78.50
10095	Manhole	2D	80.43	82.75	83.66	83.66	83.66	83.69	84.01	84.01	84.02	84.04
10096	Manhole	2D	80.23	82.08	82.97	82.97	82.98	83.02	83.25	83.25	83.26	83.31
10097	Manhole	2D	78.40	82.54	78.46	78.46	78.55	78.55	78.46	78.46	78.55	78.55
10098	Manhole	2D	75.08	82.52	83.27	83.27	83.28	83.26	83.70	83.70	83.71	83.69
10099	Manhole	2D	81.58	83.82	83.72	83.71	83.74	83.74	84.19	84.19	84.29	84.28
10100	Manhole	2D	74.68	83.24	83.33	83.32	83.33	83.29	84.00	83.99	84.00	83.96
10101	Manhole	2D	79.43	81.96	82.99	82.99	82.99	82.85	83.42	83.42	83.43	83.28
10102	Manhole	2D	75.48	83.20	83.63	83.62	83.64	83.63	84.04	84.04	84.04	84.06
10103	Manhole	2D	79.83	83.30	83.68	83.68	83.71	83.68	84.34	84.34	84.35	84.33
10106	Manhole	2D	80.43	82.13	83.57	83.56	83.57	83.57	83.88	83.87	83.88	83.88
10107	Manhole	2D	80.43	81.95	82.89	82.89	82.90	82.90	83.19	83.19	83.19	83.19
10108	Manhole	2D	75.58	83.35	84.17	84.17	84.18	84.14	84.49	84.49	84.50	84.46
10109	Manhole	2D	75.58	82.70	83.11	83.11	83.12	83.12	83.40	83.40	83.41	83.41
10110	Manhole	2D	79.10	86.10	84.20	84.20	84.21	84.24	84.86	84.86	84.91	84.92
10111	Manhole	2D	79.35	85.69	84.37	84.37	84.38	84.42	85.14	85.14	85.16	85.18
10112	Manhole	2D	77.70	83.72	84.28	84.28	84.29	84.29	84.40	84.40	84.40	84.40
10113	Manhole	2D	78.30	81.99	82.85	82.85	82.85	82.83	83.28	83.28	83.28	83.27
10114	Manhole	2D	78.30	82.98	83.38	83.38	83.38	83.37	83.70	83.70	83.71	83.67
10115	Manhole	2D	82.21	82.21	84.49	84.49	84.49	84.42	85.12	85.12	85.12	85.06
10118	Manhole	2D	79.20	82.82	83.60	83.60	83.61	83.67	84.25	84.24	84.25	84.29
10119	Manhole	2D	79.08	82.50	83.15	83.14	83.15	83.19	83.75	83.74	83.75	83.80
10120	Manhole	2D	79.08	81.15	82.37	82.36	82.38	82.36	82.51	82.51	82.52	82.50
10121	Manhole	2D	78.08	82.03	83.26	83.25	83.28	83.29	83.82	83.80	83.82	83.84
10123	Manhole	2D	78.26	81.11	82.46	82.44	82.47	82.42	82.78	82.77	82.77	82.72
10124	Manhole	2D	77.08	79.95	80.62	80.61	80.62	80.61	81.22	81.21	81.20	81.18
10128	Manhole	2D	78.88	82.30	82.99	82.99	83.00	83.01	83.32	83.32	83.32	83.34
10135	Manhole	2D	81.48	83.25	84.41	84.40	84.43	84.44	85.09	85.09	85.09	85.10
10136	Manhole	2D	81.48	82.19	83.24	83.24	83.26	83.17	83.88	83.88	83.89	83.79
10138	Manhole	2D	84.42	85.68	86.30	86.30	85.86	85.86	86.58	86.58	86.01	86.01
10245	Manhole	2D	71.05	78.21	79.57	79.56	79.53	78.82	80.09	80.07	80.04	79.92

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
10247	Manhole	2D	72.63	78.35	79.99	79.94	79.85	79.36	80.61	80.60	80.53	80.37
10251	Manhole	2D	71.72	80.66	80.42	80.42	80.39	80.30	81.02	81.00	80.95	80.89
10260	Manhole	2D	71.98	78.16	73.54	73.54	73.54	73.54	78.64	78.62	78.57	78.52
10261	Manhole	2D	72.08	78.41	73.54	73.54	73.54	73.54	78.73	78.71	78.66	78.60
10262	Manhole	2D	70.33	77.07	71.69	71.69	71.70	71.70	74.08	74.06	74.05	73.96
10263	Manhole	2D	71.80	78.99	72.69	72.69	72.72	72.72	75.92	75.90	75.88	75.75
10264	Manhole	2D	68.15	75.67	70.09	70.09	70.10	70.10	71.16	71.16	71.16	71.14
10265	Manhole	2D	68.76	76.52	71.31	71.31	71.32	71.32	73.23	73.23	73.22	73.17
10266	Manhole	2D	69.25	76.83	71.55	71.55	71.56	71.56	73.86	73.85	73.84	73.76
10285	Manhole	2D	71.26	79.35	79.56	79.54	79.51	78.91	80.09	80.03	80.01	79.89
10289	Manhole	2D	72.15	78.81	73.54	73.54	73.54	73.54	79.22	79.20	79.13	78.95
10290	Manhole	2D	72.15	78.11	73.54	73.54	73.54	73.54	78.37	78.37	78.35	78.34
10297	Manhole	2D	76.52	81.31	80.19	80.20	80.20	80.19	80.93	80.94	80.92	80.91
10302	Manhole	2D	68.19	74.36	75.82	75.80	75.86	75.82	76.53	76.36	76.53	76.49
10304	Manhole	2D	71.30	74.67	75.56	75.53	75.59	75.56	76.25	76.11	76.26	76.23
10306	Manhole	2D	70.60	74.86	75.15	75.14	75.15	75.15	75.53	75.41	75.53	75.54
10308	Manhole	2D	71.32	74.65	75.07	75.01	75.10	75.13	75.68	75.54	75.70	75.76
10309	Manhole	2D	70.46	74.97	75.31	75.27	75.33	75.31	75.86	75.72	75.87	75.86
10311	Manhole	2D	70.47	75.21	75.12	74.81	75.16	75.10	76.29	76.13	76.31	76.27
10313	Manhole	2D	71.03	75.00	75.12	74.81	75.16	75.10	76.02	75.86	76.04	76.02
20053	Manhole	Sealed	72.10	78.48	75.38	75.08	75.31	75.20	77.16	76.40	76.66	76.76
20053!_2D	Manhole	2D	78.45	78.48	78.48	78.48	78.48	78.48	78.48	78.48	78.48	78.48
20102	Manhole	Sealed	73.67	76.48	78.35	78.36	77.72	77.48	79.13	78.99	78.50	78.73
20103	Manhole	Sealed	73.66	79.39	78.40	78.41	77.77	77.53	79.21	79.07	78.58	78.85
20103!_2D	Manhole	2D	79.36	79.39	79.39	79.39	79.39	79.39	80.19	80.07	79.99	80.21
20104	Manhole	Sealed	73.63	79.36	78.55	78.54	77.96	77.69	79.25	79.13	78.79	78.95
20104!_2D	Manhole	2D	79.33	79.36	79.36	79.36	79.36	79.36	79.36	79.36	79.36	79.36
20105	Manhole	Sealed	73.98	79.62	78.69	78.69	78.18	77.89	79.30	79.29	79.02	79.12
20105!_2D	Manhole	2D	79.59	79.62	79.77	79.77	79.74	79.72	79.94	79.94	79.97	79.97
20106	Manhole	Sealed	74.19	79.23	78.83	78.82	78.38	78.12	79.41	79.41	79.18	79.27
20106!_2D	Manhole	2D	79.19	79.23	79.30	79.30	79.23	79.23	79.48	79.48	79.47	79.48
20107	Manhole	Sealed	74.28	78.84	79.18	79.18	78.92	78.74	79.69	79.68	79.58	79.62
20107!_2D	Manhole	2D	78.81	78.84	79.67	79.67	79.62	79.61	80.08	80.08	80.02	80.02
20108	Manhole	Sealed	74.91	78.94	79.29	79.29	79.11	78.99	79.71	79.71	79.65	79.67
20108!_2D	Manhole	2D	78.91	78.94	79.47	79.47	79.42	79.39	79.75	79.75	79.72	79.73
20109	Manhole	Sealed	75.06	79.28	79.33	79.32	79.18	79.08	79.72	79.72	79.67	79.68
20109!_2D	Manhole	2D	79.25	79.28	79.65	79.65	79.62	79.60	79.90	79.90	79.89	79.89
20110	Manhole	Sealed	75.27	79.19	79.38	79.38	79.29	79.22	79.74	79.74	79.70	79.71
20110!_2D	Manhole	2D	79.16	79.19	79.46	79.46	79.43	79.41	79.73	79.73	79.71	79.72
20111	Manhole	Sealed	74.93	78.72	79.35	79.34	79.23	79.16	79.72	79.72	79.67	79.68
20111!_2D	Manhole	2D	78.69	78.72	79.29	79.29	79.24	79.20	79.58	79.58	79.56	79.57
20112	Manhole	Sealed	75.45	79.13	79.45	79.45	79.39	79.34	79.79	79.79	79.77	79.77
20112!_2D	Manhole	2D	79.09	79.13	79.41	79.41	79.37	79.34	79.69	79.69	79.68	79.68
20113	Manhole	Sealed	75.56	78.98	79.55	79.55	79.50	79.46	79.94	79.94	79.92	79.92
20113!_2D	Manhole	2D	78.94	78.98	79.85	79.85	79.83	79.81	80.25	80.24	80.23	80.23
20114	Manhole	Sealed	75.95	79.18	79.55	79.55	79.51	79.46	79.90	79.90	79.88	79.88
20114!_2D	Manhole	2D	79.15	79.18	79.66	79.66	79.63	79.60	79.91	79.91	79.90	79.90
20115	Manhole	Sealed	76.62	78.83	79.38	79.38	79.35	79.32	79.63	79.62	79.62	79.62
20115!_2D	Manhole	2D	78.80	78.83	79.35	79.35	79.32	79.30	79.60	79.60	79.59	79.59
20116	Manhole	2D	75.20	77.88	79.58	79.55	79.58	79.12	80.14	80.10	80.13	80.10
20117	Manhole	2D	75.35	78.13	78.94	78.93	79.61	79.11	79.49	79.50	80.16	80.10
20118	Manhole	2D	75.47	77.86	78.62	78.62	79.40	78.88	79.19	79.17	79.94	79.85
20119	Manhole	Sealed	71.85	77.93	75.38	75.08	75.31	75.20	77.16	76.40	76.66	76.76
20119!_2D	Manhole	2D	77.90	77.93	77.93	77.93	77.93	77.93	77.93	77.93	77.93	77.93
20120	Manhole	Sealed	71.77	78.20	75.38	75.08	75.31	75.20	77.15	76.38	76.66	76.76
20120!_2D	Manhole	2D	78.16	78.20	78.20	78.20	78.20	78.20	78.20	78.20	78.20	78.20
20121	Manhole	Sealed	71.38	79.00	75.38	75.08	75.31	75.20	77.14	76.38	76.66	76.75
20121!_2D	Manhole	2D	77.93	77.96	78.56	78.56	78.50	78.56	78.79	78.79	78.75	78.81
20122	Manhole	Sealed	71.33	78.44	75.35	75.05	75.29	75.17	77.08	76.31	76.59	76.67
20122!_2D	Manhole	2D	78.40	78.44	78.44	78.44	78.44	78.44	78.44	78.44	78.44	78.44
20123	Manhole	Sealed	71.13	78.78	75.31	75.02	75.26	75.14	77.00	76.23	76.52	76.58
20123!_2D	Manhole	2D	78.75	78.78	78.78	78.78	78.78	78.78	78.78	78.78	78.78	78.78
20124	Manhole	Sealed	71.17	77.09	75.26	74.97	75.20	75.07	76.70	76.09	76.31	76.35
20124!_2D	Manhole	2D	77.06	77.09	77.09	77.09	77.09	77.09	77.09	77.09	77.09	77.09
20125	Manhole	Sealed	72.15	79.12	75.44	75.15	75.39	75.26	77.37	76.61	76.88	76.93
20125!_2D	Manhole	2D	79.08	79.12	79.12	79.12	79.12	79.12	79.12	79.12	79.12	79.12

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
20126	Manhole	Sealed	72.24	79.31	75.52	75.22	75.48	75.34	77.63	76.87	77.13	77.17
20126!_2D	Manhole	2D	79.28	79.31	79.31	79.31	79.31	79.31	79.46	79.45	79.44	79.46
20127	Manhole	Sealed	72.31	78.91	75.67	75.36	75.64	75.48	78.09	77.36	77.59	77.62
20127!_2D	Manhole	2D	78.88	78.91	79.16	79.16	79.16	79.16	79.22	79.22	79.22	79.22
20128	Manhole	Sealed	72.41	78.63	75.74	75.42	75.72	75.55	78.35	77.65	77.86	77.88
20128!_2D	Manhole	2D	78.60	78.63	79.35	79.35	79.37	79.36	79.55	79.55	79.56	79.55
20129	Manhole	Sealed	73.26	78.64	75.75	75.43	75.72	75.55	78.37	77.67	77.87	77.89
20129!_2D	Manhole	2D	78.61	78.64	78.64	78.64	78.64	78.64	79.36	79.36	79.33	79.34
20131	Manhole	2D	75.72	78.69	79.45	79.45	79.32	79.05	79.97	79.98	79.86	79.79
20132	Manhole	2D	75.63	78.40	79.44	79.44	79.31	79.05	79.97	79.97	79.86	79.79
20133	Manhole	2D	75.92	78.85	79.64	79.63	79.51	79.26	80.16	80.17	80.05	79.98
20134	Manhole	2D	75.78	78.93	79.48	79.47	79.35	79.15	79.97	79.97	79.86	79.79
20135	Manhole	2D	75.77	79.42	79.62	79.62	79.39	79.06	80.20	80.20	80.09	80.03
20136	Manhole	2D	76.33	78.03	78.63	78.62	78.50	78.24	79.11	79.11	78.99	78.91
20137	Manhole	2D	76.04	78.42	79.78	79.77	79.64	79.37	80.29	80.29	80.17	80.11
20138	Manhole	2D	75.68	77.98	79.27	79.26	79.13	78.86	79.75	79.75	79.63	79.58
20139	Manhole	2D	75.81	78.16	79.14	79.14	79.02	78.77	79.61	79.61	79.49	79.41
20140	Manhole	2D	75.69	77.49	79.19	79.18	79.04	78.68	79.61	79.61	79.48	79.37
20141	Manhole	2D	75.42	77.71	79.49	79.48	79.34	79.08	79.95	79.95	79.82	79.81
20142	Manhole	2D	75.32	77.88	79.48	79.48	79.33	78.96	79.95	79.95	79.82	79.74
20142-1	Manhole	2D	75.54	77.70	79.37	79.37	79.23	78.88	79.83	79.83	79.69	79.62
30000	Manhole	Sealed	64.99	82.20	80.72	80.59	80.72	80.70	81.88	81.65	81.77	81.77
30001	Manhole	Sealed	64.82	80.59	79.63	79.43	79.63	79.60	80.94	80.58	80.77	80.77
30002	Manhole	Sealed	65.27	81.75	81.49	81.40	81.49	81.48	82.64	82.48	82.57	82.57
30003	Manhole	Sealed	64.31	75.29	77.68	77.30	77.67	77.61	79.32	78.65	79.00	79.01
30004	Manhole	Sealed	64.29	74.65	77.49	77.09	77.48	77.42	79.16	78.46	78.83	78.84
30005	Manhole	Sealed	64.14	74.01	76.20	75.72	76.19	76.12	77.83	76.89	77.40	77.39
30006	Manhole	Sealed	64.07	74.01	75.74	75.23	75.73	75.65	77.30	76.28	76.83	76.82
30007	Manhole	Sealed	64.88	82.15	80.54	80.40	80.54	80.52	81.69	81.45	81.58	81.58
30008	Manhole	Sealed	66.80	79.17	78.86	78.61	78.86	78.82	80.25	79.82	80.05	80.05
30009	Manhole	Sealed	64.27	74.59	77.14	76.72	77.14	77.07	78.84	78.08	78.49	78.49
30010	Manhole	Sealed	66.90	80.91	80.54	80.42	80.55	80.53	81.58	81.38	81.48	81.49
30011	Manhole	Sealed	67.13	79.75	80.87	80.78	80.87	80.86	81.75	81.62	81.69	81.69
30012	Manhole	Sealed	64.92	80.98	80.04	79.86	80.04	80.01	81.25	80.95	81.11	81.11
30013	Manhole	Sealed	64.54	78.41	78.33	78.01	78.32	78.27	79.89	79.32	79.62	79.62
30014	Manhole	Sealed	65.06	74.80	76.88	76.44	76.87	76.80	78.52	77.71	78.14	78.14
30015	Manhole	Sealed	63.97	76.14	74.88	74.32	74.85	74.77	76.22	75.45	75.91	75.92
30016	Manhole	Sealed	64.00	74.60	75.28	74.75	75.27	75.19	76.79	75.69	76.27	76.27
30017	Manhole	Sealed	65.58	75.04	77.08	76.66	77.08	77.01	78.77	78.00	78.41	78.41
30018	Manhole	Sealed	64.96	81.00	80.20	80.04	80.20	80.17	81.37	81.10	81.24	81.25
30019	Manhole	Sealed	65.26	82.78	81.37	81.27	81.37	81.36	82.52	82.35	82.44	82.45
30020	Manhole	Sealed	64.70	79.36	79.18	78.94	79.18	79.15	80.59	80.16	80.39	80.39
30021	Manhole	Sealed	64.28	73.92	77.33	76.92	77.32	77.26	79.03	78.30	78.69	78.69
30022	Manhole	Sealed	64.21	74.47	76.68	76.24	76.68	76.61	78.37	77.51	77.97	77.96
30023	Manhole	Sealed	64.54	79.60	78.84	78.57	78.84	78.80	80.33	79.85	80.11	80.11
30027	Manhole	Sealed	64.82	80.99	80.31	80.16	80.31	80.29	81.46	81.20	81.34	81.34
30028	Outfall	Sealed	65.36	81.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30029	Manhole	Sealed	65.40	81.55	72.06	72.06	72.07	72.07	73.37	73.37	73.37	73.36
30030	Manhole	2D	73.43	73.43	75.41	75.19	75.49	75.38	77.57	77.12	77.38	77.40
30032	Manhole	2D	77.40	82.29	82.18	82.20	82.19	82.15	82.95	82.96	82.95	82.92
30033	Manhole	2D	74.46	83.60	82.34	82.36	82.34	82.31	83.33	83.34	83.37	83.29
30034	Manhole	2D	78.00	82.47	83.14	83.12	83.15	83.11	83.78	83.79	84.32	83.74
30035	Manhole	2D	78.00	82.99	83.15	83.10	83.14	83.12	83.80	83.82	84.39	83.88
30036	Manhole	2D	77.75	82.57	80.72	80.72	80.72	80.70	81.60	81.62	81.59	81.58
30037	Manhole	2D	77.33	83.04	81.38	81.40	81.39	81.36	82.89	82.91	82.89	82.87
3143189	Manhole	2D	75.37	86.61	87.05	87.05	87.05	86.91	87.79	87.79	87.79	87.75
3143195	Manhole	2D	83.89	88.04	88.08	88.08	88.08	88.06	88.50	88.50	88.50	88.49
3143196	Manhole	2D	75.11	86.38	86.86	86.86	86.85	86.71	87.69	87.69	87.69	87.63
3143197	Manhole	2D	83.59	87.70	87.09	87.09	87.08	86.95	88.52	88.53	88.53	88.59
3143201	Manhole	2D	74.87	86.09	86.60	86.60	86.60	86.44	87.48	87.48	87.48	87.41
3143205	Manhole	2D	74.35	86.88	85.99	85.99	85.98	85.69	87.09	87.09	87.09	86.92
3143206	Manhole	2D	74.65	88.45	86.36	86.36	86.36	86.11	87.49	87.49	87.49	87.42
3143209	Manhole	2D	69.55	86.31	86.41	86.41	86.40	86.39	86.64	86.64	86.63	86.62
3143214	Manhole	2D	79.00	86.50	87.27	87.27	87.27	87.20	87.75	87.75	87.75	87.74
3143215	Manhole	2D	80.56	86.67	87.28	87.30	87.30	87.25	87.62	87.64	87.64	87.62
3143216	Manhole	2D	82.26	86.98	87.44	87.45	87.45	87.41	87.71	87.72	87.72	87.69

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
3143228	Manhole	2D	79.87	86.65	87.20	87.20	87.20	87.22	87.60	87.60	87.60	87.60
3143498	Manhole	Sealed	84.59	86.73	87.05	87.05	87.05	86.91	87.79	87.79	87.79	87.75
3143499	Manhole	Sealed	83.58	86.11	86.86	86.86	86.85	86.71	87.69	87.69	87.69	87.63
3143507	Manhole	2D	82.51	86.35	86.66	86.66	86.66	86.32	87.66	87.66	87.66	87.60
3144582	Manhole	2D	79.45	85.47	86.63	86.63	86.62	86.56	87.26	87.26	87.26	87.21
3144583	Manhole	2D	73.76	87.72	86.02	86.01	85.99	85.87	87.03	87.03	87.08	86.99
3144584	Manhole	2D	76.68	87.43	87.42	87.41	87.00	86.87	88.04	88.04	87.81	87.81
3144586	Manhole	2D	70.70	83.61	84.20	84.20	84.21	84.24	84.86	84.86	84.91	84.92
3144587	Manhole	2D	77.19	86.76	85.40	85.39	85.34	85.13	86.59	86.59	86.55	86.41
3144591	Manhole	2D	76.54	86.97	86.43	86.42	86.49	86.36	87.14	87.14	87.13	87.10
3144598	Manhole	2D	76.64	85.91	86.97	86.96	87.09	86.99	87.50	87.50	87.60	87.55
3144599	Manhole	2D	76.53	86.76	85.11	85.10	85.04	84.81	86.40	86.40	86.34	86.18
3144600	Manhole	2D	78.62	86.59	85.57	85.57	85.56	85.56	86.30	86.30	86.28	86.26
3144602	Manhole	2D	68.83	82.28	83.06	83.04	83.04	83.02	83.68	83.68	86.21	83.62
3144603	Manhole	2D	69.28	81.99	84.45	84.27	84.39	84.15	84.89	85.15	93.31	85.13
3144605	Manhole	2D	69.30	82.42	83.55	83.49	83.59	83.56	84.59	84.65	85.09	84.49
3144606	Manhole	2D	69.96	82.05	83.14	83.17	83.26	83.15	83.91	84.06	86.44	83.99
3144607	Manhole	2D	69.54	82.59	83.36	83.32	83.33	83.26	83.93	83.94	84.99	83.88
3144608	Manhole	2D	70.06	82.11	82.82	82.81	82.80	82.79	83.50	83.53	83.76	83.42
3144609	Manhole	2D	75.91	86.27	84.83	84.82	84.75	84.48	86.21	86.21	86.13	85.95
3144610	Manhole	2D	72.83	86.77	84.70	84.68	84.61	84.33	86.07	86.06	85.96	85.79
3144612	Manhole	2D	70.54	82.19	83.59	83.59	83.61	83.63	84.14	84.14	84.20	84.20
3144613	Manhole	2D	70.97	82.60	83.63	83.62	83.64	83.66	84.26	84.26	84.32	84.32
3144614	Manhole	2D	72.41	82.47	83.52	83.52	83.58	83.63	84.09	84.09	84.18	84.21
3144615	Manhole	2D	71.67	82.63	83.74	83.74	83.80	83.81	84.32	84.32	84.42	84.41
3144616	Manhole	2D	69.64	82.24	82.31	82.34	82.32	82.28	83.26	83.26	83.24	83.21
3144617	Manhole	2D	82.48	85.77	84.03	84.01	83.93	83.57	85.48	85.48	85.36	85.23
3144618	Manhole	2D	71.98	82.53	83.68	83.67	83.72	83.76	84.25	84.26	84.33	84.35
3144619	Manhole	2D	77.98	82.94	83.87	83.87	83.85	83.80	84.40	84.40	84.38	84.28
3144623	Manhole	2D	72.17	83.67	83.73	83.73	83.74	83.79	84.26	84.26	84.33	84.41
3144624	Manhole	2D	77.08	84.90	85.35	85.35	85.34	85.31	85.80	85.80	85.79	85.78
3144627	Manhole	2D	75.85	82.54	84.10	84.09	84.05	83.99	84.78	84.78	84.75	84.68
3144628	Manhole	2D	75.73	82.35	84.04	84.03	83.99	83.92	84.78	84.78	84.75	84.67
3144629	Manhole	2D	74.66	84.46	83.62	83.60	83.48	83.19	84.87	84.87	84.86	84.73
3144631	Manhole	2D	72.69	83.78	84.11	84.11	84.07	83.97	84.75	84.75	84.73	84.69
3144632	Manhole	2D	75.30	85.00	83.53	83.53	83.58	83.61	83.99	83.99	84.05	84.06
3144633	Manhole	2D	75.23	85.44	83.53	83.53	83.58	83.62	84.02	84.02	84.09	84.11
3144637	Manhole	2D	69.49	84.00	84.01	83.99	83.93	83.83	84.79	84.79	84.77	84.73
3144638	Manhole	2D	75.53	84.72	83.65	83.65	83.66	83.63	84.02	84.02	84.08	84.07
3144640	Manhole	2D	74.26	82.25	83.37	83.37	83.40	83.46	83.74	83.74	83.75	83.81
3144641	Manhole	2D	75.64	82.92	83.54	83.54	83.57	83.60	83.93	83.93	83.94	83.95
3144642	Manhole	2D	75.86	81.53	82.99	82.99	83.01	83.04	83.37	83.37	83.38	83.40
3144643	Manhole	2D	76.08	82.50	83.58	83.57	83.58	83.50	83.84	83.84	83.85	83.78
3144646	Manhole	2D	76.23	82.60	83.14	83.14	83.16	83.21	83.49	83.49	83.50	83.53
3144647	Manhole	2D	76.38	83.21	83.22	83.22	83.24	83.27	83.62	83.62	83.63	83.67
3144648	Manhole	2D	70.28	82.63	83.35	83.35	83.35	83.34	83.66	83.66	83.65	83.64
3144911	Manhole	2D	77.42	84.45	84.86	84.84	84.79	84.53	85.83	85.83	85.80	85.77
3144912	Manhole	2D	76.92	84.56	85.07	85.05	85.06	84.80	86.33	86.33	86.53	86.42
3144913	Manhole	2D	82.48	85.73	85.54	85.54	85.54	85.51	86.03	86.03	86.03	86.02
3144914	Manhole	2D	81.48	84.40	85.46	85.45	85.45	85.41	85.97	85.97	85.96	85.93
3144915	Manhole	2D	83.38	85.87	85.09	85.08	85.05	84.87	85.97	85.97	85.97	85.95
3144916	Manhole	2D	82.38	84.70	85.27	85.26	85.20	84.98	85.90	85.90	85.89	85.87
3144917	Manhole	2D	81.28	85.06	84.03	84.01	83.93	83.56	85.39	85.39	85.31	85.16
3144928	Manhole	2D	82.85	85.00	85.54	85.54	85.54	85.55	85.90	85.90	85.91	85.94
3144930	Manhole	2D	79.18	84.01	85.04	85.04	85.04	85.08	85.30	85.30	85.29	85.31
3144931	Manhole	2D	78.52	82.77	84.11	84.10	84.06	84.02	84.78	84.77	84.75	84.69
3144932	Manhole	2D	80.85	84.57	84.08	84.07	83.96	83.69	85.04	85.04	84.99	84.92
3144935	Manhole	2D	79.46	83.88	84.27	84.27	84.23	84.07	84.89	84.89	84.88	84.79
3144936	Manhole	2D	79.46	83.42	84.11	84.10	84.06	83.97	84.73	84.73	84.71	84.67
3144937	Manhole	2D	74.53	82.57	83.28	83.28	83.28	83.28	83.59	83.59	83.58	83.56
3144938	Manhole	2D	74.53	82.46	83.13	83.13	83.13	83.14	83.35	83.35	83.34	83.33
3144944	Manhole	2D	74.91	81.43	82.48	82.48	82.49	82.55	83.05	83.05	83.10	83.15
3144951	Manhole	2D	78.71	82.44	83.11	83.11	83.13	83.14	83.44	83.44	83.45	83.46
3144952	Manhole	2D	79.01	81.95	82.59	82.59	82.60	82.62	82.87	82.87	82.88	82.89
3144955	Manhole	2D	78.64	81.64	82.96	82.96	82.98	82.99	83.32	83.32	83.33	83.32
3144956	Manhole	2D	78.31	82.03	83.37	83.36	83.39	83.43	83.74	83.74	83.75	83.78

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
3144962	Manhole	2D	67.36	80.79	82.53	82.53	82.52	82.52	83.12	83.12	83.11	83.11
3144967	Manhole	2D	78.74	84.57	85.56	85.56	85.56	85.56	85.87	85.87	85.87	85.83
3146601	Manhole	2D	76.17	78.85	80.37	80.37	80.24	80.04	80.92	80.91	80.84	80.65
3146604	Manhole	2D	75.94	79.56	80.12	80.12	79.97	79.67	80.70	80.65	80.58	80.37
3146605	Manhole	2D	75.88	79.80	80.08	80.08	79.83	79.42	80.72	80.65	80.58	80.34
3146608	Manhole	2D	74.50	78.98	79.46	79.46	78.39	77.88	80.15	80.08	79.80	79.67
3146737	Manhole	2D	74.40	80.36	79.36	79.35	78.04	77.58	80.14	80.00	79.18	79.23
3146738	Manhole	2D	74.59	79.66	79.34	79.35	77.76	77.41	80.07	79.92	78.70	78.85
3146742	Manhole	2D	76.21	79.26	79.87	79.86	78.86	79.58	80.54	80.55	80.43	80.39
3146748	Manhole	2D	75.45	79.49	79.90	79.89	78.64	78.62	80.54	80.53	80.37	80.23
3146749	Manhole	2D	75.69	79.69	79.69	79.68	78.51	78.23	80.55	80.50	80.31	80.24
3146752	Manhole	2D	76.35	79.52	79.81	79.81	79.55	79.36	80.38	80.39	80.27	80.08
3146756	Manhole	2D	74.86	79.48	80.07	80.07	79.15	79.71	80.71	80.72	80.60	80.51
3146767	Manhole	2D	76.18	78.78	80.36	80.35	80.23	80.04	80.90	80.90	80.83	80.65
3146769	Manhole	2D	75.98	77.92	80.25	80.24	80.12	79.94	80.83	80.79	80.71	80.58
3175098	Manhole	2D	77.66	88.05	89.03	89.03	89.03	89.05	89.35	89.35	89.35	89.37
3175100	Manhole	2D	77.41	88.55	89.02	89.02	89.02	89.06	89.36	89.36	89.36	89.40
3175102	Manhole	2D	75.04	88.17	88.85	88.85	88.85	88.85	89.30	89.30	89.30	89.59
3175104	Manhole	2D	77.18	88.96	88.80	88.80	88.81	88.82	89.38	89.38	89.39	89.41
3175107	Manhole	2D	73.62	87.33	88.31	88.31	88.33	88.36	88.87	88.87	88.87	88.88
3175109	Manhole	2D	82.11	88.49	87.82	87.82	87.84	87.86	88.47	88.47	88.48	88.46
3175111	Manhole	2D	73.32	88.70	87.82	87.82	87.84	87.86	88.47	88.47	88.48	88.46
3175112	Manhole	2D	73.51	88.05	88.08	88.08	88.10	88.14	88.77	88.77	88.77	88.77
3175113	Manhole	2D	79.36	86.58	88.00	88.00	88.01	88.02	88.49	88.49	88.49	88.48
3175114	Manhole	Sealed	83.99	87.78	88.20	88.20	88.20	89.58	88.69	88.69	88.70	88.70
3175115	Manhole	2D	80.08	87.35	88.20	88.20	88.20	88.22	88.69	88.69	88.70	88.70
3175121	Manhole	2D	79.85	87.28	88.09	88.09	88.10	88.11	88.55	88.55	88.55	88.56
3175122	Manhole	Sealed	84.20	88.05	88.09	88.09	88.10	88.11	88.55	88.55	88.55	88.56
3175261	Manhole	Sealed	83.33	87.69	88.00	88.00	88.01	88.02	88.49	88.49	88.49	88.48
3175272	Manhole	2D	75.99	84.81	86.63	86.63	86.63	87.00	86.69	86.69	86.70	87.09
3175279	Manhole	2D	77.14	88.40	88.67	88.67	88.67	88.69	89.06	89.06	89.06	89.08
3176092	Manhole	2D	80.95	87.29	86.15	86.15	86.27	86.21	87.24	87.24	87.29	87.23
3176094	Manhole	2D	82.43	87.12	88.29	88.29	88.29	88.31	88.87	88.87	88.87	88.89
3176096	Manhole	2D	75.84	86.35	86.02	86.02	86.14	86.08	86.61	86.61	86.66	86.62
3176098	Manhole	2D	74.00	87.47	85.88	85.88	86.00	85.94	86.52	86.52	86.58	86.49
3176100	Manhole	Sealed	72.54	86.58	86.24	86.24	86.33	86.29	86.86	86.86	86.93	86.85
3176102	Manhole	Sealed	72.64	84.19	86.79	86.79	86.86	86.83	87.34	87.34	87.37	87.32
3176104	Manhole	2D	72.89	87.64	87.33	87.33	87.37	87.36	87.87	87.87	87.88	87.86
3176105	Manhole	2D	77.26	84.67	86.27	86.27	86.28	86.28	86.49	86.49	86.52	86.59
3176107	Manhole	2D	74.27	83.51	83.57	83.57	83.60	83.62	84.27	84.27	84.28	84.26
3176108	Manhole	2D	76.98	84.09	86.10	86.10	86.11	86.11	86.33	86.33	86.34	86.36
3176109	Manhole	2D	73.92	82.14	83.24	83.24	83.25	83.25	83.49	83.49	83.50	83.50
3176110	Manhole	2D	71.14	84.39	84.21	84.20	84.22	84.23	85.01	85.01	85.01	85.07
3176112	Manhole	2D	76.55	86.97	86.77	86.77	86.78	86.78	87.40	87.39	87.40	87.38
3176113	Manhole	2D	71.06	82.95	84.12	84.12	84.13	84.15	84.58	84.58	84.58	84.61
3176115	Manhole	Sealed	76.35	84.45	86.74	86.74	86.75	86.75	87.43	87.43	87.43	87.41
3176245	Manhole	2D	67.32	83.89	83.61	83.61	83.62	83.59	84.57	84.57	84.58	84.49
3176246	Manhole	2D	67.71	84.54	83.88	83.88	83.90	83.86	84.59	84.59	84.60	84.51
3176247	Manhole	2D	68.07	82.52	84.27	84.27	84.29	84.23	84.74	84.74	84.76	84.67
3176248	Manhole	2D	68.27	82.77	84.40	84.40	84.43	84.36	84.79	84.79	84.81	84.72
3176249	Manhole	2D	68.49	83.92	84.85	84.85	84.90	84.84	85.26	85.26	85.30	85.21
3176251	Manhole	2D	68.69	84.75	85.33	85.33	85.38	85.31	85.84	85.84	85.86	85.76
3176254	Manhole	2D	81.84	86.03	86.88	86.88	86.93	86.90	87.25	87.25	87.27	87.25
3176255	Manhole	2D	72.20	86.00	85.77	85.77	85.88	85.82	86.37	86.37	86.45	86.35
3176274	Manhole	2D	80.43	84.61	85.34	85.34	85.34	85.37	85.50	85.50	85.50	85.53
3176275	Manhole	2D	80.30	85.87	86.40	86.39	86.40	86.36	86.62	86.62	86.62	86.59
3177634	Manhole	2D	79.71	87.65	88.07	88.07	88.08	88.09	88.55	88.55	88.56	88.56
3177638	Manhole	2D	79.68	87.33	88.06	88.06	88.06	88.07	88.55	88.55	88.56	88.57
3177642	Manhole	2D	78.84	86.89	87.89	87.89	87.89	87.89	88.32	88.32	88.32	88.33
3177643	Manhole	2D	83.57	88.12	88.23	88.23	88.23	88.23	88.72	88.72	88.73	88.74
3177646	Manhole	2D	86.11	88.46	88.65	88.65	88.65	88.70	88.91	88.91	88.91	89.00
3177647	Outfall	Stored	85.84	87.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3177653	Manhole	2D	78.58	86.83	87.89	87.89	87.90	87.88	88.31	88.31	88.31	88.32
3177657	Manhole	2D	86.26	89.10	88.66	88.66	88.66	88.70	88.91	88.91	88.91	89.00
3177664	Manhole	2D	78.15	86.60	87.89	87.89	87.89	87.87	88.30	88.30	88.30	88.30
3177674	Manhole	2D	76.68	86.18	87.17	87.17	87.17	87.11	87.67	87.67	87.67	87.65

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
3177675	Manhole	2D	83.41	87.41	87.54	87.54	87.54	87.53	87.89	87.89	87.89	87.84
3177677	Manhole	2D	76.61	86.37	87.25	87.25	87.25	87.16	87.90	87.90	87.91	87.88
3177678	Manhole	2D	83.13	87.15	87.62	87.62	87.62	87.57	88.17	88.17	88.17	88.16
3177683	Manhole	2D	75.55	85.83	87.16	87.16	87.16	87.04	87.83	87.83	87.83	87.78
3177966	Manhole	Sealed	86.38	88.03	88.66	88.66	88.66	88.71	88.91	88.91	88.91	89.00
3177985	Manhole	Sealed	83.13	86.53	87.16	87.16	87.16	87.04	87.83	87.83	87.83	87.78
3177990	Manhole	2D	84.10	86.57	87.86	87.86	87.87	87.85	88.22	88.22	88.22	88.22
3178003	Manhole	Sealed	83.64	87.40	87.89	87.89	87.90	87.88	88.31	88.31	88.32	88.32
3178015	Manhole	2D	84.25	87.45	87.95	87.95	87.96	87.97	88.32	88.32	88.32	88.32
3178751	Manhole	2D	81.27	85.84	86.52	86.52	86.52	86.48	86.83	86.83	86.84	86.80
3178752	Manhole	2D	81.01	86.71	87.23	87.23	87.23	87.22	87.57	87.57	87.57	87.58
3178753	Manhole	2D	74.12	86.85	86.74	86.74	86.75	86.75	87.34	87.34	87.34	87.33
3178754	Manhole	2D	70.82	83.86	84.33	84.33	84.35	84.35	84.99	84.99	84.99	84.99
3178755	Manhole	2D	80.07	85.89	86.50	86.50	86.50	86.44	86.85	86.85	86.85	86.81
3178756	Manhole	2D	70.71	83.61	84.32	84.32	84.34	84.34	84.95	84.95	84.95	84.95
3178758	Manhole	2D	75.82	85.86	86.46	86.46	86.63	86.62	86.67	86.67	86.88	86.87
3178759	Manhole	2D	75.97	85.42	86.24	86.24	86.25	86.20	86.39	86.39	86.42	86.36
3178760	Manhole	2D	76.09	86.02	86.61	86.61	86.62	86.59	86.80	86.80	86.84	86.80
3178761	Manhole	2D	76.25	85.68	86.43	86.42	86.54	86.53	86.61	86.61	86.78	86.77
3178762	Manhole	2D	75.67	87.54	86.69	86.69	86.71	86.69	87.27	87.27	87.27	87.26
3178763	Manhole	2D	79.54	86.93	86.75	86.75	86.85	86.81	87.17	87.17	87.22	87.23
3178765	Manhole	2D	77.44	86.00	86.52	86.51	86.64	86.61	86.74	86.74	87.04	87.04
3178767	Manhole	2D	69.73	83.51	84.35	84.35	84.36	84.37	85.08	85.08	85.08	85.09
3178768	Manhole	Sealed	69.76	83.37	84.37	84.37	84.39	84.41	85.10	85.10	85.11	85.13
3178769	Manhole	2D	69.81	84.18	84.43	84.43	84.45	84.50	85.17	85.17	85.17	85.23
3178770	Manhole	2D	69.85	84.36	84.47	84.47	84.48	84.54	85.26	85.26	85.27	85.32
3178771	Manhole	2D	69.98	85.15	84.57	84.57	84.58	84.64	85.37	85.37	85.37	85.42
3178772	Manhole	2D	70.16	85.53	84.75	84.75	84.76	84.84	85.68	85.68	85.68	85.76
3178773	Manhole	2D	70.18	84.71	84.67	84.66	84.67	84.73	85.25	85.25	85.25	85.28
3178775	Manhole	2D	77.97	87.23	86.72	86.72	86.73	86.69	88.04	88.04	88.04	88.03
3178778	Manhole	2D	77.00	86.36	86.73	86.73	86.74	86.71	87.06	87.06	87.06	87.05
3178779	Manhole	2D	76.99	86.52	86.87	86.87	86.87	86.94	87.27	87.27	87.27	87.32
3178781	Manhole	2D	70.33	83.50	84.49	84.49	84.50	84.53	85.09	85.09	85.09	85.12
3178783	Manhole	2D	70.35	83.66	84.50	84.50	84.51	84.55	85.22	85.22	85.23	85.26
3178785	Manhole	2D	74.07	87.55	86.81	86.81	86.81	86.77	87.67	87.67	87.68	87.66
3178787	Manhole	2D	74.91	87.97	86.51	86.51	86.51	86.46	87.30	87.30	87.32	87.29
3178788	Manhole	2D	77.82	87.46	86.47	86.47	86.47	86.45	87.07	87.07	87.08	87.05
3178790	Manhole	2D	70.52	85.89	84.41	84.41	84.42	84.45	85.15	85.15	85.17	85.19
3178791	Manhole	2D	70.70	85.77	84.37	84.37	84.38	84.42	85.14	85.14	85.16	85.18
3178792	Manhole	2D	77.89	87.28	85.84	85.83	85.79	85.64	86.89	86.88	86.86	86.78
3178793	Manhole	2D	78.67	87.00	86.18	86.17	86.15	86.03	87.12	87.12	87.12	87.06
3178794	Manhole	2D	77.10	87.25	87.65	87.65	87.65	87.63	88.03	88.03	88.03	88.04
3178797	Manhole	2D	78.91	86.64	86.48	86.47	86.46	86.38	87.06	87.06	87.05	87.03
3178987	Manhole	2D	75.10	82.12	83.61	83.61	83.61	83.59	83.71	83.71	83.72	83.70
3178988	Manhole	2D	75.30	81.77	83.85	83.85	83.86	83.87	84.05	84.05	84.05	84.04
3178989	Manhole	2D	75.30	81.97	84.02	84.02	84.03	84.05	84.72	84.72	84.73	84.73
3178992	Manhole	2D	74.16	84.47	85.36	85.36	85.37	85.49	85.59	85.59	85.59	85.70
3179002	Manhole	2D	80.15	85.69	86.35	86.35	86.35	86.34	86.62	86.62	86.63	86.64
3179010	Manhole	2D	79.92	84.31	84.97	84.97	84.97	84.95	85.16	85.16	85.16	85.15
3179011	Manhole	2D	79.72	85.28	86.73	86.73	86.73	86.68	86.98	86.98	86.98	86.94
3179012	Manhole	2D	79.42	84.33	85.23	85.23	85.23	85.23	85.44	85.44	85.44	85.45
3179013	Manhole	2D	79.42	84.93	85.30	85.30	85.30	85.29	85.49	85.49	85.49	85.48
3179018	Manhole	2D	79.92	84.78	85.41	85.41	85.41	85.31	85.59	85.59	85.59	85.51
3179019	Manhole	2D	79.92	84.52	84.82	84.82	84.82	84.79	84.97	84.97	84.98	84.90
3179020	Manhole	2D	77.00	85.29	86.50	86.50	86.50	86.45	86.74	86.74	86.74	86.68
3179021	Manhole	2D	77.00	85.20	86.19	86.19	86.19	86.13	86.39	86.39	86.39	86.32
3179024	Manhole	2D	78.62	86.51	86.47	86.47	86.47	86.47	87.06	87.06	87.07	87.04
3179025	Manhole	2D	80.52	86.17	86.35	86.35	86.35	86.30	86.42	86.42	86.43	86.38
3179029	Manhole	2D	80.62	85.93	86.47	86.47	86.47	86.40	86.67	86.67	86.67	86.57
3179030	Manhole	2D	77.52	85.37	86.08	86.08	86.08	86.05	86.26	86.26	86.26	86.26
3218806	Manhole	2D	74.90	82.11	82.88	82.87	82.90	82.90	83.82	83.81	83.79	83.80
3218808	Manhole	2D	66.42	80.01	81.43	81.38	81.42	81.41	81.96	81.92	81.94	81.94
3218814	Manhole	2D	67.03	81.14	81.83	81.81	81.83	81.81	82.32	82.31	82.31	82.30
3218819	Manhole	2D	67.38	81.76	82.30	82.29	82.30	82.27	82.91	82.91	82.91	82.88
3218824	Manhole	2D	67.97	81.52	82.65	82.64	82.65	82.61	83.21	83.21	83.21	83.18
3218829	Manhole	2D	68.48	81.82	83.03	83.03	83.03	83.01	83.70	83.71	83.69	83.69

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
3218832	Manhole	2D	71.01	81.83	81.54	81.54	81.53	81.56	82.38	82.38	82.38	82.36
3218866	Manhole	2D	68.68	82.82	80.19	80.20	80.20	80.19	80.93	80.94	80.92	80.91
3218873	Manhole	2D	68.03	78.12	78.69	78.67	78.70	78.69	78.98	78.97	78.96	78.96
3219151	Manhole	2D	77.96	81.42	81.81	81.80	81.82	81.76	82.26	82.25	82.26	82.21
3219152	Manhole	2D	77.46	81.10	81.94	81.93	81.95	81.93	82.42	82.41	82.42	82.42
3219153	Manhole	2D	76.51	79.55	81.52	81.48	81.51	81.50	82.04	82.02	82.03	82.04
3219183	Manhole	2D	71.37	79.07	80.02	80.01	80.02	79.99	80.63	80.61	80.62	80.60
3219184	Manhole	2D	71.01	78.89	80.09	80.08	80.09	80.07	80.72	80.71	80.72	80.71
3219186	Manhole	2D	71.09	77.91	76.89	76.87	76.93	76.91	77.99	77.95	77.98	77.96
3219196	Manhole	2D	73.18	78.02	78.08	78.07	78.09	78.10	78.43	78.40	78.42	78.43
3219197	Manhole	2D	73.00	77.14	77.87	77.86	77.88	77.87	78.31	78.27	78.30	78.29
3219198	Manhole	2D	74.31	78.20	78.63	78.62	78.64	78.64	78.75	78.74	78.75	78.75
3219200	Manhole	2D	69.47	73.94	74.85	74.84	74.88	74.88	75.52	75.38	75.53	75.52
3219201	Manhole	2D	68.99	73.72	75.69	75.67	75.72	75.68	76.39	76.25	76.40	76.37
3221259	Manhole	2D	67.45	77.67	77.72	77.62	77.78	77.76	78.33	78.26	78.24	78.23
3221268	Manhole	2D	66.97	76.97	77.11	76.97	77.20	77.17	78.04	77.89	77.94	77.84
3221271	Manhole	2D	66.69	77.55	76.21	75.99	76.36	76.30	77.51	77.17	77.41	77.32
3221280	Manhole	Sealed	66.76	78.13	75.66	75.37	75.82	75.74	77.00	76.57	76.96	76.91
3234001	Manhole	Stored	68.06	83.95	87.11	87.11	87.12	87.11	88.63	88.63	88.64	88.63
3234041	Manhole	2D	73.73	84.44	83.72	83.72	83.73	83.71	84.66	84.66	84.66	84.66
3234043	Manhole	2D	70.93	85.69	83.31	83.31	83.33	83.33	84.89	84.89	84.90	84.84
3234049	Manhole	Sealed	71.87	85.05	83.82	83.81	83.85	83.87	85.47	85.47	85.49	85.48
3234050	Manhole	2D	80.33	84.19	83.58	83.58	83.66	83.71	84.78	84.77	84.78	84.81
3234051	Manhole	Sealed	74.97	83.42	84.11	84.11	84.12	84.10	85.26	85.26	85.27	85.26
3234052	Manhole	Sealed	74.51	84.14	83.96	83.96	83.97	83.96	84.81	84.81	84.82	84.81
3234054	Manhole	Sealed	75.48	83.87	84.11	84.11	84.12	84.10	85.23	85.23	85.24	85.23
3234057	Manhole	2D	72.25	84.99	83.82	83.82	83.85	83.87	85.47	85.47	85.49	85.48
3234058	Manhole	Sealed	70.15	85.12	70.25	70.25	70.40	70.40	79.73	79.88	74.17	73.89
3234059	Manhole	Sealed	72.67	85.43	83.82	83.82	83.85	83.87	85.45	85.45	85.47	85.46
3234307	Manhole	2D	67.04	83.32	83.09	83.09	83.10	83.08	84.51	84.51	84.52	84.41
3234312	Manhole	2D	67.60	83.31	84.66	84.66	84.66	84.65	85.15	85.15	85.16	85.14
3234315	Manhole	Sealed	66.85	83.59	82.59	82.59	82.61	82.59	84.38	84.38	84.39	84.29
3236559	Manhole	2D	73.27	84.24	84.24	84.24	84.25	84.25	84.95	84.95	84.95	84.93
3236568	Manhole	Sealed	73.15	85.01	83.72	83.71	83.74	83.74	84.78	84.76	84.78	84.78
3236569	Manhole	Sealed	73.23	85.23	83.73	83.72	83.74	83.75	84.83	84.81	84.82	84.82
3236576	Manhole	2D	72.23	84.13	84.07	84.07	84.08	84.08	84.96	84.96	84.97	84.97
3236582	Manhole	2D	72.70	85.11	83.71	83.70	83.72	83.72	84.78	84.76	84.78	84.78
3236584	Manhole	2D	66.58	84.75	83.71	83.69	83.72	83.72	84.78	84.76	84.78	84.78
3236585	Manhole	Sealed	69.35	85.24	83.80	83.79	83.81	83.81	84.86	84.85	84.86	84.86
3236588	Manhole	Sealed	73.98	85.30	83.63	83.62	83.64	83.63	84.35	84.34	84.35	84.34
3236589	Manhole	Sealed	74.01	85.00	83.33	83.33	83.33	83.29	83.98	83.97	83.98	83.94
3236590	Manhole	Sealed	71.95	83.86	84.03	84.02	84.04	84.04	84.90	84.89	84.90	84.90
3236593	Manhole	Sealed	69.54	83.91	84.02	84.01	84.03	84.03	84.92	84.91	84.92	84.92
3236596	Manhole	Sealed	69.91	83.99	83.78	83.78	83.79	83.77	84.56	84.55	84.56	84.55
3236615	Manhole	Sealed	66.38	84.77	83.34	83.32	83.35	83.35	84.49	84.46	84.48	84.49
3236631	Manhole	Sealed	65.27	82.69	81.87	81.79	81.88	81.86	83.03	82.89	82.97	82.97
3236632	Manhole	Sealed	65.43	82.61	82.36	82.30	82.36	82.35	83.52	83.42	83.47	83.48
3236633	Manhole	Sealed	65.63	84.05	82.92	82.89	82.92	82.92	83.89	83.84	83.87	83.88
3236634	Manhole	Sealed	65.62	83.63	82.67	82.63	82.67	82.66	83.70	83.63	83.67	83.67
3236636	Manhole	2D	74.13	82.53	82.76	82.75	82.76	82.76	83.09	83.08	83.09	83.11
4161810	Manhole	2D	80.88	84.03	83.74	83.73	83.61	83.32	84.87	84.87	84.79	84.67
4161811	Manhole	2D	82.15	82.81	83.68	83.67	83.63	83.54	84.33	84.33	84.30	84.19
4161812	Manhole	2D	78.52	83.26	83.62	83.61	83.59	83.55	84.16	84.16	84.13	83.94
4165577	Manhole	Sealed	70.86	77.95	75.86	75.60	75.75	75.64	77.45	77.08	77.13	76.92
4165579	Manhole	Sealed	72.04	78.61	76.91	76.65	76.76	76.65	78.48	78.33	78.24	78.08
4165581	Manhole	Sealed	72.60	77.91	77.17	76.91	76.99	76.93	78.58	78.53	78.47	78.34
4165583	Manhole	Sealed	73.46	78.72	77.21	76.96	77.03	76.98	78.78	78.76	78.71	78.60
4165583!_2D	Manhole	2D	77.86	77.89	78.15	78.13	78.08	78.07	78.81	78.80	78.75	78.67
4165585	Manhole	Sealed	71.93	78.30	73.54	73.54	73.54	73.54	78.64	78.62	78.58	78.51
4165604	Manhole	Sealed	72.50	78.78	75.86	75.60	75.75	75.64	77.45	77.08	77.13	76.92
4165604!_2D	Manhole	2D	77.91	77.95	78.05	78.05	78.05	78.05	78.09	78.09	78.09	78.09
4165605	Manhole	Sealed	72.50	79.39	75.87	75.60	75.75	75.65	77.56	77.16	77.19	76.95
4165605!_2D	Manhole	2D	78.52	78.56	78.74	78.74	78.74	78.74	79.07	79.05	79.00	78.90
4165607	Manhole	Sealed	73.10	78.81	77.17	76.91	76.99	76.93	78.52	78.48	78.43	78.32
4165607!_2D	Manhole	2D	77.94	77.98	78.03	78.03	78.03	78.03	78.36	78.34	78.29	78.21
4165610	Manhole	Sealed	73.96	78.83	77.21	76.96	77.03	76.98	78.77	78.76	78.71	78.60

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
4165610!_2D	Manhole	2D	77.96	78.00	78.12	78.11	78.10	78.08	78.76	78.74	78.69	78.61
4165614	Manhole	2D	72.13	79.44	73.60	73.60	73.61	73.61	78.66	78.63	78.56	78.41
4165616	Manhole	2D	72.19	78.71	73.69	73.69	73.69	73.69	78.77	78.75	78.68	78.47
5000	Manhole	Sealed	69.54	78.15	76.71	76.58	76.62	76.48	78.09	77.99	77.90	77.78
5000!_2D	Manhole	2D	77.28	77.32	77.37	77.36	77.38	77.39	78.01	77.92	77.88	77.78
5001	Manhole	2D	79.15	86.18	86.76	86.75	86.74	86.69	87.34	87.34	87.34	87.33
5005	Manhole	2D	67.93	77.93	78.53	78.48	78.53	78.51	78.84	78.81	78.82	78.81
5007	Manhole	2D	70.48	82.14	83.44	83.42	83.32	83.23	84.00	84.00	84.30	83.84
5010	Manhole	2D	75.73	83.90	83.22	83.22	83.19	82.46	84.09	84.09	84.08	83.72
5013	Manhole	2D	74.77	85.74	86.49	86.49	86.49	86.32	87.39	87.39	87.39	87.31
5022	Manhole	Sealed	70.05	82.53	82.94	82.93	82.93	82.91	83.61	83.63	92.88	83.57
5023	Manhole	2D	69.70	82.26	82.49	82.49	82.47	82.45	83.35	83.36	83.35	83.28
5025	Manhole	2D	69.64	82.43	81.81	81.84	81.82	81.79	82.88	82.90	82.87	82.85
5026	Manhole	2D	69.21	82.67	81.57	81.59	81.57	81.54	82.62	82.65	82.61	82.59
5027	Manhole	2D	69.20	82.76	81.11	81.12	81.11	81.09	82.09	82.11	82.08	82.07
5028	Manhole	2D	67.58	77.88	77.94	77.85	77.99	77.97	78.47	78.41	78.44	78.42
5029	Manhole	2D	72.36	78.87	78.97	78.97	78.98	78.98	79.17	79.17	79.17	79.18
5030	Manhole	2D	70.22	78.20	78.44	78.42	78.45	78.46	78.66	78.64	78.65	78.67
5031	Manhole	2D	69.43	77.19	76.39	76.22	76.33	76.18	78.00	77.89	77.83	77.73
5032	Manhole	2D	69.07	77.09	76.03	75.82	75.96	75.82	77.86	77.66	77.64	77.53
5033	Manhole	Sealed	66.69	77.94	75.87	75.61	76.03	75.96	77.21	76.80	77.13	77.07
5034	Manhole	2D	68.29	77.93	75.46	75.19	75.36	75.24	76.91	76.53	76.63	76.63
5057	Manhole	Sealed	70.12	77.11	77.40	77.33	77.25	77.12	78.40	78.36	78.11	77.95
5058	Manhole	2D	75.00	78.19	78.62	78.61	78.63	78.63	78.93	78.92	78.92	78.93
5059	Manhole	2D	69.58	82.77	83.37	83.33	83.33	83.24	83.93	83.93	84.53	83.86
5218	Outfall	Sealed	70.05	80.39	79.42	79.42	79.42	78.20	80.23	80.23	80.23	80.06
5225	Manhole	2D	68.99	76.36	76.55	76.42	76.64	76.61	77.84	77.72	77.73	77.70
5251	Outfall	Sealed	70.05	82.23	79.46	79.46	79.46	78.27	80.25	80.25	80.25	80.07
5360	Manhole	2D	72.04	77.99	73.54	73.54	73.54	73.54	78.66	78.65	78.60	78.53
5361	Manhole	Sealed	71.93	78.87	73.54	73.54	73.54	73.54	78.60	78.57	78.49	78.40
5632	Outfall	Sealed	70.05	82.31	79.45	79.45	79.45	78.24	80.24	80.24	80.24	80.06
5654	Manhole	2D	72.17	78.84	80.24	80.24	80.24	80.16	81.23	81.23	81.20	81.12
5659	Manhole	2D	71.87	79.35	80.47	80.47	80.46	80.38	81.53	81.53	81.48	81.41
5665	Manhole	2D	72.01	80.28	80.48	80.48	80.46	80.37	81.53	81.52	81.45	81.38
5669	Manhole	2D	71.87	81.55	80.45	80.45	80.42	80.33	81.27	81.26	81.19	81.07
5671	Manhole	2D	71.54	79.60	80.39	80.39	80.37	80.27	80.88	80.87	80.84	80.91
5708649	Manhole	2D	71.13	75.87	76.57	76.48	76.65	76.62	77.57	77.42	77.52	77.50
5708650	Manhole	2D	70.60	75.43	76.55	76.42	76.64	76.57	77.83	77.72	77.72	77.63
5708651	Manhole	2D	70.70	75.40	76.79	76.66	76.89	76.84	78.11	78.00	78.00	77.94
5708685	Manhole	2D	70.87	75.64	76.84	76.81	76.89	76.86	77.64	77.51	77.60	77.56
5708686	Manhole	2D	70.70	75.51	76.92	76.87	76.99	76.93	78.42	78.30	78.30	78.18
5708689	Manhole	2D	70.70	75.01	77.16	77.12	77.23	77.16	78.26	78.15	78.17	78.05
5744	Manhole	Sealed	71.93	71.33	80.49	80.49	80.48	80.40	81.56	81.55	81.51	81.43
5750	Manhole	2D	70.83	78.63	79.53	79.51	79.47	78.68	80.08	80.06	80.04	79.92
5763	Manhole	2D	71.77	78.85	79.53	79.50	79.51	79.10	80.10	80.02	80.04	79.90
5765	Manhole	2D	71.99	77.90	79.45	79.49	79.50	79.12	79.95	80.03	80.04	79.91
5770	Manhole	2D	72.22	79.20	79.79	79.77	79.71	79.35	80.40	80.40	80.34	80.19
5771	Manhole	2D	72.42	79.15	79.83	79.79	79.73	79.36	80.41	80.40	80.35	80.20
5774	Manhole	2D	70.59	78.56	71.93	71.93	71.94	71.94	74.45	74.43	74.41	74.31
5776	Manhole	2D	68.49	77.39	70.81	70.81	70.83	70.83	72.25	72.25	72.25	72.21
5779	Manhole	2D	69.08	76.90	71.46	71.46	71.48	71.48	73.63	73.62	73.61	73.55
5784	Pond	Sealed	53.60	64.30	78.84	78.84	78.76	78.17	81.78	81.78	81.75	81.72
5788-1	Manhole	2D	73.70	78.85	79.36	79.35	77.64	77.41	79.94	79.91	78.34	78.62
5788-2	Manhole	2D	73.70	78.49	79.34	79.34	77.64	77.41	79.84	79.82	78.34	78.59
5788-3	Manhole	2D	73.70	78.96	79.37	79.36	77.64	77.41	79.97	79.95	78.34	78.63
5804	Manhole	2D	74.54	79.97	79.68	79.67	78.51	78.23	80.41	80.36	80.17	80.06
5809	Manhole	2D	74.58	79.72	79.89	79.88	78.64	78.62	80.56	80.56	80.42	80.28
5816	Manhole	2D	68.32	76.86	75.40	75.06	75.40	75.39	77.21	76.93	77.22	77.19
5817	Manhole	2D	68.46	75.99	76.09	75.98	76.22	76.16	77.44	77.27	77.39	77.39
5819	Manhole	2D	74.60	79.59	80.07	80.05	78.86	79.30	80.74	80.75	80.63	80.48
5822	Manhole	2D	74.60	79.56	80.02	80.01	79.00	79.36	80.66	80.67	80.54	80.39
5825	Manhole	2D	66.42	75.31	75.45	75.36	75.50	75.46	76.19	76.04	76.21	76.19
5826	Manhole	2D	65.41	75.39	75.12	74.81	75.12	75.10	76.19	75.97	76.18	76.17
5827	Manhole	2D	65.23	76.75	74.90	74.44	74.90	74.82	76.24	75.73	76.11	76.11
5830	Manhole	2D	74.85	79.65	79.84	79.83	79.12	79.36	80.34	80.35	80.24	80.02
5837	Manhole	2D	73.62	77.80	79.98	79.98	79.90	79.52	80.50	80.51	80.40	80.28

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
5839	Manhole	2D	73.62	77.95	79.86	79.86	79.78	79.33	80.38	80.39	80.28	80.06
5849	Manhole	2D	70.16	75.26	76.98	76.93	77.04	77.01	78.08	77.98	77.99	77.92
5850	Manhole	2D	69.55	76.10	76.93	76.89	76.98	76.96	78.38	78.25	78.26	78.19
5854	Manhole	2D	66.74	74.96	75.55	75.52	75.59	75.56	76.24	76.10	76.25	76.24
5860	Manhole	Sealed	67.44	74.21	75.65	75.64	75.69	75.65	76.26	76.24	76.27	76.25
5861	Manhole	2D	66.41	74.17	75.64	75.62	75.63	75.61	76.31	76.15	76.31	76.25
5868	Manhole	Sealed	71.01	76.74	76.89	76.87	76.93	76.91	77.73	77.65	77.72	77.70
5870	Manhole	2D	71.07	78.32	76.89	76.87	76.93	76.91	77.99	77.95	77.98	77.96
5874	Manhole	2D	73.00	77.31	78.08	78.07	78.09	78.10	78.53	78.50	78.52	78.54
5876	Manhole	2D	71.91	78.58	79.06	79.02	79.07	79.06	79.63	79.59	79.61	79.61
5879	Manhole	2D	77.00	81.66	81.98	82.12	81.98	81.97	83.43	83.88	83.42	83.45
5881	Manhole	2D	74.32	87.25	84.62	84.62	84.64	84.60	87.16	87.17	87.17	87.16
5887	Manhole	2D	71.86	78.74	79.05	79.00	79.06	79.05	79.62	79.57	79.60	79.61
5888	Manhole	2D	71.65	78.78	79.02	78.94	79.03	79.02	79.71	79.64	79.68	79.68
5890	Manhole	2D	72.85	86.68	84.86	84.85	84.79	84.53	86.17	86.16	86.09	85.92
5891	Manhole	2D	73.41	86.98	85.66	85.65	85.62	85.45	86.80	86.80	86.79	86.66
5895	Manhole	Sealed	71.38	79.22	78.98	78.85	78.98	78.97	79.85	79.68	79.78	79.78
5896	Manhole	Sealed	71.06	80.70	78.93	78.75	78.93	78.91	80.01	79.74	79.88	79.88
5897	Manhole	2D	71.01	77.23	79.26	79.26	79.26	79.30	80.03	80.03	80.03	80.00
5897-1	Outfall	Stored	73.01	71.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5902	Manhole	2D	77.62	87.35	86.98	86.98	86.98	86.94	87.92	87.93	87.93	87.89
5905	Manhole	2D	74.25	87.86	86.24	86.23	86.22	86.13	87.15	87.15	87.19	87.12
5906134	Manhole	2D	74.65	86.99	84.72	84.72	84.74	84.70	87.24	87.24	87.24	87.23
5906135	Manhole	2D	74.78	87.05	85.16	85.16	85.18	85.14	87.42	87.42	87.42	87.41
5906136	Manhole	2D	74.82	86.77	85.34	85.34	85.35	85.32	87.50	87.50	87.50	87.49
5906137	Manhole	2D	74.87	86.81	85.51	85.51	85.53	85.49	87.58	87.58	87.59	87.57
5906138	Manhole	2D	75.02	87.13	85.86	85.86	85.87	85.83	87.77	87.77	87.77	87.75
5906139	Manhole	2D	75.25	87.15	86.24	86.24	86.25	86.22	87.94	87.94	87.94	87.93
5906140	Manhole	2D	75.32	86.66	86.35	86.35	86.37	86.33	87.95	87.95	87.96	87.94
5906141	Manhole	2D	75.36	87.10	86.96	86.96	86.96	86.93	88.18	88.19	88.18	88.17
5906142	Manhole	2D	75.41	86.97	87.04	87.04	87.04	87.01	88.19	88.19	88.19	88.17
5906143	Manhole	2D	75.62	87.63	87.27	87.27	87.27	87.24	88.38	88.38	88.38	88.37
5906172	Manhole	2D	77.57	87.59	86.97	86.97	86.97	86.93	88.28	88.28	88.28	88.23
5906175	Manhole	2D	76.31	86.46	86.28	86.28	86.29	86.25	87.89	87.89	87.89	87.88
5906176	Manhole	2D	77.96	88.14	86.57	86.57	86.58	86.54	87.80	87.81	87.81	87.77
5906177	Manhole	2D	78.65	86.57	86.89	86.89	86.90	86.86	87.70	87.70	87.70	87.65
5906183	Manhole	2D	76.20	86.56	85.95	85.95	85.97	85.88	87.42	87.43	87.43	87.36
5906184	Manhole	2D	76.81	86.29	86.70	86.70	86.70	86.50	87.80	87.80	87.80	87.77
5906227	Manhole	2D	76.76	86.16	86.40	86.40	86.40	86.16	87.54	87.54	87.54	87.51
5906228	Manhole	2D	76.78	86.38	86.44	86.44	86.45	86.22	87.57	87.57	87.57	87.54
5906232	Manhole	2D	82.44	86.53	88.09	88.09	88.10	88.10	88.54	88.54	88.54	88.55
5906233	Manhole	2D	82.09	88.12	87.85	87.85	87.86	87.85	88.54	88.54	88.54	88.53
5906234	Manhole	2D	81.50	86.83	87.54	87.54	87.55	87.54	88.38	88.38	88.38	88.38
5906250	Manhole	2D	79.63	86.92	87.67	87.67	87.67	87.62	88.32	88.32	88.32	88.32
5906258	Manhole	2D	77.06	85.84	86.55	86.55	86.55	86.39	87.25	87.25	87.25	87.17
5906312	Manhole	2D	75.76	86.85	87.41	87.41	87.41	87.38	88.41	88.41	88.41	88.40
5906313	Manhole	2D	75.81	87.27	87.51	87.51	87.52	87.48	88.53	88.53	88.53	88.51
5906314	Manhole	2D	76.86	89.04	87.89	87.89	87.89	87.84	89.26	89.26	89.27	89.20
5906316	Manhole	2D	78.23	87.67	87.93	87.93	87.94	87.91	88.63	88.63	88.63	88.61
5906317	Manhole	2D	78.33	87.08	87.94	87.94	87.94	87.92	88.57	88.57	88.57	88.55
5906318	Manhole	Sealed	76.94	87.23	87.88	87.88	87.88	87.84	89.07	89.07	89.08	89.03
5906319	Manhole	2D	78.02	86.76	87.66	87.66	87.66	87.69	88.07	88.07	88.07	88.11
5906321	Manhole	2D	78.36	88.03	87.95	87.95	87.95	87.96	88.47	88.47	88.47	88.48
5906330	Manhole	2D	80.19	87.05	88.12	88.12	88.12	88.11	88.52	88.52	88.53	88.53
5906331	Manhole	2D	78.84	86.74	87.98	87.98	87.98	88.00	88.53	88.53	88.53	88.54
5906359	Manhole	2D	78.45	86.87	88.09	88.09	88.09	88.10	88.69	88.69	88.70	88.71
5906361	Manhole	2D	79.07	86.97	88.18	88.18	88.18	88.18	88.68	88.68	88.69	88.67
5906388	Manhole	2D	75.90	87.17	87.53	87.53	87.53	87.50	88.53	88.53	88.53	88.51
5906390	Manhole	2D	78.06	87.55	87.51	87.51	87.52	87.48	88.37	88.37	88.37	88.33
5906410	Manhole	2D	80.37	86.45	88.20	88.20	88.20	88.15	88.78	88.78	88.78	88.72
5906476	Manhole	2D	79.70	86.77	88.21	88.21	88.21	88.23	88.71	88.71	88.71	88.70
5906479	Manhole	2D	79.77	86.89	88.24	88.24	88.25	88.26	88.75	88.75	88.75	88.75
5906481	Manhole	2D	80.92	88.24	88.46	88.46	88.47	88.44	89.28	89.28	89.28	89.27
5916	Manhole	2D	75.91	87.40	87.58	87.58	87.58	87.55	88.53	88.53	88.54	88.52
5921	Manhole	2D	74.00	87.91	86.62	86.62	86.63	86.60	87.32	87.32	87.34	87.31
5923	Manhole	2D	75.17	87.83	86.66	86.66	86.67	86.65	87.32	87.32	87.33	87.32

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
5926	Manhole	2D	75.41	87.25	86.68	86.68	86.70	86.67	87.30	87.30	87.31	87.30
5928	Manhole	2D	77.97	86.42	87.39	87.39	87.39	87.37	87.74	87.74	87.74	87.75
5929	Manhole	2D	78.04	86.68	87.77	87.77	87.77	87.75	88.14	88.14	88.14	88.15
5940	Manhole	Sealed	76.45	87.51	88.09	88.09	88.10	88.07	88.73	88.73	88.73	88.72
5942	Manhole	2D	79.70	81.74	83.38	83.38	83.39	83.31	84.00	84.00	84.01	83.92
5952	Manhole	2D	75.96	86.68	86.73	86.73	86.74	86.74	87.24	87.24	87.25	87.24
5960	Manhole	2D	76.44	86.83	86.74	86.74	86.75	86.75	87.47	87.47	87.48	87.44
5963	Manhole	2D	76.77	84.92	86.66	86.66	86.67	86.67	86.99	86.99	87.00	87.00
5967	Manhole	2D	73.20	87.38	87.60	87.60	87.63	87.63	88.18	88.18	88.19	88.16
5968	Manhole	2D	73.07	87.74	87.46	87.46	87.50	87.49	88.00	88.00	88.01	87.99
5974	Manhole	2D	72.69	87.07	86.92	86.92	86.98	86.96	87.44	87.44	87.47	87.42
5979	Manhole	2D	68.55	86.16	85.07	85.07	85.12	85.04	85.54	85.54	85.57	85.46
5982	Manhole	2D	68.34	84.50	84.64	84.64	84.72	84.67	85.08	85.08	85.15	85.07
5985	Manhole	2D	68.14	84.64	84.35	84.35	84.38	84.31	84.78	84.78	84.80	84.71
5988	Manhole	2D	67.97	83.10	84.21	84.21	84.23	84.17	84.73	84.73	84.75	84.66
5990	Manhole	2D	67.84	83.17	84.05	84.05	84.07	84.01	84.64	84.64	84.65	84.56
5993	Manhole	2D	67.77	83.07	83.95	83.95	83.97	83.92	84.59	84.59	84.60	84.51
5997	Manhole	2D	67.64	84.99	83.82	83.82	83.83	83.79	84.59	84.59	84.60	84.51
5999	Manhole	2D	67.58	85.14	83.76	83.76	83.77	83.73	84.58	84.58	84.59	84.50
6003	Manhole	2D	67.45	84.29	83.67	83.67	83.68	83.64	84.58	84.58	84.58	84.50
6006	Manhole	2D	67.20	84.46	83.52	83.52	83.53	83.50	84.57	84.57	84.57	84.49
6013	Manhole	2D	67.00	84.79	82.92	82.92	82.94	82.91	84.47	84.47	84.48	84.38
6016	Manhole	Sealed	66.60	83.54	82.19	82.19	82.21	82.19	84.25	84.25	84.26	84.16
6018	Manhole	2D	67.16	84.05	83.72	83.71	83.72	83.68	84.70	84.70	84.70	84.66
6021	Manhole	2D	73.84	87.51	88.50	88.50	88.51	88.53	88.93	88.93	88.94	88.94
6023	Manhole	2D	73.94	87.72	88.67	88.67	88.68	88.68	89.11	89.11	89.11	89.26
6028	Manhole	2D	76.19	88.55	88.97	88.97	88.97	88.97	89.39	89.39	89.39	89.44
6029677	Manhole	2D	73.53	78.22	80.16	80.15	80.07	79.66	80.68	80.69	80.58	80.41
6029685	Manhole	2D	73.55	78.33	80.14	80.14	80.07	79.65	80.65	80.66	80.55	80.37
6029687	Manhole	2D	73.57	78.17	80.10	80.09	80.02	79.59	80.60	80.61	80.51	80.30
6029695	Manhole	2D	73.62	78.20	79.85	79.85	79.78	79.40	80.34	80.35	80.25	80.05
6029697	Manhole	2D	73.79	78.78	80.11	80.10	80.05	79.91	80.59	80.60	80.50	80.38
6029708	Manhole	2D	74.20	79.05	80.06	80.06	80.02	79.91	80.51	80.51	80.44	80.34
6029724	Manhole	2D	72.49	77.88	79.85	79.84	79.84	79.79	80.46	80.45	80.42	80.37
6029730	Manhole	2D	68.65	81.00	80.01	80.00	80.03	80.02	81.01	81.01	81.00	80.98
6029738	Manhole	2D	74.54	79.43	80.16	80.15	80.13	80.02	80.76	80.76	80.71	80.63
6029740	Manhole	2D	74.64	78.76	79.79	79.79	79.77	79.71	80.35	80.35	80.31	80.26
6029741	Manhole	2D	74.85	78.54	79.65	79.64	79.63	79.52	80.21	80.21	80.16	80.05
6029751	Manhole	2D	68.13	81.86	80.02	80.02	80.04	80.02	81.00	81.00	80.99	80.97
6029753	Manhole	2D	68.13	82.18	79.98	79.98	79.99	79.98	80.65	80.66	80.64	80.63
6029755	Manhole	2D	74.21	81.76	80.02	80.02	80.04	80.02	81.00	81.00	80.99	80.97
6029762	Manhole	2D	68.46	81.62	80.58	80.58	80.58	80.57	81.35	81.35	81.34	81.32
6029770	Manhole	2D	70.78	81.17	81.27	81.27	81.27	81.25	81.75	81.75	81.74	81.71
6029772	Manhole	Sealed	71.24	80.59	82.43	82.43	82.42	82.40	84.81	84.81	84.79	84.77
6029773	Manhole	2D	72.64	80.81	81.72	81.72	81.72	81.72	82.09	82.09	82.09	82.09
6029774	Manhole	2D	72.64	80.56	81.20	81.20	81.20	81.15	81.55	81.55	81.55	81.49
6029809	Manhole	2D	70.66	75.39	77.03	76.87	76.93	76.91	77.67	77.55	77.63	77.61
6029814	Manhole	2D	71.12	75.68	77.05	77.03	77.09	77.08	77.82	77.69	77.78	77.77
6029820	Manhole	2D	71.10	75.90	76.77	76.75	76.81	76.71	77.51	77.39	77.47	77.36
6029823	Manhole	2D	66.51	74.72	75.55	75.54	75.58	75.57	76.23	76.08	76.23	76.22
6031	Manhole	2D	76.39	87.76	89.20	89.20	89.20	89.20	89.60	89.60	89.60	89.61
6037	Manhole	2D	78.64	88.59	89.64	89.64	89.64	89.65	89.89	89.89	89.89	89.90
6040	Manhole	2D	77.59	90.17	89.78	89.78	89.78	89.78	90.19	90.19	90.19	90.19
6046	Manhole	2D	73.40	80.90	80.24	80.24	80.24	80.16	81.12	81.12	81.11	81.07
6049	Manhole	2D	69.54	69.60	77.96	77.84	78.61	78.52	79.52	79.61	79.70	79.72
6050	Outfall	Sealed	68.13	75.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6052589	Manhole	2D	76.25	83.59	83.80	83.80	83.79	83.30	84.45	84.45	84.45	84.33
6052590	Manhole	2D	78.17	83.14	83.53	83.53	83.53	83.36	83.83	83.83	83.83	83.77
6052591	Manhole	2D	78.17	83.27	83.81	83.81	83.80	83.42	84.36	84.36	84.36	84.28
6052597	Manhole	2D	77.06	84.54	84.07	84.07	84.07	83.66	84.88	84.88	84.88	84.82
6052599	Manhole	2D	77.43	85.01	84.38	84.38	84.38	84.05	85.60	85.60	85.60	85.58
6052601	Manhole	2D	78.28	84.90	84.46	84.46	84.46	84.31	85.40	85.40	85.40	85.35
6052608	Manhole	2D	78.73	83.62	84.45	84.45	84.45	84.35	84.93	84.93	84.93	84.85
6052609	Manhole	2D	78.73	84.01	84.45	84.45	84.45	84.32	84.91	84.91	84.91	84.91
6052620	Manhole	2D	78.63	84.87	85.02	85.02	85.02	85.00	85.36	85.36	85.36	85.34
6052621	Manhole	2D	78.31	85.05	82.30	82.30	82.30	82.29	83.30	83.30	83.31	83.28

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
6052633	Outfall	Sealed	78.04	78.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6061092	Manhole	2D	78.36	88.31	87.05	87.05	87.03	87.00	87.87	87.87	87.88	87.86
6061094	Manhole	2D	85.04	87.27	87.05	87.05	87.03	87.00	87.61	87.61	87.61	87.60
6061230	Manhole	2D	74.55	88.11	89.03	89.03	89.02	88.95	89.16	89.16	89.16	89.09
6061231	Outfall	Sealed	88.76	88.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6061276	Manhole	2D	76.10	88.08	87.78	87.78	87.79	87.76	88.63	88.63	88.63	88.62
6061278	Manhole	2D	83.55	87.85	87.79	87.79	87.79	87.77	88.52	88.52	88.53	88.53
6061287	Manhole	2D	76.26	86.82	87.93	87.93	87.93	87.90	88.71	88.71	88.71	88.70
6061295	Manhole	2D	76.33	87.04	87.96	87.96	87.97	87.94	88.71	88.71	88.71	88.71
6061297	Manhole	2D	83.45	87.48	87.93	87.93	87.93	87.84	88.39	88.39	88.39	88.30
6061307	Manhole	2D	77.70	88.49	88.15	88.15	88.15	88.13	88.72	88.72	88.72	88.71
6061308	Manhole	2D	76.64	87.53	88.10	88.10	88.10	88.08	88.73	88.73	88.73	88.72
6061320	Manhole	2D	78.22	88.09	88.32	88.32	88.32	88.31	88.74	88.74	88.74	88.74
6061322	Manhole	2D	80.60	88.19	88.83	88.83	88.83	88.82	89.10	89.10	89.10	89.09
6061332	Manhole	2D	78.62	87.74	88.31	88.31	88.31	88.30	88.69	88.69	88.69	88.67
6061338	Manhole	2D	80.69	87.86	88.46	88.46	88.46	88.45	88.80	88.80	88.80	88.78
6061347	Manhole	2D	82.02	88.32	88.65	88.65	88.65	88.65	88.91	88.91	88.91	88.91
6061355	Manhole	2D	79.50	87.86	88.32	88.32	88.33	88.32	88.74	88.74	88.75	88.75
6061365	Manhole	2D	79.82	87.90	88.41	88.41	88.41	88.41	88.84	88.84	88.85	88.85
6061368	Manhole	2D	80.72	87.46	88.42	88.42	88.42	88.43	88.86	88.86	88.86	88.87
6061377	Manhole	2D	81.11	87.68	88.42	88.42	88.43	88.43	88.86	88.86	88.87	88.87
6061387	Manhole	2D	81.22	87.49	88.36	88.36	88.37	88.37	88.78	88.78	88.78	88.79
6061395	Manhole	2D	76.61	87.54	88.10	88.10	88.11	88.08	88.73	88.73	88.73	88.72
6061397	Manhole	2D	76.70	87.71	88.12	88.12	88.12	88.10	88.73	88.73	88.73	88.72
6061405	Manhole	2D	76.80	88.29	88.17	88.17	88.18	88.15	88.84	88.84	88.84	88.84
6061415	Manhole	2D	76.90	87.46	88.19	88.19	88.19	88.18	88.82	88.82	88.82	88.82
6061423	Manhole	2D	77.21	87.43	88.28	88.28	88.29	88.27	88.84	88.84	88.84	88.83
6061431	Manhole	2D	77.27	87.94	88.39	88.39	88.39	88.37	89.00	89.00	89.01	89.00
6061433	Manhole	2D	78.27	88.69	88.47	88.47	88.47	88.45	89.14	89.14	89.14	89.10
6061441	Manhole	2D	79.43	88.37	88.81	88.81	88.81	88.80	89.30	89.30	89.30	89.29
6061443	Manhole	2D	81.27	88.16	88.74	88.74	88.74	88.75	89.16	89.16	89.17	89.19
6061451	Manhole	2D	80.35	87.89	88.54	88.54	88.54	88.68	88.91	88.91	88.91	89.08
6061459	Manhole	2D	78.26	89.01	88.44	88.44	88.44	88.42	89.00	89.00	89.00	88.99
6061461	Manhole	2D	78.40	89.10	88.47	88.47	88.47	88.45	89.00	89.00	89.00	88.99
6061463	Manhole	Sealed	78.52	88.31	88.51	88.51	88.50	88.48	89.00	89.00	89.00	88.98
6061466	Manhole	2D	79.11	87.89	88.51	88.51	88.50	88.48	88.94	88.94	88.94	88.90
6061468	Manhole	Sealed	79.14	87.99	88.53	88.53	88.53	88.51	88.98	88.98	88.98	88.95
6061471	Manhole	2D	79.28	88.42	88.58	88.58	88.58	88.56	89.05	89.05	89.05	89.04
6061479	Manhole	2D	81.17	88.53	88.97	88.97	88.97	88.93	89.38	89.38	89.38	89.35
6061481	Manhole	2D	81.66	88.18	88.98	88.98	88.98	88.93	89.36	89.36	89.36	89.38
6061489	Manhole	2D	82.40	87.96	88.95	88.95	88.95	89.03	89.27	89.27	89.27	89.35
6061497	Manhole	2D	82.60	88.09	89.18	89.18	89.18	89.13	89.55	89.55	89.55	89.50
6061499	Manhole	2D	83.21	88.24	89.20	89.20	89.20	89.18	89.50	89.50	89.50	89.48
6062507	Manhole	2D	80.74	88.00	88.87	88.87	88.86	88.88	89.30	89.30	89.30	89.30
6062515	Manhole	2D	82.50	88.51	89.16	89.16	89.16	89.16	89.59	89.59	89.59	89.58
6062523	Manhole	2D	83.31	89.45	89.16	89.16	89.16	89.16	89.60	89.60	89.61	89.61
6062528	Manhole	2D	81.64	87.93	88.71	88.71	88.71	88.71	89.17	89.17	89.17	89.19
6062536	Manhole	2D	80.59	88.63	88.64	88.64	88.64	88.63	89.07	89.07	89.07	89.06
6062544	Manhole	2D	82.34	88.40	88.99	88.99	88.99	88.98	89.37	89.37	89.37	89.35
6062552	Manhole	2D	79.43	87.81	88.57	88.57	88.56	88.55	88.97	88.97	88.97	88.94
6062554	Manhole	2D	81.50	87.59	88.58	88.58	88.58	88.58	88.98	88.98	88.98	89.00
6062562	Manhole	2D	79.48	87.78	88.52	88.52	88.52	88.49	88.87	88.87	88.87	88.82
6062570	Manhole	2D	78.07	88.03	88.57	88.57	88.56	88.57	89.01	89.01	89.01	89.01
6062572	Manhole	2D	83.89	88.39	88.57	88.57	88.56	88.57	88.92	88.92	88.92	88.91
6062580	Manhole	2D	84.67	88.44	88.86	88.86	88.86	88.85	89.24	89.24	89.24	89.24
6062588	Manhole	2D	80.79	87.89	88.35	88.35	88.35	88.34	88.76	88.76	88.77	88.75
6062598	Manhole	2D	80.98	87.57	88.33	88.33	88.33	88.31	88.77	88.77	88.77	88.75
6073349	Manhole	2D	87.87	88.84	89.42	89.42	89.42	89.47	89.77	89.77	89.77	89.79
6073352	Manhole	2D	78.53	88.93	89.47	89.47	89.47	89.55	89.69	89.69	89.69	89.77
6073404	Outfall	Sealed	87.87	87.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6073416	Outfall	Sealed	87.53	87.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6073420	Manhole	2D	81.81	88.85	89.43	89.43	89.43	89.43	89.74	89.74	89.74	89.74
6073424	Manhole	2D	84.39	89.05	89.55	89.55	89.55	89.61	89.74	89.74	89.74	89.81
6073426	Manhole	2D	83.58	89.18	89.45	89.45	89.45	89.50	89.61	89.61	89.62	89.69
6073433	Manhole	2D	80.88	88.70	89.65	89.65	89.65	89.64	89.91	89.91	89.91	89.91
6073436	Manhole	2D	80.86	90.30	90.39	90.39	90.39	90.38	90.81	90.81	90.81	90.82

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6073438	Manhole	2D	79.68	88.84	89.88	89.88	89.89	89.91	90.10	90.10	90.10	90.14
6073447	Manhole	2D	79.50	89.33	89.89	89.89	89.90	89.91	90.15	90.15	90.15	90.18
6073451	Manhole	2D	78.79	89.32	89.81	89.81	89.81	89.82	90.07	90.07	90.07	90.09
6073459	Manhole	2D	77.60	90.25	89.78	89.78	89.78	89.78	90.18	90.18	90.18	90.18
6073463	Manhole	2D	79.98	88.67	89.75	89.75	89.75	89.73	90.03	90.03	90.03	90.02
6073469	Manhole	2D	80.51	88.78	89.70	89.70	89.70	89.71	89.95	89.95	89.95	89.97
6073473	Manhole	2D	80.69	89.42	89.68	89.68	89.68	89.68	89.93	89.93	89.93	89.94
6073491	Manhole	2D	76.96	89.35	89.78	89.78	89.78	89.78	90.16	90.16	90.16	90.16
6075001	Manhole	2D	76.85	88.74	89.78	89.78	89.78	89.78	90.16	90.16	90.16	90.16
6075003	Manhole	2D	79.48	88.71	89.64	89.64	89.64	89.62	89.92	89.92	89.92	89.91
6075006	Manhole	Sealed	75.40	88.12	88.90	88.90	88.90	88.88	89.35	89.35	89.35	89.37
6075008	Manhole	2D	81.64	88.04	88.83	88.83	88.83	88.82	89.24	89.24	89.24	89.25
6075011	Manhole	2D	78.41	88.87	89.21	89.21	89.22	89.19	89.68	89.68	89.68	89.68
6075013	Manhole	2D	80.43	88.86	89.20	89.20	89.21	89.19	89.65	89.65	89.65	89.67
6075016	Manhole	2D	78.57	87.42	88.93	88.93	88.94	88.84	89.36	89.36	89.36	89.27
6075019	Manhole	2D	78.27	88.32	88.94	88.94	88.94	88.89	89.39	89.39	89.40	89.36
6075021	Manhole	2D	81.78	88.29	88.90	88.90	88.90	88.86	89.46	89.46	89.47	89.44
6075024	Manhole	2D	80.94	88.34	88.91	88.91	88.92	88.79	89.36	89.36	89.36	89.31
6075027	Manhole	Sealed	75.17	88.52	88.86	88.86	88.86	88.85	89.31	89.31	89.31	89.45
6075033	Manhole	Sealed	75.27	88.90	88.87	88.87	88.87	88.86	89.32	89.32	89.32	89.40
6075039	Manhole	2D	81.28	87.61	88.83	88.83	88.84	88.83	89.26	89.26	89.26	89.27
6075045	Manhole	2D	77.18	88.08	89.00	89.00	89.01	88.98	89.49	89.49	89.49	89.50
6075065	Manhole	2D	79.48	88.42	89.19	89.19	89.20	89.18	89.62	89.62	89.62	89.63
6075083	Manhole	2D	78.08	88.34	88.93	88.93	88.94	88.90	89.40	89.40	89.40	89.38
6075085	Manhole	2D	78.34	87.48	88.89	88.89	88.89	88.85	89.35	89.35	89.35	89.33
6075095	Manhole	Sealed	79.11	87.64	88.90	88.90	88.90	88.76	89.31	89.31	89.31	89.17
6075097	Manhole	2D	78.58	87.41	88.90	88.90	88.90	88.77	89.31	89.31	89.31	89.18
6075103	Manhole	2D	79.93	88.35	88.87	88.87	88.87	88.75	89.26	89.26	89.26	89.14
6075107	Manhole	2D	79.85	88.14	88.88	88.88	88.88	88.75	89.27	89.27	89.27	89.14
6075111	Manhole	2D	80.01	88.46	88.89	88.89	88.90	88.78	89.32	89.32	89.32	89.24
6075121	Manhole	2D	80.41	88.56	88.91	88.91	88.92	88.79	89.36	89.36	89.36	89.32
6075123	Manhole	2D	80.55	88.56	88.91	88.91	88.92	88.79	89.36	89.36	89.36	89.32
6075125	Manhole	2D	80.40	88.58	88.90	88.90	88.91	88.78	89.34	89.34	89.34	89.29
6075451	Manhole	2D	76.79	88.44	89.79	89.79	89.79	89.78	90.17	90.17	90.17	90.17
6075459	Manhole	2D	76.62	88.28	89.78	89.78	89.78	89.78	90.19	90.19	90.19	90.18
6075463	Manhole	2D	76.53	88.35	90.05	90.05	90.05	90.05	90.79	90.79	90.79	90.79
6075465	Manhole	2D	76.56	87.77	89.78	89.78	89.78	89.79	90.21	90.21	90.21	90.22
6076543	Manhole	2D	78.53	88.74	89.34	89.34	89.34	89.30	89.56	89.56	89.56	89.52
6076557	Manhole	2D	77.48	87.76	88.90	88.90	88.91	88.88	89.35	89.35	89.35	89.36
6076597	Manhole	2D	78.43	87.85	88.94	88.94	88.94	88.88	89.38	89.38	89.38	89.33
6076632	Manhole	2D	73.18	87.94	88.68	88.68	88.69	88.67	88.79	88.79	88.79	88.77
6076635	Outfall	Sealed	88.18	88.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6198704	Manhole	2D	74.06	87.38	84.35	84.35	84.37	84.33	87.05	87.06	87.06	87.04
6198706	Manhole	2D	73.74	87.85	84.04	84.04	84.06	84.02	86.91	86.92	86.92	86.90
6198708	Manhole	2D	72.84	87.32	83.33	83.33	83.35	83.32	86.58	86.59	86.59	86.58
6198711	Manhole	2D	72.54	87.31	82.99	82.99	83.01	82.97	86.44	86.45	86.45	86.43
6198730	Manhole	2D	71.54	85.59	81.97	81.97	81.99	81.96	85.75	85.76	85.75	85.74
6198761	Manhole	2D	70.56	84.90	80.93	80.93	80.94	80.91	85.01	85.03	85.01	85.00
6198771	Manhole	2D	70.14	85.00	80.40	80.40	80.41	80.38	84.63	84.66	84.63	84.62
6198780	Manhole	2D	69.83	85.27	79.91	79.91	79.92	79.89	84.27	84.30	84.27	84.25
6198784	Manhole	2D	69.66	85.11	79.61	79.61	79.63	79.59	84.07	84.11	84.07	84.06
6198788	Manhole	2D	69.34	84.18	79.17	79.17	79.18	79.15	83.76	83.80	83.76	83.74
6198792	Manhole	2D	68.69	82.41	78.91	78.91	78.84	78.30	83.09	83.14	83.09	83.06
6198793	Manhole	2D	77.44	82.60	78.91	78.91	78.84	78.55	83.11	82.98	83.10	83.08
6198800	Manhole	2D	67.20	80.75	78.89	78.89	78.82	78.23	82.01	82.01	82.02	82.00
6198804	Manhole	Sealed	66.92	80.44	78.88	78.88	78.81	78.22	81.92	81.92	81.94	81.92
6198806	Manhole	Sealed	75.21	79.88	78.88	78.88	78.81	78.23	81.74	81.74	81.75	81.72
6198808	Manhole	2D	75.30	80.39	78.88	78.88	78.81	78.22	81.57	81.57	81.58	81.58
6198813	Manhole	Sealed	75.24	80.50	78.89	78.88	78.81	78.23	81.62	81.62	81.64	81.60
6198813!_2D	Manhole	2D	80.04	80.08	80.18	80.18	80.18	80.18	81.16	81.17	81.18	81.13
6198814	Manhole	Sealed	75.24	80.37	78.89	78.88	78.81	78.23	81.72	81.72	81.74	81.71
6198814!_2D	Manhole	2D	79.92	79.95	80.51	80.51	80.51	80.48	81.66	81.66	81.68	81.63
6198824	Manhole	2D	66.64	80.47	78.88	78.88	78.80	78.22	81.87	81.87	81.89	81.88
6198825	Manhole	Sealed	75.60	80.62	78.88	78.88	78.81	78.22	81.57	81.57	81.59	81.59
6198825!_2D	Manhole	2D	80.17	80.20	80.49	80.49	80.49	80.50	81.62	81.62	81.64	81.63
6198826	Manhole	Sealed	75.60	81.04	78.88	78.88	78.81	78.22	81.59	81.59	81.61	81.61

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
6198826!_2D	Manhole	2D	80.59	80.62	80.69	80.69	80.69	80.69	81.79	81.79	81.80	81.79
6198834	Manhole	2D	66.31	80.77	78.87	78.87	78.80	78.21	81.85	81.85	81.87	81.85
6198836	Manhole	Sealed	66.21	80.33	78.87	78.87	78.79	78.21	81.87	81.84	81.88	81.85
6198837	Manhole	Sealed	74.94	81.41	78.87	78.87	78.80	78.21	81.69	81.69	81.71	81.71
6198837!_2D	Manhole	2D	80.55	80.58	80.70	80.70	80.70	80.70	81.53	81.53	81.55	81.56
6198838	Manhole	Sealed	75.50	80.80	78.87	78.87	78.79	78.21	81.86	81.83	81.87	81.84
6198838!_2D	Manhole	2D	80.34	80.38	80.63	80.63	80.63	80.57	81.72	81.72	81.74	81.67
6198839	Manhole	Sealed	75.50	80.87	78.87	78.87	78.79	78.21	81.84	81.83	81.86	81.84
6198839!_2D	Manhole	2D	80.42	80.45	80.63	80.63	80.63	80.69	81.72	81.73	81.75	81.78
6198853	Manhole	2D	65.93	80.91	78.86	78.86	78.79	78.20	81.97	81.93	81.98	81.94
6198854	Manhole	Sealed	76.84	81.21	78.86	78.86	78.79	78.20	81.89	81.86	81.90	81.87
6198854!_2D	Manhole	2D	81.17	81.21	81.26	81.26	81.26	81.26	81.41	81.40	81.42	81.41
6198858	Manhole	2D	64.42	81.22	78.85	78.85	78.77	78.18	81.90	81.88	81.91	81.87
6198859	Manhole	Sealed	76.64	81.22	78.85	78.85	78.77	78.18	81.87	81.85	81.87	81.83
6198859!_2D	Manhole	2D	81.19	81.22	81.43	81.43	81.43	81.43	81.74	81.74	81.72	81.68
6198860	Manhole	Sealed	76.64	81.92	78.85	78.85	78.77	78.18	81.92	81.90	81.92	81.88
6198860!_2D	Manhole	2D	81.89	81.92	82.26	82.26	82.26	82.27	82.53	82.52	82.49	82.48
6198869	Manhole	2D	74.18	80.52	80.16	80.16	80.16	80.12	81.86	81.86	81.88	81.87
6198872	Manhole	2D	75.73	80.60	80.81	80.81	80.82	80.82	81.87	81.87	81.89	81.88
6198873	Manhole	Sealed	75.46	80.61	80.16	80.16	80.17	80.13	81.82	81.83	81.84	81.83
6198873!_2D	Manhole	2D	80.16	80.19	80.45	80.45	80.46	80.45	81.64	81.64	81.65	81.64
6198874	Manhole	Sealed	75.46	81.13	80.16	80.16	80.16	80.13	81.79	81.79	81.81	81.80
6198874!_2D	Manhole	2D	80.68	80.71	80.83	80.83	80.83	80.83	81.52	81.53	81.54	81.52
6198884	Manhole	2D	75.88	80.89	81.04	81.04	81.05	81.04	81.90	81.90	81.91	81.90
6198885	Manhole	Sealed	75.76	80.92	80.98	80.98	80.98	80.98	81.75	81.75	81.76	81.76
6198885!_2D	Manhole	2D	80.47	80.50	80.75	80.75	80.75	80.75	81.19	81.20	81.21	81.20
6198886	Manhole	Sealed	75.84	81.53	81.05	81.05	81.05	81.04	81.91	81.91	81.92	81.92
6198886!_2D	Manhole	2D	81.08	81.11	81.31	81.31	81.31	81.31	82.03	82.03	82.04	82.04
6198892	Manhole	2D	76.15	81.09	81.18	81.18	81.18	81.18	81.84	81.84	81.85	81.85
6198894	Manhole	Sealed	76.22	80.74	81.03	81.03	81.03	81.03	81.53	81.53	81.53	81.47
6198894!_2D	Manhole	2D	80.71	80.74	80.85	80.85	80.85	80.85	81.34	81.34	81.33	81.27
7204174	Manhole	2D	67.04	81.98	83.39	83.39	83.40	83.35	84.51	84.51	84.52	84.41
A10	Manhole	2D	70.47	73.82	74.23	74.21	74.24	74.22	74.71	74.68	74.70	74.69
A11	Manhole	2D	70.21	74.23	74.35	74.35	74.37	74.36	74.86	74.84	74.86	74.85
A13	Manhole	2D	65.50	74.07	74.50	74.49	74.51	74.51	74.92	74.91	74.92	74.94
A15	Manhole	2D	65.50	74.84	74.84	74.84	74.85	74.85	75.21	75.20	75.21	75.18
A17	Manhole	2D	66.10	73.29	73.87	73.86	73.88	73.81	74.27	74.27	74.28	74.21
A18	Manhole	2D	66.10	72.18	73.31	73.30	73.32	73.33	73.70	73.67	73.70	73.72
A2	Manhole	2D	69.63	73.80	74.79	74.76	74.83	74.85	75.44	75.41	75.44	75.48
A20	Manhole	2D	70.73	74.23	74.56	74.56	74.57	74.56	75.26	75.23	75.26	75.24
A21	Manhole	2D	71.03	73.87	74.87	74.86	74.89	74.90	75.36	75.35	75.36	75.36
A22	Manhole	2D	71.24	74.54	75.20	75.20	75.21	75.19	75.49	75.49	75.49	75.48
A25	Manhole	2D	73.35	74.60	75.35	75.35	75.36	75.31	75.62	75.62	75.62	75.59
A26	Manhole	2D	74.28	75.05	75.30	75.30	75.30	75.28	75.38	75.38	75.38	75.37
A28	Manhole	2D	76.03	77.17	78.19	78.19	78.19	78.17	78.34	78.34	78.34	78.31
A29	Manhole	2D	75.73	77.91	78.30	78.30	78.31	78.31	78.51	78.51	78.51	78.50
A3	Manhole	2D	69.53	72.58	73.39	73.36	73.39	73.36	73.57	73.53	73.56	73.53
A31	Manhole	2D	73.75	79.12	79.17	79.17	79.18	79.18	79.40	79.39	79.40	79.40
A32	Manhole	2D	72.36	78.34	79.12	79.10	79.12	79.12	79.36	79.34	79.36	79.38
A34	Manhole	2D	73.86	78.80	78.97	78.97	78.97	78.98	79.03	79.03	79.03	79.03
A35	Manhole	2D	73.77	78.78	79.17	79.17	79.17	79.18	79.47	79.47	79.48	79.47
A41	Manhole	2D	68.29	72.08	73.92	73.91	73.92	73.81	74.36	74.35	74.36	74.25
A42	Manhole	2D	72.14	75.61	75.80	75.80	75.79	75.78	76.11	76.11	76.11	76.09
A43	Manhole	2D	70.06	74.32	75.58	75.58	75.58	75.59	75.82	75.82	75.82	75.82
A46	Manhole	2D	71.50	77.32	77.68	77.68	77.69	77.71	78.07	78.07	78.07	78.09
A47	Manhole	2D	71.48	76.89	78.02	78.02	78.01	77.97	78.50	78.50	78.50	78.44
A48	Manhole	2D	73.30	75.67	76.81	76.81	76.81	76.79	76.87	76.87	76.87	76.85
A5	Manhole	2D	70.09	73.79	74.02	74.00	74.03	74.05	74.51	74.48	74.50	74.55
A6	Manhole	2D	70.40	73.29	73.88	73.86	73.88	73.90	74.41	74.37	74.40	74.39
A8	Manhole	2D	68.60	72.94	73.60	73.59	73.60	73.60	73.87	73.86	73.86	73.87
A9	Manhole	2D	70.24	72.54	73.08	73.08	73.08	73.06	73.26	73.26	73.26	73.24
AM1	Manhole	Sealed	61.18	74.15	73.46	73.39	73.45	73.43	73.96	73.77	73.83	73.84
AM12	Manhole	Sealed	63.30	73.04	74.20	74.19	74.21	74.20	74.63	74.60	74.61	74.61
AM14	Manhole	Sealed	65.34	73.49	74.51	74.51	74.53	74.53	74.93	74.91	74.93	74.94
AM16	Manhole	Sealed	65.95	72.15	73.78	73.77	73.80	73.74	74.19	74.18	74.19	74.15
AM19	Manhole	2D	64.21	74.18	74.56	74.55	74.56	74.56	74.96	74.95	74.96	74.97

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
AM23	Manhole	2D	66.96	74.93	75.17	75.17	75.18	75.16	75.46	75.46	75.46	75.46
AM24	Manhole	2D	66.96	76.38	75.35	75.35	75.36	75.31	75.63	75.63	75.63	75.60
AM27	Manhole	2D	70.10	78.76	78.22	78.22	78.22	78.21	78.49	78.49	78.49	78.48
AM30	Manhole	2D	70.10	79.67	79.10	79.09	79.09	79.10	79.43	79.42	79.42	79.43
AM33	Manhole	Sealed	70.16	77.36	79.13	79.12	79.12	79.13	79.38	79.37	79.37	79.39
AM36	Manhole	Sealed	71.10	78.88	79.12	79.11	79.11	79.12	79.36	79.36	79.35	79.35
AM37	Manhole	2D	66.95	73.61	74.67	74.66	74.67	74.59	75.12	75.10	75.11	75.02
AM38	Manhole	2D	64.82	73.22	74.74	74.73	74.74	74.73	75.20	75.18	75.20	75.19
AM39	Manhole	2D	65.73	73.86	74.95	74.94	74.95	74.98	75.41	75.40	75.41	75.45
AM4	Manhole	Sealed	61.62	73.25	73.65	73.61	73.65	73.64	74.12	74.00	74.04	74.04
AM40	Manhole	2D	67.73	73.59	74.87	74.85	74.86	74.85	75.31	75.30	75.31	75.30
AM44	Manhole	2D	65.73	76.84	75.76	75.76	75.75	75.75	76.11	76.11	76.10	76.09
AM45	Manhole	2D	66.85	76.95	77.32	77.32	77.31	77.30	77.62	77.62	77.62	77.59
AM49	Manhole	2D	67.11	76.76	77.08	77.08	77.08	77.08	77.24	77.24	77.23	77.22
AM50	Manhole	2D	67.95	77.06	77.08	77.08	77.08	77.07	77.14	77.14	77.14	77.13
AM7	Manhole	Sealed	61.99	74.19	73.71	73.67	73.70	73.69	74.14	74.05	74.08	74.08
B01	Manhole	Sealed	70.51	79.83	79.52	79.51	79.46	78.44	80.27	80.27	80.22	80.04
B03	Manhole	Sealed	73.82	77.53	79.53	79.53	79.48	78.45	80.48	80.48	80.41	80.05
B03_2D	Manhole	2D	80.56	80.66	80.96	80.96	80.96	80.77	82.65	82.59	82.33	80.84
B04	Manhole	Sealed	71.00	81.13	79.52	79.51	79.41	78.43	80.27	80.27	80.18	79.98
B05	Manhole	Sealed	74.00	78.57	79.55	79.55	79.45	78.48	80.35	80.35	80.30	80.07
B05_2D	Manhole	2D	80.54	80.91	80.97	80.97	80.98	80.97	81.08	81.08	81.15	81.03
B06	Manhole	Sealed	74.13	79.02	79.57	79.58	79.42	78.44	80.35	80.35	80.26	80.01
B06_2D	Manhole	2D	79.78	79.88	80.51	80.51	80.53	80.22	82.09	82.03	82.10	80.33
B07	Manhole	Sealed	71.09	80.33	79.52	79.52	79.35	78.42	80.27	80.27	80.14	79.96
B08	Manhole	Sealed	73.69	78.47	79.55	79.56	79.39	78.46	80.30	80.30	80.18	80.01
B08_2D	Manhole	2D	79.78	80.54	80.74	80.74	80.71	80.71	81.02	81.02	80.91	80.87
B10	Manhole	Sealed	71.67	80.35	79.52	79.53	79.22	78.40	80.26	80.26	80.03	79.91
B12	Manhole	Sealed	74.55	77.56	79.12	79.11	79.12	78.55	79.91	79.72	79.99	79.52
B12_2D	Manhole	2D	76.52	77.56	79.06	79.05	79.19	78.62	79.85	79.65	80.08	79.52
B13	Manhole	Sealed	71.95	80.71	79.58	79.56	78.93	78.43	80.30	80.28	79.77	79.78
B14	Manhole	Sealed	71.93	80.74	79.54	79.55	79.01	78.39	80.25	80.24	79.85	79.82
B15	Manhole	Sealed	73.19	79.28	79.72	79.73	79.22	78.56	80.59	80.58	80.33	80.86
B15_2D	Manhole	2D	75.16	80.32	79.84	79.84	79.34	78.67	80.78	80.78	80.60	81.47
B18	Manhole	Sealed	72.00	80.10	79.89	79.86	79.35	78.89	80.67	80.56	80.23	80.23
B19	Manhole	Sealed	73.14	77.42	79.97	79.97	79.63	79.01	80.50	80.45	80.35	80.21
B19_2D	Manhole	2D	75.11	79.64	79.95	79.94	79.63	79.02	80.41	80.37	80.30	80.16
B20	Manhole	Sealed	72.06	79.27	79.98	79.96	79.50	78.95	80.76	80.66	80.51	80.36
B20_2D	Manhole	2D	78.57	79.94	79.99	79.97	79.59	79.27	80.73	80.64	80.54	81.05
B22	Manhole	Sealed	72.09	80.07	80.07	80.06	79.63	79.00	80.89	80.80	80.57	80.44
B24	Manhole	Sealed	72.16	80.26	80.24	80.24	79.82	79.07	81.14	81.07	80.87	80.60
B26	Manhole	Sealed	76.01	79.43	80.38	80.38	80.03	79.19	81.28	81.25	81.09	80.70
B26_2D	Manhole	2D	79.24	79.46	79.67	79.67	79.64	79.55	79.83	79.84	79.78	79.74
B27	Manhole	Sealed	72.18	79.62	80.46	80.46	80.07	79.18	81.44	81.40	81.22	80.80
B29	Manhole	Sealed	72.25	79.19	80.64	80.64	80.28	79.30	81.70	81.67	81.52	80.96
B30	Manhole	Sealed	74.25	80.16	80.85	80.84	80.51	79.61	82.01	81.96	81.84	81.45
B30_2D	Manhole	2D	78.63	79.56	80.31	80.30	80.20	80.34	80.88	80.87	80.85	81.15
B31	Manhole	Sealed	73.14	78.98	80.86	80.85	80.51	79.56	82.02	81.98	81.87	81.42
B31_2D	Manhole	2D	78.63	79.23	80.23	80.23	80.15	79.67	80.75	80.77	80.65	80.48
B32	Manhole	Sealed	72.04	80.18	80.90	80.89	80.53	79.55	82.11	82.06	81.94	81.48
B35	Manhole	Sealed	76.99	80.23	82.07	82.05	81.94	80.44	83.27	83.26	83.16	82.33
B35_2D	Manhole	2D	81.18	81.53	82.57	82.56	82.50	82.17	83.60	83.60	83.56	82.65
B36	Manhole	Sealed	72.44	84.28	81.43	81.43	81.05	80.02	83.00	82.93	82.85	82.52
B38	Manhole	Sealed	72.60	85.44	81.80	81.80	81.45	80.67	83.55	83.52	83.40	83.04
B39	Manhole	Sealed	74.00	84.49	81.88	81.84	81.58	80.93	83.75	83.72	83.60	83.16
B39_2D	Manhole	2D	82.97	84.51	84.98	84.98	84.98	84.81	85.35	85.35	85.34	85.12
B41	Manhole	Sealed	72.62	85.52	81.89	81.88	81.54	80.96	83.67	83.64	83.50	83.15
B45	Manhole	Sealed	72.64	84.74	82.83	82.81	82.61	82.13	84.38	84.37	84.19	83.84
B46	Manhole	Sealed	75.58	85.07	82.83	82.81	82.61	82.14	84.42	84.41	84.21	83.84
B46_2D	Manhole	2D	84.77	84.87	85.00	85.00	84.91	84.91	85.62	85.62	85.22	85.05
B47	Manhole	Sealed	72.69	84.98	83.08	83.05	82.88	82.44	84.57	84.57	84.40	84.08
B48	Manhole	Sealed	72.70	85.08	83.54	83.52	83.38	82.99	84.95	84.94	84.80	84.54
B49	Manhole	Sealed	76.03	85.22	83.98	83.97	83.88	83.52	85.32	85.32	85.23	85.05
B50	Manhole	Sealed	79.94	84.21	84.11	84.09	84.06	83.63	85.55	85.54	85.50	85.32
B50_2D	Manhole	2D	84.57	84.67	85.02	85.02	85.03	85.02	85.86	85.86	85.83	85.65
BB-END	Outfall	Sealed	0.00	72.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
BM10	Manhole	Sealed	63.03	74.81	73.99	73.71	73.89	73.81	74.75	74.33	74.57	74.57
BM13	Manhole	Sealed	62.69	75.31	73.92	73.61	73.82	73.74	74.75	74.33	74.59	74.59
BM14	Manhole	Sealed	62.65	75.47	74.53	74.31	74.46	74.43	75.25	75.07	75.20	75.20
BM2	Manhole	Sealed	65.64	75.20	74.35	74.33	74.36	74.33	74.69	74.61	74.65	74.64
BM20	Manhole	Sealed	62.92	74.94	75.03	74.95	75.02	75.00	75.57	75.50	75.55	75.54
BM24	Manhole	Sealed	63.17	74.33	75.11	75.05	75.11	75.09	75.63	75.58	75.61	75.61
BM25	Manhole	Sealed	64.63	74.35	75.28	75.23	75.28	75.25	75.83	75.79	75.83	75.81
BM29	Manhole	Sealed	67.85	74.20	75.42	75.38	75.47	75.44	76.49	76.46	76.51	76.50
BM30	Manhole	Sealed	64.99	74.50	75.34	75.29	75.36	75.32	76.19	76.17	76.19	76.18
BM33	Manhole	Sealed	66.24	76.06	75.53	75.51	75.56	75.54	76.26	76.24	76.26	76.25
BM34	Manhole	Sealed	66.62	75.84	75.95	75.94	75.95	75.96	76.39	76.39	76.39	76.39
BM38	Manhole	Sealed	67.45	76.74	76.11	76.11	76.10	76.11	76.47	76.48	76.46	76.46
BM4	Manhole	Sealed	65.39	73.56	74.31	74.28	74.33	74.30	74.69	74.60	74.65	74.64
BM40	Manhole	Sealed	66.13	74.29	75.47	75.43	75.51	75.47	76.65	76.62	76.65	76.64
BM7	Manhole	2D	64.82	73.70	74.30	74.23	74.31	74.28	74.71	74.59	74.65	74.65
C003	Manhole	Sealed	71.05	81.05	79.88	79.88	79.85	79.31	80.53	80.53	80.51	80.45
C004	Manhole	Sealed	71.06	81.62	80.35	80.35	80.32	80.23	80.91	80.87	80.84	80.91
C005	Manhole	Sealed	71.42	80.37	80.35	80.35	80.32	80.23	80.87	80.87	80.84	80.92
C006	Manhole	Sealed	72.39	80.13	80.25	80.25	80.32	80.21	80.73	80.73	80.82	80.81
C006_2D	Manhole	2D	74.51	80.21	80.26	80.26	80.34	80.22	80.72	80.72	80.82	80.80
C007	Manhole	Sealed	71.07	81.19	80.40	80.40	80.36	80.26	80.93	80.93	80.90	80.96
C008	Manhole	Sealed	72.50	80.29	80.21	80.21	80.15	79.58	80.74	80.75	80.69	80.67
C008_2D	Manhole	2D	74.66	80.21	80.22	80.22	80.16	79.58	80.75	80.75	80.69	80.68
C009	Manhole	Sealed	72.76	79.58	80.20	80.20	80.37	80.14	80.67	80.67	80.83	80.81
C009_2D	Manhole	2D	74.73	79.23	80.18	80.18	80.40	80.13	80.64	80.64	80.84	80.80
C010	Manhole	Sealed	71.08	80.33	80.45	80.45	80.41	80.28	81.00	81.00	80.96	80.99
C011	Manhole	Sealed	72.57	78.89	80.79	80.79	80.72	80.33	81.25	81.25	81.17	81.08
C011_2D	Manhole	2D	79.92	80.02	81.17	81.17	81.11	80.81	81.63	81.63	81.55	81.51
C012	Manhole	Sealed	71.08	79.86	80.48	80.48	80.44	80.30	81.04	81.04	81.00	81.01
C013	Manhole	Sealed	76.49	79.33	80.74	80.73	80.68	80.32	81.17	81.17	81.10	80.96
C013_2D	Manhole	2D	79.54	79.64	80.69	80.69	80.63	80.20	81.14	81.15	81.07	80.88
C014	Manhole	Sealed	77.22	80.46	80.66	80.66	80.65	80.31	80.93	80.94	80.87	80.81
C014_2D	Manhole	2D	80.29	80.56	80.63	80.63	80.62	80.42	80.90	80.90	80.83	80.78
C019	Manhole	Sealed	75.35	79.09	79.64	79.64	80.24	79.95	80.11	80.11	80.69	80.61
C019_2D	Manhole	2D	77.32	79.09	79.62	79.62	80.23	79.95	80.09	80.09	80.69	80.60
C020	Manhole	Sealed	75.33	79.11	80.50	80.50	80.48	80.32	81.07	81.06	81.05	81.03
C021	Manhole	Sealed	71.09	80.00	80.54	80.54	80.49	80.33	81.11	81.11	81.06	81.04
C022	Manhole	Sealed	75.78	79.24	80.52	80.52	80.48	80.31	81.11	81.11	81.06	81.03
C023	Manhole	Sealed	77.13	79.35	80.77	80.77	80.71	80.39	81.24	81.24	81.17	81.09
C023_2D	Manhole	2D	79.71	79.81	80.79	80.79	80.74	80.44	81.26	81.26	81.18	81.10
C024	Manhole	Sealed	75.81	79.59	80.17	80.17	80.11	79.84	80.62	80.63	80.55	80.49
C024_2D	Manhole	2D	77.78	79.27	80.16	80.16	80.10	79.83	80.61	80.62	80.54	80.48
C028	Manhole	Sealed	75.05	79.39	80.59	80.59	80.50	80.32	81.17	81.17	81.08	81.02
C028_2D	Manhole	2D	77.02	79.52	80.58	80.58	80.20	79.99	81.07	81.07	80.66	80.56
C029	Manhole	Sealed	71.09	78.28	80.61	80.61	80.56	80.37	81.19	81.19	81.14	81.08
C030	Manhole	Sealed	76.14	78.64	80.54	80.54	80.50	80.27	81.12	81.12	81.08	80.98
C030_2D	Manhole	2D	78.11	78.64	80.28	80.28	80.23	79.65	80.75	80.75	80.67	80.28
C033	Manhole	Sealed	71.10	79.06	80.68	80.68	80.63	80.40	81.27	81.27	81.22	81.12
C035	Manhole	Sealed	71.14	78.72	80.77	80.77	80.71	80.45	81.38	81.38	81.32	81.17
C036	Manhole	Sealed	73.33	77.69	80.77	80.77	80.71	80.42	81.38	81.38	81.32	81.14
C036_2D	Manhole	2D	78.90	79.00	81.02	81.02	80.96	80.23	81.49	81.49	81.41	80.88
C036A	Manhole	Sealed	75.73	78.28	80.81	80.81	80.75	80.52	81.29	81.29	81.22	81.18
C036A_2D	Manhole	2D	79.12	79.22	80.82	80.82	80.76	80.55	81.30	81.30	81.22	81.19
C037	Manhole	Sealed	71.21	78.78	80.81	80.81	80.75	80.47	81.42	81.42	81.36	81.20
C038	Manhole	Sealed	73.31	78.50	81.16	81.16	81.09	80.59	81.69	81.69	81.61	81.36
C038_2D	Manhole	2D	79.14	79.24	81.26	81.26	81.20	80.59	81.73	81.73	81.65	81.22
C038A	Manhole	Sealed	73.93	79.17	81.27	81.27	81.20	80.72	81.81	81.81	81.73	81.53
C038A_2D	Manhole	2D	79.85	79.95	81.44	81.44	81.39	81.06	81.91	81.92	81.84	81.71
C038B	Manhole	Sealed	76.70	78.61	81.27	81.27	81.21	80.94	81.74	81.74	81.66	81.58
C038B_2D	Manhole	2D	79.47	79.57	81.28	81.28	81.22	80.96	81.74	81.74	81.67	81.59
C040	Manhole	Sealed	71.27	79.14	80.91	80.91	80.85	80.53	81.55	81.54	81.48	81.27
C041	Manhole	Sealed	75.88	80.33	80.80	80.80	80.75	80.48	81.42	81.42	81.38	81.17
C041_2D	Manhole	2D	79.67	79.72	80.36	80.36	80.31	80.13	80.82	80.82	80.76	80.67
C044	Manhole	Sealed	76.32	80.07	80.96	80.96	80.90	80.58	81.46	81.46	81.42	81.27
C044_2D	Manhole	2D	80.57	80.67	80.80	80.80	80.79	80.77	81.24	81.24	81.17	81.21
C045	Manhole	Sealed	71.28	79.56	80.97	80.97	80.90	80.58	81.59	81.59	81.53	81.30

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
C046	Manhole	Sealed	75.92	79.40	81.00	81.00	80.93	80.60	81.59	81.59	81.53	81.31
C046_2D	Manhole	2D	79.75	79.85	80.83	80.82	80.80	80.74	81.31	81.31	81.26	81.17
C047	Manhole	Sealed	71.29	79.59	81.01	81.01	80.93	80.60	81.62	81.62	81.55	81.32
C048	Manhole	Sealed	76.20	79.09	80.90	80.90	80.85	80.36	81.45	81.45	81.39	80.92
C048_2D	Manhole	2D	77.67	79.09	80.47	80.47	80.45	79.88	80.97	80.97	80.89	80.18
C049	Manhole	Sealed	71.35	80.07	81.08	81.08	81.01	80.63	81.69	81.69	81.63	81.35
C051	Manhole	Sealed	71.39	79.58	81.18	81.18	81.11	80.67	81.79	81.78	81.72	81.39
C051B	Manhole	2D	75.89	78.56	79.90	79.90	79.86	79.42	80.40	80.39	80.31	79.72
C051B_2D	Manhole	2D	77.36	78.43	80.27	80.26	80.02	79.25	80.79	80.77	80.48	79.54
C053	Manhole	Sealed	71.53	79.18	81.37	81.37	81.31	80.75	81.98	81.98	81.92	81.48
C054	Manhole	Sealed	76.39	78.54	80.71	80.71	80.68	80.04	81.23	81.23	81.19	80.55
C054_2D	Manhole	2D	77.86	78.54	80.05	80.05	80.02	79.28	80.56	80.55	80.47	79.58
C055	Manhole	Sealed	71.60	79.26	81.59	81.59	81.53	80.83	82.19	82.19	82.14	81.57
C057	Manhole	Sealed	75.12	78.42	81.25	81.25	81.22	80.46	81.82	81.81	81.78	81.09
C057_2D	Manhole	2D	77.07	78.42	80.30	80.30	80.28	79.27	80.81	80.81	80.73	79.58
C060	Manhole	Sealed	73.47	78.20	81.14	81.14	81.11	80.28	81.70	81.70	81.66	80.87
C060_2D	Manhole	2D	78.25	78.38	80.36	80.36	80.34	79.29	80.87	80.87	80.79	79.61
C061	Manhole	Sealed	71.85	79.72	81.80	81.80	81.74	80.91	82.40	82.40	82.36	81.66
C062	Manhole	Sealed	76.16	78.69	80.57	80.57	80.54	79.73	81.09	81.09	81.02	80.15
C062_2D	Manhole	2D	77.63	78.74	80.19	80.19	80.16	79.31	80.69	80.69	80.62	79.61
C063	Manhole	Sealed	73.42	81.45	82.13	82.13	82.09	81.04	82.75	82.75	82.72	81.80
C064	Manhole	Sealed	75.46	81.79	82.13	82.13	82.09	81.04	82.66	82.66	82.67	81.81
C064_2D	Manhole	2D	82.18	82.28	82.30	82.30	82.30	82.30	82.46	82.46	82.45	82.38
C065	Manhole	Sealed	73.45	82.34	82.38	82.38	82.34	81.13	83.01	83.01	82.98	81.91
C066	Manhole	Sealed	73.26	82.53	82.58	82.58	82.54	81.42	83.23	83.22	83.20	82.23
C067	Manhole	Sealed	73.86	82.33	82.35	82.35	82.31	81.13	82.96	82.96	82.93	81.90
C068	Manhole	Sealed	79.06	81.89	82.35	82.35	82.31	81.13	82.92	82.92	82.90	81.92
C068_2D	Manhole	2D	82.30	82.40	82.46	82.46	82.46	82.56	82.80	82.80	82.80	82.75
C069	Manhole	Sealed	73.46	82.51	83.09	83.09	83.05	82.08	83.75	83.75	83.73	82.92
C070	Manhole	Sealed	77.85	82.31	82.35	82.35	82.31	81.13	82.96	82.96	82.94	81.90
C070_2D	Manhole	2D	82.93	83.03	83.12	83.12	83.12	83.13	83.13	83.13	83.13	83.14
C071	Manhole	Sealed	73.13	82.97	83.46	83.46	83.43	82.55	84.16	84.16	84.14	83.42
C072	Manhole	Sealed	77.79	83.85	83.46	83.46	83.43	82.55	84.16	84.16	84.14	83.42
C072_2D	Manhole	2D	83.28	83.31	83.81	83.81	83.81	83.80	84.12	84.12	84.12	84.12
C073	Manhole	Sealed	78.50	82.67	83.55	83.55	83.52	82.61	84.33	84.33	84.31	83.54
C073_2D	Manhole	2D	84.01	84.11	84.67	84.67	84.67	84.51	85.08	85.08	85.08	84.80
C080	Manhole	Sealed	83.96	84.06	84.70	84.70	84.72	84.55	85.12	85.12	85.13	84.80
C080_2D	Manhole	2D	84.53	84.63	85.38	85.38	85.39	85.18	85.76	85.76	85.76	85.48
C081	Manhole	Sealed	73.63	84.00	84.17	84.17	84.14	83.43	84.94	84.94	84.92	84.37
C082	Manhole	Sealed	81.12	84.57	84.19	84.19	84.17	83.45	84.98	84.98	84.96	84.42
C082_2D	Manhole	2D	84.53	84.53	85.05	85.05	85.05	85.11	85.56	85.56	85.55	85.42
C083	Manhole	Sealed	73.71	84.32	84.49	84.49	84.47	83.84	85.28	85.28	85.27	84.80
C083_2D	Manhole	2D	78.68	84.45	84.98	84.98	84.98	84.61	85.47	85.47	85.47	85.00
C084	Manhole	Sealed	79.55	84.32	85.19	85.19	85.19	85.30	85.54	85.54	85.54	85.60
C084_2D	Manhole	2D	81.57	84.32	85.01	85.01	85.01	85.23	85.28	85.28	85.28	85.43
C085	Manhole	Sealed	79.47	85.86	85.42	85.42	85.41	85.39	85.86	85.86	85.86	85.80
C086	Manhole	Sealed	79.37	85.26	85.81	85.81	85.81	85.90	86.16	86.16	86.16	86.20
C086_2D	Manhole	2D	81.57	85.35	85.81	85.81	85.81	86.00	86.11	86.11	86.11	86.22
C088	Manhole	Sealed	79.48	85.35	84.97	84.97	84.96	84.42	85.62	85.62	85.62	85.39
C088_2D	Manhole	2D	80.95	85.21	85.16	85.16	85.14	84.63	85.66	85.66	85.66	85.58
C089	Manhole	Sealed	73.90	84.71	84.73	84.73	84.72	84.15	85.58	85.58	85.57	85.15
C090	Manhole	Sealed	82.59	86.06	84.75	84.75	84.73	84.16	85.60	85.60	85.60	85.20
C090_2D	Manhole	2D	86.31	86.41	86.55	86.55	86.55	86.57	86.61	86.61	86.61	86.66
C092	Manhole	Sealed	74.05	86.71	85.28	85.28	85.27	84.82	86.27	86.27	86.27	85.96
C092A	Manhole	Sealed	74.01	85.94	85.04	85.04	85.03	84.53	85.97	85.97	85.96	85.60
C092B	Manhole	Sealed	76.70	86.67	85.05	85.05	85.03	84.53	85.97	85.97	85.97	85.61
C092B_2D	Manhole	2D	86.97	87.07	87.14	87.14	87.14	87.14	87.17	87.17	87.17	87.21
C093	Manhole	Sealed	85.01	86.41	85.37	85.37	85.40	85.28	86.60	86.59	86.62	86.38
C093_2D	Manhole	2D	87.32	87.42	87.62	87.62	87.62	87.62	87.83	87.83	87.83	87.84
C094	Manhole	Sealed	77.02	86.52	85.32	85.32	85.31	84.87	86.54	86.54	86.56	86.32
C095	Manhole	Sealed	83.90	86.62	85.34	85.34	85.34	84.91	86.78	86.78	86.81	86.66
C095_2D	Manhole	2D	87.42	87.52	87.71	87.71	87.71	87.74	87.98	87.98	87.98	88.09
C096	Manhole	Sealed	83.46	86.11	86.35	86.35	86.35	86.06	87.58	87.58	87.58	87.53
C096_2D	Manhole	2D	87.05	87.15	87.59	87.59	87.59	87.60	88.13	88.13	88.13	88.17
C097	Manhole	Sealed	77.24	86.64	86.24	86.24	86.23	85.92	87.40	87.40	87.40	87.32
C098	Manhole	Sealed	83.54	86.52	86.25	86.25	86.24	85.94	87.61	87.61	87.61	87.58

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
C098_2D	Manhole	2D	87.27	87.37	87.51	87.51	87.51	87.50	87.95	87.95	87.95	88.02
C099	Manhole	Sealed	84.10	87.23	86.25	86.25	86.25	85.94	87.42	87.42	87.42	87.33
C103	Manhole	Sealed	84.36	87.76	86.26	86.26	86.25	85.94	87.43	87.43	87.43	87.33
C103_2D	Manhole	2D	87.94	88.04	88.13	88.13	88.13	88.13	88.18	88.18	88.18	88.18
CP03	Manhole	2D	67.39	74.41	74.70	74.67	74.71	74.70	75.10	75.01	75.03	75.03
CP04	Manhole	2D	67.44	73.50	74.63	74.59	74.64	74.62	75.11	74.98	75.00	75.00
CP06	Manhole	2D	67.43	73.72	74.70	74.68	74.72	74.70	75.14	75.05	75.07	75.07
CP07	Manhole	2D	67.43	74.23	74.81	74.79	74.83	74.81	75.28	75.19	75.21	75.20
CP10	Manhole	2D	66.24	74.17	74.59	74.57	74.61	74.59	75.00	74.90	74.92	74.92
CP114	Manhole	2D	66.45	73.91	74.38	74.37	74.40	74.38	74.74	74.71	74.73	74.74
CP16	Manhole	2D	66.76	73.27	74.48	74.46	74.50	74.46	74.85	74.80	74.82	74.81
CP17	Manhole	2D	67.00	73.99	75.36	75.27	75.36	75.33	75.92	75.87	75.91	75.90
CP18	Manhole	2D	67.00	74.18	75.04	74.94	75.04	74.96	75.61	75.55	75.59	75.52
CP20	Manhole	2D	67.77	75.03	75.54	75.54	75.54	75.55	75.79	75.79	75.80	75.81
CP22	Manhole	2D	68.78	73.94	75.29	75.25	75.28	75.24	75.78	75.75	75.80	75.74
CP24	Manhole	2D	69.00	75.30	75.52	75.52	75.53	75.50	75.91	75.87	75.89	75.84
CP25	Manhole	2D	69.00	73.63	74.70	74.68	74.69	74.68	75.11	75.06	75.09	75.08
CP27	Manhole	2D	69.20	74.36	74.86	74.84	74.86	74.87	75.30	75.25	75.28	75.29
CP28	Manhole	2D	69.20	74.19	75.20	75.18	75.20	75.20	75.64	75.59	75.62	75.63
CP33	Manhole	2D	67.88	75.24	75.34	75.33	75.36	75.35	75.60	75.55	75.61	75.59
CP35	Manhole	2D	67.05	76.13	75.40	75.37	75.43	75.43	76.02	75.88	76.03	76.03
CPM1	Manhole	Sealed	63.17	74.13	75.04	74.94	75.04	74.97	75.66	75.57	75.65	75.62
CPM11	Manhole	Sealed	65.15	74.76	74.70	74.68	74.72	74.70	75.12	75.05	75.07	75.06
CPM12	Manhole	2D	66.37	75.09	74.80	74.79	74.83	74.80	75.20	75.19	75.19	75.19
CPM13	Manhole	Sealed	65.53	73.80	74.50	74.48	74.52	74.49	74.88	74.84	74.86	74.85
CPM15	Manhole	Sealed	66.56	73.42	74.49	74.47	74.51	74.48	74.86	74.81	74.83	74.82
CPM19	Manhole	2D	64.36	74.60	75.36	75.29	75.34	75.32	75.89	75.84	75.86	75.85
CPM2	Manhole	Sealed	64.04	73.45	74.63	74.58	74.64	74.62	75.11	74.96	75.00	75.00
CPM21	Manhole	2D	64.54	74.61	75.36	75.31	75.36	75.35	75.90	75.85	75.88	75.88
CPM23	Manhole	Sealed	65.05	74.65	75.32	75.29	75.34	75.32	75.80	75.76	75.81	75.79
CPM26	Manhole	Sealed	65.41	74.79	75.32	75.28	75.34	75.32	75.79	75.76	75.80	75.78
CPM29	Manhole	Sealed	65.57	75.59	75.47	75.47	75.48	75.49	75.85	75.83	75.87	75.86
CPM30	Manhole	2D	66.31	75.01	75.39	75.38	75.40	75.38	75.85	75.83	75.86	75.84
CPM31	Manhole	2D	65.68	74.20	76.00	76.00	76.00	76.05	76.28	76.27	76.28	76.33
CPM32	Manhole	2D	65.93	75.15	75.36	75.34	75.42	75.39	75.78	75.73	75.87	75.84
CPM34	Manhole	2D	66.58	74.84	75.40	75.37	75.43	75.43	75.94	75.85	75.94	75.96
CPM5	Manhole	Sealed	64.46	73.78	74.71	74.68	74.73	74.70	75.14	75.05	75.07	75.07
CPM8	Manhole	Sealed	64.63	74.23	74.71	74.69	74.73	74.71	75.14	75.05	75.07	75.07
CPM9	Manhole	2D	64.94	74.07	74.71	74.69	74.73	74.71	75.14	75.05	75.07	75.07
D02	Manhole	Sealed	76.68	83.64	82.93	82.93	82.90	82.01	83.61	83.61	83.60	83.09
D02_2D	Manhole	2D	79.27	83.64	83.29	83.28	83.26	82.37	83.86	83.86	83.86	83.78
D03	Manhole	Sealed	73.41	82.80	82.88	82.88	82.85	81.96	83.58	83.58	83.56	83.00
D04	Manhole	Sealed	76.68	82.34	82.84	82.84	82.81	81.97	83.43	83.43	83.42	83.01
D04_2D	Manhole	2D	79.27	82.34	82.70	82.70	82.69	82.01	82.95	82.95	82.95	83.05
D05	Manhole	Sealed	76.62	80.86	81.98	81.98	81.96	81.05	82.47	82.47	82.46	81.66
D05_2D	Manhole	2D	78.59	80.63	80.93	80.93	80.93	80.85	81.01	81.01	81.01	80.97
D06	Manhole	Sealed	73.97	79.35	82.23	82.23	82.19	81.09	82.82	82.82	82.79	81.82
D07	Manhole	Sealed	76.62	79.95	81.87	81.87	81.85	80.96	82.40	82.40	82.38	81.60
D07_2D	Manhole	2D	77.68	79.95	80.61	80.61	80.60	80.51	81.03	81.03	80.96	80.83
D08	Manhole	Sealed	75.49	79.64	80.46	80.46	80.34	80.06	81.02	81.03	80.93	80.73
D08_2D	Manhole	2D	78.97	79.64	80.43	80.43	80.34	80.08	80.96	80.97	80.88	80.67
D09	Manhole	Sealed	73.76	78.98	80.47	80.47	80.34	80.06	81.04	81.04	80.95	80.74
D10	Manhole	Sealed	75.49	79.32	80.48	80.48	80.36	80.09	81.05	81.05	80.96	80.76
D10_2D	Manhole	2D	78.97	79.49	80.58	80.58	80.49	80.33	81.11	81.12	81.03	80.92
D11	Manhole	Sealed	73.99	79.13	80.41	80.40	80.24	79.85	80.98	80.98	80.89	80.67
D11_2D	Manhole	2D	76.46	79.16	80.26	80.26	80.17	79.89	80.78	80.79	80.70	80.49
D12	Manhole	Sealed	73.68	78.31	80.45	80.45	80.26	79.84	81.04	81.04	80.95	80.73
D13	Manhole	Sealed	74.68	79.36	80.32	80.32	80.15	79.63	80.92	80.92	80.82	80.59
D13_2D	Manhole	2D	78.97	78.98	79.81	79.80	79.72	79.45	80.32	80.33	80.23	80.01
D14	Manhole	Sealed	73.57	78.12	80.47	80.46	80.27	79.67	81.08	81.08	80.98	80.74
D15	Manhole	Sealed	73.99	78.26	80.47	80.47	80.28	79.73	81.08	81.08	80.98	80.75
D15_2D	Manhole	2D	78.97	79.07	80.53	80.52	80.44	80.23	81.05	81.06	80.96	80.81
D16	Manhole	Sealed	73.46	78.97	80.58	80.57	80.27	79.46	81.44	81.41	81.29	80.87
D17	Manhole	Sealed	73.40	78.41	80.46	80.45	80.19	79.36	81.33	81.31	81.18	80.75
D18	Manhole	Sealed	73.43	77.61	80.16	80.15	80.04	79.46	80.73	80.73	80.62	80.41
E0	Manhole	Sealed	70.51	81.20	75.40	75.40	75.40	75.40	76.01	76.00	76.00	75.99

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
E04	Manhole	Sealed	84.00	86.66	87.22	87.23	87.23	87.13	87.94	87.94	87.94	87.93
E04_2D	Manhole	2D	87.64	87.74	88.20	88.20	88.20	88.13	88.68	88.68	88.68	88.68
E05	Manhole	Sealed	77.84	86.40	87.16	87.16	87.16	87.07	87.78	87.78	87.77	87.76
E06	Manhole	Sealed	84.00	86.24	87.16	87.16	87.16	87.07	87.82	87.82	87.82	87.81
E06_2D	Manhole	2D	87.64	87.74	87.84	87.84	87.84	87.84	88.07	88.06	88.06	88.08
E08	Manhole	Sealed	76.41	85.16	85.01	85.00	84.96	84.79	85.79	85.79	85.77	85.72
E1	Manhole	2D	77.58	80.64	77.86	77.86	77.92	77.89	78.37	78.37	78.40	78.31
E13	Manhole	2D	78.19	81.32	81.69	81.69	81.69	81.68	82.10	82.10	82.10	82.11
E14	Manhole	2D	78.19	81.23	81.93	81.94	81.94	81.93	82.38	82.38	82.39	82.38
E16	Manhole	2D	77.69	81.48	81.72	81.72	81.72	81.72	81.98	81.98	81.98	81.98
E17	Manhole	2D	79.12	81.54	82.04	82.04	82.04	82.06	82.43	82.43	82.43	82.46
E2	Manhole	2D	77.15	80.74	77.23	77.23	77.35	77.35	77.23	77.23	77.35	77.35
E21	Manhole	2D	77.35	80.87	81.61	81.60	81.61	81.59	82.05	82.05	82.06	82.04
E22	Manhole	2D	77.35	80.13	81.30	81.30	81.30	81.30	81.75	81.75	81.75	81.74
E25	Manhole	2D	78.23	80.75	81.17	81.17	81.17	81.14	81.52	81.52	81.52	81.49
E26	Manhole	2D	78.21	79.95	81.29	81.29	81.29	81.28	81.67	81.67	81.67	81.66
E4	Manhole	2D	76.60	81.17	77.89	77.89	77.90	77.90	78.96	78.95	78.95	78.94
E5	Manhole	2D	78.22	81.12	79.04	79.04	79.06	79.06	79.40	79.40	79.41	79.41
E8	Manhole	2D	77.96	81.07	81.18	81.18	81.18	81.18	81.98	81.88	81.89	81.89
E9	Manhole	2D	77.96	80.85	80.73	80.73	80.74	80.73	81.76	81.77	81.77	81.76
EM10	Manhole	Sealed	71.76	82.45	80.16	80.16	80.15	80.14	80.96	80.94	80.93	80.93
EM11	Manhole	Sealed	73.15	82.49	81.34	81.34	81.34	81.33	81.84	81.84	81.83	81.83
EM12	Manhole	Sealed	72.27	82.85	81.25	81.25	81.24	81.24	81.79	81.79	81.78	81.78
EM15	Manhole	Sealed	73.43	81.94	81.44	81.44	81.44	81.43	81.89	81.89	81.88	81.88
EM18	Manhole	Sealed	73.60	82.80	81.45	81.44	81.44	81.43	81.89	81.89	81.88	81.88
EM20	Manhole	Sealed	73.92	81.34	81.45	81.44	81.44	81.43	81.89	81.89	81.88	81.88
EM23	Manhole	Sealed	75.45	81.26	81.36	81.36	81.36	81.35	81.78	81.78	81.77	81.76
EM24	Manhole	Sealed	76.97	80.58	81.29	81.28	81.28	81.27	81.66	81.66	81.66	81.64
EM3	Manhole	Sealed	71.11	81.69	77.22	77.22	77.22	77.22	78.30	78.28	78.28	78.28
EM6	Manhole	Sealed	71.30	82.71	78.05	78.05	78.05	78.05	79.06	79.05	79.04	79.04
EM7	Manhole	Sealed	71.67	82.50	80.00	80.00	79.99	79.98	80.85	80.83	80.81	80.81
F1	Manhole	2D	66.79	72.26	73.37	73.51	73.54	73.43	73.70	73.82	73.85	73.76
F2	Manhole	2D	65.50	75.04	68.39	68.39	68.39	68.39	71.35	71.35	71.35	71.35
F3	Manhole	2D	65.40	75.14	68.15	68.15	68.15	68.15	70.62	70.62	70.63	70.63
F4OUT	Outfall	Sealed	65.30	73.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G2	Manhole	2D	65.20	72.08	68.93	68.93	68.94	68.94	72.15	72.15	72.15	72.15
GM01	Manhole	Sealed	63.80	71.19	68.32	68.32	68.33	68.33	70.53	70.53	70.53	70.53
GM1	Manhole	2D	63.85	74.40	74.84	74.49	74.75	74.69	75.71	75.25	75.51	75.54
GM3	Manhole	2D	63.85	72.04	68.78	68.78	68.79	68.79	71.40	71.40	71.40	71.39
GM4	Manhole	2D	64.00	73.18	69.81	69.81	69.82	69.82	72.65	72.65	72.65	72.64
GM5	Manhole	2D	64.30	72.17	70.51	70.51	70.52	70.52	73.17	73.17	73.17	73.16
GM6	Manhole	2D	64.40	72.38	70.56	70.56	70.58	70.58	73.17	73.17	73.17	73.16
GM7	Manhole	2D	64.60	73.16	70.59	70.59	70.60	70.60	73.24	73.24	73.24	73.23
GOUT	Outfall	Sealed	63.50	72.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H1	Manhole	2D	63.52	72.40	73.17	73.11	73.20	73.15	74.00	73.94	73.98	73.97
H2	Manhole	Sealed	63.52	72.05	73.22	73.18	73.26	73.22	74.07	74.02	74.05	74.05
H3	Manhole	2D	63.60	73.99	73.37	73.33	73.41	73.36	74.21	74.19	74.20	74.22
IH-10_JUNCTION_E01	Manhole	Sealed	70.24	77.50	79.52	79.51	79.48	78.44	80.27	80.27	80.25	80.08
IH-10_JUNCTION_E116	Manhole	2D	70.61	80.56	79.52	79.51	79.47	78.55	80.22	80.21	80.17	80.01
IH-10_MH_C1	Manhole	2D	70.60	79.68	79.60	79.60	79.57	78.66	80.33	80.33	80.31	80.17
IH-10_MH_C105A	Manhole	2D	70.82	78.76	79.74	79.74	79.71	79.03	80.43	80.43	80.41	80.32
IH-10_MH_C107	Manhole	2D	70.92	79.27	79.80	79.79	79.77	79.16	80.46	80.46	80.44	80.36
IH-10_MH_C121	Manhole	2D	70.69	79.54	79.67	79.66	79.63	78.83	80.37	80.37	80.35	80.24
IH-10_MH_C2A	Manhole	Sealed	71.07	79.60	79.76	79.75	79.72	79.00	80.49	80.49	80.47	80.38
IH-10_MH_C7	Manhole	2D	70.78	79.30	79.72	79.71	79.68	78.96	80.41	80.41	80.39	80.47
IH-10_MH_WD13	Manhole	Sealed	70.92	79.81	79.76	79.75	79.72	79.00	80.49	80.49	80.47	80.38
IH-10_MH_WD19	Manhole	Sealed	71.04	81.03	79.53	79.52	79.48	78.48	80.26	80.26	80.24	80.07
IH-10_MH_WD20A	Manhole	Sealed	71.88	79.24	79.76	79.76	79.73	79.02	80.49	80.49	80.48	80.38
IH-10_MH_WD3	Manhole	Sealed	72.07	81.05	79.76	79.76	79.73	79.02	80.49	80.49	80.48	80.38
IH-10_MH_WD35	Manhole	Sealed	70.89	77.62	79.52	79.52	79.48	78.48	80.26	80.26	80.24	80.07
IH-10_MH_WD4	Manhole	Sealed	71.60	78.92	79.76	79.76	79.73	79.01	80.49	80.49	80.48	80.38
IH-10_MH_WD6	Manhole	Sealed	71.51	79.40	79.76	79.76	79.73	79.01	80.49	80.49	80.48	80.38
IH-10_MH_WD7	Manhole	Sealed	71.31	78.31	79.76	79.75	79.72	79.00	80.49	80.49	80.47	80.38
J1	Manhole	2D	62.75	71.65	72.70	72.68	72.70	72.60	73.58	73.42	73.52	73.44
J2	Manhole	Sealed	62.75	72.99	73.35	73.34	73.37	73.32	73.80	73.76	73.84	73.83
J3	Manhole	2D	62.87	73.60	73.81	73.80	73.83	73.82	74.15	74.14	74.23	74.27

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
L01	Manhole	2D	70.29	75.00	74.38	74.36	74.39	74.36	74.75	74.69	74.73	74.72
L03	Manhole	2D	70.29	74.05	74.35	74.33	74.36	74.33	74.60	74.53	74.55	74.54
L06	Manhole	2D	67.81	73.15	74.14	74.11	74.16	74.13	74.51	74.46	74.48	74.47
L08	Manhole	2D	70.45	73.51	74.11	73.79	73.93	73.85	74.58	74.36	74.46	74.45
L09	Manhole	2D	70.45	73.29	74.16	73.73	73.95	73.90	74.83	74.33	74.60	74.59
L11	Manhole	2D	70.65	74.13	73.92	73.62	73.82	73.74	74.81	74.33	74.59	74.61
L12	Manhole	2D	70.65	74.40	73.93	73.65	73.86	73.78	74.86	74.48	74.72	74.72
L15	Manhole	2D	71.93	74.53	75.20	75.18	75.20	75.17	75.72	75.69	75.72	75.69
L16	Manhole	2D	71.05	74.06	75.34	75.29	75.34	75.28	75.87	75.82	75.85	75.80
L19	Manhole	2D	70.54	74.67	75.19	75.14	75.19	75.18	75.70	75.66	75.69	75.69
L21	Manhole	2D	70.54	73.62	75.06	75.02	75.06	75.04	75.57	75.53	75.56	75.55
L22	Manhole	2D	70.34	73.31	75.31	75.27	75.32	75.30	75.82	75.78	75.81	75.81
L23	Manhole	2D	70.00	73.51	75.12	75.07	75.12	75.10	75.62	75.58	75.61	75.61
L26	Manhole	2D	71.66	75.21	75.46	75.41	75.46	75.43	75.99	75.95	75.98	75.97
L27	Manhole	2D	71.66	74.11	75.24	75.20	75.24	75.21	75.74	75.70	75.73	75.71
L35	Manhole	2D	71.22	74.70	75.57	75.57	75.57	75.59	75.90	75.90	75.91	75.91
L36	Manhole	2D	71.22	76.29	76.56	76.56	76.56	76.57	76.88	76.88	76.88	76.89
L37	Manhole	2D	73.84	75.49	75.88	75.89	75.88	75.88	76.21	76.23	76.22	76.21
L39	Manhole	2D	73.98	76.02	76.39	76.39	76.39	76.40	76.73	76.73	76.74	76.74
LB001	Manhole	2D	75.21	75.93	76.51	76.46	76.58	76.54	77.64	77.48	77.60	77.59
M01	Manhole	Sealed	59.09	71.79	67.50	67.50	67.54	67.54	70.48	70.21	70.33	70.33
M03	Manhole	2D	67.00	71.26	67.66	67.66	67.69	67.69	70.56	70.30	70.42	70.42
M04	Manhole	2D	67.00	71.83	68.95	68.95	68.95	68.95	71.98	71.88	71.93	71.94
M06	Manhole	2D	66.60	71.69	68.43	68.43	68.43	68.43	71.64	71.38	71.50	71.50
M07	Manhole	2D	66.60	71.53	67.58	67.58	67.61	67.61	70.65	70.40	70.51	70.51
M09	Manhole	2D	64.60	72.04	67.66	67.66	67.70	67.70	71.02	70.76	70.88	70.88
M10	Manhole	2D	64.60	72.68	67.50	67.50	67.54	67.54	70.53	70.27	70.38	70.38
M12	Manhole	2D	64.70	72.42	67.79	67.79	67.83	67.83	71.36	71.10	71.22	71.22
M13	Manhole	2D	64.70	72.45	67.50	67.50	67.54	67.54	70.53	70.28	70.39	70.39
M16	Manhole	2D	65.70	72.91	67.47	67.47	67.51	67.51	70.44	70.19	70.30	70.30
M18	Manhole	2D	65.70	72.74	67.48	67.48	67.52	67.52	70.48	70.22	70.34	70.34
M20	Manhole	2D	64.00	71.81	67.46	67.46	67.50	67.50	70.41	70.16	70.27	70.27
M21	Manhole	2D	64.00	72.07	67.47	67.47	67.51	67.51	70.41	70.16	70.27	70.27
M23	Manhole	2D	65.00	71.25	67.47	67.47	67.50	67.50	70.42	70.16	70.27	70.27
M24	Manhole	2D	65.00	72.22	67.46	67.46	67.50	67.50	70.40	70.14	70.25	70.25
MM11	Manhole	Sealed	57.50	72.73	67.48	67.48	67.52	67.52	70.45	70.19	70.31	70.30
MM14	Manhole	Sealed	57.08	72.69	67.47	67.47	67.51	67.51	70.42	70.16	70.27	70.27
MM15	Manhole	2D	60.78	72.19	67.47	67.47	67.51	67.51	70.44	70.19	70.30	70.30
MM17	Manhole	2D	62.87	72.95	67.48	67.48	67.52	67.52	70.47	70.22	70.33	70.33
MM19	Manhole	Sealed	56.90	72.35	67.46	67.46	67.50	67.50	70.40	70.14	70.25	70.25
MM2	Manhole	Sealed	58.81	71.89	67.50	67.50	67.54	67.54	70.47	70.21	70.33	70.33
MM22	Manhole	Sealed	56.81	72.03	67.46	67.46	67.50	67.50	70.38	70.13	70.24	70.23
MM25	Manhole	Sealed	56.51	72.42	67.45	67.45	67.49	67.49	70.35	70.10	70.20	70.20
MM5	Manhole	Sealed	58.05	72.20	67.49	67.49	67.53	67.53	70.47	70.21	70.33	70.33
MM8	Manhole	Sealed	57.85	72.67	67.48	67.48	67.52	67.52	70.46	70.20	70.32	70.32
MOUT	Outfall	Sealed	63.89	72.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MX1	Manhole	Sealed	60.35	71.97	69.62	69.46	69.56	69.51	70.27	69.96	70.12	70.12
MX2	Manhole	Sealed	61.83	71.97	67.50	67.50	67.54	67.54	70.46	70.18	70.31	70.30
N02	Manhole	2D	66.25	71.42	70.56	70.42	70.55	70.50	71.66	71.62	71.64	71.64
N03	Manhole	2D	65.90	70.03	70.09	69.94	70.08	70.03	70.83	70.65	70.74	70.73
N06	Manhole	2D	66.40	71.51	71.52	71.38	71.51	71.47	72.15	72.13	72.14	72.14
N07	Manhole	2D	65.60	70.70	70.43	70.28	70.42	70.37	71.65	71.59	71.62	71.63
N09	Manhole	2D	66.50	72.40	70.71	70.58	70.71	70.66	72.07	71.91	72.00	71.99
N10	Manhole	2D	67.50	72.63	70.74	70.61	70.74	70.69	72.14	71.98	72.06	72.06
N13	Manhole	2D	73.60	73.70	74.34	74.34	74.34	74.31	74.41	74.41	74.41	74.38
N14	Manhole	2D	68.30	73.05	71.09	70.98	71.10	71.05	72.59	72.46	72.55	72.52
N16	Manhole	2D	68.60	73.39	71.39	71.28	71.40	71.36	72.92	72.81	72.90	72.88
N17	Manhole	2D	68.60	73.59	71.39	71.29	71.40	71.36	72.84	72.73	72.82	72.80
N19	Manhole	2D	67.00	73.45	73.02	72.94	73.09	73.02	73.77	73.74	73.77	73.75
N20	Manhole	2D	66.90	72.90	73.01	72.93	73.08	73.01	73.68	73.67	73.69	73.67
N21	Manhole	2D	67.22	73.51	71.55	71.45	71.57	71.54	73.31	73.21	73.32	73.30
N22	Manhole	2D	67.12	73.22	71.55	71.45	71.57	71.53	73.24	73.14	73.24	73.23
N24	Manhole	2D	66.10	73.83	72.58	72.53	72.60	72.61	73.72	73.63	73.71	73.72
N25	Manhole	2D	66.50	72.52	73.21	73.21	73.21	73.29	73.57	73.56	73.57	73.65
N26	Manhole	2D	66.10	73.51	72.22	72.17	72.24	72.23	73.29	73.15	73.29	73.24
N27	Manhole	2D	66.40	71.75	72.41	72.39	72.43	72.43	73.23	73.16	73.22	73.21

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
NM1	Manhole	Sealed	60.30	71.36	70.06	69.91	70.05	69.99	70.89	70.66	70.75	70.75
NM11	Manhole	Sealed	61.68	73.77	70.69	70.56	70.69	70.65	71.90	71.74	71.83	71.82
NM12	Manhole	Sealed	60.98	73.80	71.04	70.93	71.05	71.00	72.38	72.25	72.34	72.33
NM15	Manhole	Sealed	60.98	73.77	71.38	71.28	71.39	71.35	72.79	72.68	72.76	72.75
NM18	Manhole	Sealed	60.98	73.75	71.53	71.43	71.55	71.51	72.90	72.81	72.89	72.88
NM23	Manhole	Sealed	62.21	73.72	71.90	71.83	71.93	71.91	73.05	72.99	73.05	73.06
NM4	Manhole	Sealed	60.40	71.88	70.23	70.08	70.22	70.17	71.16	70.96	71.05	71.04
NM5	Manhole	Sealed	60.45	71.88	70.39	70.25	70.38	70.33	71.41	71.23	71.31	71.30
NM8	Manhole	Sealed	60.98	72.95	70.59	70.46	70.59	70.54	71.76	71.59	71.68	71.67
OM0	Manhole	2D	67.79	83.19	83.78	83.78	83.78	83.79	84.03	84.02	84.02	84.04
OM1	Manhole	2D	68.15	83.21	83.78	83.77	83.77	83.79	84.02	84.02	84.02	84.04
OM10	Manhole	2D	70.12	84.16	84.55	84.55	84.55	84.55	84.74	84.74	84.75	84.76
OM11	Manhole	2D	71.28	84.48	84.78	84.78	84.78	84.78	84.96	84.96	84.96	84.95
OM2	Manhole	2D	67.33	83.22	83.73	83.73	83.73	83.73	83.93	83.93	83.93	83.92
OM3	Manhole	2D	68.19	83.97	84.20	84.19	84.20	84.21	84.38	84.38	84.38	84.42
OM4	Manhole	2D	69.12	83.87	84.08	84.08	84.08	84.07	84.20	84.20	84.20	84.19
OM5	Manhole	2D	69.82	83.72	84.04	84.04	84.05	84.03	84.20	84.20	84.20	84.18
OM6	Manhole	2D	69.23	83.72	84.03	84.03	84.03	84.04	84.33	84.33	84.33	84.34
OM7	Manhole	2D	68.22	84.19	84.13	84.13	84.12	84.13	84.46	84.46	84.46	84.46
OM8	Manhole	2D	69.20	83.06	84.03	84.03	84.03	84.03	84.22	84.22	84.22	84.21
OM9	Manhole	2D	69.20	84.22	84.39	84.39	84.39	84.39	84.56	84.56	84.56	84.56
OOUT	Manhole	Sealed	67.26	82.65	83.78	83.78	83.78	83.79	84.03	84.02	84.02	84.04
P04	Manhole	2D	67.36	73.99	73.74	73.51	73.68	73.62	75.15	74.96	75.14	75.11
P05	Manhole	2D	69.80	73.90	74.06	73.96	74.04	74.02	74.53	74.43	74.48	74.50
P06	Manhole	2D	69.80	74.54	74.20	74.07	74.18	74.15	75.10	75.01	75.09	75.07
P08	Manhole	2D	69.80	74.07	74.49	74.43	74.49	74.49	75.11	75.02	75.08	75.10
P09	Manhole	2D	69.80	74.58	74.86	74.79	74.88	74.86	75.57	75.48	75.54	75.55
P12	Manhole	2D	72.40	73.81	74.65	74.60	74.66	74.63	75.27	75.18	75.24	75.23
P13	Manhole	2D	72.40	74.14	74.54	74.52	74.55	74.54	75.08	75.00	75.05	75.05
P17	Manhole	2D	73.40	75.89	75.91	75.89	75.92	75.91	76.35	76.33	76.34	76.33
P18	Manhole	2D	73.40	75.35	75.70	75.69	75.70	75.70	75.99	75.99	75.99	75.99
P23	Manhole	2D	71.72	79.54	79.56	79.56	79.56	79.56	79.88	79.88	79.88	79.87
P24	Manhole	2D	79.68	79.78	79.95	79.95	79.96	79.96	80.36	80.37	80.38	80.39
P27	Manhole	2D	73.43	79.24	79.70	79.70	79.71	79.73	80.20	80.21	80.21	80.25
P28	Manhole	2D	76.43	79.82	80.02	80.03	80.04	80.02	80.60	80.61	80.61	80.60
P30	Manhole	2D	74.94	79.81	80.11	80.11	80.11	80.11	80.41	80.41	80.41	80.40
P31	Manhole	2D	71.94	79.27	80.09	80.10	80.10	80.10	80.51	80.51	80.51	80.52
P33	Manhole	2D	77.32	80.11	81.33	81.32	81.32	81.35	81.68	81.67	81.68	81.70
P34	Manhole	2D	77.12	80.12	80.73	80.73	80.74	80.72	81.12	81.11	81.12	81.10
P36	Manhole	2D	75.78	80.79	81.23	81.22	81.23	81.19	81.56	81.56	81.56	81.53
P38	Manhole	2D	75.37	80.44	81.54	81.53	81.55	81.39	81.87	81.86	81.87	81.73
P40	Manhole	2D	75.35	81.41	82.15	82.13	82.16	82.13	82.54	82.52	82.53	82.52
P41	Manhole	2D	75.05	81.23	81.82	81.80	81.82	81.79	82.19	82.17	82.19	82.17
P43	Manhole	2D	74.81	79.96	80.45	80.45	80.44	80.45	80.83	80.82	80.83	80.83
P44	Manhole	2D	74.81	81.70	80.54	80.54	80.54	80.54	81.19	81.18	81.18	81.18
P46	Manhole	2D	74.76	79.05	79.80	79.80	79.80	79.78	80.15	80.14	80.15	80.14
P47	Manhole	2D	74.76	78.71	79.57	79.57	79.57	79.55	79.93	79.92	79.92	79.92
P49	Manhole	2D	80.43	80.53	81.08	81.08	81.09	81.09	81.29	81.29	81.30	81.29
P50	Manhole	2D	80.11	80.21	80.51	80.54	80.51	80.52	80.72	80.74	80.72	80.71
PM1	Manhole	Sealed	62.10	75.35	73.26	72.95	73.16	73.10	74.09	73.76	73.96	73.96
PM10	Manhole	Sealed	62.77	73.91	74.50	74.43	74.50	74.48	75.09	74.99	75.03	75.04
PM11	Manhole	Sealed	63.67	74.05	74.56	74.50	74.56	74.55	75.14	75.05	75.09	75.10
PM14	Manhole	Sealed	63.70	73.90	74.64	74.59	74.65	74.63	75.22	75.14	75.18	75.18
PM15	Manhole	Sealed	63.97	75.90	75.05	75.00	75.05	75.04	75.61	75.56	75.58	75.58
PM16	Manhole	Sealed	64.05	75.71	75.36	75.32	75.36	75.35	75.93	75.88	75.90	75.90
PM19	Manhole	Sealed	65.22	76.45	75.78	75.75	75.78	75.77	76.35	76.33	76.34	76.33
PM2	Manhole	2D	67.66	74.91	73.86	73.63	73.81	73.76	75.04	74.85	74.96	74.97
PM20	Manhole	2D	69.80	78.35	76.79	76.77	76.80	76.79	77.96	77.94	77.96	77.96
PM21	Manhole	2D	65.60	79.89	76.72	76.70	76.72	76.72	77.75	77.73	77.74	77.74
PM22	Manhole	Sealed	66.93	80.13	77.15	77.13	77.14	77.14	78.11	78.10	78.10	78.10
PM25	Manhole	Sealed	67.88	78.89	78.94	78.94	78.93	78.93	79.65	79.65	79.64	79.65
PM26	Manhole	2D	71.25	78.60	79.13	79.12	79.15	79.15	79.71	79.72	79.72	79.70
PM29	Manhole	Sealed	68.37	79.61	79.74	79.75	79.74	79.75	80.30	80.30	80.29	80.31
PM3	Manhole	Sealed	62.21	75.42	73.57	73.34	73.51	73.46	74.37	74.08	74.26	74.26
PM32	Manhole	Sealed	68.69	79.85	80.03	80.03	80.03	80.03	80.44	80.44	80.44	80.44
PM35	Manhole	Sealed	71.13	81.24	80.73	80.73	80.74	80.72	81.11	81.11	81.11	81.10

Node ID	Node Type	Flood Type	Flowline Elevation	Ground Elevation	Exist 10-Year WSEL	Prop Phase 1 10-Year WSEL	Future Phase 2 10-Year WSEL	Future Phase 3 10-Year WSEL	Exist 100-Year WSEL	Prop Phase 1 100-Year WSEL	Future Phase 2 100-Year WSEL	Future Phase 3 100-Year WSEL
PM37	Manhole	Sealed	71.97	80.96	81.22	81.21	81.22	81.17	81.56	81.55	81.56	81.52
PM39	Manhole	Sealed	74.72	80.17	81.54	81.53	81.55	81.40	81.87	81.86	81.87	81.74
PM42	Manhole	Sealed	74.83	80.97	81.95	81.93	81.95	81.91	82.32	82.31	82.32	82.29
PM45	Manhole	Sealed	71.86	80.17	80.45	80.45	80.44	80.45	80.90	80.90	80.90	80.89
PM48	Manhole	Sealed	72.44	79.27	79.94	79.94	79.92	79.91	80.34	80.34	80.33	80.32
PM51	Manhole	Sealed	79.69	79.72	80.47	80.48	80.47	80.47	80.79	80.80	80.79	80.78
PM7	Manhole	Sealed	62.50	75.63	74.04	73.90	74.01	73.98	74.66	74.49	74.62	74.63
W1400105_sta0010	Break	Sealed	0.00	75.95	74.90	74.38	74.94	74.85	76.54	75.97	76.64	76.68
W1400105_sta0157	Break	Sealed	67.77	74.96	74.99	74.54	75.07	74.98	76.81	76.30	76.85	76.90
W1400105_sta0213	Break	Sealed	70.65	72.31	74.99	74.54	75.00	74.99	76.92	76.32	76.87	76.92
W1400105_sta1458	Break	Sealed	73.41	73.66	75.41	75.19	75.49	75.38	77.70	77.22	77.53	77.50
W14001_sta10765	Break	Sealed	0.00	60.03	69.27	69.11	69.23	69.18	69.83	69.57	69.71	69.70
W14001_sta10923	Break	Sealed	60.30	72.57	69.62	69.44	69.56	69.51	70.27	69.96	70.12	70.12
W14001_sta11029	Break	Sealed	0.00	0.00	70.14	69.89	70.06	70.00	70.94	70.58	70.79	70.78
W14001_sta12065	Break	Sealed	60.51	60.54	72.15	71.85	72.05	71.99	72.92	72.59	72.80	72.80
W14001_sta12528	Break	Sealed	62.80	65.72	72.15	71.87	72.05	72.00	72.88	72.56	72.76	72.76
W14001_sta13031	Break	Sealed	62.08	63.08	73.03	72.65	72.89	72.83	73.87	73.50	73.73	73.73
W14001_sta13092	Break	Sealed	0.00	0.00	73.18	72.78	73.03	72.97	74.07	73.68	73.92	73.93
W14001_sta13491	Break	Sealed	0.00	0.00	73.31	72.90	73.15	73.09	74.21	73.82	74.07	74.07
W14001_sta13602	Break	Sealed	62.52	0.00	73.83	73.39	73.66	73.60	74.73	74.33	74.59	74.59
W14001_sta13756	Break	Sealed	0.00	0.00	73.50	73.07	73.33	73.27	74.42	74.00	74.28	74.26
W14001_sta14232	Break	Sealed	62.88	74.56	73.96	73.47	73.75	73.68	75.03	74.55	74.86	74.86
W14001_sta14781	Break	Sealed	63.70	68.10	74.42	73.85	74.17	74.10	75.58	75.11	75.46	75.51
W14001_sta14945	Break	Sealed	63.97	65.97	74.62	74.02	74.54	74.47	75.79	75.28	75.76	75.75
W14001_sta14971	Break	Sealed	63.81	65.47	74.62	74.02	74.54	74.47	75.81	75.30	75.74	75.74
W14001_sta15025	Break	Sealed	0.00	66.66	74.66	74.05	74.64	74.57	75.80	75.34	75.96	75.97
W14001_sta15081	Break	Sealed	64.32	66.18	74.69	74.06	#N/A	#N/A	75.88	75.34	#N/A	#N/A
W14001_sta15381	Break	Sealed	0.00	0.00	74.73	74.08	74.67	74.60	75.93	75.37	75.96	75.97
W14001_sta15481	Break	Sealed	65.28	64.68	74.75	74.13	74.70	74.63	76.11	75.44	76.01	76.02
W14001_sta15671	Break	Sealed	65.16	66.56	74.83	74.26	74.75	74.68	76.35	75.62	76.05	76.07
W14001_sta15863	Break	Sealed	67.50	67.06	74.86	74.32	74.80	74.72	76.42	75.64	76.09	76.10
W14001_sta16016	Break	Sealed	74.94	67.17	74.92	74.42	74.84	74.76	76.43	75.73	76.11	76.12
W14001_sta16681	Break	Sealed	66.32	70.06	75.25	74.92	75.10	75.00	76.63	76.06	76.24	76.27
W14001_sta16756	Break	Sealed	0.00	70.77	75.29	74.93	75.29	75.16	76.64	76.10	76.37	76.42
W14001_sta16821	Break	Sealed	71.12	72.79	75.27	74.93	75.15	75.04	76.65	76.10	76.29	76.32
W14001_sta18066	Break	Sealed	75.14	75.86	77.48	77.45	77.46	77.33	78.47	78.28	78.32	78.47
W14001_sta18481	Break	Sealed	73.50	75.36	78.29	78.28	77.59	77.36	79.01	78.88	78.34	78.53
W14001_sta19161	Break	Sealed	74.87	75.88	79.20	79.20	77.62	77.39	79.85	79.81	78.31	78.54
W14001_sta19481	Break	Sealed	73.70	76.20	79.42	79.38	77.64	77.41	80.02	79.97	78.34	78.57
W14001_sta19701	Break	Sealed	72.44	73.60	80.12	80.10	79.77	79.29	80.97	80.78	80.74	80.36
W14001_sta19981	Break	Sealed	75.72	75.40	80.07	80.07	79.73	79.27	80.92	80.73	80.67	80.29
W14001_sta20481	Break	Sealed	75.61	75.66	80.09	80.06	79.74	79.27	80.99	80.74	80.65	80.28
W14001_sta20881	Break	Stored	0.00	0.00	80.16	80.12	#N/A	#N/A	80.95	80.90	#N/A	#N/A
W14001_sta21026	Break	Sealed	73.55	78.67	80.25	80.25	79.90	79.81	80.87	80.81	80.65	80.39
W54001	Manhole	2D	68.19	79.43	77.63	#N/A	#N/A	#N/A	80.31	#N/A	#N/A	#N/A
WittePond	Manhole	2D	72.46	76.17	81.44	81.43	81.05	80.02	83.02	82.94	82.87	82.55
Pond	Pond	#N/A	65.03	76.24	#N/A	70.63	72.70	71.28	#N/A	75.36	75.96	75.96

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
-1027	-1027_Outfall	1	Conduit	CIRC	3.3	1	1	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01
-1018	-1018_Outfall	1	Conduit	CIRC	10	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5000	5031	1	Conduit	CIRC	19	42	42	42.39	42.48	38.67	39.00	46.20	45.50	38.27	37.47
5001	3178797	1	Conduit	CIRC	95.4	30	30	25.79	25.86	28.96	33.61	24.27	24.31	24.76	26.67
5005	10049	1	Conduit	RECT	158.6	60	72	201.17	201.73	187.24	195.71	189.06	190.08	178.09	180.03
5007	5059	1	Conduit	CIRC	145.1	66	66	111.91	114.87	111.61	112.52	111.23	111.60	329.78	111.28
5010	D03	1	Conduit	CIRC	179.6	42	42	41.73	41.73	42.01	48.55	50.71	50.71	51.10	60.44
5013	3143205	1	Conduit	CIRC	322.4	66	66	134.49	134.50	134.41	142.59	149.04	149.49	149.86	160.78
5022	3144608	1	Conduit	CIRC	25.5	72	72	159.12	159.08	161.75	160.54	148.61	149.17	-813.55	149.66
5023	3144616	1	Conduit	RECT	65.6	60	72	161.15	159.56	160.81	160.17	148.62	147.33	147.70	147.88
5025	5026	1	Conduit	RECT	72.7	60	72	183.15	185.11	181.12	180.53	199.73	201.00	198.71	199.55
5026	5027	1	Conduit	RECT	161.5	60	72	183.28	185.17	181.23	180.64	202.97	203.29	203.13	203.00
5027	10046	1	Conduit	RECT	112.6	60	72	191.33	192.76	189.31	188.97	214.94	215.86	214.00	213.94
5028	3221259	1	Conduit	RECT	130.8	72	84	202.04	202.64	188.02	196.47	192.22	197.08	188.17	187.44
5029	5030	1	Conduit	CIRC	132.6	24	24	14.93	14.98	14.11	14.52	14.18	14.28	13.71	13.73
5030	3221259	1	Conduit	CIRC	49.9	24	24	22.69	22.85	20.51	21.88	21.05	21.29	19.63	20.06
5031	5032	1	Conduit	CIRC	118.7	42	42	42.72	42.80	40.34	39.93	48.63	48.99	45.86	45.06
5032	5034	1	Conduit	CIRC	274.9	42	42	43.44	44.49	43.20	42.27	60.29	62.02	59.54	57.82
5033	3221280	1	Conduit	RECT	65.8	72	84	230.32	231.96	216.34	221.73	229.89	235.69	216.50	216.50
5034	W14001_sta16681	1	Conduit	CIRC	107.4	42	42	43.97	45.02	43.70	42.72	60.63	62.26	59.96	58.72
5057	5000	1	Conduit	CIRC	196	42	42	42.21	42.30	38.37	38.59	45.79	45.10	38.03	37.09
5058	5005	1	Conduit	CIRC	70.8	24	24	13.86	13.99	11.40	12.71	12.26	12.45	10.69	11.05
5059	3144607	1	Conduit	CIRC	33.5	72	72	112.14	115.09	111.83	112.73	111.25	111.61	969.77	111.32
5225	5817	1	Conduit	CIRC	263.1	36	36	37.97	37.85	34.96	36.63	42.93	41.86	36.69	38.23
5361	10263	1	Conduit	CIRC	74.4	24	24	11.61	11.62	11.62	11.62	33.03	33.15	33.05	32.98
5361	4165585	2	Conduit	CIRC	107.6	36	36	-2.62	-2.12	-2.06	-2.06	-21.50	-21.28	-20.87	-20.07
5654	5659	1	Conduit	rect	59	48	60	-107.55	-107.52	-105.56	-105.30	-125.76	-125.58	-122.24	-127.76
5659	5665	1	Conduit	rect	99	48	60	56.39	56.43	57.08	55.60	88.49	88.46	93.71	116.51
5665	5669	1	Conduit	rect	148	48	60	59.34	59.36	59.95	60.63	97.37	97.36	98.77	121.74
5669	10251	1	Conduit	rect	150	48	60	59.35	59.37	59.96	60.65	97.39	97.38	98.79	121.78
5671	C005	1	Conduit	RECT	125.3	48	72	61.44	61.46	62.16	64.51	99.80	99.96	102.26	123.39
5744	5659	1	Conduit	CIRC	92.8	48	48	22.34	22.34	22.34	22.99	22.61	22.61	22.70	23.20
5744	5659	2	Conduit	CIRC	92.8	48	48	24.70	24.70	24.68	24.36	25.29	25.29	25.28	25.33
5750	IH-10_JUNCTION_E116	1	Conduit	rect	225	48	72	42.23	46.26	50.91	101.72	-61.56	-65.01	-61.60	60.41
5763	10285	1	Conduit	RECT	512	48	72	34.02	37.21	38.52	75.85	32.53	35.84	32.91	46.96
5765	5763	1	Conduit	RECT	214	48	72	-44.10	31.62	31.82	51.47	-64.93	32.36	27.67	38.43
5770	5765	1	Conduit	CIRC	232	48	48	56.02	49.05	42.84	49.44	57.89	52.76	47.20	46.82
5771	5770	1	Conduit	CIRC	212	48	48	24.48	22.72	22.49	29.77	23.60	22.14	19.80	25.64
5774	10262	1	Conduit	CIRC	127.8	36	36	12.42	12.42	12.43	12.43	33.85	33.83	33.56	33.39
5776	10264	1	Conduit	RECT	323.3	48	48	40.33	40.33	40.33	40.33	79.65	79.51	79.02	78.13
5779	10265	1	Conduit	CIRC	332.1	48	48	22.78	22.78	22.76	22.76	50.88	49.28	47.46	46.91
5784	5744	2	pump	MATHEWSON_ SUMP	617.5	N/A	N/A	4.07	4.07	4.07	4.14	4.19	4.19	4.19	4.24
5784	5744	3	pump	MATHEWSON_ SUBMERSIBLE	617.5	N/A	N/A	21.05	21.05	21.05	21.36	21.61	21.61	21.62	21.83
5784	5744	4	pump	MATHEWSON_ SUBMERSIBLE	617.5	N/A	N/A	21.05	21.05	21.05	21.36	21.61	21.61	21.62	21.83
5804	3146608	1	Conduit	CIRC	77	24	24	11.21	11.11	8.02	14.32	12.98	12.98	14.61	15.58
5809	5804	1	Conduit	CIRC	87.4	24	24	10.63	10.54	8.02	14.31	10.76	10.75	12.17	15.57
5816	W1400105_sta0157	1	Conduit	CIRC	62.3	36	36	47.62	48.61	45.59	45.92	55.83	60.29	49.74	48.55
5817	5816	1	Conduit	CIRC	50.4	36	36	47.66	48.62	45.59	45.92	55.81	52.59	44.73	45.31

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
5819	5809	1	Conduit	CIRC	160.5	24	24	8.22	8.25	8.02	14.30	8.28	8.27	11.16	15.30
5822	5819	1	Conduit	CIRC	98.9	24	24	5.40	5.41	8.02	5.93	-6.89	-6.64	8.73	-6.72
5825	5826	1	Conduit	CIRC	317.4	30	30	20.82	20.13	18.20	19.90	22.44	21.29	20.08	22.06
5826	5827	1	Conduit	CIRC	180.6	36	36	26.56	28.44	23.90	25.06	32.39	33.15	27.85	29.32
5827	W14001_sta15671	1	Conduit	CIRC	21.2	36	36	26.68	28.45	#N/A	#N/A	32.50	33.19	#N/A	#N/A
5827	Prop_Chan_07	1	Conduit	CIRC	21.2	36	36	#N/A	#N/A	23.90	25.06	#N/A	#N/A	27.86	29.35
5830	5822	1	Conduit	CIRC	168.3	24	24	-7.07	-6.97	5.19	-1.02	-9.40	-9.32	-9.23	-10.11
5837	D18	1	Conduit	CIRC	19.3	24	24	-10.23	-10.24	9.10	14.19	-11.86	-11.74	-11.51	14.07
5839	D18	1	Conduit	CIRC	22.5	24	24	-12.09	-12.09	-11.28	-10.07	-13.23	-13.12	-12.96	-13.09
5849	5850	1	Conduit	CIRC	323.8	36	36	27.14	26.93	24.15	27.08	30.22	29.72	26.27	28.07
5850	5225	1	Conduit	CIRC	346.9	36	36	32.37	32.02	29.09	31.69	35.41	34.86	30.90	32.74
5854	5825	1	Conduit	CIRC	317.6	30	30	18.86	18.28	16.40	18.07	20.17	19.41	18.14	20.15
5860	5854	1	Conduit	CIRC	315.3	24	24	17.48	17.20	15.55	17.48	17.36	16.87	15.43	16.47
5861	5860	1	Conduit	CIRC	323.9	24	24	7.02	6.98	6.71	6.74	7.05	6.96	6.79	6.70
5868	6029809	1	Conduit	CIRC	71.5	30	30	-2.94	-3.36	1.45	1.59	10.28	10.87	10.31	10.16
5870	5868	1	Conduit	CIRC	43.2	24	24	-1.90	-2.14	0.91	0.99	10.28	10.87	10.31	10.16
5874	5876	1	Conduit	CIRC	422.2	24	24	-9.93	-9.88	-9.99	-9.86	-10.72	-10.48	-10.56	-10.52
5876	5887	1	Conduit	CIRC	36.8	30	30	21.97	22.19	18.81	20.58	16.26	16.39	14.47	15.21
5879	5025	1	Conduit	CIRC	101.3	24	24	16.94	16.97	16.54	16.77	21.87	25.03	21.84	22.26
5881	6198704	1	Conduit	RECT	78.9	60	120	325.21	325.34	322.56	322.30	300.96	300.02	297.56	300.25
5887	5888	1	Conduit	CIRC	119.1	30	30	21.90	22.07	18.58	20.59	16.22	16.35	14.46	15.18
5888	5895	1	Conduit	CIRC	171.3	30	30	21.90	22.07	18.29	20.63	16.17	16.31	14.44	15.14
5890	3144610	1	Conduit	CIRC	11.4	66	66	157.05	157.64	160.29	167.39	147.87	148.08	150.99	159.38
5891	5890	1	Conduit	CIRC	411.7	66	66	142.73	143.20	145.15	151.83	134.56	134.77	138.04	145.09
5895	5896	1	Conduit	CIRC	183.7	30	30	21.84	22.00	17.94	20.58	16.14	16.27	14.42	15.10
5896	30008	1	Conduit	CIRC	267.9	30	30	21.66	21.84	17.46	20.39	16.09	16.22	14.41	15.05
5897	5897-1	1	Conduit	CIRC	100	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5902	5906172	1	Conduit	CIRC	17.3	24	24	-2.43	-2.42	-2.41	-2.56	-23.11	-23.12	-23.11	-22.90
5905	3144583	1	Conduit	CIRC	256.6	66	66	103.02	103.51	107.13	118.21	97.39	97.59	101.93	112.76
5916	5906388	1	Conduit	RECT	31.3	60	72	130.54	130.55	129.97	128.89	123.32	123.31	122.48	122.97
5921	3178787	1	Conduit	CIRC	240.5	60	60	77.41	78.37	81.47	89.12	75.31	75.48	81.15	91.28
5923	5921	1	Conduit	CIRC	93.9	60	60	71.71	71.68	75.63	83.53	67.35	67.52	73.22	83.30
5926	5923	1	Conduit	CIRC	289.7	60	60	65.29	65.28	68.88	77.16	59.75	60.66	63.27	70.51
5928	3177674	1	Conduit	CIRC	464.2	54	54	90.13	90.09	90.43	95.63	82.53	82.67	82.85	87.35
5929	5928	1	Conduit	CIRC	39.9	54	54	125.28	125.29	125.32	127.26	129.97	129.97	129.85	130.73
5940	6061295	1	Conduit	RECT	275.4	60	72	113.68	113.68	113.07	113.51	100.61	100.61	99.96	100.30
5942	3178768	1	Conduit	CIRC	5.7	24	24	-26.25	-26.24	-26.57	-27.86	-27.45	-27.44	-27.77	-29.09
5952	3178762	1	Conduit	CIRC	294	54	54	41.38	41.38	43.61	47.83	49.06	49.24	43.82	46.06
5960	3176115	1	Conduit	CIRC	130.7	48	48	34.14	34.14	36.33	41.24	35.10	35.26	34.63	35.63
5963	3176112	1	Conduit	CIRC	39.3	42	42	-41.44	-41.38	-41.81	-41.41	-79.67	-79.66	-79.70	-77.75
5967	5968	1	Conduit	CIRC	193.5	96	96	245.77	245.78	243.87	247.25	247.86	247.87	245.47	249.23
5968	3176104	1	Conduit	CIRC	282.2	96	96	231.08	231.10	227.90	232.11	224.48	224.49	220.01	225.68
5974	3176102	1	Conduit	CIRC	51	96	96	242.73	242.74	239.68	244.05	253.17	253.18	247.71	249.69
5979	3176249	1	Conduit	RECT	95	96	96	356.32	356.32	354.98	343.37	408.53	408.52	401.79	385.00
5982	3176248	1	Conduit	RECT	107.7	96	96	358.83	358.81	395.33	399.22	398.25	398.24	434.12	434.37
5985	3176247	1	Conduit	RECT	103.6	96	96	298.34	298.25	293.47	287.80	275.44	274.74	269.57	265.27
5988	5990	1	Conduit	RECT	199.7	96	96	307.48	307.38	303.13	300.06	297.49	296.69	291.80	290.00
5990	5993	1	Conduit	RECT	89.3	96	96	303.52	303.44	299.36	297.28	302.06	301.15	296.22	293.95
5993	3176246	1	Conduit	RECT	89.5	96	96	296.21	296.11	292.38	291.00	306.38	305.50	300.60	297.36
5997	5999	1	Conduit	RECT	91.6	96	96	293.87	293.75	288.61	284.77	305.95	303.74	299.10	296.49
5999	6003	1	Conduit	RECT	178.9	96	96	295.53	295.40	290.34	286.59	295.66	294.72	290.17	287.84

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
6003	3176245	1	Conduit	RECT	88.8	96	96	299.59	299.31	294.42	288.39	298.37	297.36	292.63	290.05
6006	7204174	1	Conduit	RECT	211.9	96	96	320.45	320.34	315.80	310.34	319.55	318.45	314.14	310.63
6013	3234315	1	Conduit	RECT	305.5	96	84	318.21	317.78	317.12	316.65	328.18	328.14	326.75	326.56
6013	3234315	2	Conduit	RECT	305.5	96	84	318.21	317.78	317.12	316.65	328.18	328.14	326.75	326.56
6016	30029	1	Conduit	RECT	1458	96	96	801.87	801.88	799.00	798.48	843.16	843.18	839.99	835.86
6018	7204174	1	Conduit	RECT	59.9	60	96	386.16	386.22	385.65	389.47	404.54	404.78	403.71	405.63
6021	3175107	1	Conduit	CIRC	356.4	96	96	221.38	221.50	219.60	222.63	216.82	216.77	215.67	212.79
6023	6021	1	Conduit	CIRC	95.8	96	96	258.04	258.04	256.44	248.60	269.36	269.36	268.09	262.20
6028	3175102	1	Conduit	CIRC	120.3	84	84	184.17	184.55	183.51	203.74	179.58	179.75	178.33	185.48
6031	6028	1	Conduit	CIRC	267.3	84	84	189.92	190.20	189.45	206.59	178.75	178.92	177.60	184.49
6037	6073459	1	Conduit	CIRC	45.2	66	66	-120.18	-120.17	-120.50	-115.84	-178.45	-178.45	-178.67	-175.01
6040	6073491	1	Conduit	CIRC	142.1	78	78	-98.75	-98.71	-100.63	-82.20	49.75	49.81	49.32	52.78
6046	5654	1	Conduit	CIRC	198.9	36	36	-12.86	-12.88	-12.87	5.16	-15.20	-15.08	-14.13	-10.26
6049	W14001_sta15481	1	Conduit	CIRC	65.5	24	24	32.42	32.24	28.88	31.59	31.48	32.35	27.50	29.25
10002	3234050	1	Conduit	CIRC	17.1	24	24	-14.59	-14.49	-15.44	-17.00	-27.15	-27.14	-27.24	-28.30
10003	3234050	1	Conduit	CIRC	22.4	24	24	-17.00	-16.93	-17.63	-18.64	-27.75	-27.74	-27.85	-28.59
10008	4165579	1	Conduit	CIRC	16.8	24	24	6.46	6.47	6.70	6.13	10.36	10.36	10.47	9.41
10009	5057	1	Conduit	CIRC	10.7	24	24	27.20	25.92	29.19	32.03	29.74	29.98	29.40	31.13
10010	5057	1	Conduit	CIRC	27.8	24	24	17.82	17.86	9.51	6.92	19.62	19.22	9.61	6.14
10011	10048	1	Conduit	CIRC	48.2	24	24	-12.84	-12.80	-13.15	-13.49	-14.72	-14.86	-14.96	-15.28
10032	6198894	1	Conduit	CIRC	37.2	24	24	-3.32	-3.32	-3.32	-3.39	-4.61	-4.61	-4.61	-4.71
10033	6198892	1	Conduit	CIRC	32.3	24	24	13.21	13.21	13.21	13.21	16.33	16.33	16.33	16.42
10034	6198872	1	Conduit	CIRC	18.9	24	24	4.52	4.51	4.52	4.99	6.30	6.29	6.47	7.25
10035	6198872	1	Conduit	CIRC	37.6	24	24	6.02	6.01	6.02	6.02	5.47	5.47	5.47	5.75
10036	6198824	1	Conduit	CIRC	25.3	24	24	3.32	3.32	3.32	3.32	18.41	18.39	18.26	19.74
10037	6198800	1	Conduit	CIRC	21.7	24	24	-0.95	-0.96	-0.94	-0.92	-16.38	-16.51	-16.38	-15.95
10044	5025	1	Conduit	RECT	133	60	72	175.12	171.96	172.99	172.24	165.52	162.89	166.44	165.41
10046	3218866	1	Conduit	RECT	150.9	60	72	192.66	194.07	190.65	190.27	217.61	218.49	216.31	216.07
10048	3218873	1	Conduit	RECT	21.7	60	72	189.87	190.40	176.45	184.63	178.92	179.88	166.57	169.68
10049	5028	1	Conduit	RECT	54.9	60	72	202.23	202.81	188.26	196.74	190.04	191.32	179.10	181.03
10051	3221268	1	Conduit	RECT	64.8	72	84	222.46	224.12	207.15	212.65	214.94	221.55	205.78	206.29
10052	10051	1	Conduit	CIRC	49.6	30	30	2.76	2.77	2.82	2.85	-14.67	-13.02	-13.81	-14.63
10053	10054	1	Conduit	RECT	212.5	72	84	225.27	226.91	210.63	216.21	217.96	225.66	207.62	208.37
10054	3221271	1	Conduit	RECT	35.7	72	84	229.75	231.40	215.44	220.98	222.27	234.06	214.92	214.93
10055	5031	1	Conduit	CIRC	6.3	24	24	0.46	0.49	0.24	0.25	-5.20	-4.58	-7.72	-6.30
10056	5032	1	Conduit	CIRC	6.1	24	24	1.16	1.15	1.24	1.18	12.59	8.61	8.42	6.33
10057	5033	1	Conduit	CIRC	6.6	24	24	1.20	1.13	0.99	0.98	1.93	1.75	1.72	1.73
10058	5034	1	Conduit	CIRC	6.2	24	24	0.60	0.57	0.57	0.59	1.02	0.95	0.97	0.97
10059	4165581	1	Conduit	CIRC	7.7	24	24	4.51	4.52	4.34	4.55	4.71	5.15	5.02	5.54
10095	3234049	1	Conduit	CIRC	30	18	18	-4.67	-4.60	-5.03	-4.90	-14.41	-14.40	-14.50	-14.39
10096	3234059	1	Conduit	CIRC	19.6	18	18	-11.67	-11.63	-11.81	-11.66	-92.26	-18.97	-19.01	-18.80
10097	3234058	1	Conduit	CIRC	20.2	18	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10098	3236569	1	Conduit	CIRC	24.8	18	18	-8.22	-8.15	-8.29	-8.49	-13.03	-12.94	-12.98	-13.12
10099	3236568	1	Conduit	CIRC	22.2	18	18	-0.35	-0.35	-0.34	-0.32	-8.39	-8.23	-7.63	-7.72
10100	3236589	1	Conduit	CIRC	30.6	30	30	-4.64	-4.99	-2.75	-3.88	10.92	10.96	11.02	10.69
10101	3236589	1	Conduit	CIRC	12.9	30	30	-19.25	-19.20	-19.29	-21.59	-27.01	-26.98	-27.02	-29.15
10102	3236588	1	Conduit	CIRC	30.3	24	24	-5.05	-5.33	3.24	-4.20	-12.00	-11.92	-12.02	-11.47
10103	3236596	1	Conduit	CIRC	7.4	18	18	-5.64	-5.61	-5.67	-5.74	-7.64	-7.61	-7.66	-7.61
10106	3234051	1	Conduit	CIRC	10.4	18	18	20.77	20.41	20.09	20.25	20.91	20.74	20.27	20.01
10107	3234052	1	Conduit	CIRC	11.6	18	18	-12.85	-12.84	-12.82	-12.66	-17.21	-17.21	-17.14	-17.09
10108	3234054	1	Conduit	CIRC	21.9	18	18	15.01	15.00	14.99	14.63	15.76	15.74	15.73	15.35

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10109	3234054	1	Conduit	CIRC	8.5	18	18	-15.37	-15.37	-15.43	-15.23	-20.41	-20.40	-20.46	-20.37
10110	3144586	1	Conduit	CIRC	20.8	24	24	-7.87	-8.97	-1.81	-2.81	0.62	0.66	0.48	0.60
10111	3178791	1	Conduit	CIRC	22.3	24	24	-5.89	-6.29	-2.09	-3.24	0.68	0.69	0.52	0.60
10112	3178790	1	Conduit	CIRC	21.7	24	24	-11.79	-11.55	-8.08	-9.03	-19.25	-19.24	-19.52	-19.85
10113	3178781	1	Conduit	CIRC	11.1	24	24	-29.52	-29.52	-29.55	-30.03	-31.19	-31.19	-31.22	-31.62
10114	3178783	1	Conduit	CIRC	12.5	24	24	-24.44	-24.43	-24.50	-25.00	-28.45	-28.44	-28.50	-29.06
10115	3178772	1	Conduit	CIRC	18.1	48	48	-42.86	-42.79	-43.37	-52.87	-67.40	-67.36	-67.13	-72.71
10118	3178768	1	Conduit	CIRC	31.4	24	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10119	3236615	1	Conduit	CIRC	17.3	24	24	12.42	12.00	12.84	14.47	24.96	25.01	24.84	25.94
10120	3236615	1	Conduit	CIRC	30	24	24	-20.96	-20.72	-20.85	-20.95	-29.22	-29.00	-29.14	-29.32
10121	3236633	1	Conduit	CIRC	28.9	24	24	22.53	22.90	21.81	22.25	21.24	21.60	20.74	21.07
10123	3236634	1	Conduit	CIRC	16	24	24	-11.27	-10.56	-11.28	-12.19	-23.87	-23.07	-23.56	-24.35
10124	3218806	1	Conduit	CIRC	10.1	24	24	-37.66	-37.62	-37.80	-37.85	-40.70	-40.67	-40.66	-40.77
10128	3176113	1	Conduit	CIRC	36.8	24	24	-23.25	-23.25	-23.31	-23.39	-24.60	-24.60	-24.62	-24.75
10135	3236590	1	Conduit	CIRC	8.9	24	24	30.36	30.51	30.51	31.52	30.68	30.74	30.46	31.22
10136	3236590	1	Conduit	CIRC	25.3	24	24	-17.30	-17.27	-17.30	-17.93	-19.75	-19.71	-19.77	-20.63
10138	3144584	1	Conduit	CIRC	7.6	18	18	-12.61	-12.53	-11.40	-10.56	-15.36	-15.36	-17.04	-17.02
10245	5750	1	Conduit	RECT	223	48	72	47.92	56.52	57.94	101.97	44.46	54.57	53.52	61.31
10247	5771	1	Conduit	CIRC	210	48	48	37.14	35.51	33.59	20.87	40.84	39.88	39.07	38.55
10251	5671	1	Conduit	RECT	190	48	72	59.37	59.39	59.98	60.68	97.43	97.42	98.82	121.83
10260	5361	1	Conduit	CIRC	45.8	24	24	4.30	3.13	1.22	0.89	13.70	13.56	12.22	12.27
10261	4165585	1	Conduit	CIRC	44.9	24	24	0.56	0.56	0.55	0.55	8.70	8.72	8.70	8.73
10262	10266	1	Conduit	CIRC	40.6	36	36	15.87	15.87	15.87	15.87	43.95	43.17	40.42	35.76
10263	5774	1	Conduit	CIRC	59.5	24	24	12.24	12.24	12.24	12.24	33.41	33.53	33.42	33.34
10264	6050	1	Conduit	RECT	28	48	48	54.24	54.24	54.23	54.23	103.90	103.71	103.15	102.19
10265	5776	1	Conduit	CIRC	277	48	48	39.76	39.77	39.76	39.76	78.57	78.47	78.03	77.27
10266	5779	1	Conduit	CIRC	171.8	48	48	21.85	21.86	21.85	21.85	47.21	47.02	46.62	46.02
10285	10245	1	Conduit	RECT	223	48	72	34.03	37.22	38.43	75.55	32.55	35.86	-33.63	46.89
10289	5360	1	Conduit	CIRC	36.6	24	24	0.50	0.50	0.50	0.50	24.43	24.26	23.65	21.02
10290	5360	1	Conduit	CIRC	45.2	24	24	0.46	0.46	0.46	0.46	-16.27	-15.94	-14.87	-13.28
10297	3218866	1	Conduit	CIRC	17.9	24	24	-2.25	-2.18	-0.97	-1.57	-0.19	-0.19	0.15	0.18
10302	5861	1	Conduit	CIRC	70.6	24	24	11.07	11.04	11.32	12.01	11.71	11.33	11.69	12.42
10304	5854	1	Conduit	CIRC	30	24	24	9.85	9.45	8.45	9.22	10.94	10.48	10.52	12.19
10306	5854	1	Conduit	CIRC	19	24	24	-15.21	-14.86	-15.94	-15.56	-20.38	-20.01	-20.48	-20.35
10308	5825	1	Conduit	CIRC	34.1	24	24	-13.70	-12.98	-14.17	-12.87	-17.04	-16.53	-16.73	-15.50
10309	5825	1	Conduit	CIRC	18	24	24	-8.95	-7.34	-9.84	-9.23	-14.99	-14.14	-14.67	-14.53
10311	5826	1	Conduit	CIRC	31.1	24	24	2.62	1.72	3.08	2.43	16.27	13.25	14.01	14.40
10313	5826	1	Conduit	CIRC	51.2	24	24	-0.86	-0.23	-0.92	-0.45	-10.35	-7.39	-9.04	-8.84
20053	20119	1	Conduit	CIRC	21.5	30	30	-0.35	-0.34	0.20	-0.26	0.37	0.37	0.42	0.41
20102	W14001_sta18481	1	Conduit	CIRC	38.2	48	48	33.23	33.18	38.71	42.64	33.13	32.76	37.98	40.69
20103	20102	1	Conduit	CIRC	13.6	48	48	33.01	33.03	38.82	42.97	32.98	32.70	38.01	40.67
20104	20103	1	Conduit	CIRC	44.4	42	42	32.87	32.87	38.88	43.13	31.60	31.77	38.05	37.84
20105	20104	1	Conduit	CIRC	119.8	42	42	32.89	32.89	38.94	43.36	31.60	31.70	38.07	37.91
20106	20105	1	Conduit	CIRC	120.3	42	42	32.92	32.92	39.06	43.87	30.89	30.89	37.74	38.08
20107	20106	1	Conduit	CIRC	120.6	42	42	32.95	32.96	39.19	44.30	30.90	30.91	37.78	38.24
20108	20107	1	Conduit	CIRC	114.5	36	36	22.75	22.88	26.63	30.06	20.31	20.34	24.12	25.54
20109	20108	1	Conduit	CIRC	80.5	36	36	17.22	17.23	21.16	25.32	16.35	16.39	19.81	21.20
20110	20111	1	Conduit	CIRC	125.3	36	36	12.71	12.71	16.26	19.36	11.82	11.88	15.11	16.31
20111	20109	1	Conduit	CIRC	123.1	36	36	15.66	15.66	19.38	23.17	14.84	14.86	18.18	19.47
20112	20110	1	Conduit	CIRC	123.6	30	30	12.83	12.85	16.70	19.44	11.76	11.77	15.07	16.61
20113	20112	1	Conduit	CIRC	124.4	30	30	12.69	12.71	16.53	19.02	12.61	12.62	14.95	16.42

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
20114	20113	1	Conduit	CIRC	123.7	21	21	5.59	5.60	6.73	7.65	4.84	4.71	5.47	6.40
20115	20114	1	Conduit	CIRC	124.4	15	15	2.89	2.89	3.49	4.02	-3.03	-3.03	-3.03	3.39
20116	W14001_sta19161	1	Conduit	CIRC	164.1	24	24	12.14	12.12	15.61	26.82	12.04	12.00	15.52	26.77
20117	20116	1	Conduit	CIRC	46.6	24	24	-19.46	-19.45	11.31	19.01	-20.16	-20.13	10.52	15.67
20118	20117	1	Conduit	CIRC	25.2	18	18	-8.87	-8.87	-6.87	-7.47	-9.26	-9.27	-7.60	-7.98
20119	20120	1	Conduit	CIRC	132.6	30	30	-1.72	-1.66	-0.95	-1.14	0.81	0.81	0.92	0.89
20120	20121	1	Conduit	CIRC	126	36	36	-2.79	-2.75	-1.70	-2.17	1.04	1.03	1.23	1.20
20121	20122	1	Conduit	CIRC	100	36	36	10.15	10.15	8.66	10.06	16.41	16.38	15.22	16.98
20122	20123	1	Conduit	CIRC	101	36	36	10.13	10.13	8.65	10.04	16.41	16.34	15.19	16.95
20123	20124	1	Conduit	CIRC	84.1	48	48	25.85	25.76	24.90	25.58	42.23	42.13	40.69	42.10
20124	W14001_sta16821	2	Conduit	CIRC	29.2	48	48	26.07	25.98	24.89	25.53	42.44	42.25	40.68	42.08
20125	20123	1	Conduit	CIRC	132.4	36	36	16.08	16.15	16.67	16.20	26.41	26.43	25.94	25.57
20126	20125	1	Conduit	CIRC	127.4	36	36	15.90	15.79	16.37	15.91	26.31	26.26	25.70	25.35
20127	20126	1	Conduit	CIRC	171.6	36	36	15.93	15.86	16.37	15.86	26.30	26.29	25.66	25.33
20128	20127	1	Conduit	CIRC	109.1	36	36	13.39	13.35	13.77	13.34	22.63	22.62	21.97	21.69
20129	20128	1	Conduit	CIRC	125.8	30	30	-1.00	-0.93	-0.90	-0.99	13.35	13.27	12.30	12.74
20131	20132	1	Conduit	CIRC	27	24	24	-6.22	-6.22	-6.24	-5.63	-8.54	-8.57	-8.67	-9.02
20132	20139	1	Conduit	CIRC	273.9	24	24	8.14	8.14	8.14	8.72	8.73	8.72	8.93	9.23
20132	20139	2	Conduit	CIRC	273.9	24	24	8.14	8.14	8.14	8.72	8.73	8.73	8.93	9.23
20133	20132	1	Conduit	CIRC	56.7	18	18	4.67	4.67	4.65	4.55	4.69	4.69	4.67	4.66
20134	20133	1	Conduit	CIRC	27.1	18	18	-4.93	-4.92	-4.80	-3.94	-5.50	-5.50	-5.50	-5.50
20135	20131	1	Conduit	CIRC	27	24	24	14.11	14.00	9.42	2.23	17.21	17.22	16.86	17.07
20136	20137	1	Conduit	CIRC	26.9	12	12	-4.98	-4.97	-5.00	-4.92	-5.29	-5.29	-5.31	-5.36
20137	20138	1	Conduit	CIRC	57.6	18	18	7.21	7.21	7.20	8.99	7.81	7.81	7.83	8.25
20138	20142-1	1	Conduit	CIRC	271.7	24	24	7.07	7.07	7.03	10.27	6.28	6.28	6.26	8.50
20138	20142-1	2	Conduit	CIRC	271.7	24	24	7.07	7.07	7.03	10.27	6.28	6.28	6.26	8.50
20139	20138	1	Conduit	CIRC	27.1	24	24	-11.63	-11.61	-11.08	-9.84	-12.64	-12.63	-12.32	-13.60
20139	20138	2	Conduit	CIRC	27.1	24	24	-11.64	-11.62	-11.08	-9.83	-12.65	-12.64	-12.32	-13.60
20140	20141	1	Conduit	CIRC	27.4	12	12	-2.92	-2.92	-2.93	-3.38	-3.25	-3.25	-3.26	-3.65
20141	20142	1	Conduit	CIRC	57.4	18	18	7.60	7.60	7.68	11.42	7.62	7.62	7.67	10.90
20142	W14001_sta18066	1	Conduit	CIRC	166.4	24	24	15.11	15.11	14.57	42.66	15.36	15.29	14.49	41.18
20142	W14001_sta18066	2	Conduit	CIRC	166.4	24	24	15.11	15.11	14.57	#N/A	15.36	15.29	14.49	#N/A
30000	30007	1	Conduit	CIRC	98.7	78	78	169.85	171.31	166.89	168.19	172.20	175.53	172.59	172.81
30001	30020	1	Conduit	CIRC	318.1	96	96	279.61	288.66	279.51	280.42	268.13	282.57	270.35	270.71
30002	30019	1	Conduit	CIRC	24.6	78	78	170.14	171.53	167.05	168.39	172.36	175.71	172.79	173.01
30003	30004	1	Conduit	CIRC	35.4	96	96	305.36	312.93	300.95	302.71	299.68	312.39	299.55	299.33
30004	30021	1	Conduit	CIRC	37.4	102	102	305.33	312.97	301.00	302.74	299.67	312.41	299.56	299.33
30005	30006	1	Conduit	CIRC	323.6	102	102	342.16	353.46	341.71	343.49	364.73	385.84	372.68	372.69
30006	30016	1	Conduit	CIRC	314.3	102	102	342.08	353.55	341.83	343.53	364.69	385.99	372.81	372.90
30007	30027	1	Conduit	CIRC	114.4	78	78	169.72	171.21	166.80	168.11	172.10	175.45	172.49	172.72
30008	30023	1	Conduit	CIRC	30	30	30	21.51	21.69	17.11	20.17	16.05	16.19	14.40	15.01
30009	30017	1	Conduit	CIRC	37.9	24	24	5.57	5.66	5.53	5.55	6.30	6.48	6.32	6.32
30009	30022	2	Conduit	CIRC	296.8	102	102	342.35	353.24	341.58	343.30	364.87	385.79	372.49	372.47
30010	30027	1	Conduit	CIRC	59.8	60	60	129.95	135.17	129.20	129.13	112.26	121.15	113.90	114.51
30011	30010	1	Conduit	CIRC	193.5	60	60	129.94	135.15	129.19	129.12	112.29	121.14	113.90	114.51
30012	30001	1	Conduit	CIRC	239.2	96	96	279.56	288.61	279.43	280.34	268.15	282.55	270.32	270.69
30013	30003	1	Conduit	CIRC	478.5	96	96	305.38	312.89	300.91	302.67	299.70	312.38	299.56	299.32
30014	W14001_sta14971	1	Conduit	CIRC	1150	24	24	5.52	5.63	5.50	5.52	6.24	6.45	6.35	6.28
30015	W14001_sta14945	2	Conduit	CIRC	14.8	102	102	414.86	425.95	414.28	415.99	496.46	515.91	504.07	504.03
30016	30015	1	Conduit	CIRC	151.5	102	102	414.53	425.93	414.23	415.94	492.15	515.41	502.30	502.38
30017	30014	1	Conduit	CIRC	298.2	24	24	5.55	5.64	5.52	5.54	6.21	6.46	6.29	6.29

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
30018	30012	1	Conduit	CIRC	63.4	96	96	279.51	288.57	279.35	280.26	268.10	282.52	270.27	270.67
30019	30000	1	Conduit	CIRC	238.7	78	78	169.99	171.40	166.96	168.28	172.28	175.60	172.68	172.90
30020	30023	1	Conduit	CIRC	24.2	96	96	279.64	288.69	279.57	280.48	268.14	282.59	270.37	270.73
30021	30009	1	Conduit	CIRC	29.8	102	102	347.94	358.89	347.16	348.87	371.11	392.29	378.81	378.80
30022	30005	1	Conduit	CIRC	329.7	102	102	342.25	353.26	341.54	343.28	364.81	385.73	372.45	372.43
30023	30013	1	Conduit	CIRC	362.4	96	96	305.80	312.38	300.46	302.20	299.89	312.17	299.57	299.29
30027	30018	1	Conduit	CIRC	11.6	96	96	279.47	288.53	279.28	280.20	268.05	282.49	270.23	270.64
30029	30028	1	Conduit	RECT	46	96	96	703.54	703.54	701.97	701.78	943.84	943.76	941.98	939.95
30029	30028	2	Conduit	RECT	46	96	96	703.54	703.54	701.97	701.78	943.84	943.76	941.98	939.95
30030	W1400105_sta1458	1	Conduit	RECT	48	36	72	10.03	10.29	10.20	11.00	21.27	20.02	21.12	22.43
30030	W1400105_sta1458	2	Conduit	RECT	48	36	72	10.03	10.29	10.20	11.00	21.27	20.02	21.12	22.43
30032	10044	1	Conduit	CIRC	32	24	24	5.22	5.23	5.22	5.25	-14.95	-15.17	-15.02	-15.25
30033	3144616	1	Conduit	CIRC	55.4	24	24	4.63	4.56	4.71	4.77	7.72	7.73	9.86	7.74
30034	5022	1	Conduit	CIRC	21	24	24	24.01	24.10	24.15	24.19	26.26	27.02	100.15	25.44
30035	5022	1	Conduit	CIRC	55	24	24	17.10	14.51	16.40	16.25	19.81	20.09	74.73	20.94
30036	10046	1	Conduit	CIRC	52.3	24	24	2.07	2.06	2.10	2.11	3.58	3.58	3.75	3.58
30037	5027	1	Conduit	CIRC	72.4	24	24	12.72	12.69	12.80	12.79	22.04	22.04	22.26	22.04
3143189	3143196	1	Conduit	CIRC	256.4	66	66	115.57	115.57	115.87	119.30	121.07	121.39	121.56	129.80
3143195	3143197	1	Conduit	CIRC	352.2	24	24	12.56	12.56	12.55	12.75	12.25	12.25	12.24	12.80
3143196	3143201	1	Conduit	CIRC	217.1	66	66	121.52	121.53	121.87	126.87	125.56	125.90	126.07	134.21
3143197	3143196	1	Conduit	CIRC	25.7	24	24	12.55	12.55	12.54	12.74	26.73	26.73	26.71	28.51
3143201	5013	1	Conduit	CIRC	73.8	66	66	121.62	121.63	121.97	126.94	125.75	126.10	126.27	134.16
3143205	C092	1	Conduit	CIRC	307.9	66	66	148.47	148.46	148.37	165.89	172.20	172.28	172.64	186.35
3143206	3143205	1	Conduit	CIRC	96.9	30	30	24.20	24.20	24.45	35.72	30.22	30.23	30.32	33.80
3143206	5906227	2	Conduit	CIRC	28.8	30	30	-22.43	-22.43	-22.68	-29.94	-22.94	-22.97	-23.09	-26.27
3143209	3144624	1	Conduit	CIRC	556.4	24	24	10.70	10.71	11.10	11.23	10.37	10.38	10.66	10.72
3143214	E05	1	Conduit	CIRC	266.6	30	30	19.22	19.23	19.28	20.32	16.00	16.07	16.08	16.97
3143215	3143214	1	Conduit	CIRC	260.3	24	24	12.70	12.65	12.71	13.36	9.84	9.86	9.93	10.96
3143216	3143215	1	Conduit	CIRC	283.4	24	24	9.89	10.32	10.42	11.07	7.17	7.17	7.14	8.25
3143228	C086	1	Conduit	CIRC	144.3	24	24	22.03	22.03	22.05	23.50	21.99	21.99	21.97	22.86
3143498	3143189	1	Conduit	CIRC	73.9	18	18	-1.53	-1.52	-1.55	-2.68	-1.11	-1.11	-1.12	-1.58
3143499	3143196	1	Conduit	CIRC	75	18	18	-3.36	-3.35	-3.60	-3.04	-1.10	-1.14	-0.92	-0.81
3143507	5013	1	Conduit	CIRC	72.8	18	18	6.06	6.07	5.75	-3.09	8.20	8.20	8.03	9.03
3144582	5001	1	Conduit	CIRC	107.9	30	30	26.66	26.88	29.41	33.96	24.31	24.35	24.81	26.86
3144583	5891	1	Conduit	CIRC	248	66	66	121.56	122.00	124.09	131.21	114.80	114.97	118.00	124.34
3144584	3144583	1	Conduit	CIRC	40.3	24	24	24.21	24.19	20.48	20.43	23.89	23.90	22.18	22.51
3144586	3144612	1	Conduit	CIRC	735.2	66	66	85.82	88.25	84.62	84.53	93.37	93.32	95.86	93.33
3144586	3178791	2	Conduit	CIRC	380.5	66	66	-80.90	-83.11	-79.70	-79.30	-87.08	-87.18	-85.99	-85.65
3144587	3144599	1	Conduit	CIRC	299.2	36	36	25.60	25.61	26.36	28.46	24.14	24.17	24.53	25.83
3144591	5891	1	Conduit	CIRC	24.4	24	24	23.07	23.11	24.12	24.84	20.26	20.28	21.20	21.74
3144598	3144591	1	Conduit	CIRC	47	24	24	23.06	23.09	24.08	24.81	20.27	20.29	21.21	21.76
3144599	3144609	1	Conduit	CIRC	288.1	36	36	25.69	25.81	26.40	28.48	24.11	24.14	24.48	25.72
3144600	3144619	1	Conduit	CIRC	478.3	30	30	22.03	22.05	22.09	22.38	23.98	23.98	24.03	24.25
3144602	3218829	1	Conduit	CIRC	176.7	48	48	31.48	31.73	29.21	30.78	35.26	35.25	-125.24	29.70
3144603	3144605	1	Conduit	CIRC	26.6	72	72	301.13	275.36	-297.36	-294.66	-397.80	-444.58	-7425.18	-463.24
3144605	3144602	1	Conduit	CIRC	129	48	48	-25.92	-26.38	18.03	-21.16	26.15	25.53	2525.98	-60.95
3144605	3144606	2	Conduit	CIRC	20.2	72	72	389.47	374.48	394.12	386.70	535.67	545.88	3571.13	528.18
3144606	5022	1	Conduit	CIRC	36.7	72	72	152.79	153.98	151.61	152.67	138.60	140.03	-4114.87	140.59
3144607	3144603	1	Conduit	CIRC	294.3	72	72	112.48	115.43	112.17	113.92	111.58	111.90	6912.38	111.40
3144608	5023	1	Conduit	RECT	131.8	60	72	159.47	158.57	160.32	158.38	145.78	144.47	145.40	146.79
3144609	3144610	1	Conduit	CIRC	30.1	36	36	25.61	25.71	26.43	28.52	24.08	24.11	24.44	25.65

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
3144610	B48	1	Conduit	CIRC	290.5	66	66	193.93	194.54	197.79	206.11	191.77	192.00	198.64	206.89
3144612	3144613	1	Conduit	CIRC	43.7	66	66	85.97	88.41	84.78	84.70	90.97	91.25	90.15	90.54
3144613	5007	1	Conduit	CIRC	298.8	66	66	111.50	114.46	111.06	112.30	111.16	111.53	220.49	111.26
3144614	3144615	1	Conduit	CIRC	20.4	24	24	11.37	11.45	11.06	11.38	-11.12	-11.12	-11.58	-10.53
3144615	3144613	1	Conduit	CIRC	39.2	24	24	24.51	25.02	20.00	21.32	21.19	21.16	20.33	20.61
3144616	10044	1	Conduit	RECT	53.6	60	72	167.27	164.73	165.69	165.21	152.55	151.11	152.43	153.65
3144617	3144917	1	Conduit	CIRC	75	24	24	-1.42	-1.33	-0.88	0.79	7.11	7.10	4.17	2.64
3144618	3144615	1	Conduit	CIRC	180	24	24	19.89	20.24	14.48	17.21	14.85	14.90	14.14	14.37
3144619	3144627	1	Conduit	CIRC	23.3	30	30	16.60	16.70	17.02	17.82	-21.59	-21.58	-21.50	-22.06
3144623	3144618	1	Conduit	CIRC	199.4	24	24	20.48	20.75	14.79	17.61	14.90	14.96	14.20	14.43
3144624	E08	1	Conduit	CIRC	279.1	30	30	19.97	20.01	20.75	22.79	17.31	17.34	18.10	20.13
3144627	3144628	1	Conduit	CIRC	53.6	36	36	22.73	22.90	23.54	25.08	18.16	18.23	19.53	21.64
3144628	3144629	1	Conduit	CIRC	458.7	36	36	31.28	31.57	32.64	36.10	24.26	24.40	26.93	31.08
3144629	B47	1	Conduit	CIRC	150.4	36	36	39.10	39.46	40.81	44.47	32.44	32.65	35.44	41.28
3144631	3144623	1	Conduit	CIRC	136.9	24	24	12.04	12.12	8.86	10.22	11.75	11.72	11.04	9.81
3144632	3144633	1	Conduit	CIRC	36.1	24	24	11.25	11.33	10.96	11.27	6.95	6.97	6.73	7.16
3144633	3144614	1	Conduit	CIRC	191	24	24	11.32	11.40	11.02	11.33	6.87	6.89	6.72	7.23
3144637	3144631	1	Conduit	CIRC	61.9	24	24	8.68	8.71	-8.64	-8.25	-8.92	-8.91	-8.93	-8.91
3144638	3144623	1	Conduit	CIRC	182	24	24	9.34	9.48	7.24	8.24	-8.46	-8.45	-8.96	-9.96
3144640	3144641	1	Conduit	CIRC	98.7	24	24	11.13	11.21	10.86	11.16	-7.19	-7.18	-7.25	7.06
3144641	3144632	1	Conduit	CIRC	191.9	24	24	11.20	11.28	10.92	11.23	7.01	7.03	6.74	7.12
3144642	3144640	1	Conduit	CIRC	23.2	24	24	-18.75	-18.74	-18.88	-19.66	-19.14	-19.14	-19.18	-19.94
3144643	3144638	1	Conduit	CIRC	152.6	24	24	9.79	9.89	7.98	8.78	-8.47	-8.46	-8.96	-9.97
3144646	3144642	1	Conduit	CIRC	197.9	24	24	6.10	6.10	6.06	6.31	6.21	6.21	6.17	6.51
3144647	3144646	1	Conduit	CIRC	85.2	24	24	4.80	4.83	4.85	4.65	6.69	6.69	6.62	6.42
3144648	3144637	1	Conduit	CIRC	441.4	24	24	-9.33	-9.27	-8.97	8.57	-12.17	-12.17	-12.14	-11.96
3144911	5890	1	Conduit	CIRC	15.1	24	24	-1.60	-1.39	2.13	-1.42	-15.17	-15.12	-14.16	-10.26
3144912	5890	1	Conduit	CIRC	30.3	24	24	16.02	16.06	16.42	16.46	17.55	17.62	23.26	24.17
3144913	3144624	1	Conduit	CIRC	10.6	24	24	15.73	15.73	15.73	15.73	21.25	21.27	21.07	21.41
3144914	3144624	1	Conduit	CIRC	35.4	24	24	13.48	13.50	14.04	15.61	12.84	12.85	12.29	11.92
3144915	E08	1	Conduit	CIRC	9.2	18	18	6.17	6.17	6.17	6.17	10.63	10.64	10.62	10.67
3144916	E08	1	Conduit	CIRC	38.6	18	18	10.27	10.17	9.87	9.39	8.98	9.09	8.92	9.19
3144917	B49	1	Conduit	CIRC	14.5	24	24	7.70	7.69	7.78	7.63	13.20	13.22	13.25	13.39
3144928	3144600	1	Conduit	CIRC	47.7	18	18	-3.13	-3.12	-3.24	-2.97	-6.95	-6.95	-7.11	-6.59
3144930	3144600	1	Conduit	CIRC	281.4	24	24	-8.57	-8.56	-8.55	-8.19	-12.39	-12.39	-12.37	-12.17
3144931	3144627	1	Conduit	CIRC	38	24	24	-6.56	6.47	13.22	7.25	6.62	5.91	13.43	7.17
3144932	3144629	1	Conduit	CIRC	24.7	18	18	11.42	11.42	11.42	11.42	13.41	13.45	14.41	15.61
3144935	3144631	1	Conduit	CIRC	37.6	24	24	13.94	13.58	13.35	10.06	14.24	13.71	13.82	12.90
3144936	3144631	1	Conduit	CIRC	26.7	24	24	6.09	5.37	5.67	4.06	6.45	5.81	5.66	8.32
3144937	3144648	1	Conduit	CIRC	5.6	24	24	-7.08	-7.07	-7.11	-7.10	-7.47	-7.47	-7.52	-7.52
3144938	3144648	1	Conduit	CIRC	19	24	24	-11.57	-11.56	-11.54	-11.26	-13.96	-13.96	-13.97	-13.71
3144944	3144586	1	Conduit	CIRC	13.6	24	24	-30.86	-30.86	-30.96	-30.66	-31.80	-31.80	-31.90	-31.53
3144951	3144647	1	Conduit	CIRC	4.6	24	24	-7.66	-7.67	-7.77	-8.63	-10.16	-10.16	-10.22	-10.92
3144952	3144951	1	Conduit	CIRC	27.8	24	24	-25.84	-25.83	-26.24	-26.28	-27.17	-27.17	-27.43	-27.29
3144955	3144956	1	Conduit	CIRC	28.4	24	24	-22.76	-22.75	-23.06	-24.00	-23.13	-23.13	-23.42	-24.34
3144956	3144640	1	Conduit	CIRC	5	24	24	13.00	13.08	11.79	10.60	11.50	9.06	10.67	8.78
3144962	3144602	1	Conduit	CIRC	60.1	30	30	39.66	39.88	35.74	38.08	-33.69	-33.75	953.77	-32.51
3144967	3144600	1	Conduit	CIRC	44.6	24	24	-7.55	-7.56	-7.58	-7.38	-19.74	-19.73	-19.54	-19.92
3146601	3146604	1	Conduit	CIRC	233.5	36	36	24.72	24.71	26.59	31.55	27.52	27.44	29.43	32.25
3146604	3146605	1	Conduit	CIRC	57.7	30	30	25.06	25.05	27.05	32.18	27.83	27.77	29.76	33.64
3146605	W14001_sta19981	1	Conduit	CIRC	158.8	36	36	26.41	25.79	27.59	32.96	28.69	28.88	30.23	34.24

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
3146608	3146737	1	Conduit	CIRC	68.3	24	24	11.23	11.42	14.38	14.66	11.20	10.72	19.67	17.29
3146737	3146738	1	Conduit	CIRC	53.7	24	24	11.20	11.48	14.52	14.81	11.25	10.78	19.81	17.41
3146738	W14001_sta19481	1	Conduit	CIRC	38	24	24	11.36	11.60	14.69	14.98	15.71	14.85	20.17	18.16
3146742	5819	1	Conduit	CIRC	16.8	12	12	-2.37	-2.36	-0.07	7.85	-2.54	-2.54	-2.59	7.74
3146748	5809	1	Conduit	CIRC	17.6	12	12	1.64	1.62	0.03	-0.10	2.16	2.20	2.36	2.49
3146749	5804	1	Conduit	CIRC	17.2	12	12	0.72	0.64	-0.03	-0.08	3.15	3.15	3.33	3.36
3146752	5830	1	Conduit	CIRC	16.2	12	12	2.82	2.86	5.21	-0.12	2.54	2.53	5.28	-2.03
3146756	5822	1	Conduit	CIRC	17.8	12	12	2.78	2.78	2.72	5.88	2.91	2.89	4.39	5.95
3146767	3146601	1	Conduit	CIRC	8.3	18	18	9.09	9.13	10.50	13.20	9.61	9.60	10.40	10.96
3146769	W14001_sta20481	1	Conduit	CIRC	143.5	15	15	7.65	7.61	8.16	15.92	7.81	7.76	8.49	16.62
3175098	6031	1	Conduit	CIRC	104.2	24	24	11.12	11.08	11.05	12.82	-8.58	-8.58	-8.62	-8.23
3175100	6028	1	Conduit	CIRC	95.9	24	24	5.38	5.38	5.27	6.79	5.68	5.68	5.56	6.99
3175102	6023	1	Conduit	CIRC	147.4	96	96	235.37	235.37	233.97	227.40	248.62	248.62	247.30	506.24
3175104	3175279	1	Conduit	CIRC	14.7	24	24	16.73	16.73	16.85	16.85	26.50	26.50	26.48	26.29
3175107	3175112	1	Conduit	CIRC	89.2	96	96	222.23	222.32	220.64	225.16	216.71	216.67	215.54	212.43
3175109	3175111	1	Conduit	CIRC	48.9	60	60	4.54	4.54	-5.65	-5.81	7.89	7.89	7.89	7.89
3175111	5967	1	Conduit	CIRC	296.5	96	96	235.68	235.70	231.06	234.84	235.64	235.64	234.12	240.86
3175112	3175111	1	Conduit	CIRC	166.2	96	96	234.70	234.72	230.13	233.84	232.13	232.13	230.46	234.71
3175112	3175113	2	Conduit	CIRC	326.4	36	36	-43.27	-43.32	-42.83	36.81	20.31	20.37	21.39	26.45
3175113	3175115	1	Conduit	CIRC	177.9	36	36	42.85	42.84	43.51	49.90	34.39	34.49	35.23	38.80
3175114	3175115	1	Conduit	CIRC	90.8	30	30	-4.58	-4.50	-4.73	-28.89	-4.34	-4.32	-4.13	-6.92
3175115	3175121	1	Conduit	CIRC	263.2	48	48	45.93	45.93	46.59	53.23	37.97	38.07	38.78	42.44
3175121	3177634	1	Conduit	CIRC	153.1	48	48	47.92	47.92	48.56	55.29	40.26	40.37	41.07	44.76
3175122	3175121	1	Conduit	CIRC	72.2	18	18	-5.46	-5.06	-4.75	-11.47	-1.69	-1.68	-1.66	-2.84
3175261	3175113	1	Conduit	CIRC	76.6	18	18	-2.76	-2.71	-3.05	-4.76	-2.03	-2.00	-2.27	-2.37
3175272	5968	1	Conduit	CIRC	35.8	30	30	-34.77	-34.91	-34.58	-26.00	-42.37	-42.37	-42.61	-35.29
3175279	6023	1	Conduit	CIRC	81.8	24	24	10.98	10.98	10.90	11.07	10.00	10.00	9.92	9.92
3176092	3176096	1	Conduit	CIRC	508.6	42	42	-19.54	-19.57	-20.25	-19.45	33.54	33.54	33.56	33.00
3176094	3176254	1	Conduit	CIRC	492	30	30	34.99	34.99	34.92	35.30	34.10	34.35	34.04	34.11
3176096	3176098	1	Conduit	CIRC	27.2	54	54	56.30	56.30	54.89	55.82	61.20	61.20	57.37	60.26
3176098	3176255	1	Conduit	CIRC	15.4	54	54	57.68	57.69	56.49	55.91	66.45	66.45	62.04	63.52
3176100	3176255	1	Conduit	RECT	179.1	96	96	263.80	263.80	258.33	264.95	284.29	284.29	277.16	278.40
3176102	3176100	1	Conduit	CIRC	151.5	96	96	237.82	237.82	232.93	236.36	244.60	244.61	238.26	244.01
3176102	3176105	2	Conduit	CIRC	15	24	24	-35.65	-35.48	-34.77	-33.13	-26.41	-26.23	-26.28	-26.43
3176104	5974	1	Conduit	CIRC	532.7	96	96	242.70	242.72	239.66	244.03	240.34	240.34	235.51	247.91
3176105	3176108	1	Conduit	CIRC	282.7	36	36	-35.35	-35.30	-34.79	-33.23	-25.88	-25.72	-25.60	-25.93
3176107	3176109	1	Conduit	CIRC	277.2	30	30	13.88	13.85	14.21	14.56	21.21	21.21	21.17	20.90
3176108	5963	1	Conduit	CIRC	240.6	42	42	-46.31	-46.30	-46.44	-46.64	-50.62	-50.62	-50.67	-50.33
3176109	3176110	1	Conduit	CIRC	32.7	30	30	-56.15	-56.11	-56.86	-56.95	-69.79	-69.78	-70.26	-71.37
3176110	3176113	1	Conduit	CIRC	387.3	54	54	28.35	29.05	26.75	29.52	62.38	62.38	62.37	63.94
3176112	5960	1	Conduit	CIRC	187.7	48	48	24.22	24.24	26.15	30.01	-31.81	-31.70	-34.32	-32.50
3176113	3178754	1	Conduit	CIRC	353.5	54	54	-45.35	-45.25	-45.85	-44.39	-63.56	-63.51	-63.74	-61.27
3176115	3178753	1	Conduit	CIRC	298.7	48	48	34.15	34.15	36.34	41.28	35.11	35.26	34.63	35.63
3176245	6006	1	Conduit	RECT	171.7	96	96	306.08	305.81	301.20	295.80	298.87	298.02	293.50	291.14
3176246	5997	1	Conduit	RECT	107.4	96	96	292.50	292.39	287.25	283.33	308.23	306.80	301.98	298.90
3176247	5988	1	Conduit	RECT	136.4	96	96	305.45	305.37	300.92	295.98	282.34	281.70	276.77	272.84
3176248	5985	1	Conduit	RECT	190.5	96	96	297.19	297.08	292.05	285.85	273.73	272.97	267.54	262.95
3176249	5982	1	Conduit	RECT	215	96	96	293.69	293.55	288.10	284.14	278.44	278.50	272.50	275.17
3176251	5979	1	Conduit	RECT	199.3	96	96	316.41	316.41	312.16	316.88	339.55	339.55	331.81	337.78
3176254	3176096	1	Conduit	CIRC	10.4	36	36	43.49	43.49	42.29	43.04	40.88	40.89	40.80	41.51
3176255	3176251	1	Conduit	RECT	318.2	96	96	321.04	321.05	313.88	317.33	356.85	356.84	347.29	343.48

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
3176274	3176275	1	Conduit	CIRC	49.4	24	24	-21.33	-21.33	-21.37	-20.79	-21.95	-21.95	-21.98	-21.38
3176275	5960	1	Conduit	CIRC	42	24	24	16.34	16.36	16.95	17.05	-20.06	-20.05	-20.47	-20.49
3177634	3177638	1	Conduit	CIRC	34.6	48	48	47.97	47.97	48.61	55.34	40.34	40.45	41.14	44.83
3177638	3177642	1	Conduit	CIRC	283.8	48	48	54.04	53.99	54.74	61.71	46.52	46.63	47.28	51.12
3177642	3177653	1	Conduit	CIRC	253.6	54	54	64.10	64.10	65.06	71.94	52.67	52.84	53.72	57.67
3177643	3177642	1	Conduit	CIRC	93.7	24	24	12.32	12.32	12.33	-16.31	14.40	14.40	14.38	14.40
3177646	3177647	1	Conduit	CIRC	267.1	21	21	9.82	9.82	9.81	9.92	10.56	10.56	10.55	10.84
3177653	3177664	1	Conduit	CIRC	363.7	54	54	71.93	71.94	72.80	80.15	63.51	63.65	64.29	68.78
3177657	3177646	1	Conduit	CIRC	154.5	18	18	-0.76	-0.76	-0.76	-0.76	-1.01	-1.01	-1.01	-1.00
3177664	5929	1	Conduit	CIRC	64.7	54	54	86.17	86.17	86.48	92.22	78.57	78.70	79.04	83.63
3177674	3177677	1	Conduit	CIRC	48.6	60	60	94.22	94.19	94.52	100.03	-133.36	-133.37	-133.65	-130.72
3177675	3177674	1	Conduit	CIRC	42	24	24	21.11	21.11	21.10	21.79	20.33	20.33	20.32	20.72
3177677	3177683	1	Conduit	CIRC	402.8	60	60	96.72	96.69	97.04	103.17	93.99	94.24	94.59	101.58
3177678	3177677	1	Conduit	CIRC	71.7	24	24	15.72	15.72	15.70	15.96	16.65	16.66	16.65	17.06
3177683	3143189	1	Conduit	CIRC	185.3	66	66	109.73	109.73	110.00	111.96	115.40	115.69	115.93	124.33
3177966	3177657	1	Conduit	CIRC	110.6	18	18	-0.35	-0.35	-0.35	-0.35	-0.59	-0.59	-0.59	-0.59
3177985	3177683	1	Conduit	CIRC	67.6	18	18	-1.43	-1.43	-1.74	-3.19	-1.43	-1.44	-1.36	-1.60
3177990	3177664	1	Conduit	CIRC	70.5	18	18	6.36	6.36	6.23	-7.59	9.37	9.34	8.96	7.81
3178003	3177653	1	Conduit	CIRC	94	18	18	-4.33	-4.30	-4.85	-8.06	-1.81	-1.80	-1.83	-2.52
3178015	3177638	1	Conduit	CIRC	72.7	18	18	6.42	6.43	6.74	8.55	-5.37	-5.37	-5.39	-5.40
3178751	3178752	1	Conduit	CIRC	127	24	24	-15.93	-15.92	-15.96	-16.18	-16.70	-16.70	-16.74	-17.03
3178752	3179002	1	Conduit	CIRC	118.8	24	24	18.32	18.32	18.28	18.16	18.92	18.92	18.87	18.79
3178753	5952	1	Conduit	CIRC	45.8	54	54	41.37	41.36	43.60	47.76	63.60	63.58	62.90	62.30
3178754	3178756	1	Conduit	CIRC	220.5	54	54	41.84	42.90	39.83	40.72	34.03	34.48	32.89	35.59
3178755	3178763	1	Conduit	CIRC	270.6	24	24	17.52	17.52	17.82	19.21	16.82	16.88	17.18	18.32
3178756	3178767	1	Conduit	CIRC	267	54	54	48.83	49.75	46.99	45.23	45.99	46.36	44.25	45.48
3178758	3178762	1	Conduit	CIRC	32.2	30	30	22.29	22.30	23.51	29.39	-29.23	-29.22	-24.05	-23.95
3178759	3178758	1	Conduit	CIRC	86	30	30	19.70	19.70	-23.41	-24.61	-20.06	-20.06	-25.49	-26.93
3178760	3178759	1	Conduit	CIRC	70.4	30	30	27.27	27.27	26.92	27.44	28.45	28.45	28.52	29.41
3178761	3178760	1	Conduit	CIRC	136.1	30	30	19.36	19.36	20.20	23.93	18.27	18.34	18.63	19.79
3178762	5926	1	Conduit	CIRC	320.4	60	60	59.37	59.35	60.58	65.65	57.74	58.52	62.18	65.69
3178763	3178765	1	Conduit	CIRC	48.5	24	24	19.26	19.38	21.79	24.01	18.09	18.15	18.46	19.62
3178765	3178761	1	Conduit	CIRC	89.1	30	30	19.16	19.16	21.02	23.95	18.10	18.17	20.26	20.33
3178767	3236593	1	Conduit	CIRC	326	54	54	83.28	85.34	82.78	81.69	88.16	87.76	85.66	82.82
3178768	3178767	1	Conduit	CIRC	42	54	54	47.10	47.17	35.13	45.14	47.92	48.00	47.69	60.71
3178769	3178768	1	Conduit	CIRC	121.7	66	66	61.06	61.14	60.88	72.55	74.58	74.66	74.68	89.12
3178770	3178769	1	Conduit	CIRC	95.8	66	66	57.13	57.21	56.59	59.31	84.79	84.85	84.78	81.99
3178771	3178770	1	Conduit	CIRC	282.2	66	66	57.86	57.93	57.45	59.79	75.99	76.10	75.69	76.64
3178772	3178771	1	Conduit	CIRC	405.4	66	66	57.90	57.97	57.49	59.81	76.15	76.21	76.03	79.99
3178773	3178772	1	Conduit	CIRC	26.3	66	66	-61.57	-61.53	-61.84	-67.52	-138.81	-138.79	-138.90	-147.75
3178775	5926	1	Conduit	CIRC	24.5	24	24	14.86	14.98	15.17	16.54	19.29	19.30	19.14	18.90
3178778	3179011	1	Conduit	CIRC	4.8	18	18	-13.67	-13.68	-13.91	-12.61	-13.98	-14.07	-13.82	-12.96
3178778	5926	2	Conduit	CIRC	48.4	24	24	14.21	14.23	14.19	14.62	13.34	13.45	12.79	13.14
3178779	5923	1	Conduit	CIRC	24.8	24	24	15.94	16.06	16.67	18.17	13.67	13.69	13.61	15.06
3178781	3178773	1	Conduit	CIRC	344.2	66	66	-61.57	-61.52	-61.84	-66.83	-70.40	-70.39	-70.45	-72.42
3178783	3178781	1	Conduit	CIRC	40.6	66	66	46.18	46.12	47.02	43.79	132.92	132.88	134.69	131.09
3178785	5921	1	Conduit	CIRC	35.2	24	24	14.06	14.09	14.15	14.96	14.73	14.74	14.47	14.39
3178787	5905	1	Conduit	CIRC	564.6	66	66	84.77	85.78	90.22	98.93	81.99	82.17	87.83	98.11
3178788	3178787	1	Conduit	CIRC	44.8	24	24	-4.09	-4.06	-5.05	-6.99	-10.63	-10.62	-10.95	-11.24
3178790	3178783	1	Conduit	CIRC	364.8	66	66	-67.47	-68.41	-62.40	-62.73	-83.22	-83.16	-82.77	-84.67
3178791	3178790	1	Conduit	CIRC	394.7	66	66	-67.39	-68.95	-65.53	-65.93	-82.00	-82.42	-80.57	-81.30

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
3178792	3144587	1	Conduit	CIRC	351.2	36	36	25.59	25.60	26.33	28.44	24.17	24.21	24.57	26.04
3178793	3178792	1	Conduit	CIRC	104.2	30	30	25.58	25.59	26.33	33.19	24.21	24.25	24.65	26.32
3178794	5905	1	Conduit	CIRC	41.8	24	24	25.87	25.93	26.10	26.81	24.64	24.66	24.92	25.63
3178797	3178793	1	Conduit	CIRC	99.7	30	30	25.58	25.59	27.88	33.32	24.24	24.28	24.71	26.49
3178987	3178791	1	Conduit	CIRC	9.7	24	24	-21.10	-21.09	-21.21	-21.85	-28.81	-28.81	-29.03	-29.42
3178988	3178790	1	Conduit	CIRC	12.9	24	24	-18.08	-18.08	-18.13	-18.53	-25.20	-25.19	-25.42	-25.60
3178989	3178783	1	Conduit	CIRC	17.4	24	24	22.35	22.95	22.51	22.91	22.77	22.55	22.88	22.41
3178992	3178753	1	Conduit	CIRC	17.4	24	24	-27.81	-27.80	-27.93	-26.66	-31.45	-31.45	-31.49	-30.40
3179002	3178755	1	Conduit	CIRC	40.4	24	24	14.77	14.76	15.03	15.84	-16.24	-16.24	-16.31	15.29
3179010	3178778	1	Conduit	CIRC	35.6	18	18	-14.74	-14.74	-14.76	-14.72	-15.33	-15.33	-15.34	-15.32
3179012	3178775	1	Conduit	CIRC	29.4	24	24	-28.09	-28.08	-28.21	-27.86	-37.20	-37.20	-37.23	-37.10
3179013	3178775	1	Conduit	CIRC	16.2	24	24	-27.06	-27.05	-27.18	-26.94	-36.34	-36.34	-36.36	-36.36
3179018	3178779	1	Conduit	CIRC	6.1	18	18	-17.85	-17.84	-17.86	-18.83	-19.18	-19.18	-19.19	-19.92
3179019	3178779	1	Conduit	CIRC	43.4	18	18	-15.13	-15.13	-15.14	-15.49	-16.03	-16.03	-16.04	-16.43
3179020	3178785	1	Conduit	CIRC	8.7	18	18	-8.02	-8.01	-8.05	-8.04	-13.53	-13.53	-13.57	-13.89
3179021	3178785	1	Conduit	CIRC	30.6	18	18	-9.80	-9.79	-9.84	-9.97	-14.25	-14.25	-14.27	-14.56
3179024	3178788	1	Conduit	CIRC	32	18	18	0.45	-0.51	-1.22	2.28	8.00	8.00	8.27	8.85
3179025	3178788	1	Conduit	CIRC	9.2	18	18	-4.70	-4.67	-4.72	-5.06	-10.64	-10.63	-10.77	-10.84
3179029	3178794	1	Conduit	CIRC	35.3	18	18	-12.17	-12.17	-12.18	-12.43	-13.04	-13.04	-13.06	-13.56
3179030	5905	1	Conduit	CIRC	27.3	18	18	-5.77	-5.71	-5.56	-4.18	-13.90	-13.88	-14.13	-13.66
3218806	3236636	1	Conduit	CIRC	460.9	24	24	-9.12	-8.74	7.49	-6.90	19.10	18.55	18.78	17.99
3218808	30011	1	Conduit	CIRC	255.2	60	60	129.93	135.14	129.18	129.12	112.31	121.14	113.90	114.51
3218814	3218808	1	Conduit	CIRC	509.3	60	60	83.92	84.30	81.96	82.51	81.13	81.78	79.79	79.57
3218819	3218814	1	Conduit	CIRC	318.6	60	60	98.18	99.24	98.26	96.39	105.96	107.29	106.00	104.11
3218824	3218819	1	Conduit	CIRC	394.1	54	54	65.26	65.72	60.97	62.17	61.37	61.87	60.08	59.00
3218829	3218824	1	Conduit	CIRC	254.1	48	48	66.47	66.93	65.02	65.70	64.28	64.46	62.93	63.30
3218832	5897	1	Conduit	CIRC	29.8	24	24	31.43	31.43	31.41	31.27	34.69	34.69	34.69	34.25
3218866	6029753	1	Conduit	RECT	43.8	60	72	192.73	194.12	190.66	190.32	217.78	218.60	216.42	216.10
3218873	5005	1	Conduit	RECT	42.3	60	72	190.42	190.95	176.98	185.17	179.49	180.43	167.88	170.50
3219151	3218814	1	Conduit	CIRC	28.5	24	24	-3.71	-3.58	-3.91	-5.41	-5.93	-5.73	-5.89	-7.60
3219152	3218814	1	Conduit	CIRC	13.6	24	24	14.41	14.41	14.33	14.51	14.73	14.84	14.61	14.66
3219153	3218808	1	Conduit	CIRC	13.2	24	24	36.30	37.27	34.67	35.77	32.85	32.77	30.60	31.51
3219183	3219184	1	Conduit	CIRC	39.6	24	24	-11.29	-11.29	-11.28	-11.79	-11.73	-11.75	-11.73	-12.21
3219184	3218832	1	Conduit	CIRC	191	24	24	-20.30	-20.30	-20.31	-20.45	-23.57	-23.58	-23.58	-23.62
3219186	5870	1	Conduit	CIRC	15.8	24	24	-0.96	-1.10	0.44	0.48	-1.81	-0.71	-1.55	-0.97
3219196	5874	1	Conduit	CIRC	16.9	24	24	-1.17	-1.12	-0.63	-1.65	-7.22	-7.05	-7.22	-7.66
3219197	5874	1	Conduit	CIRC	6.2	24	24	-11.18	-11.18	-11.18	-11.73	-11.59	-11.64	-11.58	-12.08
3219198	5876	1	Conduit	CIRC	16.2	24	24	-24.94	-24.15	-25.30	-24.95	-36.02	-35.29	-35.95	-35.84
3219200	5860	1	Conduit	CIRC	18.3	24	24	-22.11	-22.09	-22.19	-21.78	-24.73	-24.71	-24.74	-24.40
3219201	5860	1	Conduit	CIRC	37.2	24	24	20.89	20.75	20.21	21.00	20.98	20.77	20.42	20.95
3221259	10051	1	Conduit	RECT	243.6	72	84	217.49	219.10	202.06	209.41	211.87	218.58	206.72	206.53
3221268	10053	1	Conduit	RECT	12.3	72	84	223.04	224.68	208.13	213.76	215.77	221.26	205.38	206.14
3221271	5033	1	Conduit	RECT	135.3	72	84	229.57	231.23	215.40	220.87	229.34	234.00	214.85	214.86
3221280	W14001_sta16681	1	Conduit	CIRC	39.8	84	84	231.08	232.01	#N/A	#N/A	234.85	236.08	#N/A	#N/A
3221280	Prop_Chan_01	1	Conduit	CIRC	41.07	84	84	#N/A	#N/A	216.32	221.66	#N/A	#N/A	216.45	216.52
3234001	3234312	1	Conduit	RECT	456.3	60	96	384.40	384.47	384.06	388.25	452.01	452.01	450.63	450.79
3234041	6006	1	Conduit	CIRC	228.1	24	24	14.14	14.16	14.12	14.19	12.44	12.39	12.49	12.39
3234043	6013	1	Conduit	CIRC	286	36	36	28.93	28.65	30.44	30.10	34.27	34.19	34.12	34.28
3234049	3234043	1	Conduit	CIRC	410.6	36	36	29.75	29.57	32.44	32.32	34.26	34.18	34.12	34.27
3234050	3234049	1	Conduit	CIRC	25.2	24	24	16.46	16.48	16.39	16.48	-18.56	-18.55	-18.77	-18.38
3234051	3234041	1	Conduit	CIRC	456.5	24	24	14.33	14.35	14.34	14.37	12.43	12.37	12.47	12.37

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
3234051	3234052	2	Conduit	CIRC	16.1	24	24	16.48	16.60	15.37	15.92	15.84	15.85	15.74	15.68
3234052	3236559	1	Conduit	CIRC	506.4	24	24	17.39	17.47	16.74	17.10	14.27	14.28	13.59	14.40
3234054	3234051	1	Conduit	CIRC	44.4	24	24	10.02	9.83	10.02	9.77	10.62	10.60	10.49	10.28
3234057	3234049	1	Conduit	CIRC	166.1	36	36	-22.18	-23.11	-20.21	-20.82	15.64	15.54	15.92	16.27
3234058	3234059	1	Conduit	CIRC	17.2	30	30	0.00	0.00	0.00	0.00	-11.02	-5.43	-4.53	-4.18
3234058	3236568	2	Conduit	CIRC	341.7	36	36	0.00	0.00	0.00	0.00	-0.86	-0.22	0.00	0.00
3234059	3234057	1	Conduit	CIRC	182.5	36	36	-22.26	-23.18	-20.26	-20.88	-14.56	-14.63	-14.90	-14.62
3234307	6013	1	Conduit	RECT	124.4	96	84	315.51	315.98	313.45	313.08	311.84	311.90	310.46	310.25
3234307	6013	2	Conduit	RECT	124.4	96	84	315.51	315.98	313.45	313.08	311.84	311.90	310.46	310.25
3234312	6018	1	Conduit	RECT	446	60	96	386.11	386.16	385.56	389.37	402.70	402.94	402.04	404.30
3234315	6016	1	Conduit	RECT	338.3	96	84	319.64	319.16	318.52	318.08	329.77	329.73	328.34	328.12
3234315	6016	2	Conduit	RECT	338.3	96	84	319.64	319.16	318.52	318.08	329.77	329.73	328.34	328.12
3236559	3236576	1	Conduit	CIRC	424.5	30	30	19.15	19.27	18.46	18.83	16.22	16.22	15.50	16.36
3236568	3236569	1	Conduit	CIRC	11	30	30	-14.23	-14.60	-13.25	-13.45	-8.77	-8.84	-8.32	-8.19
3236568	3236582	2	Conduit	CIRC	420.6	36	36	14.35	14.70	13.34	13.56	9.71	9.62	8.80	9.40
3236569	3234059	1	Conduit	CIRC	342	30	30	-25.35	-26.23	-23.11	-23.91	-17.77	-17.89	-17.90	-17.82
3236576	3236590	1	Conduit	CIRC	279.5	36	36	19.22	19.33	18.53	18.89	25.61	25.64	25.60	25.77
3236582	3236584	1	Conduit	CIRC	32.5	36	36	14.41	14.76	13.40	13.62	9.87	9.77	8.80	9.57
3236584	3236615	1	Conduit	CIRC	504.3	72	72	113.92	116.61	112.00	112.34	107.85	108.50	104.48	104.40
3236585	3236584	1	Conduit	CIRC	14.3	60	60	108.11	108.94	102.40	102.39	102.23	102.68	99.80	99.21
3236585	3236569	2	Conduit	CIRC	453.2	30	30	-11.39	-11.82	-10.38	-10.83	6.08	6.05	6.14	6.27
3236588	3236585	1	Conduit	CIRC	20.2	30	30	-15.59	-15.41	-15.67	-16.12	-27.30	-27.16	-27.29	-27.69
3236589	3236588	1	Conduit	CIRC	15.3	24	24	-13.74	-13.63	-13.86	-14.60	-17.72	-17.69	-17.73	-18.88
3236590	3236593	1	Conduit	CIRC	7.8	36	36	19.26	19.36	19.24	19.39	36.36	36.44	36.26	36.19
3236593	3236585	1	Conduit	CIRC	377.3	60	60	90.68	92.88	90.06	89.18	94.26	93.97	91.85	89.87
3236596	3236589	1	Conduit	CIRC	361.2	24	24	7.54	7.55	7.57	8.03	8.96	8.96	8.93	9.36
3236596	3236593	2	Conduit	CIRC	18	24	24	-12.66	-12.61	-12.66	-13.09	-16.17	-16.14	-16.18	-16.72
3236615	3236633	1	Conduit	CIRC	631.9	78	78	132.80	134.28	131.05	132.21	151.14	153.74	152.53	152.26
3236631	30002	1	Conduit	CIRC	324	78	78	170.25	171.62	167.12	168.46	172.39	175.72	172.80	173.03
3236632	3236631	1	Conduit	CIRC	426.1	78	78	170.42	171.75	167.22	168.59	172.58	175.85	172.94	173.14
3236633	3236634	1	Conduit	CIRC	29.8	78	78	144.58	145.51	140.48	142.27	148.89	149.63	144.94	145.99
3236634	3236632	1	Conduit	CIRC	471.9	78	78	144.25	144.99	141.66	142.55	152.76	153.78	149.42	148.72
3236636	3236633	1	Conduit	CIRC	30	24	24	-9.75	-9.04	-9.72	-9.51	-21.92	-21.39	-21.63	-21.50
4161810	3144629	1	Conduit	CIRC	28	18	18	5.41	5.41	5.41	5.41	6.11	6.16	6.49	7.70
4161811	3144628	1	Conduit	CIRC	19.1	18	18	-8.36	-8.35	-8.54	-8.85	-9.18	-9.18	-9.43	-9.70
4161812	3144627	1	Conduit	CIRC	38.2	18	18	-10.04	-10.01	-9.78	-9.67	-11.61	-11.61	-11.59	-12.49
4165577	W14001_sta16681	1	Conduit	CIRC	294.8	30	30	15.69	15.71	15.50	15.48	22.12	23.28	21.15	19.68
4165579	4165577	1	Conduit	CIRC	220.4	24	24	13.21	13.26	13.01	12.99	15.71	16.57	16.23	15.93
4165581	4165579	1	Conduit	CIRC	184.7	24	24	7.19	7.19	6.75	7.12	10.92	11.06	10.33	9.93
4165583	4165581	1	Conduit	CIRC	309.1	24	24	4.33	3.81	2.82	2.60	7.86	7.91	7.06	6.36
4165585	5360	1	Conduit	CIRC	68.3	36	36	-2.47	-1.98	-1.51	-1.02	-15.44	-15.46	-16.55	-16.52
4165604	4165577	1	Conduit	CIRC	7.6	24	24	0.73	0.73	0.74	0.73	1.25	1.24	1.24	1.26
4165605	4165577	1	Conduit	CIRC	51.3	24	24	1.89	1.88	1.86	1.83	8.94	8.37	7.12	4.84
4165607	4165581	1	Conduit	CIRC	50.1	24	24	0.26	0.27	0.28	0.27	-5.20	-4.59	-4.12	-2.77
4165610	4165583	1	Conduit	CIRC	56.5	24	24	1.00	0.90	0.76	0.67	2.37	2.39	-2.10	1.95
4165614	5361	1	Conduit	CIRC	85.1	36	36	9.45	9.46	9.45	9.45	16.93	16.93	16.67	16.69
4165616	4165614	1	Conduit	CIRC	62.9	30	30	9.45	9.45	9.45	9.44	16.64	16.65	16.54	16.55
5708649	5225	1	Conduit	CIRC	32.2	24	24	6.45	7.84	5.92	6.32	-12.60	-12.90	-10.96	-10.68
5708650	5225	1	Conduit	CIRC	25.9	24	24	-11.78	-11.22	-11.84	-11.83	-13.04	-13.26	-12.69	-13.14
5708651	5708650	1	Conduit	CIRC	21.2	24	24	19.58	19.36	19.56	20.68	20.45	20.43	20.29	21.22
5708685	5850	1	Conduit	CIRC	29.2	24	24	16.70	11.46	11.49	11.24	27.22	-20.43	-19.20	-18.93

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
5708686	5850	1	Conduit	CIRC	16.3	24	24	-15.97	14.34	13.51	19.66	13.04	-17.76	-23.64	19.85
5708689	5849	1	Conduit	CIRC	28.6	24	24	16.85	16.84	16.88	15.39	18.40	18.40	18.37	16.99
5906134	5881	1	Conduit	RECT	13.6	60	120	327.65	327.65	325.47	325.15	304.85	304.84	303.54	306.20
5906135	5906134	1	Conduit	RECT	200.9	60	120	318.50	318.50	316.33	316.00	297.28	297.28	295.97	298.43
5906136	5906135	1	Conduit	RECT	48.2	60	120	318.58	318.59	316.40	316.08	297.52	297.52	296.19	298.60
5906137	5906136	1	Conduit	RECT	71.5	60	120	278.95	278.95	276.89	277.28	261.27	261.29	260.02	262.55
5906138	5906137	1	Conduit	RECT	204.6	60	120	279.03	279.03	276.98	277.36	261.53	261.54	260.26	262.75
5906139	5906138	1	Conduit	RECT	300.6	60	120	258.52	258.53	256.48	256.81	245.08	245.07	243.77	245.77
5906140	5906139	1	Conduit	RECT	97.5	60	120	217.50	217.49	215.62	216.07	203.76	203.75	202.52	204.00
5906141	5906140	1	Conduit	CIRC	71.6	60	60	217.27	217.26	215.44	215.88	204.04	204.04	202.80	204.27
5906142	5906141	1	Conduit	RECT	66.7	60	120	212.69	212.70	210.86	210.14	197.97	197.97	196.70	197.50
5906143	5906142	1	Conduit	RECT	259.9	60	120	212.57	212.56	210.70	210.02	198.18	198.18	196.91	197.72
5906172	5906141	1	Conduit	CIRC	52.7	24	24	-2.47	-2.47	-2.46	-2.62	8.32	8.34	8.35	7.05
5906175	5906139	1	Conduit	CIRC	40.7	36	36	27.54	27.54	27.45	27.51	23.36	23.36	-23.38	-24.20
5906176	5906175	1	Conduit	CIRC	481.5	36	36	27.52	27.52	27.43	27.49	23.41	23.41	23.32	23.35
5906177	5906176	1	Conduit	CIRC	510.6	36	36	27.49	27.49	27.41	27.47	23.47	23.47	23.39	23.43
5906183	5906136	1	Conduit	CIRC	349.4	36	36	31.30	31.30	31.18	30.45	29.30	29.30	29.20	28.93
5906184	5906258	1	Conduit	CIRC	130.5	30	30	-19.49	-19.49	-19.64	-22.25	26.39	26.38	26.32	27.52
5906227	5906228	1	Conduit	CIRC	16.3	30	30	-22.44	-22.44	-22.73	-30.01	-22.57	-22.57	-22.74	-25.09
5906228	5906184	1	Conduit	CIRC	251.5	30	30	-22.50	-22.50	-22.72	-30.10	-22.61	-22.61	-22.71	-25.17
5906232	5906233	1	Conduit	CIRC	200.4	24	24	14.73	14.73	14.67	14.88	12.98	12.98	12.86	13.01
5906233	5906234	1	Conduit	CIRC	298.1	24	24	14.77	14.77	14.70	14.93	12.99	13.00	12.88	13.02
5906234	5906177	1	Conduit	CIRC	39	30	30	27.12	27.12	27.13	27.82	27.97	27.97	27.98	28.96
5906250	5906184	1	Conduit	CIRC	276.7	24	24	16.97	16.97	16.98	18.55	15.42	15.45	15.47	17.28
5906258	5906183	1	Conduit	CIRC	601.7	30	30	20.90	20.90	20.82	19.74	17.55	17.55	-17.52	-18.09
5906312	5906143	1	Conduit	RECT	189.6	60	120	200.02	200.01	199.30	197.80	180.34	180.33	179.27	179.94
5906313	5906312	1	Conduit	RECT	130.9	60	120	199.68	199.69	198.99	197.50	180.95	180.89	179.72	180.41
5906314	5906313	1	Conduit	CIRC	263.3	48	48	61.15	61.15	61.04	61.46	71.44	71.48	71.41	68.86
5906316	5906318	1	Conduit	CIRC	186.3	36	36	26.39	26.39	26.31	25.95	24.61	24.63	-24.67	24.80
5906317	5906316	1	Conduit	CIRC	81.4	36	36	26.36	26.36	26.29	25.92	24.59	24.61	24.35	24.78
5906318	5906314	1	Conduit	CIRC	56.7	48	48	60.95	60.95	60.75	61.42	-68.79	-68.85	-69.20	-65.21
5906319	5906318	1	Conduit	CIRC	55.2	36	36	36.52	36.48	36.29	36.90	-75.29	-75.33	-75.49	-72.26
5906321	5906319	1	Conduit	CIRC	231.8	36	36	36.48	36.46	36.27	36.85	33.39	33.41	33.08	33.63
5906330	5906331	1	Conduit	CIRC	260.4	24	24	12.38	12.38	12.30	12.51	10.77	10.78	10.68	10.95
5906331	5906321	1	Conduit	CIRC	323.3	36	36	33.96	33.94	33.77	34.32	30.84	30.86	30.55	31.11
5906359	5906317	1	Conduit	CIRC	95.2	36	36	26.16	26.16	26.09	26.50	24.40	24.41	24.22	26.03
5906361	5906359	1	Conduit	CIRC	605.2	36	36	22.70	22.70	22.62	22.86	20.92	20.93	20.69	21.05
5906388	5906313	1	Conduit	RECT	48.4	60	120	130.68	130.67	130.13	129.07	122.94	122.94	122.10	122.53
5906390	5906313	1	Conduit	CIRC	34.4	24	24	-0.18	-0.17	-0.17	-0.17	-14.64	-14.65	-14.72	-15.39
5906410	5906331	1	Conduit	CIRC	301.1	24	24	19.28	19.28	19.19	19.55	18.49	18.51	18.38	18.38
5906476	5906361	1	Conduit	CIRC	134.3	30	30	17.37	17.36	17.32	18.02	14.80	14.81	14.60	15.95
5906479	5906476	1	Conduit	CIRC	35.7	30	30	11.08	11.07	11.04	12.12	11.28	11.28	11.24	12.21
5906481	5906479	1	Conduit	CIRC	403.3	24	24	10.17	10.17	10.13	10.23	10.72	10.72	10.68	10.71
6029677	D18	1	Conduit	CIRC	209.5	30	30	13.39	13.37	13.40	19.78	13.26	13.22	13.48	14.18
6029685	6029677	1	Conduit	CIRC	41	30	30	9.85	9.92	11.82	18.42	7.92	8.02	9.13	12.47
6029687	6029685	1	Conduit	CIRC	37.8	30	30	-9.70	-9.69	9.95	15.91	-10.30	-10.29	-10.21	-12.44
6029695	6029687	1	Conduit	CIRC	99.3	30	30	-17.29	-17.29	-17.12	15.96	-17.69	-17.67	-17.61	-17.34
6029697	6029695	1	Conduit	CIRC	348.1	30	30	12.43	12.50	14.05	18.43	12.23	12.23	12.44	15.80
6029708	6029697	1	Conduit	CIRC	286.6	30	30	-6.09	-6.11	6.37	7.25	-7.15	-7.02	-6.67	6.18
6029724	6029730	1	Conduit	CIRC	372.1	24	24	20.57	20.60	18.36	17.66	20.33	20.25	17.95	17.08
6029730	6029751	1	Conduit	CIRC	201.1	24	24	20.89	20.92	18.73	18.25	20.71	20.63	18.33	17.51

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
6029738	6029708	1	Conduit	CIRC	221.1	30	30	8.44	8.30	8.81	9.77	13.69	13.58	13.80	14.35
6029740	6029738	1	Conduit	CIRC	67.4	30	30	-26.11	-26.07	-25.76	-24.42	-28.31	-28.33	-28.08	-27.03
6029741	6029740	1	Conduit	CIRC	22.2	24	24	-9.45	-9.44	-9.39	-10.85	-9.56	-9.56	-9.54	-11.06
6029751	6029753	1	Conduit	CIRC	115.2	24	24	21.13	21.16	19.10	18.71	21.00	20.92	18.63	17.86
6029753	10048	1	Conduit	RECT	287.7	60	72	219.23	220.28	217.52	216.49	253.23	253.95	251.85	251.00
6029755	6029751	1	Conduit	CIRC	9.7	24	24	-0.41	-0.41	-0.40	-0.41	0.26	0.26	0.27	0.56
6029762	6029753	1	Conduit	CIRC	36.4	24	24	27.88	28.05	24.20	25.81	27.14	27.07	27.09	26.94
6029770	6029762	1	Conduit	CIRC	117.4	24	24	24.44	24.60	20.67	22.76	19.55	19.61	18.55	18.95
6029772	6029770	1	Conduit	CIRC	172.8	24	24	24.65	24.79	20.88	23.20	25.87	25.87	25.78	25.81
6029773	6029772	1	Conduit	CIRC	5	24	24	-23.36	-23.36	-23.34	-22.97	-46.18	-46.19	-46.17	-45.93
6029774	6029772	1	Conduit	CIRC	20.8	24	24	-27.77	-27.77	-27.90	-28.23	-45.59	-45.59	-45.70	-45.91
6029809	5849	2	Conduit	CIRC	331.4	36	36	17.39	17.18	15.28	17.53	-24.50	-24.74	-22.67	-21.74
6029814	6029809	1	Conduit	CIRC	49.5	24	24	12.51	12.50	12.43	12.79	12.63	12.61	12.52	12.88
6029820	6029809	1	Conduit	CIRC	40.7	24	24	-9.43	-9.28	-9.63	-12.38	-11.21	-11.21	-11.37	-14.09
6029823	5861	1	Conduit	CIRC	20.7	24	24	-8.07	-8.07	-8.06	-6.07	-9.27	-9.27	-9.25	-7.31
6052589	5010	1	Conduit	CIRC	318.1	42	42	41.72	41.71	41.99	48.50	40.18	40.19	40.50	49.94
6052590	6052589	1	Conduit	CIRC	31.9	24	24	15.22	15.23	15.37	20.19	-18.98	-18.98	-18.99	-18.59
6052591	6052589	1	Conduit	CIRC	31.9	24	24	11.86	11.86	11.91	11.65	10.87	10.87	10.97	13.29
6052597	6052589	1	Conduit	CIRC	217.5	36	36	22.72	22.72	22.73	27.15	29.15	29.15	29.18	30.96
6052599	6052597	1	Conduit	CIRC	246	36	36	22.71	22.71	22.72	27.03	34.57	34.58	34.51	35.48
6052601	6052599	1	Conduit	CIRC	58.1	24	24	18.14	18.14	18.34	21.05	15.93	15.92	16.09	19.36
6052608	6052601	1	Conduit	CIRC	33.2	24	24	16.40	16.40	16.57	19.02	-15.01	-15.01	-15.02	16.71
6052609	6052601	1	Conduit	CIRC	31.8	24	24	5.18	5.18	5.22	6.16	-16.31	-16.31	-16.43	-15.53
6052620	6052621	1	Conduit	CIRC	160.5	24	24	28.13	28.13	28.10	28.05	28.88	28.88	28.85	28.68
6052621	6052633	1	Conduit	CIRC	139	24	24	28.13	28.13	28.10	28.05	33.79	33.79	33.77	33.64
6061092	5902	1	Conduit	CIRC	229	24	24	-2.38	-2.38	-2.36	-2.51	-5.71	-5.71	-5.45	-4.82
6061094	6061092	1	Conduit	CIRC	228.7	24	24	-2.26	-2.26	-2.25	-2.38	-8.86	-8.86	-8.99	-8.89
6061230	6061231	1	Conduit	CIRC	390.8	30	30	0.47	0.47	0.47	0.39	1.20	1.20	0.78	0.60
6061276	5916	1	Conduit	RECT	235.1	60	72	130.41	130.40	129.84	128.76	123.50	123.49	122.67	123.17
6061278	6061276	1	Conduit	CIRC	323.7	24	24	-7.00	-7.00	-6.81	-6.81	-6.45	-6.46	-6.51	-6.17
6061287	6061276	1	Conduit	RECT	212.1	60	72	119.47	119.46	118.93	118.83	110.52	110.52	109.78	110.20
6061295	6061287	1	Conduit	RECT	96	60	72	119.10	119.10	118.49	118.76	111.40	111.39	110.72	111.00
6061297	6061295	1	Conduit	CIRC	250.3	24	24	-3.06	-3.06	-2.99	-4.56	-9.13	-9.14	-9.19	-9.83
6061307	6061308	1	Conduit	CIRC	59.4	36	36	33.60	33.60	33.46	33.29	30.51	30.51	30.32	30.62
6061308	5940	1	Conduit	RECT	13.7	60	120	113.58	113.58	112.99	113.44	100.84	100.84	100.12	100.55
6061320	6061307	1	Conduit	CIRC	246.2	36	36	33.55	33.55	33.41	33.56	30.62	30.62	30.43	30.74
6061322	6061320	1	Conduit	CIRC	172	24	24	12.11	12.11	12.06	12.04	11.85	11.85	11.80	11.79
6061332	6061320	1	Conduit	CIRC	195.4	36	36	26.83	26.83	26.71	26.50	22.88	22.89	22.66	22.51
6061338	6061320	1	Conduit	CIRC	183.4	24	24	10.23	10.24	10.17	10.36	8.59	8.58	8.50	9.00
6061347	6061338	1	Conduit	CIRC	344.3	24	24	5.30	5.30	5.27	5.60	5.62	5.62	5.58	5.60
6061355	6061332	1	Conduit	CIRC	191.1	30	30	26.78	26.78	26.66	26.45	22.82	22.83	22.60	22.45
6061365	6061355	1	Conduit	CIRC	160.4	30	30	24.97	24.97	24.85	24.91	21.01	21.01	20.79	20.81
6061368	6061365	1	Conduit	CIRC	28.7	24	24	14.30	14.30	14.26	14.50	11.49	11.50	11.38	11.87
6061377	6061368	1	Conduit	CIRC	140.6	24	24	12.34	12.31	12.19	12.55	9.88	9.88	9.75	10.10
6061387	6061365	1	Conduit	CIRC	158	24	24	10.77	10.75	10.72	10.57	8.97	8.97	8.87	8.65
6061395	6061308	1	Conduit	RECT	29.4	60	72	79.09	79.07	78.66	78.53	65.22	65.22	64.78	64.98
6061397	6061395	1	Conduit	RECT	137.1	60	72	78.96	78.96	78.56	78.43	65.40	65.40	64.87	65.16
6061405	6061397	1	Conduit	CIRC	139.6	60	60	78.88	78.88	78.48	78.36	70.04	69.99	69.67	71.09
6061415	6061405	1	Conduit	CIRC	129.8	60	60	76.79	76.78	76.35	76.66	62.77	62.77	62.24	62.54
6061423	6061415	1	Conduit	CIRC	409.4	60	60	68.58	68.58	68.11	68.99	55.02	55.02	54.64	54.89
6061431	6061423	1	Conduit	CIRC	80	60	60	74.92	74.92	74.64	74.05	99.34	99.34	99.12	97.98

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6061433	6061431	1	Conduit	CIRC	35.4	36	36	29.97	29.97	29.89	31.96	31.08	31.08	31.09	28.96
6061441	6061433	1	Conduit	CIRC	162.2	36	36	29.90	29.90	29.82	31.91	22.36	22.34	22.14	22.27
6061443	6061441	1	Conduit	CIRC	147.6	24	24	-5.90	-5.90	-5.94	-5.43	-6.98	-6.98	-7.03	-6.28
6061451	6061441	1	Conduit	CIRC	102.3	30	30	23.96	23.97	23.75	24.83	-17.95	-17.95	-18.00	17.23
6061459	6061431	1	Conduit	CIRC	129.1	48	48	32.20	32.21	31.86	31.73	31.57	31.57	31.32	31.53
6061461	6061459	1	Conduit	CIRC	33.2	48	48	32.10	32.11	31.76	31.86	31.63	31.63	31.38	31.60
6061463	6061461	1	Conduit	CIRC	142	48	48	32.03	32.03	31.75	32.20	31.68	31.68	31.44	31.66
6061466	6061463	1	Conduit	CIRC	100.1	42	42	28.57	28.57	28.29	28.39	25.23	25.24	25.03	-26.25
6061468	6061466	1	Conduit	CIRC	29.6	42	42	27.82	27.82	27.55	27.61	27.21	27.21	26.86	28.83
6061471	6061468	1	Conduit	CIRC	164.9	42	42	25.39	25.39	25.12	25.24	20.73	20.73	20.55	20.94
6061479	6061451	1	Conduit	CIRC	210.4	30	30	23.88	23.88	23.67	20.99	16.42	16.42	16.26	16.41
6061481	6061479	1	Conduit	CIRC	241.1	24	24	5.61	5.61	5.56	4.40	-5.13	-5.13	-5.15	-5.13
6061489	6061479	1	Conduit	CIRC	245.4	24	24	19.50	19.50	19.40	18.54	14.12	14.13	14.00	14.06
6061497	6061489	1	Conduit	CIRC	68.6	24	24	16.77	16.77	16.70	16.14	11.91	11.91	11.75	11.72
6061499	6061497	1	Conduit	CIRC	305.1	24	24	11.81	11.81	11.77	11.91	-5.94	-5.94	-5.93	-5.92
6062507	6061463	1	Conduit	CIRC	41.2	24	24	17.91	17.91	17.87	18.75	17.94	17.94	17.90	18.78
6062515	6062507	1	Conduit	CIRC	349.4	24	24	7.40	7.40	7.37	7.38	7.39	7.39	7.36	7.33
6062523	6062515	1	Conduit	CIRC	167.2	24	24	-1.75	-1.75	-1.65	-1.87	4.04	4.04	4.06	4.13
6062528	6061468	1	Conduit	CIRC	214.4	24	24	7.41	7.41	7.40	7.47	7.20	7.20	7.19	7.40
6062536	6061471	1	Conduit	CIRC	34.8	24	24	8.58	8.58	8.57	8.69	8.46	8.46	8.43	8.43
6062544	6062536	1	Conduit	CIRC	260.8	24	24	8.59	8.59	8.57	8.70	8.94	8.94	8.90	8.88
6062552	6061471	1	Conduit	CIRC	151.7	42	42	22.61	22.63	22.35	22.47	-23.49	-23.49	-23.66	-24.64
6062554	6062552	1	Conduit	CIRC	132.1	24	24	5.09	5.09	5.05	5.47	4.75	4.75	4.76	5.25
6062562	6062552	1	Conduit	CIRC	56.4	42	42	-23.24	-23.24	-23.39	-25.72	-34.78	-34.78	-34.88	-37.83
6062570	6062562	1	Conduit	CIRC	87.6	36	36	18.94	18.94	18.82	19.36	24.54	24.54	24.40	28.04
6062572	6062570	1	Conduit	CIRC	36.6	24	24	6.41	6.41	6.41	6.30	6.42	6.42	6.39	-6.72
6062580	6062572	1	Conduit	CIRC	386.3	24	24	6.20	6.20	6.19	6.20	7.20	7.20	7.18	7.24
6062588	6062570	1	Conduit	CIRC	163.5	30	30	16.31	16.31	16.22	16.76	-15.58	-15.58	-16.29	-16.88
6062598	6062588	1	Conduit	CIRC	152.6	30	30	14.02	14.02	13.96	14.50	9.90	9.90	9.68	9.81
6073349	6073404	1	Conduit	CIRC	305.2	24	24	6.92	6.92	6.94	7.33	9.45	9.45	9.46	9.61
6073352	6076543	1	Conduit	CIRC	46.5	24	24	8.11	8.11	8.11	10.97	8.27	8.27	8.27	11.08
6073420	6073416	1	Conduit	CIRC	308.7	24	24	8.15	8.15	8.12	8.09	10.94	10.94	10.91	10.89
6073424	6073426	1	Conduit	CIRC	63.3	24	24	7.91	7.91	7.91	8.08	9.11	9.11	9.13	8.66
6073426	6073352	1	Conduit	CIRC	126	24	24	-2.59	-2.59	-2.59	-3.58	-4.66	-4.66	-4.66	-4.76
6073433	6073473	1	Conduit	CIRC	256.7	48	48	-41.08	-38.82	-39.39	-31.25	-14.11	-14.11	-14.18	-17.47
6073436	6073438	1	Conduit	CIRC	246	48	48	60.99	60.99	60.98	58.69	73.23	73.23	73.15	71.07
6073438	6073447	1	Conduit	CIRC	236.9	60	60	-70.84	-79.03	-69.50	-56.51	-37.43	-37.43	-37.61	-31.40
6073447	6073451	1	Conduit	CIRC	261.3	60	60	46.29	46.29	46.14	46.99	50.04	50.04	49.82	50.43
6073451	6037	1	Conduit	CIRC	185.2	66	66	86.16	86.16	85.99	88.00	91.05	91.05	90.84	93.33
6073459	6040	1	Conduit	CIRC	43.5	78	78	-96.08	-95.90	-98.63	-80.12	49.21	49.23	48.94	52.97
6073463	6073459	1	Conduit	CIRC	172.3	54	54	-56.94	-56.88	-57.70	-51.40	-38.01	-38.01	-38.09	-39.43
6073469	6073463	1	Conduit	CIRC	45.6	48	48	-61.68	-63.77	-61.47	-55.11	-27.53	-27.53	-27.56	-22.04
6073473	6073469	1	Conduit	CIRC	279.3	48	48	-65.22	-67.22	-64.44	-52.98	-14.56	-14.56	-14.61	-16.08
6073491	6075001	1	Conduit	CIRC	185	84	84	-100.10	-99.92	-100.86	-82.01	52.04	52.07	51.55	54.81
6075001	6075451	1	Conduit	CIRC	101	84	84	-103.85	-103.64	-104.50	-84.81	52.17	52.20	51.61	54.67
6075003	6075011	1	Conduit	CIRC	307.8	24	24	13.01	13.01	13.74	12.80	9.36	9.36	9.30	9.32
6075006	6075033	1	Conduit	CIRC	154.1	78	78	-115.12	-114.94	-115.32	-99.38	54.29	54.29	53.92	50.21
6075008	6075039	1	Conduit	CIRC	215.8	48	48	-44.80	-44.79	-43.20	-34.84	-15.48	-15.48	-15.59	-15.15
6075011	6075045	1	Conduit	CIRC	581.5	54	54	-57.12	-57.58	-56.83	-48.67	34.58	34.58	34.36	33.91
6075013	6075065	1	Conduit	CIRC	264.1	48	48	-39.54	-39.44	-44.01	-37.91	17.06	17.06	16.91	18.22
6075016	6076597	1	Conduit	CIRC	118.9	60	60	-56.73	-56.04	-58.81	-49.51	-30.35	-30.35	-30.54	-50.63

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
6075019	6075083	1	Conduit	CIRC	134.5	60	60	-90.56	-89.61	-90.27	-76.51	26.99	27.05	27.24	-29.04
6075021	6075085	1	Conduit	CIRC	385.3	48	48	-49.17	-49.37	-49.05	-38.91	23.37	23.37	23.32	23.39
6075024	6075123	1	Conduit	CIRC	212.6	48	48	-55.44	-28.82	-30.33	-28.10	9.19	9.19	9.15	8.99
6075027	3175102	1	Conduit	CIRC	33.4	78	78	-112.03	-111.82	-111.84	-96.31	57.40	57.40	57.04	53.90
6075033	6075027	1	Conduit	CIRC	106.2	78	78	-115.71	-115.52	-115.61	-99.92	54.29	54.29	53.92	50.21
6075039	6075006	1	Conduit	CIRC	33.3	48	48	-46.47	-46.80	-46.51	-39.97	-25.77	-25.77	-25.83	-25.89
6075045	6075006	1	Conduit	CIRC	278.8	60	60	58.06	57.84	57.20	55.84	54.58	54.58	54.38	55.42
6075065	6075011	1	Conduit	CIRC	33.9	48	48	-46.39	-46.33	-49.64	-42.11	-26.48	-26.48	-26.59	-25.51
6075083	6076557	1	Conduit	CIRC	118.3	60	60	-90.19	-89.23	-89.61	-76.51	51.77	51.77	51.61	44.60
6075085	6075019	1	Conduit	CIRC	37.4	48	48	-51.50	-51.71	-51.43	-40.82	-30.67	-30.67	-30.68	-28.67
6075095	6075097	1	Conduit	CIRC	20.7	54	54	-56.93	-56.14	-56.32	-48.78	-19.97	-19.97	-20.15	-18.48
6075097	6075016	1	Conduit	CIRC	8.1	60	60	-55.39	-54.62	-54.68	-48.62	-38.62	-38.62	-38.74	-55.69
6075103	6075107	1	Conduit	CIRC	40.9	48	48	-45.46	-45.54	-46.10	-42.01	-19.96	-19.96	-20.10	18.31
6075107	6075095	1	Conduit	CIRC	196.4	54	54	-54.74	-54.19	-54.41	-47.19	-19.97	-19.97	-20.15	-18.48
6075111	6075103	1	Conduit	CIRC	38.7	48	48	-45.24	-45.92	-46.53	-42.76	42.92	42.92	42.86	56.21
6075121	6075125	1	Conduit	CIRC	41.1	48	48	-28.72	-28.03	-29.41	-26.34	26.19	26.19	26.14	29.18
6075123	6075121	1	Conduit	CIRC	44.9	48	48	-30.80	-29.99	-31.04	-28.96	9.08	9.20	8.60	7.80
6075125	6075111	1	Conduit	CIRC	218.5	48	48	-45.70	-44.72	-45.67	-42.37	17.44	17.45	17.36	21.72
6075451	6075459	1	Conduit	CIRC	287.2	84	84	-102.02	-101.69	-102.71	-82.50	55.19	55.27	54.52	57.13
6075459	6075465	1	Conduit	CIRC	81.7	84	84	-103.15	-102.75	-103.77	-83.16	55.81	55.81	-55.68	-67.29
6075463	6031	1	Conduit	CIRC	148.8	84	84	209.14	209.14	208.78	208.80	254.55	254.56	254.30	253.78
6075465	6075463	1	Conduit	CIRC	41.7	84	84	-125.46	-125.47	-125.62	-123.71	-190.54	-190.54	-190.65	-188.50
6076543	6073420	1	Conduit	CIRC	265.8	24	24	-4.04	-4.04	-4.04	-4.86	-5.97	-5.97	-5.97	-6.65
6076557	6075006	1	Conduit	CIRC	30.6	66	66	-90.09	-88.92	-90.25	-76.31	38.95	38.94	38.28	29.45
6076597	6075019	1	Conduit	CIRC	160.4	60	60	-66.55	-66.52	-66.53	-54.49	-32.71	-32.71	-32.86	-38.34
6076632	6076635	1	Conduit	CIRC	374.1	24	24	1.73	1.73	1.34	1.20	2.44	2.44	2.10	1.92
6198704	6198706	1	Conduit	RECT	111.8	60	120	321.95	321.94	319.44	319.26	294.81	293.77	291.14	294.10
6198706	6198708	1	Conduit	RECT	317	60	120	317.85	317.72	314.85	314.78	289.42	289.39	287.74	289.11
6198708	6198711	1	Conduit	RECT	85.1	60	120	312.70	312.63	309.99	309.89	286.31	286.26	284.59	286.17
6198711	6198730	1	Conduit	RECT	338	60	120	353.92	353.94	351.52	351.36	319.90	319.83	318.19	321.29
6198730	6198761	1	Conduit	RECT	325.8	60	120	370.55	370.58	367.98	367.92	333.13	333.13	331.34	333.33
6198761	6198771	1	Conduit	RECT	136.8	60	120	367.68	367.73	365.22	365.12	332.48	332.48	330.67	332.76
6198771	6198780	1	Conduit	RECT	119.2	60	120	365.29	365.35	362.75	362.64	331.91	331.91	330.04	332.17
6198780	6198784	1	Conduit	RECT	44.2	60	120	365.26	365.28	362.77	362.90	331.34	331.35	329.49	331.60
6198784	6198788	1	Conduit	RECT	98	60	120	365.69	365.71	363.19	364.08	330.73	330.74	328.90	330.99
6198788	6198792	1	Conduit	RECT	224.3	60	120	377.42	377.45	374.92	375.68	348.35	346.30	345.58	346.41
6198792	6198800	1	Conduit	RECT	496.6	60	120	417.49	417.49	415.02	414.42	391.69	391.70	389.76	393.79
6198793	6198792	1	Conduit	CIRC	39.4	24	24	9.46	9.46	9.46	9.46	14.65	14.65	14.69	15.01
6198800	6198804	1	Conduit	RECT	97.3	60	120	453.15	453.15	450.74	449.45	444.71	444.71	443.02	447.61
6198804	6198824	1	Conduit	RECT	74.7	60	120	463.15	463.15	460.73	459.42	453.95	453.96	452.58	458.33
6198806	6198804	1	Conduit	CIRC	64.2	24	24	7.39	7.39	7.39	7.12	-10.80	-10.78	-10.76	-11.20
6198808	6198804	1	Conduit	CIRC	9.9	24	24	2.70	2.70	2.70	2.99	-25.68	-25.61	-25.82	-25.45
6198813	6198806	1	Conduit	CIRC	13.3	24	24	0.53	0.53	0.53	0.53	-7.88	-7.87	-7.87	-8.02
6198814	6198806	1	Conduit	CIRC	7.7	24	24	6.86	6.86	6.86	6.59	8.40	8.42	8.36	8.28
6198824	6198834	1	Conduit	RECT	120.7	60	120	470.13	470.13	467.70	467.03	464.69	464.69	463.42	469.93
6198825	6198808	1	Conduit	CIRC	18.1	24	24	2.33	2.33	2.33	2.45	3.94	3.90	3.99	4.12
6198826	6198808	1	Conduit	CIRC	28.9	24	24	0.29	0.29	0.28	0.28	5.18	5.17	5.15	5.08
6198834	6198836	1	Conduit	RECT	53.9	60	120	503.08	503.08	500.63	499.91	489.75	489.75	488.63	495.91
6198836	6198853	1	Conduit	RECT	92.9	60	120	506.20	506.20	503.76	503.20	492.95	492.95	491.89	499.31
6198837	6198834	1	Conduit	CIRC	27.6	24	24	1.00	1.00	1.00	1.00	-14.47	-14.27	-14.48	-13.97
6198838	6198836	1	Conduit	CIRC	6.2	24	24	1.95	1.95	1.95	1.36	8.47	8.49	8.26	7.22

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
6198839	6198836	1	Conduit	CIRC	20.5	24	24	1.24	1.24	1.24	1.83	7.46	7.48	6.61	7.78
6198853	6198858	1	Conduit	RECT	321.7	60	120	520.34	520.25	518.07	516.34	512.84	512.86	511.86	519.76
6198854	6198853	1	Conduit	CIRC	15.7	24	24	0.31	0.31	0.31	0.31	-12.25	-11.49	-12.86	-11.74
6198858	5784	1	Conduit	RECT	186.1	60	120	535.71	535.71	533.25	533.51	536.80	536.82	535.93	544.51
6198859	6198858	1	Conduit	CIRC	17.8	24	24	2.13	2.13	2.13	2.12	-8.36	-7.57	-9.07	-8.24
6198860	6198858	1	Conduit	CIRC	12.3	24	24	4.31	4.31	4.31	4.59	13.80	12.81	13.12	12.49
6198869	6198834	1	Conduit	CIRC	202.2	24	24	28.60	28.60	28.58	28.46	24.75	24.75	24.68	24.83
6198872	6198869	1	Conduit	CIRC	116.4	24	24	19.46	19.46	19.37	19.48	19.40	19.40	19.32	19.51
6198873	6198869	1	Conduit	CIRC	11.8	24	24	2.08	2.08	2.11	2.07	-5.02	-5.01	-5.05	-5.04
6198874	6198869	1	Conduit	CIRC	23.3	24	24	0.65	0.65	0.64	0.65	-5.99	-5.99	-6.03	-6.10
6198884	6198872	1	Conduit	CIRC	106	24	24	12.42	12.42	12.35	12.29	12.31	12.31	12.24	12.17
6198885	6198884	1	Conduit	CIRC	16.9	24	24	-5.60	-5.60	-5.61	-5.59	-8.65	-8.65	-8.66	-8.65
6198886	6198884	1	Conduit	CIRC	28.5	24	24	1.32	1.32	1.33	1.37	4.42	4.38	4.42	4.52
6198892	6198884	1	Conduit	CIRC	101.6	24	24	8.47	8.49	8.42	8.40	8.41	8.41	8.37	8.36
6198894	6198892	1	Conduit	CIRC	182.8	24	24	-6.05	-6.05	-6.05	-6.08	-10.56	-10.56	-10.52	-10.72
7204174	3234307	1	Conduit	RECT	38.8	96	84	315.47	315.94	313.41	313.03	310.62	310.71	309.29	306.84
7204174	3234307	2	Conduit	RECT	38.8	96	84	315.47	315.94	313.41	313.03	310.62	310.71	309.29	306.84
10008!_2D	10008	1	weir	N/A	0.667	0.83	8	6.50	6.50	6.72	6.16	10.36	10.38	10.48	9.41
10009!_2D	10009	1	weir	N/A	1.083	0.83	13	36.95	34.64	36.73	41.23	40.59	40.03	36.75	40.12
10010!_2D	10010	1	weir	N/A	1.083	0.83	13	17.82	17.85	9.15	5.75	26.99	26.39	9.11	-5.60
10032!_2D	10032	1	weir	N/A	0.604		7.25	-3.32	-3.32	-3.32	-3.39	-4.61	-4.61	-4.61	-4.71
10055!_2D	10055	1	weir	N/A	0.667	0.83	8	0.45	0.45	0.18	0.18	-5.19	-4.58	-7.72	-6.30
10056!_2D	10056	1	weir	N/A	0.667	0.83	8	1.15	1.15	1.24	1.20	8.79	7.33	7.07	6.34
10059!_2D	10059	1	weir	N/A	0.667	0.83	8	4.53	4.53	4.35	4.56	4.87	5.15	5.02	5.54
20053!_2D	20053	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20103!_2D	20103	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	15.45	12.34	10.20	16.26
20104!_2D	20104	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20105!_2D	20105	1	weir	N/A	0.604		7.25	1.28	1.28	0.89	0.74	3.97	3.96	4.46	4.44
20106!_2D	20106	1	weir	N/A	0.604		7.25	0.46	0.46	0.01	0.00	2.45	2.46	2.58	2.73
20107!_2D	20107	1	weir	N/A	0.604		7.25	14.18	14.19	14.80	14.92	18.62	18.73	19.77	19.74
20108!_2D	20108	1	weir	N/A	0.604		7.25	6.20	6.21	6.74	6.66	6.39	6.40	6.77	6.23
20109!_2D	20109	1	weir	N/A	0.604		7.25	4.91	4.91	4.42	4.02	6.69	6.70	6.98	6.76
20110!_2D	20110	1	weir	N/A	0.604		7.25	1.98	1.99	2.18	2.15	2.42	2.43	2.69	2.50
20111!_2D	20111	1	weir	N/A	0.604		7.25	3.27	3.27	4.23	4.91	-8.21	-8.17	-6.82	-7.17
20112!_2D	20112	1	weir	N/A	0.604		7.25	-1.47	-1.46	1.55	1.52	-4.61	-4.60	-4.14	-4.27
20113!_2D	20113	1	weir	N/A	0.604		7.25	10.72	10.72	12.53	14.02	15.30	15.30	15.55	15.50
20114!_2D	20114	1	weir	N/A	0.604		7.25	4.56	4.56	4.92	5.14	4.98	4.98	5.05	4.99
20115!_2D	20115	1	weir	N/A	0.604		7.25	2.89	2.88	3.48	4.01	-3.03	-3.03	-3.03	3.37
20119!_2D	20119	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20120!_2D	20120	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20121!_2D	20121	1	weir	N/A	0.604		7.25	10.17	10.17	8.69	10.13	16.40	16.40	15.32	17.08
20122!_2D	20122	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20123!_2D	20123	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20124!_2D	20124	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20125!_2D	20125	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20126!_2D	20126	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	1.17	1.13	0.92	1.18
20127!_2D	20127	1	weir	N/A	0.604		7.25	2.60	2.60	2.65	2.63	3.74	3.73	3.71	3.69
20128!_2D	20128	1	weir	N/A	0.604		7.25	13.47	13.47	13.82	13.51	19.41	19.41	19.50	19.13
20129!_2D	20129	1	weir	N/A	0.604		7.25	0.00	0.00	0.00	0.00	13.28	13.21	12.31	12.74
20142-1	20142	1	Conduit	CIRC	28.1	24	24	-11.13	-11.11	-10.94	10.47	-12.35	-12.28	-12.23	-12.23
20142-1	20142	2	Conduit	CIRC	28.1	24	24	-11.13	-11.11	-10.94	10.47	-12.35	-12.28	-12.23	-12.23

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
4165583!_2D	4165583	1	weir	N/A	0.667	0.83	8	3.32	2.88	2.03	1.84	8.25	8.68	8.97	5.01
4165604!_2D	4165604	1	weir	N/A	0.667	0.83	8	0.74	0.74	0.74	0.74	1.25	1.25	1.25	1.26
4165605!_2D	4165605	1	weir	N/A	0.667	0.83	8	1.90	1.90	1.87	1.85	8.93	8.37	7.11	4.82
4165607!_2D	4165607	1	weir	N/A	0.667	0.83	8	0.30	0.30	0.30	0.30	-5.20	-4.59	-4.12	-2.77
4165610!_2D	4165610	1	weir	N/A	0.667	0.83	8	0.98	0.88	0.76	0.62	2.37	2.39	2.07	1.94
5000!_2D	5000	1	weir	N/A	0.667	0.83	8	0.27	0.21	0.42	0.51	-5.27	-4.56	1.77	1.86
5788-1	W14001_sta19481	1	Conduit	RECT	5	36	36	-7.72	5.88	2.35	4.04	12.97	9.16	7.58	31.17
5788-2	W14001_sta19481	1	Conduit	RECT	5	36	36	-22.14	-21.91	-0.12	-0.11	-50.37	-48.88	6.78	19.34
5788-3	W14001_sta19481	1	Conduit	RECT	5	36	36	15.64	15.38	-0.12	4.89	33.43	31.44	2.78	35.30
6198813!_2D	6198813	1	weir	N/A	0.427	0.42	5.125	0.53	0.53	0.53	0.53	-7.88	-7.87	-7.87	-8.02
6198814!_2D	6198814	1	weir	N/A	0.427	0.42	5.125	6.86	6.86	6.86	6.59	8.85	8.85	8.74	8.69
6198825!_2D	6198825	1	weir	N/A	0.427	0.42	5.125	2.33	2.33	2.33	2.45	4.18	4.23	4.15	4.37
6198826!_2D	6198826	1	weir	N/A	0.427	0.42	5.125	0.28	0.28	0.28	0.27	5.34	5.34	5.32	5.27
6198837!_2D	6198837	1	weir	N/A	0.667	0.83	8	1.00	1.00	1.00	1.00	-15.99	-16.10	-16.22	-15.57
6198838!_2D	6198838	1	weir	N/A	0.427	0.42	5.125	1.95	1.95	1.95	1.36	8.36	8.37	8.19	7.34
6198839!_2D	6198839	1	weir	N/A	0.427	0.42	5.125	1.24	1.24	1.24	1.83	7.37	7.39	7.36	7.66
6198854!_2D	6198854	1	weir	N/A	0.604		7.25	0.31	0.31	0.31	0.31	-10.44	-9.75	-10.66	-10.04
6198859!_2D	6198859	1	weir	N/A	0.604		7.25	2.13	2.13	2.13	2.13	-5.66	-4.87	-6.11	-5.51
6198860!_2D	6198860	1	weir	N/A	0.604		7.25	4.31	4.31	4.31	4.59	10.43	10.19	9.39	9.21
6198873!_2D	6198873	1	weir	N/A	0.427	0.42	5.125	2.08	2.08	2.11	2.07	-5.02	-5.01	-5.04	-5.04
6198874!_2D	6198874	1	weir	N/A	0.427	0.42	5.125	0.66	0.66	0.66	0.66	-5.98	-5.99	-6.02	-6.10
6198885!_2D	6198885	1	weir	N/A	0.427	0.42	5.125	-5.60	-5.60	-5.61	-5.60	-8.65	-8.65	-8.66	-8.65
6198886!_2D	6198886	1	weir	N/A	0.427	0.42	5.125	1.32	1.32	1.33	1.37	4.56	4.56	4.58	4.62
6198894!_2D	6198894	1	weir	N/A	0.604		7.25	-2.73	-2.73	-2.73	-2.69	-7.45	-7.45	-7.49	-7.24
A10	AM12	1	Conduit	CIRC	47.1	24	24	8.27	8.38	7.59	7.80	9.65	10.01	9.71	9.47
A11	AM12	1	Conduit	CIRC	73.8	24	24	10.10	10.13	9.87	9.91	12.29	12.23	11.85	11.69
A13	AM14	1	Conduit	CIRC	24.1	24	24	9.88	9.92	9.54	9.75	9.27	9.92	9.98	10.52
A15	AM14	1	Conduit	CIRC	21.6	24	24	20.83	20.86	20.72	20.71	21.77	22.03	21.63	21.37
A17	AM16	1	Conduit	CIRC	17.7	24	24	18.54	18.49	18.05	16.10	20.29	19.90	19.94	17.98
A18	AM16	1	Conduit	CIRC	23.7	24	24	-17.30	-17.29	-17.28	-16.28	-17.47	-17.44	-17.44	-16.31
A2	AM1	1	Conduit	CIRC	24.9	24	24	39.40	40.19	39.68	40.32	42.01	43.91	42.89	43.38
A20	AM19	1	Conduit	CIRC	61.7	24	24	1.88	1.89	1.80	1.86	13.69	13.42	13.46	12.57
A21	AM19	1	Conduit	CIRC	51.5	24	24	14.57	14.52	14.48	14.75	17.30	17.35	17.01	16.82
A22	AM23	1	Conduit	CIRC	66.3	24	24	6.49	6.52	6.30	6.50	4.73	4.48	4.59	4.68
A25	AM24	1	Conduit	CIRC	57.3	24	24	-4.57	5.01	4.67	-5.26	3.30	3.82	3.38	-4.47
A26	AM24	1	Conduit	CIRC	41.5	24	24	-7.50	-7.51	-7.22	-6.69	-11.22	-11.22	-10.74	-10.38
A28	AM27	1	Conduit	CIRC	35.8	24	24	4.71	4.74	4.68	-4.60	-8.09	-8.07	-8.23	-8.91
A29	AM27	1	Conduit	CIRC	33.3	24	24	8.88	8.89	8.74	9.52	8.73	8.74	8.62	9.22
A3	AM1	1	Conduit	CIRC	22.8	24	24	8.59	8.71	7.86	8.36	-15.78	-13.13	-14.58	-15.05
A31	AM33	1	Conduit	CIRC	43.4	24	24	6.51	6.68	6.42	6.35	6.36	6.55	6.26	6.18
A32	AM33	1	Conduit	CIRC	40.1	24	24	5.63	5.57	5.59	5.63	5.27	-5.58	5.25	5.28
A34	AM36	1	Conduit	CIRC	38	24	24	-8.00	-7.84	-8.07	-8.22	-12.12	-12.10	-12.25	-12.22
A35	AM36	1	Conduit	CIRC	36.5	24	24	7.87	7.97	7.71	7.80	12.73	12.97	12.56	12.17
A41	AM39	1	Conduit	CIRC	17.1	24	24	-28.00	-28.00	-28.23	-30.11	-28.31	-28.30	-28.54	-30.42
A42	AM44	1	Conduit	CIRC	26.5	24	24	6.89	6.89	6.91	6.34	6.57	6.58	6.58	6.08
A43	AM44	1	Conduit	CIRC	31.6	24	24	-14.84	-14.83	-14.94	-14.52	-18.82	-18.80	-19.04	-18.48
A46	AM45	1	Conduit	CIRC	42.2	24	24	18.62	18.62	18.22	19.09	20.70	20.70	20.06	21.17
A47	AM45	1	Conduit	CIRC	23.1	24	24	29.99	29.99	29.76	29.13	33.59	33.60	33.34	32.74
A48	AM49	1	Conduit	CIRC	48	24	24	-11.21	-11.21	-11.59	-11.92	-12.99	-12.99	-13.42	-13.59
A5	AM4	1	Conduit	CIRC	30.5	24	24	19.88	20.06	19.68	20.74	24.74	23.01	23.78	24.94
A6	AM4	1	Conduit	CIRC	40	24	24	14.62	14.88	14.37	14.93	16.10	18.70	17.74	17.30

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
A8	AM7	1	Conduit	CIRC	40.6	24	24	17.51	17.63	16.00	16.91	-17.64	-16.19	-17.28	-17.18
A9	AM7	1	Conduit	CIRC	34	24	24	-16.80	-16.19	-16.87	-17.01	-21.04	-19.94	-20.82	-21.01
AM1	W14001_sta12065	1	Conduit	CIRC	398.8	66	66	125.09	125.99	113.74	120.41	110.60	113.33	107.84	108.27
AM12	AM7	1	Conduit	CIRC	738.4	60	60	71.35	71.74	69.12	70.55	73.83	76.16	73.46	74.35
AM14	AM12	1	Conduit	CIRC	309.7	36	36	19.74	19.80	19.06	19.48	17.95	18.10	17.72	18.06
AM16	AM12	1	Conduit	CIRC	492.2	24	24	13.81	13.74	12.82	14.19	15.13	14.79	13.95	15.37
AM19	AM12	1	Conduit	CIRC	513.6	54	54	49.43	50.06	48.81	49.36	48.77	48.95	45.95	47.40
AM23	AM19	1	Conduit	CIRC	612.9	36	36	27.05	27.14	25.71	26.31	26.09	26.15	25.03	25.45
AM23	AM24	2	Conduit	CIRC	300	36	36	-21.81	-21.86	-21.30	-21.54	-21.47	-21.55	-20.57	-20.97
AM27	AM24	1	Conduit	CIRC	297	24	24	19.75	19.74	19.67	19.78	19.88	19.87	19.78	19.86
AM30	AM27	1	Conduit	CIRC	347.1	24	24	12.24	12.25	11.94	12.07	11.97	11.99	11.75	11.84
AM33	AM30	1	Conduit	CIRC	169.5	24	24	10.42	10.44	10.14	10.27	10.15	10.17	9.96	10.04
AM36	AM33	1	Conduit	CIRC	372.1	24	24	4.85	4.87	4.79	4.78	4.47	4.62	4.51	4.44
AM37	AM38	1	Conduit	CIRC	20.2	24	24	-6.02	-6.00	-6.11	-9.12	-6.79	-6.78	-6.85	-9.93
AM38	AM19	1	Conduit	CIRC	383.1	36	36	26.84	26.74	25.35	26.59	24.56	24.11	22.78	23.98
AM39	AM44	1	Conduit	CIRC	295.2	24	24	-16.34	-16.40	-14.91	-15.65	-15.10	-15.14	-14.34	-14.58
AM39	AM38	2	Conduit	CIRC	300.1	30	30	24.14	24.16	22.68	24.02	22.57	21.99	20.64	22.13
AM4	AM1	1	Conduit	CIRC	366.5	66	66	101.56	102.27	92.02	97.52	90.15	90.89	83.71	86.74
AM40	AM39	1	Conduit	CIRC	46.7	24	24	7.63	7.61	7.15	-7.71	8.05	7.76	7.40	-7.91
AM45	AM44	1	Conduit	CIRC	292	24	24	15.10	15.11	15.09	14.97	14.97	14.97	14.95	14.85
AM49	AM45	1	Conduit	CIRC	152.3	24	24	-7.46	-7.46	-7.48	-7.43	-9.56	-9.56	-9.58	-9.33
AM50	AM49	1	Conduit	CIRC	495.3	24	24	-0.83	-0.84	-0.91	-0.80	-3.15	-3.15	-3.13	-3.01
AM7	AM4	1	Conduit	CIRC	306.5	66	66	92.62	93.23	83.99	88.98	83.65	84.18	77.62	80.50
B01	IH-10_JUNCTION_E01	1	Conduit	RECT	55	60	96	123.83	126.28	-83.68	166.31	135.04	137.37	-92.43	158.59
B03	B01	1	Conduit	CIRC	39.1	24	24	3.49	3.49	3.45	1.19	15.82	15.54	14.35	1.93
B03_2D	B03	1	weir	N/A	0.427	0.42	5.125	3.45	3.45	3.45	1.20	15.76	15.50	14.33	1.93
B04	B01	1	Conduit	RECT	177.9	60	96	119.33	119.31	-120.97	149.44	126.72	126.01	-106.89	118.12
B05	B04	1	Conduit	CIRC	92.3	24	24	4.00	4.01	3.98	3.86	6.37	6.38	7.06	5.83
B05_2D	B05	1	weir	N/A	0.427	0.42	5.125	3.96	3.96	3.98	3.88	6.35	6.35	7.06	5.81
B06	B07	1	Conduit	CIRC	28.8	24	24	8.19	8.18	8.29	3.97	16.66	16.59	17.51	7.94
B06_2D	B06	1	weir	N/A	0.427	0.42	5.125	8.15	8.15	8.29	4.00	16.66	16.59	17.51	8.09
B07	B04	1	Conduit	RECT	167.4	60	96	119.02	119.03	-122.67	96.79	126.43	125.71	-107.74	74.28
B07	B04	2	Conduit	RECT	167.4	60	60	#N/A	#N/A	#N/A	52.07	#N/A	#N/A	#N/A	43.33
B08	B07	1	Conduit	CIRC	7	24	24	9.91	9.90	9.64	9.62	11.95	11.86	11.58	11.65
B08_2D	B08	1	weir	N/A	0.427	0.42	5.125	9.86	9.86	9.65	9.63	12.02	11.90	11.72	11.74
B10	B07	1	Conduit	RECT	263.9	60	96	117.88	117.78	-131.07	93.82	122.98	122.33	-112.03	-73.13
B10	B07	2	Conduit	RECT	263.9	60	60	#N/A	#N/A	#N/A	52.19	#N/A	#N/A	#N/A	42.11
B12	B13	1	Conduit	CIRC	36.3	24	24	-25.27	-25.20	24.87	-19.46	-27.09	-26.69	26.55	-19.71
B12_2D	B12	1	weir	N/A	1	1	12	-25.09	-25.01	28.56	-24.00	-26.84	-26.41	32.82	22.60
B13	W14001_sta19481	1	Conduit	CIRC	22.8	48	48	101.89	99.36	349.75	314.16	122.17	117.67	374.18	359.56
B13	W14001_sta19481	2	Conduit	CIRC	22.8	48	48	101.89	99.36	#N/A	#N/A	122.17	117.67	#N/A	#N/A
B13	B14	3	Conduit	RECT	61.7	60	96	116.29	116.15	-137.75	92.76	121.80	120.73	-141.75	-99.30
B13	B14	4	Conduit	RECT	57.4	60	60	#N/A	#N/A	#N/A	48.36	#N/A	#N/A	#N/A	-62.50
B14	B10	1	Conduit	RECT	473.9	60	96	117.62	117.59	-130.83	93.15	122.91	122.20	-111.90	-73.47
B14	B10	2	Conduit	RECT	473.9	60	60	#N/A	#N/A	#N/A	52.22	#N/A	#N/A	#N/A	42.06
B15	B14	1	Conduit	CIRC	10.6	24	24	22.21	22.12	22.05	22.00	32.02	31.31	35.24	52.99
B15_2D	B15	1	weir	N/A	1	1	12	22.10	22.08	22.04	22.02	31.94	31.24	35.25	52.99
B18	B13	1	Conduit	RECT	152.9	60	96	259.84	255.88	264.08	346.43	272.76	267.38	287.55	340.50
B19	B22	1	Conduit	CIRC	42.7	24	24	-9.55	-9.31	6.14	6.07	-19.49	-18.65	-14.66	-15.10
B19_2D	B19	1	weir	N/A	1	1	12	-9.53	-9.30	6.11	6.08	-19.49	-18.64	-14.66	-15.09
B20	B18	1	Conduit	RECT	100.4	60	96	146.86	146.84	169.70	172.33	153.08	151.35	170.69	154.25

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B20	B18	2	Conduit	RECT	103.9	60	60	#N/A	#N/A	#N/A	90.87	#N/A	#N/A	#N/A	94.14
B20_2D	B20	1	weir	N/A	1	1	12	15.57	15.69	15.53	15.52	17.36	17.84	23.17	59.66
B22	B20	1	Conduit	RECT	101.8	60	96	145.88	145.91	168.29	169.12	158.22	155.90	169.09	149.34
B22	B20	2	Conduit	RECT	101.8	60	60	#N/A	#N/A	#N/A	91.05	#N/A	#N/A	#N/A	82.31
B24	B22	1	Conduit	RECT	187.2	60	96	146.01	145.54	167.79	167.76	175.82	173.39	182.07	148.78
B24	B22	2	Conduit	RECT	187.2	60	60	#N/A	#N/A	#N/A	91.44	#N/A	#N/A	#N/A	82.10
B26	B27	1	Conduit	CIRC	116.3	30	30	-9.83	-9.80	-7.27	2.21	-14.10	-13.82	-13.30	-11.56
B26_2D	B26	1	weir	N/A	0.427	0.42	5.125	-9.81	-9.79	-7.27	2.23	-14.07	-13.80	-13.28	-11.55
B27	B24	1	Conduit	RECT	242.1	60	96	146.00	145.47	167.75	167.40	175.82	173.40	182.07	148.94
B27	B24	2	Conduit	RECT	242.1	60	60	#N/A	#N/A	#N/A	91.59	#N/A	#N/A	#N/A	81.77
B29	B27	1	Conduit	RECT	157.4	60	96	155.56	154.74	168.72	166.10	189.62	187.07	195.25	147.86
B29	B27	2	Conduit	RECT	157.4	60	60	#N/A	#N/A	#N/A	92.27	#N/A	#N/A	#N/A	85.48
B30	B32	1	Conduit	CIRC	21.4	24	24	-8.87	-8.86	9.22	13.84	-12.85	-12.60	-12.39	11.65
B30_2D	B30	1	weir	N/A	0.427	0.42	5.125	-8.86	-8.86	9.22	13.94	-12.85	-12.59	-12.39	11.78
B31	B32	1	Conduit	CIRC	15.7	24	24	-9.20	-9.17	-7.06	8.87	-13.16	-12.92	-12.83	-11.30
B31_2D	B31	1	weir	N/A	0.427	0.42	5.125	-9.19	-9.17	-7.06	9.16	-13.15	-12.91	-12.82	-11.30
B32	B29	1	Conduit	RECT	146.2	60	96	185.42	184.81	183.42	223.53	236.13	232.83	239.63	264.84
B35	B36	1	Conduit	CIRC	26.7	24	24	47.82	48.37	50.85	34.08	39.50	39.74	42.91	44.18
B35_2D	B35	1	weir	N/A	1	1	12	59.89	59.14	58.49	34.10	50.48	50.77	53.30	56.57
B36	B32	1	Conduit	RECT	309.7	60	96	203.30	202.74	196.48	211.68	262.07	258.21	264.70	282.37
B38	B36	1	Conduit	RECT	324.1	60	96	282.51	283.49	289.53	302.06	279.36	279.92	287.20	302.62
B39	B38	1	Conduit	CIRC	48	24	24	15.44	15.44	15.44	14.64	16.89	16.91	17.13	15.99
B39_2D	B39	1	weir	N/A	0.427	0.42	5.125	15.41	15.41	15.41	14.66	17.04	17.06	17.30	16.01
B41	B38	1	Conduit	RECT	29.7	60	96	266.81	267.83	273.68	286.79	261.18	261.70	269.07	285.38
B45	B41	1	Conduit	RECT	344.6	60	96	266.90	267.92	273.71	286.91	261.26	261.79	269.16	285.48
B46	B45	1	Conduit	CIRC	16.4	24	24	1.38	1.39	0.62	0.60	9.04	9.04	5.29	1.95
B46_2D	B46	1	weir	N/A	0.427	0.42	5.125	1.37	1.37	0.59	0.58	9.04	9.03	5.35	1.94
B47	B45	1	Conduit	RECT	45.5	60	96	265.73	266.76	273.32	286.52	257.55	258.14	268.54	284.89
B48	B47	1	Conduit	CIRC	36	66	66	229.90	230.66	235.28	244.07	229.18	229.55	236.94	247.54
B49	B48	1	Conduit	CIRC	20.4	30	30	36.66	36.77	37.89	38.87	37.61	37.70	38.73	41.44
B50	B49	1	Conduit	CIRC	47.2	18	18	4.84	4.82	5.28	4.11	8.25	8.38	8.53	8.61
B50_2D	B50	1	weir	N/A	0.427	0.42	5.125	5.31	5.31	5.38	4.12	8.25	8.38	8.52	8.61
BM10	BM13	1	Conduit	CIRC	198.2	48	48	30.22	31.31	27.81	29.24	26.94	30.43	25.08	25.23
BM13	W14001_sta13602	1	Conduit	CIRC	97.2	48	48	37.03	38.42	32.48	36.10	32.94	44.84	38.39	36.86
BM14	W14001_sta13602	1	Conduit	CIRC	224.2	54	54	83.80	83.20	77.24	82.17	84.34	80.71	78.75	83.87
BM2	BM4	1	Conduit	CIRC	178.3	36	36	11.92	12.43	11.35	11.74	10.67	11.00	10.25	10.20
BM20	BM14	1	Conduit	CIRC	674.4	54	54	68.67	68.29	62.77	67.99	68.88	66.91	64.40	69.16
BM24	BM20	1	Conduit	CIRC	187.2	54	54	55.86	56.01	50.06	55.78	54.33	53.35	50.42	54.81
BM25	BM24	1	Conduit	CIRC	284.4	42	42	37.68	38.03	34.94	36.94	34.34	35.03	32.95	33.01
BM29	BM30	1	Conduit	CIRC	65.1	24	24	7.80	7.80	7.80	7.80	13.60	13.60	13.60	13.60
BM30	BM25	1	Conduit	CIRC	222	42	42	32.00	32.16	31.49	31.88	38.48	38.85	38.27	38.54
BM33	BM30	1	Conduit	CIRC	180.6	30	30	22.43	22.62	20.86	21.69	21.93	22.11	20.04	20.83
BM34	BM33	1	Conduit	CIRC	272	30	30	22.52	22.70	20.93	21.83	21.95	22.12	20.05	20.86
BM38	BM34	1	Conduit	CIRC	177.9	24	24	11.88	11.92	11.25	11.54	10.92	10.97	10.44	10.60
BM4	BM7	1	Conduit	CIRC	404.9	36	36	11.87	12.40	11.33	11.70	10.65	10.99	10.23	10.18
BM40	BM30	1	Conduit	CIRC	67.6	24	24	9.50	9.50	9.50	9.50	16.77	16.77	16.77	16.77
BM7	BM10	1	Conduit	CIRC	567	36	36	19.54	22.39	19.22	20.27	16.70	19.10	17.35	17.81
C003	IH-10_MH_C107	1	Conduit	RECT	299	60	96	90.07	89.94	87.90	137.35	101.23	100.99	96.23	117.97
C003	IH-10_MH_WD3	2	Conduit	CIRC	37	24	24	14.65	14.63	14.42	22.06	16.29	16.27	15.71	19.06
C003	IH-10_MH_C107	3	Conduit	RECT	299	60	96	90.07	89.94	87.90	137.35	101.23	100.99	96.23	117.97
C004	C003	1	Conduit	RECT	84.4	60	96	177.08	177.06	175.49	294.32	213.60	213.20	206.39	242.51

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
C005	C004	1	Conduit	RECT	86	60	96	67.51	67.53	71.23	75.64	105.19	105.13	111.85	129.40
C006	C005	1	Conduit	CIRC	66	24	24	-8.36	-8.37	10.35	11.18	-11.21	-11.20	9.79	-10.97
C006_2D	C006	1	weir	N/A	0.667	0.83	8	2.05	2.05	4.40	2.05	-4.11	-4.11	4.74	-6.39
C007	C004	1	Conduit	RECT	60.4	60	120	127.02	127.10	125.88	122.02	137.86	137.88	131.28	98.03
C007	C004	2	Conduit	RECT	60.4	60	120	#N/A	#N/A	#N/A	122.02	#N/A	#N/A	#N/A	98.03
C008	C003	1	Conduit	CIRC	62.1	24	24	18.70	18.68	17.89	20.86	21.01	20.93	19.74	21.91
C008_2D	C008	1	weir	N/A	0.667	0.83	8	2.44	2.41	1.36	1.31	5.70	5.63	4.66	7.11
C009	C006	1	Conduit	CIRC	102.6	24	24	-10.38	-10.38	9.07	10.84	-8.80	-8.80	8.43	8.79
C009_2D	C009	1	weir	N/A	0.667	0.83	8	-10.37	-10.37	9.07	10.83	-8.79	-8.79	8.43	8.79
C010	C007	1	Conduit	RECT	105.8	60	120	127.01	127.09	126.04	122.18	137.86	137.87	131.27	98.13
C010	C007	2	Conduit	RECT	105.8	60	120	#N/A	#N/A	#N/A	122.18	#N/A	#N/A	#N/A	98.13
C011	C008	1	Conduit	CIRC	99.6	24	24	18.55	18.53	17.73	20.56	19.28	19.25	18.41	20.35
C011_2D	C011	1	weir	N/A	0.667	0.83	8	24.96	24.98	24.32	28.09	25.36	25.32	24.49	27.83
C012	C010	1	Conduit	RECT	33.8	60	120	127.01	127.09	126.21	122.36	137.85	137.87	131.26	98.23
C012	C010	2	Conduit	RECT	33.8	60	120	#N/A	#N/A	#N/A	122.36	#N/A	#N/A	#N/A	98.23
C013	C011	1	Conduit	CIRC	38.2	24	24	-7.65	-7.28	-7.82	-7.88	-8.16	-8.16	-8.50	-10.72
C013_2D	C013	1	weir	N/A	0.604		7.25	-7.13	-7.12	-7.26	-6.18	-6.71	-6.70	-6.96	-9.38
C014	C013	1	Conduit	CIRC	53	12	12	1.52	1.52	1.74	2.27	-2.26	-2.26	-2.30	-1.88
C014_2D	C014	1	weir	N/A	0.604		7.25	-1.27	-1.26	-0.97	0.65	-2.26	-2.26	-2.30	-1.88
C019	C020	1	Conduit	CIRC	35.4	12	12	-5.38	-5.38	3.77	7.69	-5.50	-5.50	-3.50	4.52
C019_2D	C019	1	weir	N/A	0.604		7.25	-5.38	-5.38	3.79	7.77	-5.50	-5.50	-3.49	4.53
C020	C021	1	Conduit	CIRC	62.8	24	24	-5.38	-5.38	3.75	7.57	-5.51	-5.51	-3.50	4.50
C021	C012	1	Conduit	RECT	118.9	60	120	127.01	127.09	126.37	122.51	137.85	137.87	131.26	98.32
C021	C012	2	Conduit	RECT	118.9	60	120	#N/A	#N/A	#N/A	122.51	#N/A	#N/A	#N/A	98.32
C022	C021	1	Conduit	CIRC	66.6	18	18	3.25	3.25	-2.96	4.19	3.80	3.76	2.83	3.51
C023	C022	1	Conduit	CIRC	29.6	12	12	4.21	4.21	3.97	4.01	4.30	4.29	4.11	4.12
C023_2D	C023	1	weir	N/A	0.604		7.25	4.21	4.21	3.97	4.01	4.30	4.29	4.11	4.12
C024	C022	1	Conduit	CIRC	25.6	12	12	-4.38	-4.38	-4.38	-4.22	-4.32	-4.32	-4.35	-4.56
C024_2D	C024	1	weir	N/A	0.604		7.25	-4.37	-4.37	-4.37	-4.22	-4.32	-4.32	-4.34	-4.55
C028	C029	1	Conduit	CIRC	49	24	24	6.94	6.94	-7.45	8.33	7.31	7.28	-7.60	-8.12
C028_2D	C028	1	weir	N/A	0.427	0.42	5.125	6.94	6.94	-7.45	8.78	7.30	7.28	-7.60	-8.11
C029	C021	1	Conduit	RECT	137.1	60	120	131.83	131.89	123.30	120.84	142.83	142.83	134.58	96.73
C029	C021	2	Conduit	RECT	137.1	60	120	#N/A	#N/A	#N/A	120.84	#N/A	#N/A	#N/A	96.73
C030	C029	1	Conduit	CIRC	45.5	24	24	-8.61	-8.61	-8.74	-9.79	-7.98	-7.98	-8.08	-10.50
C030_2D	C030	1	weir	N/A	0.427	0.42	5.125	-8.60	-8.60	-8.72	-9.78	-7.97	-7.98	-8.07	-10.49
C033	C029	1	Conduit	RECT	112.6	60	120	140.96	140.99	137.82	121.03	153.50	153.52	149.98	104.96
C033	C029	2	Conduit	RECT	112.6	60	120	#N/A	#N/A	#N/A	121.03	#N/A	#N/A	#N/A	104.96
C035	C033	1	Conduit	RECT	156.2	60	120	140.95	140.99	137.83	121.08	153.47	153.49	149.95	104.95
C035	C033	2	Conduit	RECT	156.2	60	120	#N/A	#N/A	#N/A	121.08	#N/A	#N/A	#N/A	104.95
C036	C035	1	Conduit	CIRC	41.6	24	24	13.53	13.52	12.96	12.92	14.14	14.11	13.56	12.68
C036_2D	C036	1	weir	N/A	0.427	0.42	5.125	9.32	9.31	8.90	7.34	9.62	9.60	9.19	7.12
C036A	C036	1	Conduit	CIRC	20.7	12	12	4.38	4.38	4.07	6.01	4.63	4.62	4.37	5.56
C036A_2D	C036A	1	weir	N/A	0.604		7.25	4.38	4.38	4.07	6.08	4.63	4.62	4.37	5.56
C037	C035	1	Conduit	RECT	45.6	60	120	133.65	133.59	130.53	115.65	139.78	139.77	136.20	102.10
C037	C035	2	Conduit	RECT	45.6	60	120	#N/A	#N/A	#N/A	115.65	#N/A	#N/A	#N/A	102.10
C038	C035	1	Conduit	CIRC	36.9	24	24	23.47	23.46	23.08	22.86	24.35	24.32	24.25	23.34
C038_2D	C038	1	weir	N/A	0.427	0.42	5.125	9.70	9.69	9.11	7.37	9.85	9.84	9.49	7.20
C038A	C038	1	Conduit	CIRC	16.1	24	24	15.31	15.28	15.00	15.58	16.52	16.50	16.21	17.99
C038A_2D	C038A	1	weir	N/A	0.604		7.25	15.31	15.28	15.00	15.58	16.52	16.50	16.21	17.99
C038B	C038	1	Conduit	CIRC	40.6	12	12	4.05	4.04	3.55	5.15	4.16	4.15	3.82	4.09
C038B_2D	C038B	1	weir	N/A	0.604		7.25	4.00	4.00	3.55	5.24	4.13	4.12	3.76	4.01

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
C040	C037	1	Conduit	RECT	248.2	60	120	133.66	133.61	130.55	115.67	139.78	139.77	136.19	102.10
C040	C037	2	Conduit	RECT	248.2	60	120	#N/A	#N/A	#N/A	115.67	#N/A	#N/A	#N/A	102.10
C041	C040	1	Conduit	CIRC	67.4	24	24	-8.69	-8.68	-8.52	-6.87	-9.17	-9.18	-9.20	-8.52
C041_2D	C041	1	weir	N/A	0.427	0.42	5.125	-8.68	-8.68	-8.52	-6.86	-9.17	-9.17	-9.19	-8.51
C044	C045	1	Conduit	CIRC	55.5	24	24	-3.08	-3.07	-2.15	1.53	-9.96	-9.92	-9.54	5.26
C044_2D	C044	1	weir	N/A	0.604		7.25	-3.08	-3.07	-2.15	1.52	-9.95	-9.92	-9.54	5.26
C045	C040	1	Conduit	RECT	202.5	60	120	122.09	122.07	116.65	103.12	108.52	108.59	107.90	84.95
C045	C040	2	Conduit	RECT	202.5	60	120	#N/A	#N/A	#N/A	103.12	#N/A	#N/A	#N/A	84.95
C046	C047	1	Conduit	CIRC	66.6	48	48	-11.11	-11.11	-9.09	12.40	-21.07	-21.00	-19.84	15.69
C046_2D	C046	1	weir	N/A	0.604		7.25	-11.11	-11.12	-9.09	12.34	-21.08	-21.00	-19.84	15.66
C047	C045	1	Conduit	RECT	112.8	60	120	117.45	117.38	112.11	99.68	110.20	110.23	107.93	82.35
C047	W14001_sta21026	2	Conduit	CIRC	50.5	36	36	72.66	72.70	81.83	69.90	78.56	78.34	87.11	83.16
C047	C045	3	Conduit	RECT	112.8	60	120	#N/A	#N/A	#N/A	99.68	#N/A	#N/A	#N/A	82.35
C048	C051	1	Conduit	CIRC	44.8	18	18	-7.66	-7.66	-7.42	-8.08	-8.46	-8.46	-8.42	-9.99
C048_2D	C048	1	weir	N/A	0.427	0.42	5.125	-7.66	-7.66	-7.42	-8.08	-8.45	-8.45	-8.42	-10.00
C049	C047	1	Conduit	RECT	48.2	60	120	184.59	184.62	186.28	118.24	193.10	193.14	194.37	122.97
C049	C047	2	Conduit	RECT	48.2	60	120	#N/A	#N/A	#N/A	118.24	#N/A	#N/A	#N/A	122.97
C051	C049	1	Conduit	RECT	72.9	60	120	184.59	184.61	186.28	118.26	193.10	193.13	194.38	122.97
C051	C049	2	Conduit	RECT	72.9	60	120	#N/A	#N/A	#N/A	118.26	#N/A	#N/A	#N/A	122.97
C051B	C051	1	Conduit	CIRC	33.1	18	18	-18.97	-18.97	-18.68	-18.50	-20.34	-20.34	-20.32	-21.67
C051B_2D	C051B	1	weir	N/A	0.427	0.42	5.125	7.14	7.14	4.91	-4.78	7.32	7.28	5.03	-4.80
C053	C051	1	Conduit	RECT	148.4	60	120	211.02	211.03	212.16	129.73	219.69	219.76	221.16	138.32
C053	C051	2	Conduit	RECT	148.4	60	120	#N/A	#N/A	#N/A	129.73	#N/A	#N/A	#N/A	138.32
C054	C053	1	Conduit	CIRC	71.7	18	18	-9.66	-9.66	-9.60	-10.15	-10.29	-10.29	-10.37	-11.62
C054_2D	C054	1	weir	N/A	0.427	0.42	5.125	-9.65	-9.65	-9.60	-10.15	-10.28	-10.28	-10.36	-11.62
C055	C053	1	Conduit	RECT	152.7	60	120	220.61	220.61	221.69	134.40	229.34	229.39	230.95	143.97
C055	C053	2	Conduit	RECT	152.7	60	120	#N/A	#N/A	#N/A	134.40	#N/A	#N/A	#N/A	143.97
C057	C055	1	Conduit	CIRC	31.5	24	24	-18.82	-18.82	-18.72	-20.24	-20.05	-20.05	-20.21	-23.00
C057_2D	C057	1	weir	N/A	0.427	0.42	5.125	-11.45	-11.45	-11.38	-12.67	-12.20	-12.20	-12.30	-14.37
C060	C055	1	Conduit	CIRC	40.5	18	18	-10.26	-10.26	-10.19	-11.58	-10.87	-10.87	-10.95	-13.04
C060_2D	C060	1	weir	N/A	0.427	0.42	5.125	-10.26	-10.26	-10.19	-11.58	-10.85	-10.86	-10.94	-13.04
C061	C055	1	Conduit	RECT	101.7	60	120	249.58	249.58	250.47	149.15	258.79	258.85	260.80	161.69
C061	C055	2	Conduit	RECT	101.7	60	120	#N/A	#N/A	#N/A	149.15	#N/A	#N/A	#N/A	161.69
C062	C057	1	Conduit	CIRC	82.3	18	18	-7.37	-7.37	-7.33	-7.57	-7.83	-7.83	-7.89	-8.63
C062_2D	C062	1	weir	N/A	0.427	0.42	5.125	-7.37	-7.37	-7.33	-7.57	-7.83	-7.83	-7.89	-8.63
C063	C061	1	Conduit	RECT	183.4	60	120	249.56	249.56	250.46	149.17	258.88	258.92	260.80	161.69
C063	C061	2	Conduit	RECT	183.4	60	120	#N/A	#N/A	#N/A	149.17	#N/A	#N/A	#N/A	161.69
C064	C063	1	Conduit	CIRC	36.6	18	18	0.42	0.42	0.42	0.43	-5.01	-5.00	-4.75	1.06
C064_2D	C064	1	weir	N/A	0.427	0.42	5.125	0.43	0.43	0.43	0.44	-5.28	-5.24	-5.25	1.07
C065	C063	1	Conduit	RECT	49.7	60	96	249.14	249.14	250.03	149.03	262.88	262.91	264.02	161.18
C065	C063	2	Conduit	RECT	49.7	60	96	#N/A	#N/A	#N/A	149.03	#N/A	#N/A	#N/A	161.18
C066	C065	1	Conduit	RECT	16.5	60	96	272.05	272.05	272.66	307.07	293.28	293.28	294.06	336.66
C067	C065	1	Conduit	CIRC	70.2	48	48	-22.97	-22.97	-22.72	-10.36	-30.48	-30.48	-30.24	-15.28
C068	C067	1	Conduit	CIRC	23.6	24	24	0.70	0.70	0.71	1.72	-3.97	-3.96	-3.68	4.19
C068_2D	C068	1	weir	N/A	0.427	0.42	5.125	0.70	0.71	0.72	1.69	-4.01	-4.09	-3.68	4.19
C069	C066	1	Conduit	RECT	50.8	60	96	229.30	229.30	229.42	249.99	245.56	245.55	245.68	266.44
C070	C067	1	Conduit	CIRC	34.8	24	24	0.96	0.96	0.96	1.06	1.35	1.35	1.30	1.18
C070_2D	C070	1	weir	N/A	0.427	0.42	5.125	0.96	0.96	0.96	1.06	1.07	1.07	1.07	1.19
C071	C069	1	Conduit	RECT	127.7	60	96	229.29	229.29	229.40	249.92	245.56	245.54	245.67	266.42
C072	C071	1	Conduit	CIRC	6.6	24	24	-0.09	-0.09	-0.09	-0.72	0.32	0.29	0.18	-0.10
C072_2D	C072	1	weir	N/A	0.427	0.42	5.125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
C073	C071	1	Conduit	CIRC	73.5	24	24	7.54	7.54	7.54	5.96	10.57	10.57	10.68	8.62
C073_2D	C073	1	weir	N/A	0.427	0.42	5.125	7.54	7.54	7.54	5.94	10.82	10.74	10.86	8.64
C080	C081	1	Conduit	CIRC	70.3	24	24	9.69	9.73	9.60	7.55	9.79	9.80	9.70	9.76
C080_2D	C080	1	weir	N/A	0.427	0.42	5.125	9.61	9.61	9.49	7.46	9.84	9.84	9.75	9.76
C081	C071	1	Conduit	RECT	350.8	60	96	221.72	221.73	221.85	243.88	235.79	235.79	235.80	259.45
C082	C081	1	Conduit	CIRC	8.5	24	24	6.16	6.16	6.14	6.73	9.93	9.93	10.03	9.36
C082_2D	C082	1	weir	N/A	0.427	0.42	5.125	6.17	6.17	6.14	6.71	10.09	10.09	10.18	9.38
C083	C081	1	Conduit	RECT	164.7	60	96	208.60	208.60	208.62	232.67	219.68	219.70	220.35	247.56
C083_2D	C083	1	weir	N/A	0.427	0.42	5.125	9.65	9.65	9.72	11.76	9.42	9.42	9.52	11.02
C084	C085	1	Conduit	CIRC	46.8	18	18	-4.97	-4.97	-4.94	5.29	-5.90	-5.90	-5.88	-4.75
C084_2D	C084	1	weir	N/A	0.427	0.42	5.125	-4.97	-4.97	-4.94	5.24	-5.90	-5.90	-5.88	-4.75
C085	C083	1	Conduit	CIRC	140.7	24	24	21.10	21.11	21.12	24.73	20.78	20.77	20.86	23.15
C086	C085	1	Conduit	CIRC	24.8	24	24	23.67	23.67	23.68	25.44	23.38	23.38	23.41	24.92
C086_2D	C086	1	weir	N/A	0.427	0.42	5.125	2.36	2.36	2.37	5.16	-2.62	-2.62	-2.56	4.72
C088	C089	1	Conduit	CIRC	98.7	18	18	4.99	4.99	4.99	5.31	5.50	5.50	5.57	7.45
C088_2D	C088	1	weir	N/A	0.427	0.42	5.125	5.00	5.00	5.00	5.32	5.52	5.52	5.59	7.47
C089	C083	1	Conduit	RECT	163.9	60	96	181.73	181.74	181.42	198.76	204.59	204.62	204.49	225.67
C090	C089	1	Conduit	CIRC	72	18	18	1.45	1.45	1.43	1.68	2.16	2.16	2.16	2.76
C090_2D	C090	1	weir	N/A	0.427	0.42	5.125	1.43	1.43	1.43	1.71	2.15	2.15	2.15	2.77
C092	C092A	1	Conduit	RECT	174.9	60	96	174.62	174.63	174.36	191.91	200.03	200.07	200.07	220.61
C092A	C089	1	Conduit	RECT	238.7	60	96	175.57	175.58	175.31	192.79	200.78	200.82	200.63	221.35
C092B	C092A	1	Conduit	CIRC	19.3	24	24	1.09	1.09	1.09	1.14	1.57	1.56	1.56	2.09
C092B_2D	C092B	1	weir	N/A	0.604		7.25	1.10	1.10	1.10	1.15	1.56	1.56	1.56	2.09
C093	C094	1	Conduit	CIRC	6.5	18	18	2.17	2.17	2.17	2.12	6.05	6.04	6.04	6.18
C093_2D	C093	1	weir	N/A	0.427	0.42	5.125	2.18	2.18	2.18	2.13	6.06	6.06	6.06	6.18
C094	C092	1	Conduit	CIRC	21.2	24	24	4.23	4.23	4.23	4.44	12.30	12.29	12.29	13.79
C095	C094	1	Conduit	CIRC	46.4	18	18	2.07	2.07	2.07	2.36	6.56	6.55	6.56	7.61
C095_2D	C095	1	weir	N/A	0.427	0.42	5.125	2.08	2.08	2.08	2.35	6.56	6.55	6.55	7.61
C096	C097	1	Conduit	CIRC	15.4	18	18	6.40	6.40	6.40	6.44	10.13	10.13	10.13	10.58
C096_2D	C096	1	weir	N/A	0.427	0.42	5.125	6.39	6.39	6.39	6.43	10.13	10.13	10.12	10.58
C097	C092	1	Conduit	CIRC	73.3	24	24	24.58	24.57	24.63	25.91	26.26	26.26	26.21	28.81
C098	C097	1	Conduit	CIRC	39.9	18	18	1.46	1.46	1.46	1.40	7.42	7.43	7.45	8.33
C098_2D	C098	1	weir	N/A	0.427	0.42	5.125	1.46	1.46	1.46	1.41	7.42	7.42	7.45	8.32
C099	C097	1	Conduit	CIRC	95.8	18	18	0.99	1.06	1.10	1.09	1.47	1.44	1.43	1.44
C103	C099	1	Conduit	CIRC	14.8	18	18	0.98	0.99	1.02	0.98	1.44	1.44	1.44	1.42
C103_2D	C103	1	weir	N/A	0.427	0.42	5.125	0.99	0.99	0.99	0.99	1.45	1.45	1.45	1.43
CP03	CPM2	1	Conduit	CIRC	19	24	24	14.60	14.77	14.13	14.51	13.15	13.55	12.79	12.97
CP04	CPM2	1	Conduit	CIRC	16.3	24	24	8.41	8.80	7.69	8.14	8.47	7.16	8.04	8.82
CP06	CPM5	1	Conduit	CIRC	23.6	24	24	4.82	4.88	4.21	4.60	3.91	4.01	3.49	3.60
CP07	CPM5	1	Conduit	CIRC	20.8	24	24	12.10	12.25	12.23	12.24	13.68	13.65	13.56	13.44
CP10	CPM9	1	Conduit	CIRC	56.7	24	24	-6.95	-6.87	-7.05	-6.92	-7.63	-7.61	-7.64	-7.59
CP114	CPM13	1	Conduit	CIRC	102.3	24	24	-6.23	-6.12	-6.22	-6.01	-6.98	-6.50	-6.94	-6.76
CP16	CPM15	1	Conduit	CIRC	59.6	24	24	-7.06	-7.03	-7.35	-7.25	-5.88	-5.92	-5.24	-5.67
CP17	CPM1	1	Conduit	CIRC	11	24	24	25.55	25.31	25.04	26.77	26.45	25.66	25.63	27.67
CP18	CPM1	1	Conduit	CIRC	27.4	24	24	7.02	7.22	5.47	6.79	-6.28	5.91	-5.21	-7.05
CP20	CPM19	1	Conduit	CIRC	305.2	18	18	6.27	6.32	5.76	6.07	5.29	5.32	5.01	5.17
CP22	CPM21	1	Conduit	CIRC	310.3	18	18	4.61	4.51	4.31	4.97	4.71	4.59	4.36	4.94
CP24	CPM23	1	Conduit	CIRC	39.7	18	18	9.28	9.31	9.08	9.11	8.52	8.57	8.19	8.21
CP25	CPM23	1	Conduit	CIRC	27.8	18	18	-10.17	-9.94	-10.21	-10.15	-10.83	-10.74	-10.85	-10.90
CP27	CPM26	1	Conduit	CIRC	21	18	18	-9.51	-9.28	-9.58	-9.36	-9.99	-9.90	-10.03	-9.91
CP28	CPM26	1	Conduit	CIRC	26.6	18	18	12.29	11.96	11.14	12.18	12.13	11.62	11.30	11.77

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
CP33	CPM32	1	Conduit	CIRC	47.6	24	24	-3.36	-2.65	-5.19	-4.33	-9.12	-9.00	-11.10	-10.66
CP35	CPM34	1	Conduit	CIRC	44.7	30	30	5.75	5.75	5.75	5.75	14.17	10.09	14.26	12.29
CPM1	W14001_sta14232	1	Conduit	CIRC	95	36	36	52.88	52.00	48.82	51.71	54.54	52.65	51.18	54.42
CPM11	CPM9	1	Conduit	CIRC	137.2	36	36	7.86	7.99	6.51	7.07	-7.64	6.73	-7.48	-7.53
CPM12	CPM11	1	Conduit	CIRC	114.1	24	24	6.54	6.54	6.54	6.54	10.04	10.23	9.96	10.03
CPM13	CPM11	1	Conduit	CIRC	191.3	27	27	-8.68	-8.61	-8.66	-8.72	-9.17	-8.94	-8.99	-9.05
CPM15	CPM13	1	Conduit	CIRC	177.1	24	24	-7.07	-7.04	-7.36	-7.26	-5.89	-5.92	-5.25	-5.68
CPM19	CPM1	1	Conduit	CIRC	396.2	36	36	38.58	38.22	35.81	38.64	38.95	38.10	36.74	39.59
CPM2	W14001_sta14232	1	Conduit	CIRC	221.6	36	36	32.54	32.93	27.60	30.71	24.38	25.80	23.09	23.13
CPM21	CPM19	1	Conduit	CIRC	130.5	36	36	34.77	34.40	32.55	35.57	35.18	34.40	33.40	35.90
CPM23	CPM21	1	Conduit	CIRC	425	36	36	29.79	29.49	27.50	30.34	29.79	29.00	27.91	29.73
CPM26	CPM23	1	Conduit	CIRC	300.1	36	36	22.85	22.49	20.58	23.43	23.21	22.50	21.29	23.27
CPM29	CPM26	1	Conduit	CIRC	137.3	36	36	24.46	24.58	23.66	24.27	22.14	22.27	21.49	21.80
CPM30	CPM29	1	Conduit	CIRC	124.4	24	24	-4.63	-4.61	-4.89	-5.34	-6.23	-6.12	-6.71	-7.23
CPM31	CPM29	1	Conduit	CIRC	125.6	36	36	39.94	39.99	39.49	40.76	41.22	41.41	40.14	41.92
CPM32	CPM29	1	Conduit	CIRC	68.7	30	30	-13.13	-13.08	-12.27	-12.78	-15.84	-15.67	-13.23	-14.67
CPM34	CPM32	1	Conduit	CIRC	331.8	30	30	-9.02	-9.02	-9.56	8.99	9.82	9.62	9.49	10.21
CPM5	CPM2	1	Conduit	CIRC	280.9	36	36	20.08	20.36	16.44	18.59	16.63	16.78	14.36	15.36
CPM8	CPM5	1	Conduit	CIRC	111.6	36	36	12.56	12.76	10.37	11.47	10.70	10.78	9.23	9.81
CPM9	CPM8	1	Conduit	CIRC	205.3	36	36	12.74	12.94	10.40	11.63	10.72	10.81	9.25	9.84
D02	D03	1	Conduit	CIRC	39.8	24	24	6.90	6.90	6.90	6.89	8.72	8.72	8.85	11.25
D02_2D	D02	1	weir	N/A	0.427	0.42	5.125	6.91	6.91	6.91	6.91	8.74	8.74	8.87	11.26
D03	C066	1	Conduit	CIRC	139	42	42	42.84	42.84	43.41	57.33	47.67	47.67	48.26	70.35
D04	D03	1	Conduit	CIRC	36.3	24	24	-4.23	-4.23	-3.98	2.44	-8.07	-8.07	-7.99	3.40
D04_2D	D04	1	weir	N/A	0.427	0.42	5.125	-4.24	-4.23	-3.98	2.45	-8.07	-8.07	-7.99	3.42
D05	D06	1	Conduit	CIRC	22.6	24	24	-11.90	-11.90	-11.76	5.50	-14.13	-14.13	-14.06	-9.71
D05_2D	D05	1	weir	N/A	0.427	0.42	5.125	-11.90	-11.90	-11.77	5.52	-14.13	-14.13	-14.06	-9.72
D06	C067	1	Conduit	CIRC	310.4	48	48	-24.94	-24.94	-24.71	-13.00	-28.07	-28.07	-28.07	-19.93
D07	D06	1	Conduit	CIRC	25.1	24	24	-13.05	-13.05	-12.95	-7.84	-14.03	-14.03	-14.08	-10.23
D07_2D	D07	1	weir	N/A	0.427	0.42	5.125	-13.05	-13.05	-12.95	-7.84	-14.03	-14.03	-14.08	-10.23
D08	D09	1	Conduit	CIRC	24.1	24	24	2.89	2.92	2.82	4.46	-2.96	-2.87	-2.78	3.35
D08_2D	D08	1	weir	N/A	0.427	0.42	5.125	3.51	3.54	2.94	4.81	-2.96	-2.87	-2.79	3.36
D09	D12	1	Conduit	CIRC	172.3	24	24	6.23	6.29	6.82	8.27	6.08	6.07	6.15	7.36
D10	D09	1	Conduit	CIRC	22.4	24	24	5.13	5.13	5.09	6.30	5.13	5.12	5.21	6.73
D10_2D	D10	1	weir	N/A	0.427	0.42	5.125	5.13	5.12	5.09	7.11	5.12	5.11	5.20	7.31
D11	D12	1	Conduit	CIRC	38.8	24	24	-4.50	-4.49	-3.24	3.79	-5.19	-5.15	-5.07	-5.00
D11_2D	D11	1	weir	N/A	0.427	0.42	5.125	-4.50	-4.49	-3.24	3.87	-5.19	-5.15	-5.07	-5.00
D12	D14	1	Conduit	CIRC	217	30	30	7.95	7.93	8.16	11.75	8.21	8.19	8.50	9.84
D13	D14	1	Conduit	CIRC	25	24	24	-8.34	-8.33	-7.63	-5.03	-8.98	-8.94	-8.91	-8.87
D13_2D	D13	1	weir	N/A	0.427	0.42	5.125	-8.34	-8.33	-7.63	-5.09	-8.98	-8.94	-8.91	-8.87
D14	D16	1	Conduit	CIRC	218	30	30	14.12	14.07	14.80	19.09	-16.07	-15.49	14.91	18.36
D15	D14	1	Conduit	CIRC	22.9	24	24	8.32	8.31	8.38	8.69	8.23	8.21	8.44	9.03
D15_2D	D15	1	weir	N/A	0.427	0.42	5.125	8.31	8.30	8.36	8.67	8.22	8.20	8.43	9.02
D16	B29	1	Conduit	CIRC	162.5	30	30	14.13	14.08	14.79	19.18	-16.06	-15.49	14.92	18.37
D17	B29	1	Conduit	CIRC	49.1	30	30	-22.04	-21.97	19.04	25.86	-31.37	-30.86	-29.97	24.91
D18	D17	1	Conduit	CIRC	85.2	30	30	-22.04	-21.97	19.03	25.85	-31.38	-30.86	-29.97	24.90
E0	30029	1	Conduit	CIRC	339.5	54	54	130.87	130.89	130.60	130.56	145.70	145.51	145.19	145.16
E04	E05	1	Conduit	CIRC	5.4	18	18	6.60	6.61	6.60	5.78	10.28	10.28	10.28	10.48
E04_2D	E04	1	weir	N/A	0.427	0.42	5.125	6.60	6.60	6.59	5.79	10.28	10.28	10.28	10.48
E05	C097	1	Conduit	CIRC	230.6	24	24	21.10	21.09	21.17	22.05	17.80	17.80	17.83	19.12
E06	E05	1	Conduit	CIRC	38.4	18	18	1.69	1.60	1.58	1.58	3.03	3.02	3.02	3.40

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
E06_2D	E06	1	weir	N/A	0.427	0.42	5.125	1.09	1.09	1.09	1.09	3.02	3.01	3.02	3.40
E08	B49	1	Conduit	CIRC	270.1	30	30	28.01	28.05	28.68	30.18	23.43	23.48	24.42	27.00
E1	E0	1	Conduit	CIRC	66.6	24	24	1.24	1.19	1.27	0.95	9.94	9.89	9.97	8.06
E13	EM12	1	Conduit	CIRC	38.4	24	24	22.99	23.00	22.94	22.98	23.10	23.23	23.15	23.20
E14	EM12	1	Conduit	CIRC	34.9	24	24	28.28	28.38	28.28	28.24	26.84	26.89	26.76	27.52
E16	EM15	1	Conduit	CIRC	40.6	18	18	11.00	11.00	11.00	10.99	10.70	10.62	10.60	10.66
E17	EM15	1	Conduit	CIRC	44.4	15	15	13.52	13.54	13.10	13.22	13.80	13.82	13.21	13.18
E2	E0	1	Conduit	CIRC	60.8	24	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E21	EM20	1	Conduit	CIRC	43.5	24	24	15.08	14.87	14.79	14.59	14.89	14.72	14.65	14.48
E22	EM20	1	Conduit	CIRC	38	24	24	12.15	11.87	11.90	11.79	9.69	9.28	9.40	9.62
E25	EM24	1	Conduit	CIRC	30.9	24	24	-6.15	-6.14	-6.18	-6.50	-7.27	-7.26	-7.32	-7.71
E26	EM24	1	Conduit	CIRC	51.3	24	24	12.05	11.82	11.86	11.41	9.93	9.70	9.77	9.47
E4	EM3	1	Conduit	CIRC	64.5	24	24	11.28	11.28	11.28	11.28	19.99	19.99	19.99	19.99
E5	EM3	1	Conduit	CIRC	44.5	24	24	12.68	12.68	12.68	12.68	22.15	22.13	22.15	22.16
E8	EM7	1	Conduit	CIRC	38.6	24	24	30.46	30.46	30.34	30.38	31.87	30.64	30.47	30.67
E9	EM7	1	Conduit	CIRC	39.8	24	24	22.94	22.94	22.94	22.94	28.81	29.09	28.97	28.91
EM10	EM7	1	Conduit	CIRC	71.5	48	48	71.40	71.72	71.57	71.29	67.27	67.28	67.00	69.02
EM11	EM12	1	Conduit	CIRC	224.9	36	36	39.06	38.63	38.64	38.44	36.49	36.33	36.19	36.33
EM12	EM10	1	Conduit	CIRC	343.2	42	42	71.31	71.64	71.50	71.21	67.23	67.25	66.97	68.99
EM15	EM11	1	Conduit	CIRC	258.5	36	36	39.02	38.59	38.60	38.41	36.57	36.42	36.28	36.42
EM18	EM15	1	Conduit	CIRC	157.4	36	36	23.36	22.92	23.00	22.66	20.25	19.86	19.94	19.86
EM20	EM18	1	Conduit	CIRC	187.4	30	30	23.33	22.88	22.97	22.62	20.22	19.82	19.92	19.83
EM23	EM20	1	Conduit	CIRC	213.6	24	24	13.53	13.31	13.34	12.88	11.63	11.43	11.47	11.14
EM24	EM23	1	Conduit	CIRC	209.2	24	24	13.51	13.29	13.32	12.86	11.61	11.42	11.46	11.13
EM3	E0	1	Conduit	CIRC	344.6	54	54	130.91	130.92	130.63	130.60	145.72	145.53	145.21	145.18
EM6	EM3	1	Conduit	CIRC	215.3	54	54	107.46	107.49	107.21	107.16	113.41	113.14	112.88	113.46
EM7	EM6	1	Conduit	CIRC	308.7	48	48	107.28	107.31	107.03	106.98	113.37	113.10	112.84	113.42
F1	W14001_sta13031	1	Conduit	CIRC	366.5	30	30	12.04	13.39	11.19	11.59	10.23	12.07	10.36	9.79
F2	F3	1	Conduit	CIRC	316	30	30	10.97	10.98	10.97	10.97	19.22	19.22	19.22	19.20
F3	F4OUT	1	Conduit	CIRC	217.6	30	30	26.37	26.37	26.37	26.37	46.35	46.35	46.35	46.34
G2	GM01	1	Conduit	CIRC	31.3	18	18	12.46	12.46	12.46	12.46	26.27	21.45	22.71	22.68
GM01	GOUT	1	Conduit	CIRC	413.9	48	48	86.17	86.18	86.18	86.17	119.32	119.32	119.22	119.16
GM1	W14001_sta14781	1	Conduit	CIRC	104.6	36	36	24.76	27.81	26.54	27.02	25.17	34.11	29.97	30.21
GM3	GM01	1	Conduit	CIRC	88.6	48	48	73.88	73.89	73.89	73.88	98.73	98.73	98.65	98.58
GM4	GM3	1	Conduit	CIRC	399.2	48	48	55.40	55.40	55.40	55.40	70.23	70.23	70.15	70.15
GM5	GM4	1	Conduit	CIRC	499.1	48	48	39.91	39.92	39.91	39.91	53.52	53.52	53.46	53.64
GM6	GM5	1	Conduit	CIRC	157.7	48	48	20.60	20.60	20.60	20.60	33.49	33.49	33.45	34.12
GM7	GM6	1	Conduit	CIRC	191.1	48	48	14.45	14.46	14.45	14.45	25.63	25.63	25.63	25.63
H1	W14001_sta12528	1	Conduit	CIRC	143.2	24	24	11.34	11.54	10.51	10.93	11.18	12.84	12.19	12.19
H2	H1	1	Conduit	CIRC	29.6	24	24	7.03	7.04	7.04	7.03	10.54	10.73	10.50	10.56
H3	H2	1	Conduit	CIRC	139.9	24	24	7.04	7.04	7.04	7.03	10.56	10.75	10.51	10.57
IH-10_JUNCTION_E01	5251	1	Conduit	rect	377	96	60	108.37	108.61	55.42	152.60	124.00	115.64	80.53	138.74
IH-10_JUNCTION_E01	5218	2	Conduit	rect	377	96	60	131.65	132.42	96.29	170.21	154.19	147.60	121.67	154.77
IH-10_JUNCTION_E01	5632	3	Conduit	RECT	377	96	60	108.37	108.61	57.84	161.36	124.40	115.95	80.77	138.73
IH-10_JUNCTION_E116	B01	1	Conduit	RECT	170	48	72	39.86	43.75	48.74	93.13	-41.93	-44.96	-41.01	56.27
IH-10_JUNCTION_E116	IH-10_MH_WD19	2	Conduit	CIRC	40	24	24	8.13	8.50	5.85	16.58	8.44	8.80	-5.81	10.48
IH-10_MH_C1	IH-10_JUNCTION_E01	1	Conduit	RECT	234	60	96	102.11	102.14	104.08	148.52	138.50	129.55	118.85	127.10
IH-10_MH_C1	IH-10_MH_C2A	2	Conduit	CIRC	36	24	24	-14.15	-14.15	-14.34	-20.16	-14.75	-14.52	-14.58	-17.34
IH-10_MH_C1	IH-10_JUNCTION_E01	3	Conduit	RECT	234	60	96	102.11	102.14	104.08	148.52	138.50	129.55	118.85	127.10
IH-10_MH_C105A	IH-10_MH_C7	1	Conduit	RECT	94	60	96	86.26	86.26	86.82	127.12	96.40	95.47	93.77	107.70
IH-10_MH_C105A	IH-10_MH_WD4	2	Conduit	CIRC	37	24	24	6.74	6.73	6.84	13.34	-8.94	-8.92	-8.99	-9.34

Upstream Node ID	Downstream Node ID	Link Suffix	Link Type	Link Shape	Length (feet)	Height (Inches)	Width (Inches)	Exist 10-Year Flow (CFS)	Prop Phase 1 10-Year Flow (CFS)	Future Phase 2 10-Year Flow (CFS)	Future Phase 3 10-Year Flow (CFS)	Exist 100-Year Flow (CFS)	Prop Phase 1 100-Year Flow (CFS)	Future Phase 2 100-Year Flow (CFS)	Future Phase 3 100-Year Flow (CFS)
IH-10_MH_C105A	IH-10_MH_C7	3	Conduit	RECT	94	60	96	86.26	86.26	86.82	127.12	96.40	95.47	93.77	107.70
IH-10_MH_C107	IH-10_MH_WD20A	1	Conduit	CIRC	37	24	24	11.30	11.30	11.38	19.70	12.67	12.64	12.12	14.87
IH-10_MH_C107	IH-10_MH_C105A	2	Conduit	RECT	248	60	96	85.23	85.12	83.17	131.36	95.37	95.14	90.78	111.29
IH-10_MH_C107	IH-10_MH_C105A	5	Conduit	RECT	248	60	96	85.23	85.12	83.17	131.36	95.37	95.14	90.78	111.29
IH-10_MH_C121	IH-10_MH_C1	1	Conduit	RECT	232	60	96	93.39	93.33	94.61	133.95	114.69	109.84	104.39	113.45
IH-10_MH_C121	IH-10_MH_WD7	2	Conduit	CIRC	40	24	24	-10.06	-10.06	-10.18	-13.73	-11.76	-11.77	-11.79	-13.05
IH-10_MH_C121	IH-10_MH_C1	3	Conduit	RECT	232	60	96	93.39	93.33	94.61	133.95	114.69	109.84	104.39	113.45
IH-10_MH_C2A	IH-10_MH_WD13	1	Conduit	RECT	149	72	144	16.95	16.96	17.18	24.29	20.91	20.02	19.09	21.34
IH-10_MH_C7	IH-10_MH_C121	3	Conduit	RECT	208	60	96	88.07	88.03	88.74	127.52	100.21	98.33	95.43	108.00
IH-10_MH_C7	IH-10_MH_WD6	4	Conduit	CIRC	40	24	24	-6.79	-6.74	-6.68	10.16	-9.83	-9.82	-9.82	-10.55
IH-10_MH_C7	IH-10_MH_C121	6	Conduit	RECT	208	60	96	88.07	88.03	88.74	127.52	100.21	98.33	95.43	108.00
IH-10_MH_WD13	IH-10_JUNCTION_E01	1	Conduit	CIRC	32	24	24	18.41	18.42	18.65	26.73	21.53	20.61	19.74	22.86
IH-10_MH_WD19	IH-10_MH_WD35	1	Conduit	RECT	150	72	144	4.09	4.28	2.94	5.95	4.25	4.45	-2.84	5.27
IH-10_MH_WD19	IH-10_MH_WD35	2	Conduit	RECT	150	72	144	4.09	4.28	2.94	5.95	4.25	4.45	-2.84	5.27

Hydraulic Element	Exist 10-Year Peak Flow (CFS)	Time	Prop Phase 1 (Pond-Only) 10-Year Peak Flow (CFS)	Time	Future Phase 2 (Channel Impvs) 10-Year Peak Flow (CFS)	Time	Future Phase 3 (Storm Sew Impvs) 10-Year Peak Flow (CFS)	Time	Exist 100-Year Peak Flow (CFS)	Time	Prop Phase 1 (Pond-Only) 100-Year Peak Flow (CFS)	Time	Future Phase 2 (Channel Impvs) 100-Year Peak Flow (CFS)	Time	Future Phase 3 (Storm Sew Impvs) 100-Year Peak Flow (CFS)	Time
W1000000_0007_R	986.7	20:15	986.7	20:15	986.7	20:15	986.7	20:15	2208.1	20:30	2208.1	20:30	2208.1	20:30	2208.1	20:30
W1000000_0809_J	39605.9	23:45	39591.8	23:45	39600.1	23:45	39597.6	23:45	61636	01:45	61576.4	01:45	61602.9	01:45	61602	01:45
W1000000_0809_R	37866.3	00:00	37851.8	00:00	37860.4	00:00	37857.8	00:00	59034	02:15	58973.3	02:15	59000.4	02:15	58999.4	02:15
W1000000_1072_J	38441.5	23:00	38427.2	23:00	38435.6	23:00	38433.1	23:00	59250.4	01:30	59188.9	01:30	59216.3	01:30	59215.3	01:30
W1000000_1102_R	8512.2	07:30	8504.1	07:30	8509.7	07:30	8507.1	07:30	17277.8	05:45	17245.3	05:45	17260.3	05:45	17259.8	05:45
W1000000_1237_J	8535.1	06:45	8527.2	06:45	8532.7	06:45	8530.2	06:45	17393.3	04:45	17360.6	04:45	17375.7	04:45	17375.2	04:45
W1000000_1237_R	8035	07:30	8028.4	07:30	8033.1	07:30	8030.8	07:30	16189.6	05:15	16161.4	05:15	16174.5	05:15	16174.1	05:15
W1000000_1488_J	8840.4	21:00	8813	21:00	8830.1	21:00	8823.6	21:00	17496.7	02:30	17475	02:45	17484.8	02:45	17484.5	02:45
W1000000_1488_R	8366	04:45	8362.7	04:45	8365.5	04:45	8363.8	04:45	16590.1	02:45	16569.7	02:45	16579.5	02:45	16579.2	02:45
W1000000_1559_J	8431	03:15	8427.6	03:15	8430.5	03:15	8428.7	03:15	16676.3	01:45	16656.2	01:45	16665.8	01:45	16665.5	01:45
W1000000_1559_R	8129.8	03:30	8127.1	03:30	8129.5	03:30	8127.9	03:30	15875.4	02:00	15857.5	02:00	15866.1	02:00	15865.9	02:00
W1000000_1606_J	8152.4	03:00	8149.8	03:00	8152.2	03:00	8150.6	03:00	15902.8	01:30	15884.2	01:30	15893.2	01:30	15892.9	01:30
W1000000_1606_R	8152.4	03:00	8149.8	03:00	8152.2	03:00	8150.6	03:00	15902.8	01:30	15884.2	01:30	15893.2	01:30	15892.9	01:30
W1000000_1628_J	8155.3	02:45	8152.7	02:45	8155.1	02:45	8153.5	02:45	15905.1	01:30	15888.1	01:30	15896.4	01:30	15896.1	01:30
W1000000_1628_R	7936.6	02:45	7934	02:45	7936.4	02:45	7934.7	02:45	15409.2	01:30	15392.2	01:30	15400.5	01:30	15400.3	01:30
W1000000_1646_J	7953.4	02:30	7951	02:30	7953.3	02:30	7951.7	02:30	15422.7	01:15	15405.4	01:15	15413.9	01:15	15413.6	01:15
W1000000_1655_R	6993.3	03:15	6993.3	03:15	6993.3	03:15	6993.3	03:15	13225.5	02:15	13225.5	02:15	13225.5	02:15	13225.5	02:15
W1000000_1663_J	6995.4	03:00	6995.4	03:00	6995.4	03:00	6995.4	03:00	13225.1	02:15	13225.1	02:15	13225.1	02:15	13225.1	02:15
W1000000_1666_R	6840.4	03:00	6840.4	03:00	6840.4	03:00	6840.4	03:00	12914.5	02:15	12914.5	02:15	12914.5	02:15	12914.5	02:15
W1000000_1757_J	6893.2	01:15	6893.2	01:15	6893.2	01:15	6893.2	01:15	12966.6	00:30	12966.6	00:30	12966.6	00:30	12966.6	00:30
W1000000_1766_J	6699.8	01:00	6699.8	01:00	6699.8	01:00	6699.8	01:00	12544.3	00:30	12544.3	00:30	12544.3	00:30	12544.3	00:30
W1000000_1766_R	6684.5	01:30	6684.5	01:30	6684.5	01:30	6684.5	01:30	12526.7	00:45	12526.7	00:45	12526.7	00:45	12526.7	00:45
W1000000_1777_R	6352.4	01:30	6352.4	01:30	6352.4	01:30	6352.4	01:30	11830.1	01:15	11830.1	01:15	11830.1	01:15	11830.1	01:15
W1000000_1865_J	6385.9	00:00	6385.9	00:00	6385.9	00:00	6385.9	00:00	11850	00:00	11850	00:00	11850	00:00	11850	00:00
W1000000_1865_R	6385.9	00:00	6385.9	00:00	6385.9	00:00	6385.9	00:00	11850	00:00	11850	00:00	11850	00:00	11850	00:00
W1000000_1879_J	6387.5	23:45	6387.5	23:45	6387.5	23:45	6387.5	23:45	11851.7	00:00	11851.7	00:00	11851.7	00:00	11851.7	00:00
W1000000_1879_R	5877.1	00:30	5877.1	00:30	5877.1	00:30	5877.1	00:30	10939.8	01:00	10939.8	01:00	10939.8	01:00	10939.8	01:00
W1000000_1985_J	5894.2	21:45	5894.2	21:45	5894.2	21:45	5894.2	21:45	10964.8	23:15	10964.8	23:15	10964.8	23:15	10964.8	23:15
W1000000_2037_J	5287.7	23:15	5287.7	23:15	5287.7	23:15	5287.7	23:15	9913.7	23:45	9913.7	23:45	9913.7	23:45	9913.7	23:45
W1000000_2046_R	5090.2	23:45	5090.2	23:45	5090.2	23:45	5090.2	23:45	9560.1	00:15	9560.1	00:15	9560.1	00:15	9560.1	00:15
W1000000_2116_J	5098.3	22:30	5098.3	22:30	5098.3	22:30	5098.3	22:30	9568	23:00	9568	23:00	9568	23:00	9568	23:00
W1000000_2116_R	4915.1	23:00	4915.1	23:00	4915.1	23:00	4915.1	23:00	9259.6	00:00	9259.6	00:00	9259.6	00:00	9259.6	00:00
W1000000_2147_J	4921.8	22:45	4921.8	22:45	4921.8	22:45	4921.8	22:45	9263.8	23:45	9263.8	23:45	9263.8	23:45	9263.8	23:45
W1000000_2150_R	3922.6	00:15	3922.6	00:15	3922.6	00:15	3922.6	00:15	7724.8	01:15	7724.8	01:15	7724.8	01:15	7724.8	01:15
W1000000_2168_R	3959.9	23:00	3959.9	23:00	3959.9	23:00	3959.9	23:00	7756.5	00:30	7756.5	00:30	7756.5	00:30	7756.5	00:30
W1000000_2250_J	4446.4	20:00	4446.4	20:00	4446.4	20:00	4446.4	20:00	8349.8	20:45	8349.8	20:45	8349.8	20:45	8349.8	20:45
W1000000_2250_R	4102.9	20:15	4102.9	20:15	4102.9	20:15	4102.9	20:15	7837	22:45	7837	22:45	7837	22:45	7837	22:45
W1000000_2271_J	4121.6	19:45	4121.6	19:45	4121.6	19:45	4121.6	19:45	7843.8	22:15	7843.8	22:15	7843.8	22:15	7843.8	22:15
W1000000_2271_R	2946.4	23:00	2946.4	23:00	2946.4	23:00	2946.4	23:00	6331.5	23:30	6331.5	23:30	6331.5	23:30	6331.5	23:30
W1000000_2340_J	2980	21:00	2980	21:00	2980	21:00	2980	21:00	6462.2	20:30	6462.2	20:30	6462.2	20:30	6462.2	20:30
W1000000_2400_R	1654.2	22:15	1654.2	22:15	1654.2	22:15	1654.2	22:15	3753.2	22:00	3753.2	22:00	3753.2	22:00	3753.2	22:00
W1000000_2403_R	1468.3	22:30	1468.3	22:30	1468.3	22:30	1468.3	22:30	3353.7	22:15	3353.7	22:15	3353.7	22:15	3353.7	22:15
W1000000_2411_J	1654.3	22:15	1654.3	22:15	1654.3	22:15	1654.3	22:15	3752.6	22:00	3752.6	22:00	3752.6	22:00	3752.6	22:00
W1000000_2486_J	1765.6	20:15	1765.6	20:15	1765.6	20:15	1765.6	20:15	3803.3	20:00	3803.3	20:00	3803.3	20:00	3803.3	20:00
W100A	421.8	16:45	421.8	16:45	421.8	16:45	421.8	16:45	791.5	17:00	791.5	17:00	791.5	17:00	791.5	17:00
W100B	1250	16:45	1250	16:45	1250	16:45	1250	16:45	2315.9	16:45	2315.9	16:45	2315.9	16:45	2315.9	16:45
W100C	2158.2	16:45	2158.2	16:45	2158.2	16:45	2158.2	16:45	3862.4	17:00	3862.4	17:00	3862.4	17:00	3862.4	17:00
W100D	554.4	17:00	554.4	17:00	554.4	17:00	554.4	17:00	999.5	17:00	999.5	17:00	999.5	17:00	999.5	17:00
W100E	634.3	17:30	634.3	17:30	634.3	17:30	634.3	17:30	1170.5	17:30	1170.5	17:30	1170.5	17:30	1170.5	17:30
W100F	380.9	16:45	380.9	16:45	380.9	16:45	380.9	16:45	687.1	16:45	687.1	16:45	687.1	16:45	687.1	16:45
W100G	377.8	17:00	377.8	17:00	377.8	17:00	377.8	17:00	700.2	17:00	700.2	17:00	700.2	17:00	700.2	17:00

Hydraulic Element	Exist 10-Year Peak Flow (CFS)	Time	Prop Phase 1 (Pond-Only) 10-Year Peak Flow (CFS)	Time	Future Phase 2 (Channel Impvs) 10-Year Peak Flow (CFS)	Time	Future Phase 3 (Storm Sew Impvs) 10-Year Peak Flow (CFS)	Time	Exist 100-Year Peak Flow (CFS)	Time	Prop Phase 1 (Pond-Only) 100-Year Peak Flow (CFS)	Time	Future Phase 2 (Channel Impvs) 100-Year Peak Flow (CFS)	Time	Future Phase 3 (Storm Sew Impvs) 100-Year Peak Flow (CFS)	Time
W100H	667.3	17:00	667.3	17:00	667.3	17:00	667.3	17:00	1226	17:15	1226	17:15	1226	17:15	1226	17:15
W100I	687.2	17:15	687.2	17:15	687.2	17:15	687.2	17:15	1265.6	17:15	1265.6	17:15	1265.6	17:15	1265.6	17:15
W100J	525.3	17:30	525.3	17:30	525.3	17:30	525.3	17:30	982	17:30	982	17:30	982	17:30	982	17:30
W100K	1477.4	17:45	1477.4	17:45	1477.4	17:45	1477.4	17:45	2735.9	17:45	2735.9	17:45	2735.9	17:45	2735.9	17:45
W100L	1099.7	17:15	1099.7	17:15	1099.7	17:15	1099.7	17:15	2003	17:15	2003	17:15	2003	17:15	2003	17:15
W100M	1415.4	19:00	1415.4	19:00	1415.4	19:00	1415.4	19:00	2697	19:15	2697	19:15	2697	19:15	2697	19:15
W100N	1689.1	17:30	1689.1	17:30	1689.1	17:30	1689.1	17:30	3053.7	18:00	3053.7	18:00	3053.7	18:00	3053.7	18:00
W100O	2820.3	18:30	2820.3	18:30	2820.3	18:30	2820.3	18:30	5230.2	18:30	5230.2	18:30	5230.2	18:30	5230.2	18:30
W1290000_0001_J	402.7	18:15	402.7	18:15	402.7	18:15	402.7	18:15	742.2	19:00	742.2	19:00	742.2	19:00	742.2	19:00
W129A	402.7	18:15	402.7	18:15	402.7	18:15	402.7	18:15	742.2	19:00	742.2	19:00	742.2	19:00	742.2	19:00
W138A	599	17:00	599	17:00	599	17:00	599	17:00	1095.3	17:30	1095.3	17:30	1095.3	17:30	1095.3	17:30
W1390000_0001_J	249.2	18:00	249.2	18:00	249.2	18:00	249.2	18:00	466.9	18:30	466.9	18:30	466.9	18:30	466.9	18:30
W139A	249.2	18:00	249.2	18:00	249.2	18:00	249.2	18:00	466.9	18:30	466.9	18:30	466.9	18:30	466.9	18:30
W1400000_0001_J	1157.7	17:30	1123.8	17:30	1144.3	17:30	1137.3	17:30	2141.5	17:45	2046.8	17:45	2089.2	17:45	2087.7	17:45
W1400000_0007_R	3852.8	17:30	3814.1	17:30	3835.9	17:30	3830.5	17:30	7104.3	17:30	7008.3	17:30	7049.5	17:30	7047.9	17:30
W1400000_0008_J	3852.8	17:30	3814.1	17:30	3835.9	17:30	3830.5	17:30	7104.3	17:30	7008.3	17:30	7049.5	17:30	7047.9	17:30
W1400000_0008_R	586.9	17:45	555.4	18:00	575.3	18:00	567.2	17:45	1087.1	18:15	997.9	18:30	1037	18:15	1035.6	18:15
W1400000_0033_J	3846.2	17:15	3807	17:30	3827.4	17:30	3822.6	17:15	7125.4	17:15	7031.3	17:15	7071.4	17:15	7069.9	17:15
W1400000_0033_R	1580.1	17:30	1580.1	17:30	1580.1	17:30	1580.1	17:30	2869.8	17:30	2869.8	17:30	2869.8	17:30	2869.8	17:30
W1400000_0134_J	1618.8	17:00	1618.8	17:00	1618.8	17:00	1618.8	17:00	2888.4	17:00	2888.4	17:00	2888.4	17:00	2888.4	17:00
W1400100_0106_J	588.5	17:15	557	17:30	577.1	17:30	568.8	17:30	1088	18:00	998.8	18:00	1038.1	18:00	1036.6	18:00
W140A	359.2	17:30	359.2	17:30	359.2	17:30	359.2	17:30	682.8	17:45	682.8	17:45	682.8	17:45	682.8	17:45
W140B	1273.7	17:00	1273.7	17:00	1273.7	17:00	1273.7	17:00	2254.4	17:00	2254.4	17:00	2254.4	17:00	2254.4	17:00
W140C	588.5	17:15	557	17:30	577.1	17:30	568.8	17:30	1088	18:00	998.8	18:00	1038.1	18:00	1036.6	18:00
W140D	590.1	17:00	590.1	17:00	590.1	17:00	590.1	17:00	1075.6	17:15	1075.6	17:15	1075.6	17:15	1075.6	17:15
W140E	1308.4	16:45	1308.4	16:45	1308.4	16:45	1308.4	16:45	2300.1	16:45	2300.1	16:45	2300.1	16:45	2300.1	16:45
W141A	495.7	16:45	495.7	16:45	495.7	16:45	495.7	16:45	930.9	17:15	930.9	17:15	930.9	17:15	930.9	17:15
W142A	437.2	17:00	437.2	17:00	437.2	17:00	437.2	17:00	779.2	17:15	779.2	17:15	779.2	17:15	779.2	17:15
W145A	578.8	17:00	578.8	17:00	578.8	17:00	578.8	17:00	1049.3	17:30	1049.3	17:30	1049.3	17:30	1049.3	17:30
W147A	559.6	17:00	559.6	17:00	559.6	17:00	559.6	17:00	1013.9	17:00	1013.9	17:00	1013.9	17:00	1013.9	17:00
W1510000_1994_R	5283.5	00:00	5283.5	00:00	5283.5	00:00	5283.5	00:00	9906	00:30	9906	00:30	9906	00:30	9906	00:30
W151A	582.5	17:45	582.5	17:45	582.5	17:45	582.5	17:45	1084.8	17:45	1084.8	17:45	1084.8	17:45	1084.8	17:45
W1560000_0000_R	1345	18:00	1345	18:00	1345	18:00	1345	18:00	2494.8	17:45	2494.8	17:45	2494.8	17:45	2494.8	17:45
W1560000_0001_J	2144	17:45	2144	17:45	2144	17:45	2144	17:45	4047.7	17:30	4047.7	17:30	4047.7	17:30	4047.7	17:30
W1560000_0122_J	1508.8	16:45	1508.8	16:45	1508.8	16:45	1508.8	16:45	2661.1	16:45	2661.1	16:45	2661.1	16:45	2661.1	16:45
W156A	1508.8	16:45	1508.8	16:45	1508.8	16:45	1508.8	16:45	2661.1	16:45	2661.1	16:45	2661.1	16:45	2661.1	16:45
W156B	1042.4	16:45	1042.4	16:45	1042.4	16:45	1042.4	16:45	1851.8	16:45	1851.8	16:45	1851.8	16:45	1851.8	16:45
W1570000_0001_J	3959.9	23:00	3959.9	23:00	3959.9	23:00	3959.9	23:00	7756.5	00:30	7756.5	00:30	7756.5	00:30	7756.5	00:30
W1670000_0020_J	1227.4	19:00	1227.4	19:00	1227.4	19:00	1227.4	19:00	2268.8	18:45	2268.8	18:45	2268.8	18:45	2268.8	18:45
W1670000_0020_R	805.7	19:45	805.7	19:45	805.7	19:45	805.7	19:45	1539.7	20:45	1539.7	20:45	1539.7	20:45	1539.7	20:45
W1670000_0105_J	811.6	18:45	811.6	18:45	811.6	18:45	811.6	18:45	1557.7	19:15	1557.7	19:15	1557.7	19:15	1557.7	19:15
W167A	713.1	17:15	713.1	17:15	713.1	17:15	713.1	17:15	1285.3	17:15	1285.3	17:15	1285.3	17:15	1285.3	17:15
W167B	811.6	18:45	811.6	18:45	811.6	18:45	811.6	18:45	1557.7	19:15	1557.7	19:15	1557.7	19:15	1557.7	19:15
W170A	698.9	17:45	698.9	17:45	698.9	17:45	698.9	17:45	1313.2	18:00	1313.2	18:00	1313.2	18:00	1313.2	18:00
W1900000_0017_J	1214.6	20:15	1214.6	20:15	1214.6	20:15	1214.6	20:15	2695.6	20:30	2695.6	20:30	2695.6	20:30	2695.6	20:30
W1900000_0327_J	1021.8	17:45	1021.8	17:45	1021.8	17:45	1021.8	17:45	2230.4	18:15	2230.4	18:15	2230.4	18:15	2230.4	18:15
W1900000_0348_J	545.2	17:00	545.2	17:00	545.2	17:00	545.2	17:00	1148.4	17:45	1148.4	17:45	1148.4	17:45	1148.4	17:45
W190A	545.2	17:00	545.2	17:00	545.2	17:00	545.2	17:00	1148.4	17:45	1148.4	17:45	1148.4	17:45	1148.4	17:45
W190B	500.6	18:00	500.6	18:00	500.6	18:00	500.6	18:00	1093.5	18:30	1093.5	18:30	1093.5	18:30	1093.5	18:30
W190C	228.7	20:30	228.7	20:30	228.7	20:30	228.7	20:30	487.5	20:30	487.5	20:30	487.5	20:30	487.5	20:30

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10PCT_10yr	13322	Existing[1]	589	62.35	73.08		73.29	0.001449	3.6	163.39	30.54	0.27
	13322	PropPh1[2]	557	62.35	72.88		73.08	0.001433	3.54	157.3	29.89	0.27
	13322	FuturePh2[3]	577	62.35	73.01		73.21	0.001445	3.58	161.06	30.29	0.27
	13322	FuturePh3[4]	569	62.35	72.96		73.15	0.001441	3.57	159.53	30.13	0.27
	13075.6	Existing[1]	589	62.15	72.69	68.44	72.91	0.001593	3.74	157.64	29.93	0.29
	13075.6	PropPh1[2]	557	62.15	72.5	68.3	72.71	0.001573	3.67	151.83	29.3	0.28
	13075.6	FuturePh2[3]	577	62.15	72.62	68.39	72.83	0.001587	3.71	155.4	29.69	0.29
	13075.6	FuturePh3[4]	569	62.15	72.57	68.35	72.78	0.001582	3.7	153.94	29.53	0.29
	13053.2		Bridge									
	13030.8	Existing[1]	589	62.08	72.52	68.37	72.74	0.001678	3.81	154.56	29.59	0.29
	13030.8	PropPh1[2]	557	62.08	72.33	68.23	72.55	0.001654	3.74	148.94	28.98	0.29
	13030.8	FuturePh2[3]	577	62.08	72.45	68.32	72.67	0.00167	3.78	152.45	29.36	0.29
	13030.8	FuturePh3[4]	569	62.08	72.4	68.28	72.62	0.001664	3.77	151.03	29.21	0.29
	12896.2	Existing[1]	589	61.87	72.31	67.87	72.51	0.001616	3.66	160.73	31.95	0.29
	12896.2	PropPh1[2]	557	61.87	72.12	67.68	72.32	0.001599	3.6	154.75	31.25	0.29
	12896.2	FuturePh2[3]	577	61.87	72.24	67.8	72.44	0.001611	3.64	158.48	31.69	0.29
	12896.2	FuturePh3[4]	569	61.87	72.19	67.75	72.39	0.001607	3.62	156.97	31.51	0.29
	12527.9	Existing[1]	589	61.3	72	67.34	72.09	0.000748	2.46	239.61	54.58	0.21
	12527.9	PropPh1[2]	557	61.3	71.81	67.21	71.9	0.000746	2.43	229.37	52.89	0.21
	12527.9	FuturePh2[3]	577	61.3	71.92	67.3	72.02	0.000748	2.45	235.73	53.95	0.21
	12527.9	FuturePh3[4]	569	61.3	71.88	67.26	71.97	0.000747	2.44	233.14	53.52	0.21
	12065.3	Existing[1]	589	60.51	71.48	66.5	71.65	0.001228	3.31	178.18	33.89	0.25
	12065.3	PropPh1[2]	557	60.51	71.3	66.32	71.46	0.001205	3.24	172.11	33.23	0.25
	12065.3	FuturePh2[3]	577	60.51	71.41	66.44	71.58	0.00122	3.28	175.88	33.64	0.25
	12065.3	FuturePh3[4]	569	60.51	71.36	66.39	71.53	0.001215	3.26	174.33	33.47	0.25
	11519.3	Existing[1]	589	60.46	70.75	66.73	70.9	0.001512	3.12	188.82	53.88	0.29
	11519.3	PropPh1[2]	557	60.46	70.57	66.58	70.72	0.001523	3.1	179.72	49.75	0.29
	11519.3	FuturePh2[3]	577	60.46	70.68	66.68	70.83	0.001519	3.11	185.31	50.97	0.29
	11519.3	FuturePh3[4]	569	60.46	70.63	66.64	70.78	0.001523	3.11	182.96	50.46	0.29
	11029.3	Existing[1]	589	60.41	70.13	66.68	70.36	0.00081	3.86	152.61	36.4	0.33
	11029.3	PropPh1[2]	557	60.41	69.95	66.53	70.18	0.000805	3.81	146.38	35.33	0.33
	11029.3	FuturePh2[3]	577	60.41	70.06	66.62	70.29	0.00081	3.84	150.17	35.99	0.33
	11029.3	FuturePh3[4]	569	60.41	70.01	66.59	70.24	0.00081	3.83	148.52	35.7	0.33
	11002.1	Existing[1]	589	60.41	70.11	66.55	70.34	0.001542	3.84	153.54	36.29	0.33
	11002.1	PropPh1[2]	557	60.41	69.93	66.4	70.16	0.001529	3.78	147.33	35.22	0.33
	11002.1	FuturePh2[3]	577	60.41	70.04	66.5	70.27	0.00154	3.82	151.11	35.87	0.33
	11002.1	FuturePh3[4]	569	60.41	69.99	66.46	70.22	0.001539	3.81	149.46	35.59	0.33
	10962.7		Bridge									
	10923.3	Existing[1]	589	60.3	69.87	66.44	70.12	0.001659	3.95	149.11	35.53	0.34
	10923.3	PropPh1[2]	557	60.3	69.71	66.29	69.94	0.001639	3.89	143.27	34.5	0.34
	10923.3	FuturePh2[3]	577	60.3	69.81	66.39	70.05	0.001654	3.93	146.86	35.14	0.34
	10923.3	FuturePh3[4]	569	60.3	69.77	66.35	70	0.001651	3.92	145.31	34.87	0.34
	10764.8	Existing[1]	589	59.93	69.8	66.26	69.93	0.000508	2.97	198.47	51.69	0.27
	10764.8	PropPh1[2]	557	59.93	69.63	66.1	69.76	0.000512	2.93	189.9	50.58	0.27
	10764.8	FuturePh2[3]	577	59.93	69.73	66.2	69.87	0.00051	2.96	195.23	51.27	0.27
	10764.8	FuturePh3[4]	569	59.93	69.69	66.16	69.82	0.000511	2.95	193	50.98	0.27

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10PCT_10yr	10641.7	Existing[1]	589	59.65	69.72	65.71	69.87	0.000441	3.1	190.58	42.38	0.25
	10641.7	PropPh1[2]	557	59.65	69.56	65.57	69.7	0.000437	3.03	184.02	40.51	0.25
	10641.7	FuturePh2[3]	577	59.65	69.66	65.66	69.8	0.00044	3.07	187.96	41.65	0.25
	10641.7	FuturePh3[4]	569	59.65	69.61	65.62	69.76	0.00044	3.06	186.19	41.14	0.25
	10599.6	Existing[1]	682	59.55	69.63	65.97	69.84	0.000621	3.66	189.73	158.05	0.3
	10599.6	PropPh1[2]	649	59.55	69.46	65.85	69.66	0.000629	3.61	181.37	153.46	0.3
	10599.6	FuturePh2[3]	670	59.55	69.57	65.93	69.77	0.000624	3.64	186.64	156.35	0.3
	10599.6	FuturePh3[4]	661	59.55	69.53	65.89	69.73	0.000625	3.62	184.54	155.2	0.3
	10581.7		Bridge									
	10563.8	Existing[1]	682	59.46	69.53	65.88	69.74	0.000624	3.66	189.31	157.82	0.3
	10563.8	PropPh1[2]	649	59.46	69.36	65.76	69.57	0.000632	3.61	181.04	153.28	0.3
	10563.8	FuturePh2[3]	670	59.46	69.47	65.84	69.68	0.000627	3.65	186.24	156.14	0.3
	10563.8	FuturePh3[4]	661	59.46	69.43	65.8	69.63	0.000628	3.63	184.16	154.99	0.3
	10404.9	Existing[1]	682	59.39	69.21	65.67	69.57	0.00107	4.81	141.8	26.97	0.37
	10404.9	PropPh1[2]	649	59.39	69.05	65.53	69.4	0.001051	4.72	137.63	26.56	0.37
	10404.9	FuturePh2[3]	670	59.39	69.15	65.62	69.5	0.001064	4.78	140.24	26.82	0.37
	10404.9	FuturePh3[4]	661	59.39	69.11	65.58	69.46	0.001057	4.75	139.21	26.72	0.37
	9889.4	Existing[1]	709	59.19	68.38		68.88	0.001606	5.65	125.56	25.32	0.45
	9889.4	PropPh1[2]	675	59.19	68.25		68.73	0.001565	5.52	122.2	24.97	0.44
	9889.4	FuturePh2[3]	696	59.19	68.34		68.82	0.001589	5.6	124.33	25.2	0.44
	9889.4	FuturePh3[4]	688	59.19	68.3		68.78	0.001582	5.57	123.45	25.1	0.44
	9202.8	Existing[1]	709	58.42	67.8	64.76	68.04	0.000807	3.94	179.86	42.84	0.34
	9202.8	PropPh1[2]	675	58.42	67.67	64.64	67.91	0.000795	3.87	174.44	42.18	0.34
	9202.8	FuturePh2[3]	696	58.42	67.76	64.71	67.99	0.000801	3.91	177.92	42.6	0.34
	9202.8	FuturePh3[4]	688	58.42	67.72	64.69	67.96	0.000801	3.9	176.4	42.42	0.34
	9132	Existing[1]	738	58.34	67.72	64.77	67.98	0.000875	4.11	179.68	42.74	0.35
	9132	PropPh1[2]	705	58.34	67.59	64.68	67.84	0.000868	4.05	174.24	42.08	0.35
	9132	FuturePh2[3]	726	58.34	67.67	64.73	67.93	0.000873	4.09	177.71	42.5	0.35
	9132	FuturePh3[4]	717	58.34	67.63	64.72	67.89	0.000871	4.07	176.23	42.33	0.35
	9104.1		Bridge									
	9076.2	Existing[1]	738	58.21	67.55	64.64	67.82	0.000896	4.14	178.15	42.56	0.36
	9076.2	PropPh1[2]	705	58.21	67.42	64.55	67.68	0.000889	4.08	172.78	41.9	0.35
	9076.2	FuturePh2[3]	726	58.21	67.5	64.6	67.77	0.000893	4.12	176.2	42.32	0.36
	9076.2	FuturePh3[4]	717	58.21	67.47	64.59	67.73	0.000891	4.1	174.74	42.15	0.36
	8911.9	Existing[1]	738	58.05	67.34		67.61	0.001797	4.17	183.53	43.73	0.32
	8911.9	PropPh1[2]	705	58.05	67.22		67.48	0.001779	4.08	178.29	42.64	0.32
	8911.9	FuturePh2[3]	726	58.05	67.3		67.57	0.00179	4.14	181.63	43.21	0.32
	8911.9	FuturePh3[4]	717	58.05	67.27		67.53	0.001785	4.11	180.21	42.97	0.32
	8753.8	Existing[1]	738	57.9	67.04		67.32	0.001943	4.25	188	49.16	0.34
	8753.8	PropPh1[2]	705	57.9	66.92		67.19	0.00193	4.17	182.14	48.46	0.33
	8753.8	FuturePh2[3]	726	57.9	67		67.27	0.001938	4.22	185.88	48.91	0.34
	8753.8	FuturePh3[4]	717	57.9	66.97		67.24	0.001934	4.2	184.3	48.72	0.33
	8320.8	Existing[1]	771	57.59	65.17		65.83	0.006823	6.51	118.41	32.66	0.6
	8320.8	PropPh1[2]	738	57.59	65.07		65.71	0.00677	6.4	115.26	31.84	0.59
	8320.8	FuturePh2[3]	759	57.59	65.14		65.79	0.006809	6.47	117.25	32.34	0.6
	8320.8	FuturePh3[4]	750	57.59	65.11		65.76	0.006797	6.44	116.39	32.1	0.6

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10PCT_10yr	7945.8	Existing[1]	771	55.6	63.88		64.19	0.002725	4.57	200.6	72.69	0.39
	7945.8	PropPh1[2]	738	55.6	63.77		64.08	0.002737	4.5	192.88	70.82	0.39
	7945.8	FuturePh2[3]	759	55.6	63.84		64.15	0.002736	4.55	197.59	71.97	0.39
	7945.8	FuturePh3[4]	750	55.6	63.81		64.12	0.002742	4.53	195.42	71.44	0.39
	7482.7	Existing[1]	771	53.23	62.12		62.51	0.005074	5.08	163.44	51.64	0.42
	7482.7	PropPh1[2]	738	53.23	61.99		62.38	0.005117	5.01	157.18	49.38	0.42
	7482.7	FuturePh2[3]	759	53.23	62.07		62.46	0.005098	5.06	161.03	50.78	0.42
	7482.7	FuturePh3[4]	750	53.23	62.04		62.43	0.005089	5.03	159.58	50.26	0.42
	7444.9	Existing[1]	809	53.04	61.96	59.47	62.32	0.004341	4.9	176.01	44.21	0.39
	7444.9	PropPh1[2]	775	53.04	61.83	59.38	62.19	0.004346	4.82	170.56	43.5	0.38
	7444.9	FuturePh2[3]	796	53.04	61.91	59.44	62.27	0.004342	4.87	173.94	43.94	0.38
	7444.9	FuturePh3[4]	788	53.04	61.88	59.41	62.24	0.004343	4.85	172.67	43.78	0.38
	7418.6		Bridge									
	7392.3	Existing[1]	809	53.07	61.22	59.5	61.75	0.007659	5.83	143.93	39.84	0.5
	7392.3	PropPh1[2]	775	53.07	61.12	59.41	61.63	0.007594	5.73	139.89	39.25	0.49
	7392.3	FuturePh2[3]	796	53.07	61.18	59.47	61.7	0.00763	5.79	142.42	39.62	0.5
	7392.3	FuturePh3[4]	788	53.07	61.16	59.44	61.67	0.007613	5.77	141.48	39.48	0.5
	7223.2	Existing[1]	809	51.31	58.78	58.13	59.72	0.018153	7.78	106.42	36.36	0.75
	7223.2	PropPh1[2]	775	51.31	58.67	58.03	59.59	0.018398	7.7	102.59	35.52	0.75
	7223.2	FuturePh2[3]	796	51.31	58.74	58.09	59.67	0.018259	7.75	104.93	36.03	0.75
	7223.2	FuturePh3[4]	788	51.31	58.71	58.07	59.64	0.018323	7.74	104.01	35.83	0.75
	6508.1	Existing[1]	851	42.18	51.15		51.79	0.00747	6.42	132.55	26.38	0.5
	6508.1	PropPh1[2]	817	42.18	51.01	48.73	51.64	0.007443	6.34	128.94	26.18	0.5
	6508.1	FuturePh2[3]	838	42.18	51.1		51.73	0.00746	6.39	131.17	26.3	0.5
	6508.1	FuturePh3[4]	830	42.18	51.06		51.69	0.007454	6.37	130.32	26.26	0.5
	5707.3	Existing[1]	851	41.84	48.67		48.86	0.002015	3.42	249.09	48.99	0.27
	5707.3	PropPh1[2]	817	41.84	48.52		48.69	0.002031	3.38	241.4	48.5	0.27
	5707.3	FuturePh2[3]	838	41.84	48.62		48.8	0.00202	3.4	246.22	48.8	0.27
	5707.3	FuturePh3[4]	830	41.84	48.58		48.76	0.002022	3.4	244.45	48.69	0.27
	5602.5	Existing[1]	894	41.79	48.39	45.16	48.61	0.002548	3.76	237.52	48.25	0.3
	5602.5	PropPh1[2]	859	41.79	48.23	45.09	48.44	0.002586	3.74	229.78	47.75	0.3
	5602.5	FuturePh2[3]	881	41.79	48.33	45.14	48.55	0.002562	3.75	234.62	48.06	0.3
	5602.5	FuturePh3[4]	873	41.79	48.29	45.12	48.51	0.002572	3.75	232.84	47.95	0.3
	5375.3		Culvert									
	5148.1	Existing[1]	894	38.37	47.42	41.74	47.51	0.000712	2.46	362.77	55.89	0.17
	5148.1	PropPh1[2]	859	38.37	47.27	41.67	47.36	0.000703	2.42	354.96	55.43	0.16
	5148.1	FuturePh2[3]	881	38.37	47.36	41.72	47.46	0.000709	2.45	359.84	55.72	0.17
	5148.1	FuturePh3[4]	873	38.37	47.33	41.7	47.42	0.000707	2.44	358.02	55.61	0.16
	4988.3	Existing[1]	1158	24.03	32.76	29.53	33.28	0.006302	5.79	199.87	33.84	0.42
	4988.3	PropPh1[2]	1124	24.03	32.63	29.44	33.15	0.006303	5.75	195.53	33.54	0.42
	4988.3	FuturePh2[3]	1144	24.03	32.71	29.49	33.23	0.006302	5.78	198.09	33.72	0.42
	4988.3	FuturePh3[4]	1137	24.03	32.68	29.48	33.2	0.006303	5.77	197.2	33.66	0.42

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	13322	Existing[1]	1088	62.35	75.34		75.66	0.001766	4.51	264.01	297.08	0.31
	13322	PropPh1[2]	999	62.35	75.07		75.36	0.001682	4.34	230.26	36.89	0.31
	13322	FuturePh2[3]	1038	62.35	75.19		75.49	0.001725	4.42	234.74	37.28	0.31
	13322	FuturePh3[4]	1037	62.35	75.18		75.49	0.001724	4.42	234.6	37.27	0.31
	13075.6	Existing[1]	1088	62.15	75	70.22	75.22	0.001438	4.04	717.1	1340.56	0.28
	13075.6	PropPh1[2]	999	62.15	74.6	69.94	74.92	0.001882	4.53	220.69	494.48	0.32
	13075.6	FuturePh2[3]	1038	62.15	74.71	70.07	75.04	0.001942	4.62	224.47	610.79	0.33
	13075.6	FuturePh3[4]	1037	62.15	74.71	70.06	75.04	0.001942	4.62	224.35	608.32	0.33
	13053.2		Bridge									
	13030.8	Existing[1]	1088	62.08	74.67	70.15	75.03	0.002105	4.82	225.64	633.3	0.34
	13030.8	PropPh1[2]	999	62.08	74.45	69.87	74.78	0.001953	4.59	217.63	399.4	0.33
	13030.8	FuturePh2[3]	1038	62.08	74.55	70	74.89	0.002021	4.69	221.14	509	0.33
	13030.8	FuturePh3[4]	1037	62.08	74.54	69.99	74.89	0.00202	4.69	221.02	504.89	0.33
	12896.2	Existing[1]	1088	61.87	74.43	69.9	74.74	0.001754	4.52	283.54	793.36	0.32
	12896.2	PropPh1[2]	999	61.87	74.22	69.61	74.51	0.001686	4.33	258.97	394.72	0.31
	12896.2	FuturePh2[3]	1038	61.87	74.31	69.74	74.61	0.001718	4.41	269.47	553.36	0.31
	12896.2	FuturePh3[4]	1037	61.87	74.31	69.74	74.61	0.001718	4.41	269.07	546.88	0.31
	12527.9	Existing[1]	1088	61.3	74.2	68.79	74.32	0.000639	2.87	522.36	1423.22	0.2
	12527.9	PropPh1[2]	999	61.3	73.98	68.57	74.1	0.00063	2.78	406.95	883.42	0.2
	12527.9	FuturePh2[3]	1038	61.3	74.07	68.67	74.2	0.000637	2.83	452.45	1058.91	0.2
	12527.9	FuturePh3[4]	1037	61.3	74.07	68.67	74.19	0.000637	2.83	450.54	1051.43	0.2
	12065.3	Existing[1]	1088	60.51	73.62	68.54	73.89	0.001349	4.19	333.99	1300.02	0.28
	12065.3	PropPh1[2]	999	60.51	73.45	68.24	73.69	0.001261	3.98	268.6	652.97	0.27
	12065.3	FuturePh2[3]	1038	60.51	73.52	68.39	73.78	0.001309	4.08	283.37	972.68	0.28
	12065.3	FuturePh3[4]	1037	60.51	73.52	68.38	73.77	0.00131	4.08	282.04	913.08	0.28
	11519.3	Existing[1]	1088	60.46	73.1	68.52	73.26	0.000911	3.26	513.87	630.28	0.24
	11519.3	PropPh1[2]	999	60.46	72.93	68.19	73.08	0.000914	3.19	338.52	370.42	0.24
	11519.3	FuturePh2[3]	1038	60.46	72.98	68.34	73.14	0.000954	3.28	343.67	412.24	0.25
	11519.3	FuturePh3[4]	1037	60.46	72.97	68.34	73.14	0.000955	3.28	343.23	408.69	0.25
	11029.3	Existing[1]	1088	60.41	72.82	68.41	72.98	0.000404	3.47	1390.75	2118.19	0.25
	11029.3	PropPh1[2]	999	60.41	72.56	68.14	72.76	0.000483	3.68	522.57	1702.44	0.27
	11029.3	FuturePh2[3]	1038	60.41	72.65	68.27	72.83	0.000455	3.61	938.01	1908.69	0.27
	11029.3	FuturePh3[4]	1037	60.41	72.64	68.27	72.83	0.000457	3.61	928.22	1897.08	0.27
	11002.1	Existing[1]	1088	60.41	72.82	68.37	72.95	0.000636	3.19	1592.71	2470.19	0.23
	11002.1	PropPh1[2]	999	60.41	72.5	68.08	72.73	0.001031	3.91	270.86	1517	0.29
	11002.1	FuturePh2[3]	1038	60.41	72.54	68.18	72.8	0.001081	4.03	274.07	1619.98	0.29
	11002.1	FuturePh3[4]	1037	60.41	72.54	68.18	72.79	0.001082	4.03	273.75	1609.76	0.29
	10962.7		Bridge									
	10923.3	Existing[1]	1088	60.3	72.27	68.21	72.51	0.001154	4.09	611.4	1306.97	0.3
	10923.3	PropPh1[2]	999	60.3	72.16	67.97	72.42	0.001183	4.08	256.19	1133.43	0.31
	10923.3	FuturePh2[3]	1038	60.3	72.18	68.07	72.45	0.001263	4.23	257.35	1158.69	0.32
	10923.3	FuturePh3[4]	1037	60.3	72.17	68.07	72.45	0.001263	4.22	257.1	1153.26	0.32
	10764.8	Existing[1]	1088	59.93	72.25	67.82	72.37	0.000291	3.01	940.33	1003.04	0.22
	10764.8	PropPh1[2]	999	59.93	72.15	67.6	72.27	0.000275	2.89	678.26	730.88	0.21
	10764.8	FuturePh2[3]	1038	59.93	72.17	67.7	72.3	0.000293	2.99	689.64	885.92	0.22
	10764.8	FuturePh3[4]	1037	59.93	72.16	67.69	72.29	0.000293	2.99	686.96	882.56	0.22

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1PCT_100yr	10641.7	Existing[1]	1088	59.65	72.14	67.34	72.33	0.000363	3.57	615.3	1574.24	0.24
	10641.7	PropPh1[2]	999	59.65	72.06	67.11	72.23	0.000322	3.33	579.2	1414.56	0.23
	10641.7	FuturePh2[3]	1038	59.65	72.08	67.21	72.25	0.000345	3.45	584.49	1443.46	0.23
	10641.7	FuturePh3[4]	1037	59.65	72.07	67.21	72.25	0.000345	3.45	582.57	1433	0.23
	10599.6	Existing[1]	1261	59.55	72.09	67.65	72.29	0.000439	3.93	903.43	971.83	0.26
	10599.6	PropPh1[2]	1168	59.55	71.92	67.43	72.18	0.000498	4.12	311.44	752.92	0.28
	10599.6	FuturePh2[3]	1209	59.55	72.02	67.53	72.22	0.000424	3.84	841	891.18	0.26
	10599.6	FuturePh3[4]	1207	59.55	72.02	67.52	72.21	0.000424	3.84	837.65	886.36	0.26
	10581.7		Bridge									
	10563.8	Existing[1]	1261	59.46	72.08	67.55	72.28	0.000412	3.84	987.3	1049.97	0.26
	10563.8	PropPh1[2]	1168	59.46	71.84	67.32	72.04	0.000408	3.73	768.94	768.98	0.25
	10563.8	FuturePh2[3]	1209	59.46	71.89	67.42	72.1	0.000436	3.88	809.06	844.07	0.26
	10563.8	FuturePh3[4]	1207	59.46	71.89	67.42	72.1	0.000436	3.88	803.93	836.26	0.26
	10404.9	Existing[1]	1261	59.39	71.55	67.7	72.08	0.001181	5.88	273.41	494.98	0.41
	10404.9	PropPh1[2]	1168	59.39	71.35	67.43	71.85	0.001128	5.65	232.23	342.6	0.39
	10404.9	FuturePh2[3]	1209	59.39	71.37	67.55	71.9	0.001198	5.83	235.12	353.94	0.41
	10404.9	FuturePh3[4]	1207	59.39	71.36	67.55	71.89	0.001198	5.83	234.17	350.29	0.41
	9889.4	Existing[1]	1310	59.19	70.51		71.29	0.001919	7.07	185.37	30.96	0.51
	9889.4	PropPh1[2]	1216	59.19	70.42		71.11	0.00172	6.66	182.68	30.73	0.48
	9889.4	FuturePh2[3]	1258	59.19	70.34		71.1	0.001913	6.99	180.09	30.51	0.51
	9889.4	FuturePh3[4]	1256	59.19	70.33		71.09	0.001911	6.98	179.96	30.5	0.51
	9202.8	Existing[1]	1310	58.42	70.08	66.35	70.39	0.000708	4.52	293.22	179.54	0.34
	9202.8	PropPh1[2]	1216	58.42	70.04	66.15	70.32	0.000622	4.22	290.78	162.91	0.32
	9202.8	FuturePh2[3]	1258	58.42	69.88	66.24	70.19	0.000738	4.51	280.27	111.64	0.34
	9202.8	FuturePh3[4]	1256	58.42	69.87	66.23	70.19	0.000737	4.5	280.02	111.26	0.34
	9132	Existing[1]	1365	58.34	69.99	66.38	70.33	0.00077	4.72	296.75	389.64	0.35
	9132	PropPh1[2]	1270	58.34	69.96	66.17	70.26	0.000679	4.41	294.8	363.74	0.33
	9132	FuturePh2[3]	1312	58.34	69.78	66.26	70.13	0.000807	4.71	283.71	250.79	0.36
	9132	FuturePh3[4]	1311	58.34	69.78	66.26	70.12	0.000808	4.71	283.48	247.52	0.36
	9104.1		Bridge									
	9076.2	Existing[1]	1365	58.21	69.6	66.25	69.98	0.000899	4.95	280.62	202.47	0.38
	9076.2	PropPh1[2]	1270	58.21	69.34	66.04	69.7	0.000909	4.84	264.29	100.01	0.38
	9076.2	FuturePh2[3]	1312	58.21	69.45	66.13	69.82	0.000907	4.89	271.25	124.73	0.38
	9076.2	FuturePh3[4]	1311	58.21	69.45	66.13	69.82	0.000907	4.89	271.08	123.93	0.38
	8911.9	Existing[1]	1365	58.05	69.3		69.74	0.001976	5.42	305.64	123.43	0.36
	8911.9	PropPh1[2]	1270	58.05	69.06		69.47	0.001947	5.26	280.8	80.18	0.35
	8911.9	FuturePh2[3]	1312	58.05	69.16		69.59	0.001961	5.33	290.53	98.5	0.36
	8911.9	FuturePh3[4]	1311	58.05	69.16		69.59	0.00196	5.33	290.27	98.05	0.36
	8753.8	Existing[1]	1365	57.9	68.98		69.42	0.002066	5.46	310.93	82.47	0.37
	8753.8	PropPh1[2]	1270	57.9	68.74		69.16	0.002035	5.29	291.81	76.54	0.36
	8753.8	FuturePh2[3]	1312	57.9	68.85		69.28	0.00205	5.37	300.1	79.16	0.36
	8753.8	FuturePh3[4]	1311	57.9	68.85		69.27	0.00205	5.37	299.89	79.1	0.36
	8320.8	Existing[1]	1427	57.59	66.86		67.86	0.006792	8.08	186.9	50.07	0.63
	8320.8	PropPh1[2]	1331	57.59	66.67		67.62	0.006717	7.84	177.81	47.67	0.62
	8320.8	FuturePh2[3]	1373	57.59	66.75		67.73	0.006752	7.94	181.75	48.72	0.63
	8320.8	FuturePh3[4]	1372	57.59	66.75		67.72	0.006754	7.94	181.63	48.69	0.63

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1PCT_100yr	7945.8	Existing[1]	1427	55.6	66		66.37	0.002072	5.21	394.18	111.01	0.36
	7945.8	PropPh1[2]	1331	55.6	65.82		66.17	0.002018	5.04	374.04	107.38	0.36
	7945.8	FuturePh2[3]	1373	55.6	65.9		66.26	0.002044	5.12	382.65	108.95	0.36
	7945.8	FuturePh3[4]	1372	55.6	65.89		66.26	0.002046	5.12	382.28	108.88	0.36
	7482.7	Existing[1]	1427	53.23	64.87		65.25	0.002933	5.28	379.72	108.32	0.34
	7482.7	PropPh1[2]	1331	53.23	64.74		65.09	0.002748	5.05	365.85	105.49	0.33
	7482.7	FuturePh2[3]	1373	53.23	64.79		65.16	0.002837	5.16	371.5	106.65	0.34
	7482.7	FuturePh3[4]	1372	53.23	64.79		65.15	0.00284	5.16	371.02	106.56	0.34
	7444.9	Existing[1]	1496	53.04	64.66	61.02	65.11	0.00315	5.56	312.44	228.15	0.35
	7444.9	PropPh1[2]	1400	53.04	64.56	60.8	64.97	0.002904	5.29	306.5	215.46	0.34
	7444.9	FuturePh2[3]	1442	53.04	64.6	60.9	65.03	0.003017	5.41	308.91	220.58	0.34
	7444.9	FuturePh3[4]	1441	53.04	64.6	60.9	65.02	0.003019	5.41	308.67	220.06	0.34
	7418.6		Bridge									
	7392.3	Existing[1]	1496	53.07	62.77	61.05	63.67	0.008895	7.73	212.68	48.74	0.57
	7392.3	PropPh1[2]	1400	53.07	62.61	60.83	63.45	0.008647	7.47	204.52	47.77	0.55
	7392.3	FuturePh2[3]	1442	53.07	62.68	60.93	63.55	0.008748	7.58	208.18	48.2	0.56
	7392.3	FuturePh3[4]	1441	53.07	62.68	60.93	63.55	0.008744	7.58	208.11	48.2	0.56
	7223.2	Existing[1]	1496	51.31	60.58	59.69	61.74	0.013799	8.84	201.77	81.3	0.7
	7223.2	PropPh1[2]	1400	51.31	60.38	59.52	61.52	0.014171	8.72	185.83	74.1	0.7
	7223.2	FuturePh2[3]	1442	51.31	60.47	59.58	61.62	0.014007	8.77	192.72	77.39	0.7
	7223.2	FuturePh3[4]	1441	51.31	60.47	59.58	61.62	0.014021	8.77	192.48	77.28	0.7
	6508.1	Existing[1]	1574	42.18	53.68		54.61	0.007536	7.71	204.61	32.89	0.52
	6508.1	PropPh1[2]	1477	42.18	53.39		54.28	0.007579	7.56	195.32	30.19	0.52
	6508.1	FuturePh2[3]	1520	42.18	53.52		54.42	0.00756	7.63	199.37	31.4	0.52
	6508.1	FuturePh3[4]	1518	42.18	53.51		54.42	0.00756	7.63	199.19	31.35	0.52
	5707.3	Existing[1]	1574	41.84	51.67		51.9	0.001694	3.84	409.96	58.33	0.26
	5707.3	PropPh1[2]	1477	41.84	51.35		51.57	0.001698	3.77	391.36	57.33	0.25
	5707.3	FuturePh2[3]	1520	41.84	51.49		51.72	0.001696	3.8	399.62	57.77	0.25
	5707.3	FuturePh3[4]	1518	41.84	51.49		51.71	0.001696	3.8	399.28	57.75	0.25
	5602.5	Existing[1]	1653	41.79	51.43	46.53	51.7	0.00187	4.2	393.84	57.72	0.27
	5602.5	PropPh1[2]	1556	41.79	51.1	46.37	51.37	0.00192	4.13	376.71	56.72	0.27
	5602.5	FuturePh2[3]	1599	41.79	51.25	46.44	51.52	0.001898	4.16	384.36	57.17	0.27
	5602.5	FuturePh3[4]	1597	41.79	51.24	46.44	51.51	0.001898	4.16	384.05	57.15	0.27
	5375.3		Culvert									
	5148.1	Existing[1]	1653	38.37	50.12	43.11	50.29	0.000811	3.27	505.97	64.31	0.19
	5148.1	PropPh1[2]	1556	38.37	49.86	42.95	50.02	0.000789	3.16	492.05	63.5	0.18
	5148.1	FuturePh2[3]	1599	38.37	49.98	43.02	50.14	0.000799	3.21	498.28	63.86	0.18
	5148.1	FuturePh3[4]	1597	38.37	49.97	43.02	50.13	0.000798	3.21	498.06	63.85	0.18
	4988.3	Existing[1]	1653	37.97	49.62		50.01	0.002763	4.99	341.14	52.61	0.32
	4988.3	PropPh1[2]	1556	37.97	49.37		49.74	0.002739	4.87	328.3	51.38	0.32
	4988.3	FuturePh2[3]	1599	37.97	49.48		49.86	0.002752	4.92	334	51.92	0.32
	4988.3	FuturePh3[4]	1597	37.97	49.48		49.85	0.002749	4.92	333.83	51.9	0.32
	4200.8	Existing[1]	1783	36	45.56		46.41	0.00818	7.41	241.21	42.56	0.53
	4200.8	PropPh1[2]	1686	36	45.37		46.18	0.008054	7.24	233.09	41	0.53
	4200.8	FuturePh2[3]	1729	36	45.45		46.28	0.008111	7.31	236.67	41.7	0.53
	4200.8	FuturePh3[4]	1728	36	45.45		46.28	0.008111	7.31	236.58	41.68	0.53

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	3767.1	Existing[1]	1783	34.6	43.92		44.2	0.003063	4.26	426.95	92.74	0.34
	3767.1	PropPh1[2]	1686	34.6	43.69		43.97	0.003103	4.22	406.61	90.1	0.34
	3767.1	FuturePh2[3]	1729	34.6	43.79		44.07	0.003085	4.24	415.64	91.28	0.34
	3767.1	FuturePh3[4]	1728	34.6	43.79		44.07	0.003089	4.24	415.26	91.23	0.34
	3368.2	Existing[1]	1866	33.01	42.58		42.94	0.003204	4.82	402.68	67.03	0.32
	3368.2	PropPh1[2]	1768	33.01	42.36		42.71	0.003193	4.72	388.13	66.3	0.32
	3368.2	FuturePh2[3]	1812	33.01	42.46		42.81	0.003201	4.77	394.57	66.62	0.32
	3368.2	FuturePh3[4]	1810	33.01	42.46		42.81	0.0032	4.77	394.28	66.61	0.32
	2735.8	Existing[1]	1866	31.73	41.9		41.99	0.000759	2.37	801.69	130.72	0.16
	2735.8	PropPh1[2]	1768	31.73	41.68		41.76	0.000755	2.32	772.96	128.67	0.16
	2735.8	FuturePh2[3]	1812	31.73	41.78		41.86	0.000758	2.34	785.55	129.58	0.16
	2735.8	FuturePh3[4]	1810	31.73	41.77		41.86	0.000758	2.34	784.99	129.53	0.16
	2065.5	Existing[1]	2002	30.37	39.73		40.61	0.009765	7.55	264.99	42.69	0.53
	2065.5	PropPh1[2]	1906	30.37	39.55		40.4	0.009595	7.41	257.34	42.22	0.53
	2065.5	FuturePh2[3]	1949	30.37	39.62		40.49	0.009699	7.48	260.51	42.42	0.53
	2065.5	FuturePh3[4]	1947	30.37	39.62		40.49	0.009693	7.48	260.38	42.41	0.53
	1689.7	Existing[1]	2002	28.45	39.01		39.15	0.001635	3.07	652.12	115.4	0.23
	1689.7	PropPh1[2]	1906	28.45	38.78		38.93	0.001673	3.04	626.13	114.19	0.23
	1689.7	FuturePh2[3]	1949	28.45	38.88		39.03	0.001657	3.06	637.66	114.73	0.23
	1689.7	FuturePh3[4]	1947	28.45	38.88		39.02	0.001656	3.05	637.32	114.71	0.23
	821.4	Existing[1]	2142	24.03	35.82	31.68	36.54	0.006312	6.83	313.41	40.29	0.43
	821.4	PropPh1[2]	2047	24.03	35.56	31.5	36.27	0.006306	6.75	303.28	39.79	0.43
	821.4	FuturePh2[3]	2089	24.03	35.68	31.58	36.39	0.006309	6.79	307.77	40.02	0.43
	821.4	FuturePh3[4]	2088	24.03	35.67	31.58	36.39	0.006309	6.79	307.66	40.01	0.43

Existing Conditions[1]: Model includes FEMA Effective geometry data with the Existing Conditions HMS model flows.

PropPh1[2]: Model includes FEMA Effective geometry data with the Proposed Phase 1 (Pond-Only) HMS model flows.

FuturePh2[3]: Model includes FEMA Effective geometry data with the Future Phase 2 (Channel Impvs) HMS model flows.

FuturePh3[4]: Model includes FEMA Effective geometry data with the Future Phase 3 (Storm Sew Impvs) HMS model flows.

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	19209.6	Existing[1]	994	67.34	74.45		75.37	0.001032	7.67	129.66	29.52	0.64
	19209.6	PropPh1[2]	994	67.34	74.45		75.37	0.001032	7.67	129.66	29.52	0.64
	19209.6	FuturePh2[3]	994	67.34	74.45		75.37	0.001032	7.67	129.66	29.52	0.64
	19209.6	FuturePh3[4]	994	67.34	74.45		75.37	0.001032	7.67	129.66	29.52	0.64
	18393.7	Existing[1]	994	65.96	72.98		74.28	0.001648	9.13	108.82	23.69	0.75
	18393.7	PropPh1[2]	994	65.96	72.98		74.28	0.001648	9.13	108.82	23.69	0.75
	18393.7	FuturePh2[3]	994	65.96	72.98		74.28	0.001648	9.13	108.82	23.69	0.75
	18393.7	FuturePh3[4]	994	65.96	72.98		74.28	0.001648	9.13	108.82	23.69	0.75
	17507.7	Existing[1]	994	64.97	72.74	70.2	73.32	0.000506	6.08	163.48	31.07	0.47
	17507.7	PropPh1[2]	994	64.97	72.74	70.2	73.32	0.000506	6.08	163.48	31.07	0.47
	17507.7	FuturePh2[3]	994	64.97	72.74	70.2	73.32	0.000506	6.08	163.48	31.07	0.47
	17507.7	FuturePh3[4]	994	64.97	72.74	70.2	73.32	0.000506	6.08	163.48	31.07	0.47
	17444.3	Existing[1]	994	64.9	71.9	71.12	73.08	0.001704	8.74	113.79	29.65	0.79
	17444.3	PropPh1[2]	994	64.9	71.9	71.12	73.08	0.001704	8.74	113.79	29.65	0.79
	17444.3	FuturePh2[3]	994	64.9	71.9	71.12	73.08	0.001704	8.74	113.79	29.65	0.79
	17444.3	FuturePh3[4]	994	64.9	71.9	71.12	73.08	0.001704	8.74	113.79	29.65	0.79
	17433.3		Bridge									
	17431.8	Existing[1]	994	64.89	71.99	70.55	72.97	0.001604	7.94	125.13	29.84	0.68
	17431.8	PropPh1[2]	994	64.89	71.99	70.55	72.97	0.001604	7.94	125.13	29.84	0.68
	17431.8	FuturePh2[3]	994	64.89	71.99	70.55	72.97	0.001604	7.94	125.13	29.84	0.68
	17431.8	FuturePh3[4]	994	64.89	71.99	70.55	72.97	0.001604	7.94	125.13	29.84	0.68
	17383.8		Bridge									
	17335.8	Existing[1]	994	64.71	70.38	70.38	72.39	0.003679	11.38	87.37	21.7	1
	17335.8	PropPh1[2]	994	64.71	70.38	70.38	72.39	0.003679	11.38	87.37	21.7	1
	17335.8	FuturePh2[3]	994	64.71	70.38	70.38	72.39	0.003679	11.38	87.37	21.7	1
	17335.8	FuturePh3[4]	994	64.71	70.38	70.38	72.39	0.003679	11.38	87.37	21.7	1
	17139	Existing[1]	994	63.93	69.34	69.34	71.45	0.00305	11.67	85.21	20.31	1
	17139	PropPh1[2]	994	63.93	69.34	69.34	71.45	0.00305	11.67	85.21	20.31	1
	17139	FuturePh2[3]	994	63.93	69.34	69.34	71.45	0.00305	11.67	85.21	20.31	1
	17139	FuturePh3[4]	994	63.93	69.34	69.34	71.45	0.00305	11.67	85.21	20.31	1
	16368.5	Existing[1]	994	60.87	68.83		69.53	0.000667	6.7	149.17	29.42	0.5
	16368.5	PropPh1[2]	994	60.87	68.83		69.53	0.000667	6.7	149.17	29.42	0.5
	16368.5	FuturePh2[3]	994	60.87	68.83		69.53	0.000667	6.7	149.17	29.42	0.5
	16368.5	FuturePh3[4]	994	60.87	68.83		69.53	0.000667	6.7	149.17	29.42	0.5
	15380.2	Existing[1]	1190	59.59	67.25		68.44	0.001692	8.75	136.02	27.54	0.69
	15380.2	PropPh1[2]	1190	59.59	67.25		68.44	0.001692	8.75	136.02	27.54	0.69
	15380.2	FuturePh2[3]	1190	59.59	67.25		68.44	0.001692	8.75	136.02	27.54	0.69
	15380.2	FuturePh3[4]	1190	59.59	67.25		68.44	0.001692	8.75	136.02	27.54	0.69
	15029.4	Existing[1]	1190	59.02	65.23	65.23	67.49	0.00373	12.07	98.6	22	1
	15029.4	PropPh1[2]	1190	59.02	65.23	65.23	67.49	0.00373	12.07	98.6	22	1
	15029.4	FuturePh2[3]	1190	59.02	65.23	65.23	67.49	0.00373	12.07	98.6	22	1
	15029.4	FuturePh3[4]	1190	59.02	65.23	65.23	67.49	0.00373	12.07	98.6	22	1
	14479.9	Existing[1]	1190	58.14	64.53	63.52	65.73	0.001226	8.79	135.42	29.51	0.72
	14479.9	PropPh1[2]	1190	58.14	64.53	63.52	65.73	0.001226	8.79	135.42	29.51	0.72
	14479.9	FuturePh2[3]	1190	58.14	64.53	63.52	65.73	0.001226	8.79	135.42	29.51	0.72
	14479.9	FuturePh3[4]	1190	58.14	64.53	63.52	65.73	0.001226	8.79	135.42	29.51	0.72
	14449.4		Bridge									
	14418.9	Existing[1]	1190	57.97	64.26	63.35	65.51	0.001311	9	132.27	29.32	0.75
	14418.9	PropPh1[2]	1190	57.97	64.26	63.35	65.51	0.001311	9	132.27	29.32	0.75
	14418.9	FuturePh2[3]	1190	57.97	64.26	63.35	65.51	0.001311	9	132.27	29.32	0.75
	14418.9	FuturePh3[4]	1190	57.97	64.26	63.35	65.51	0.001311	9	132.27	29.32	0.75

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	13972.2	Existing[1]	1190	56.53	64.16		64.79	0.000669	6.35	187.32	39.85	0.52
	13972.2	PropPh1[2]	1190	56.53	64.16		64.79	0.000669	6.35	187.32	39.85	0.52
	13972.2	FuturePh2[3]	1190	56.53	64.16		64.79	0.000669	6.35	187.32	39.85	0.52
	13972.2	FuturePh3[4]	1190	56.53	64.16		64.79	0.000669	6.35	187.32	39.85	0.52
	13404.1	Existing[1]	1619	54.71	62.92		64.17	0.001443	8.95	180.9	32.14	0.66
	13404.1	PropPh1[2]	1619	54.71	62.92		64.17	0.001443	8.95	180.9	32.14	0.66
	13404.1	FuturePh2[3]	1619	54.71	62.92		64.17	0.001443	8.95	180.9	32.14	0.66
	13404.1	FuturePh3[1]	1619	54.71	62.92		64.17	0.001443	8.95	180.9	32.14	0.66
	12959.9	Existing[1]	1619	53.36	63.32		63.66	0.000274	4.63	349.46	56.35	0.33
	12959.9	PropPh1[2]	1619	53.36	63.32		63.66	0.000274	4.63	349.46	56.35	0.33
	12959.9	FuturePh2[3]	1619	53.36	63.32		63.66	0.000274	4.63	349.46	56.35	0.33
	12959.9	FuturePh3[4]	1619	53.36	63.32		63.66	0.000274	4.63	349.46	56.35	0.33
	12859.9	Existing[1]	1757	53.06	62.35	60.26	63.38	0.002738	8.12	216.28	40.99	0.62
	12859.9	PropPh1[2]	1757	53.06	62.35	60.26	63.38	0.002738	8.12	216.28	40.99	0.62
	12859.9	FuturePh2[3]	1757	53.06	62.35	60.26	63.38	0.002738	8.12	216.28	40.99	0.62
	12859.9	FuturePh3[4]	1757	53.06	62.35	60.26	63.38	0.002738	8.12	216.28	40.99	0.62
	12817.9		Bridge									
	12775.9	Existing[1]	1757	52.87	61.47	60.07	62.81	0.003831	9.28	189.37	37.29	0.73
	12775.9	PropPh1[2]	1757	52.87	61.47	60.07	62.81	0.003831	9.28	189.37	37.29	0.73
	12775.9	FuturePh2[3]	1757	52.87	61.47	60.07	62.81	0.003831	9.28	189.37	37.29	0.73
	12775.9	FuturePh3[4]	1757	52.87	61.47	60.07	62.81	0.003831	9.28	189.37	37.29	0.73
	12490	Existing[1]	1757	52.01	61.04	58.82	61.85	0.001671	7.25	242.39	48.92	0.57
	12490	PropPh1[2]	1757	52.01	61.04	58.82	61.85	0.001671	7.25	242.39	48.92	0.57
	12490	FuturePh2[3]	1757	52.01	61.04	58.82	61.85	0.001671	7.25	242.39	48.92	0.57
	12490	FuturePh3[4]	1757	52.01	61.04	58.82	61.85	0.001671	7.25	242.39	48.92	0.57
	12193.4	Existing[1]	1885	51.11	58.09	58.09	60.67	0.009215	12.87	146.43	28.73	1
	12193.4	PropPh1[2]	1885	51.11	58.09	58.09	60.67	0.009215	12.87	146.43	28.73	1
	12193.4	FuturePh2[3]	1885	51.11	58.09	58.09	60.67	0.009215	12.87	146.43	28.73	1
	12193.4	FuturePh3[4]	1885	51.11	58.09	58.09	60.67	0.009215	12.87	146.43	28.73	1
	11598.5	Existing[1]	1885	49.79	58.23		58.59	0.000794	4.78	393.99	65.37	0.34
	11598.5	PropPh1[2]	1885	49.79	58.23		58.59	0.000794	4.78	393.99	65.37	0.34
	11598.5	FuturePh2[3]	1885	49.79	58.23		58.59	0.000794	4.78	393.99	65.37	0.34
	11598.5	FuturePh3[4]	1885	49.79	58.23		58.59	0.000794	4.78	393.99	65.37	0.34
	11492.6	Existing[1]	1885	49.55	58.15	54.14	58.49	0.000738	4.66	404.62	66.07	0.33
	11492.6	PropPh1[2]	1885	49.55	58.15	54.14	58.49	0.000738	4.66	404.62	66.07	0.33
	11492.6	FuturePh2[3]	1885	49.55	58.15	54.14	58.49	0.000738	4.66	404.62	66.07	0.33
	11492.6	FuturePh3[4]	1885	49.55	58.15	54.14	58.49	0.000738	4.66	404.62	66.07	0.33
	11443.6		Bridge									
	11394.6	Existing[1]	1885	49.2	57.66	53.79	58.01	0.000789	4.77	394.9	65.43	0.34
	11394.6	PropPh1[2]	1885	49.2	57.66	53.79	58.01	0.000789	4.77	394.9	65.43	0.34
	11394.6	FuturePh2[3]	1885	49.2	57.66	53.79	58.01	0.000789	4.77	394.9	65.43	0.34
	11394.6	FuturePh3[4]	1885	49.2	57.66	53.79	58.01	0.000789	4.77	394.9	65.43	0.34
	11197.6	Existing[1]	1885	48.43	57.68		57.88	0.000135	3.58	559.38	89.63	0.23
	11197.6	PropPh1[2]	1885	48.43	57.68		57.88	0.000135	3.58	559.38	89.63	0.23
	11197.6	FuturePh2[3]	1885	48.43	57.68		57.88	0.000135	3.58	559.38	89.63	0.23
	11197.6	FuturePh3[4]	1885	48.43	57.68		57.88	0.000135	3.58	559.38	89.63	0.23
	11108	Existing[1]	1885	48.08	57.62	52.76	57.85	0.000149	3.89	517.54	79.39	0.25
	11108	PropPh1[2]	1885	48.08	57.62	52.76	57.85	0.000149	3.89	517.54	79.39	0.25
	11108	FuturePh2[3]	1885	48.08	57.62	52.76	57.85	0.000149	3.89	517.54	79.39	0.25
	11108	FuturePh3[4]	1885	48.08	57.62	52.76	57.85	0.000149	3.89	517.54	79.39	0.25
	11097		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	11095.7	Existing[1]	1885	48.04	57.61	52.85	57.85	0.000302	3.94	511.63	79.52	0.25
	11095.7	PropPh1[2]	1885	48.04	57.61	52.85	57.85	0.000302	3.94	511.63	79.52	0.25
	11095.7	FuturePh2[3]	1885	48.04	57.61	52.85	57.85	0.000302	3.94	511.63	79.52	0.25
	11095.7	FuturePh3[4]	1885	48.04	57.61	52.85	57.85	0.000302	3.94	511.64	79.52	0.25
	11073		Bridge									
	11050.3	Existing[1]	1885	47.71	57.23	52.52	57.47	0.000308	3.96	508.14	79.31	0.25
	11050.3	PropPh1[2]	1885	47.71	57.23	52.52	57.47	0.000308	3.96	508.14	79.31	0.25
	11050.3	FuturePh2[3]	1885	47.71	57.23	52.52	57.47	0.000308	3.96	508.14	79.31	0.25
	11050.3	FuturePh3[4]	1885	47.71	57.23	52.52	57.47	0.000308	3.96	508.14	79.31	0.25
	11007.9	Existing[1]	2149	47.75	57.2	52.41	57.45	0.001461	3.97	558.07	79.12	0.25
	11007.9	PropPh1[2]	2149	47.75	57.2	52.41	57.45	0.001461	3.97	558.07	79.12	0.25
	11007.9	FuturePh2[3]	2149	47.75	57.2	52.41	57.45	0.001461	3.97	558.07	79.12	0.25
	11007.9	FuturePh3[4]	2149	47.75	57.2	52.41	57.45	0.001461	3.97	558.07	79.12	0.25
	10997.4		Bridge									
	10986.9	Existing[1]	2149	47.72	57.12	52.37	57.37	0.001497	4	553.73	78.95	0.25
	10986.9	PropPh1[2]	2149	47.72	57.12	52.37	57.37	0.001497	4	553.73	78.95	0.25
	10986.9	FuturePh2[3]	2149	47.72	57.12	52.37	57.37	0.001497	4	553.73	78.95	0.25
	10986.9	FuturePh3[4]	2149	47.72	57.12	52.37	57.37	0.001497	4	553.73	78.95	0.25
	10363.6	Existing[1]	2286	44.94	54.76		55.5	0.006185	7	364.52	96.72	0.49
	10363.6	PropPh1[2]	2286	44.94	54.76		55.5	0.006184	7	364.52	96.72	0.49
	10363.6	FuturePh2[3]	2286	44.94	54.76		55.5	0.006184	7	364.52	96.72	0.49
	10363.6	FuturePh3[4]	2286	44.94	54.76		55.5	0.006184	7	364.53	96.72	0.49
	9604.7	Existing[1]	2453	41.43	52		52.37	0.002846	5.2	641.43	132.54	0.34
	9604.7	PropPh1[2]	2453	41.43	52		52.37	0.002847	5.2	641.31	132.54	0.34
	9604.7	FuturePh2[3]	2453	41.43	52		52.37	0.002846	5.2	641.37	132.54	0.34
	9604.7	FuturePh3[4]	2453	41.43	52		52.37	0.002848	5.2	641.21	132.53	0.34
	9178.3	Existing[1]	2453	38.89	50.68		51.14	0.002913	5.46	470.97	72.98	0.35
	9178.3	PropPh1[2]	2453	38.89	50.68		51.14	0.002915	5.46	470.83	72.97	0.35
	9178.3	FuturePh2[3]	2453	38.89	50.68		51.14	0.002914	5.46	470.9	72.97	0.35
	9178.3	FuturePh3[4]	2453	38.89	50.68		51.14	0.002917	5.47	470.72	72.96	0.35
	8486.4	Existing[1]	2698	34.77	48.94		49.34	0.002341	5.39	648.92	94.89	0.31
	8486.4	PropPh1[2]	2698	34.77	48.93		49.33	0.002345	5.4	648.5	94.87	0.31
	8486.4	FuturePh2[3]	2698	34.77	48.94		49.33	0.002343	5.39	648.73	94.88	0.31
	8486.4	FuturePh3[4]	2698	34.77	48.93		49.33	0.002349	5.4	648.18	94.86	0.31
	8058.8	Existing[1]	2698	34.42	48.37		48.61	0.001149	3.95	719.59	88.52	0.23
	8058.8	PropPh1[2]	2698	34.42	48.36		48.6	0.001151	3.95	719.11	88.43	0.23
	8058.8	FuturePh2[3]	2698	34.42	48.37		48.61	0.00115	3.95	719.38	88.48	0.23
	8058.8	FuturePh3[4]	2698	34.42	48.36		48.6	0.001153	3.96	718.73	88.35	0.23
	7626	Existing[1]	2887	34.07	47.92		48.13	0.001065	3.92	926.61	103.26	0.22
	7626	PropPh1[2]	2887	34.07	47.91		48.12	0.001067	3.93	925.95	103.25	0.22
	7626	FuturePh2[3]	2887	34.07	47.92		48.12	0.001066	3.93	926.31	103.25	0.22
	7626	FuturePh3[4]	2887	34.07	47.91		48.12	0.001069	3.93	925.43	103.25	0.22
	6629.4	Existing[1]	3106	31.18	46.12		46.58	0.00228	5.45	580.83	71.96	0.3
	6629.4	PropPh1[2]	3106	31.18	46.11		46.57	0.002289	5.46	579.98	71.85	0.3
	6629.4	FuturePh2[3]	3106	31.18	46.12		46.58	0.002284	5.45	580.45	71.91	0.3
	6629.4	FuturePh3[4]	3106	31.18	46.1		46.57	0.002296	5.46	579.32	71.75	0.31
	5764.3	Existing[1]	3106	29.94	44.75		45.09	0.001302	4.85	841.84	116.14	0.25
	5764.3	PropPh1[2]	3106	29.94	44.73		45.07	0.00131	4.86	839.54	115.99	0.25
	5764.3	FuturePh2[3]	3106	29.94	44.74		45.08	0.001305	4.86	840.81	116.07	0.25
	5764.3	FuturePh3[4]	3106	29.94	44.72		45.05	0.001316	4.87	837.73	115.87	0.25

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	5522.1	Existing[1]	3106	29.59	44.34	37.56	44.74	0.001469	5.14	701.59	81.56	0.26
	5522.1	PropPh1[2]	3106	29.59	44.32	37.56	44.72	0.001479	5.15	699.77	81.46	0.27
	5522.1	FuturePh2[3]	3106	29.59	44.33	37.56	44.73	0.001473	5.15	700.78	81.52	0.26
	5522.1	FuturePh3[4]	3106	29.59	44.3	37.56	44.7	0.001487	5.16	698.33	81.39	0.27
	5499.1		Bridge									
	5485.3	Existing[1]	3106	29.57	44.24	36.71	44.53	0.001054	4.35	790.83	86.84	0.22
	5485.3	PropPh1[2]	3106	29.57	44.22	36.71	44.51	0.001061	4.36	788.88	86.75	0.23
	5485.3	FuturePh2[3]	3106	29.57	44.23	36.71	44.52	0.001057	4.35	789.96	86.8	0.22
	5485.3	FuturePh3[4]	3106	29.57	44.2	36.71	44.49	0.001067	4.37	787.35	86.68	0.23
	5417.8		Bridge									
	5350.3	Existing[1]	3106	30.24	43.63	37.38	44	0.001579	4.93	682.52	81.76	0.27
	5350.3	PropPh1[2]	3106	30.24	43.6	37.38	43.97	0.001592	4.94	680.49	81.66	0.27
	5350.3	FuturePh2[3]	3106	30.24	43.61	37.38	43.99	0.001585	4.93	681.61	81.72	0.27
	5350.3	FuturePh3[4]	3106	30.24	43.58	37.38	43.95	0.001603	4.95	678.89	81.58	0.27
	5343.7	Existing[1]	3106	30.34	43.56	36.95	43.96	0.001531	5.22	681	79.27	0.27
	5343.7	PropPh1[2]	3106	30.34	43.53	36.95	43.94	0.001543	5.23	679.01	79.17	0.27
	5343.7	FuturePh2[3]	3106	30.34	43.55	36.95	43.95	0.001537	5.23	680.11	79.22	0.27
	5343.7	FuturePh3[4]	3106	30.34	43.51	36.95	43.92	0.001553	5.24	677.44	79.08	0.27
	5314.7		Bridge									
	5285.7	Existing[1]	3106	30.19	43.12	36.8	43.55	0.001673	5.37	658.43	78.09	0.28
	5285.7	PropPh1[2]	3106	30.19	43.09	36.8	43.53	0.001687	5.38	656.37	77.98	0.28
	5285.7	FuturePh2[3]	3106	30.19	43.11	36.8	43.54	0.00168	5.37	657.42	78.03	0.28
	5285.7	FuturePh3[4]	3106	30.19	43.07	36.8	43.51	0.001698	5.39	654.74	77.89	0.28
	4805.3	Existing[1]	3106	28.79	42.16		42.65	0.002048	5.66	610.75	76.44	0.31
	4805.3	PropPh1[2]	3106	28.79	42.13		42.62	0.002074	5.69	607.88	76.27	0.31
	4805.3	FuturePh2[3]	3106	28.79	42.15		42.63	0.002061	5.67	609.34	76.36	0.31
	4805.3	FuturePh3[4]	3106	28.79	42.1		42.59	0.002094	5.7	605.6	76.14	0.31
	4470.3	Existing[1]	3106	27.81	41.69		42.01	0.001603	5.28	916.06	103.63	0.27
	4470.3	PropPh1[2]	3106	27.81	41.64		41.97	0.001626	5.31	911.39	103.51	0.27
	4470.3	FuturePh2[3]	3106	27.81	41.67		41.99	0.001614	5.3	913.77	103.57	0.27
	4470.3	FuturePh3[4]	3106	27.81	41.61		41.93	0.001645	5.33	907.66	103.42	0.27
	4332	Existing[1]	3106	27.41	41.04	35.58	41.65	0.002544	6.34	548.63	67.49	0.34
	4332	PropPh1[2]	3106	27.41	40.99	35.58	41.6	0.002589	6.38	544.97	67.28	0.34
	4332	FuturePh2[3]	3106	27.41	41.01	35.58	41.63	0.002566	6.36	546.84	67.39	0.34
	4332	FuturePh3[4]	3106	27.41	40.94	35.58	41.56	0.002626	6.41	542.04	67.11	0.34
	4321.5		Bridge									
	4320.7	Existing[1]	3106	27.38	40.92	35.55	41.54	0.002623	6.4	542.33	67.13	0.34
	4320.7	PropPh1[2]	3106	27.38	40.86	35.55	41.49	0.002671	6.44	538.6	66.92	0.35
	4320.7	FuturePh2[3]	3106	27.38	40.89	35.55	41.51	0.002646	6.42	540.51	67.03	0.35
	4320.7	FuturePh3[4]	3106	27.38	40.82	35.55	41.45	0.002707	6.47	535.88	66.76	0.35
	4273.2		Bridge									
	4225.7	Existing[1]	3106	26.96	40.05	35.13	40.73	0.003042	6.7	512.82	65.42	0.37
	4225.7	PropPh1[2]	3106	26.96	39.99	35.13	40.68	0.003109	6.75	508.58	65.17	0.37
	4225.7	FuturePh2[3]	3106	26.96	40.02	35.13	40.71	0.003075	6.73	510.75	65.3	0.37
	4225.7	FuturePh3[4]	3106	26.96	39.94	35.13	40.64	0.003161	6.78	505.47	64.99	0.37
	3807.1	Existing[1]	3106	25.2	39.99		40.09	0.00039	2.8	1646.39	185.66	0.14
	3807.1	PropPh1[2]	3106	25.2	39.92		40.02	0.000398	2.82	1633.71	185.23	0.14
	3807.1	FuturePh2[3]	3106	25.2	39.96		40.05	0.000394	2.81	1640.19	185.45	0.14
	3807.1	FuturePh3[4]	3106	25.2	39.87		39.97	0.000404	2.83	1624.38	184.9	0.14

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	3403.8	Existing[1]	3846	23.47	39.62	30.61	39.83	0.000738	3.74	1066.7	104.57	0.19
	3403.8	PropPh1[2]	3807	23.47	39.55	30.58	39.77	0.000736	3.72	1059.83	104.12	0.19
	3403.8	FuturePh2[3]	3827	23.47	39.59	30.6	39.8	0.000737	3.73	1063.33	104.35	0.19
	3403.8	FuturePh3[4]	3778	23.47	39.5	30.56	39.72	0.000735	3.71	1054.79	103.79	0.19
	3306.3		Bridge									
	3208.8	Existing[1]	3846	22.18	38.03	29.33	38.26	0.000801	3.83	1036.07	102.57	0.19
	3208.8	PropPh1[2]	3807	22.18	37.97	29.29	38.2	0.000799	3.81	1029.83	102.19	0.19
	3208.8	FuturePh2[3]	3827	22.18	38	29.31	38.23	0.0008	3.82	1033.19	102.39	0.19
	3208.8	FuturePh3[4]	3778	22.18	37.92	29.27	38.15	0.000797	3.8	1025.01	101.91	0.19
	2790.6	Existing[1]	3847	22	35.09		36.9	0.015376	10.79	360.66	58.13	0.73
	2790.6	PropPh1[2]	3808	22	35.04		36.84	0.01543	10.76	357.85	57.92	0.73
	2790.6	FuturePh2[3]	3829	22	35.07		36.87	0.015401	10.78	359.36	58.03	0.73
	2790.6	FuturePh3[4]	3778	22	35		36.79	0.015482	10.74	355.62	57.75	0.73
	2557.7	Existing[1]	3847	21.48	34.03		34.88	0.004343	7.45	543.81	74.22	0.44
	2557.7	PropPh1[2]	3808	21.48	33.97		34.82	0.004343	7.42	539.85	73.96	0.44
	2557.7	FuturePh2[3]	3829	21.48	34		34.85	0.004343	7.43	541.99	74.1	0.44
	2557.7	FuturePh3[4]	3778	21.48	33.93		34.77	0.004347	7.4	536.6	73.74	0.44
	2427.7	Existing[1]	3847	21.18	32.88	29.79	34.07	0.007046	8.77	446.6	57.67	0.53
	2427.7	PropPh1[2]	3808	21.18	32.83	29.75	34.01	0.007026	8.73	443.86	57.54	0.53
	2427.7	FuturePh2[3]	3829	21.18	32.86	29.77	34.04	0.007036	8.75	445.34	57.61	0.53
	2427.7	FuturePh3[4]	3778	21.18	32.79	29.72	33.96	0.007023	8.71	441.47	57.43	0.53
	2416.7		Bridge									
	2405.7	Existing[1]	3847	20.97	32.57	29.58	33.79	0.007297	8.87	441.16	57.42	0.54
	2405.7	PropPh1[2]	3808	20.97	32.53	29.54	33.74	0.00727	8.83	438.59	57.3	0.54
	2405.7	FuturePh2[3]	3829	20.97	32.55	29.56	33.77	0.007284	8.85	439.98	57.36	0.54
	2405.7	FuturePh3[4]	3778	20.97	32.49	29.51	33.69	0.007265	8.81	436.29	57.19	0.54
	2340.9	Existing[1]	3849	19.76	32.66	27.74	33.16	0.002742	5.63	693.4	91.46	0.34
	2340.9	PropPh1[2]	3810	19.76	32.62	27.7	33.1	0.002739	5.61	689.03	91.26	0.34
	2340.9	FuturePh2[3]	3831	19.76	32.64	27.72	33.13	0.00274	5.62	691.4	91.37	0.34
	2340.9	FuturePh3[4]	3777	19.76	32.57	27.67	33.06	0.002738	5.59	685.2	91.09	0.34
	2279.4		Bridge									
	2217.9	Existing[1]	3849	18.97	31.2	26.95	31.78	0.003648	6.14	632.3	88.71	0.39
	2217.9	PropPh1[2]	3810	18.97	31.15	26.91	31.73	0.003644	6.11	628.4	88.53	0.39
	2217.9	FuturePh2[3]	3831	18.97	31.18	26.93	31.76	0.003646	6.12	630.51	88.63	0.39
	2217.9	FuturePh3[4]	3777	18.97	31.11	26.88	31.69	0.003644	6.09	624.92	88.37	0.39
	1752.3	Existing[1]	3850	17.74	29.12		29.86	0.004467	7.11	674.09	144.09	0.44
	1752.3	PropPh1[2]	3811	17.74	29.07		29.81	0.004469	7.09	667.73	141.3	0.44
	1752.3	FuturePh2[3]	3832	17.74	29.1		29.84	0.004466	7.1	671.25	142.85	0.44
	1752.3	FuturePh3[4]	3777	17.74	29.03		29.77	0.004478	7.07	661.8	138.65	0.44
	781.2	Existing[1]	3853	16.28	26.11	22.1	26.51	0.002601	5.1	775.71	115.27	0.33
	781.2	PropPh1[2]	3814	16.28	26.07	22.08	26.47	0.002601	5.09	770.4	115.05	0.33
	781.2	FuturePh2[3]	3836	16.28	26.09	22.09	26.49	0.002601	5.1	773.39	115.17	0.33
	781.2	FuturePh3[4]	3776	16.28	26.02	22.05	26.41	0.002605	5.07	764.8	114.82	0.33

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	19209.6	Existing[1]	1760	67.34	76.76		77.88	0.000882	8.51	225.05	86.15	0.62
	19209.6	PropPh1[2]	1760	67.34	76.76		77.88	0.000882	8.51	225.05	86.15	0.62
	19209.6	FuturePh2[3]	1760	67.34	76.76		77.88	0.000882	8.51	225.05	86.15	0.62
	19209.6	FuturePh3[4]	1760	67.34	76.76		77.88	0.000882	8.51	225.05	86.15	0.62
	18393.7	Existing[1]	1760	65.96	75.27		76.89	0.001574	10.23	172.07	31.66	0.77
	18393.7	PropPh1[2]	1760	65.96	75.27		76.89	0.001574	10.23	172.07	31.66	0.77
	18393.7	FuturePh2[3]	1760	65.96	75.27		76.89	0.001574	10.23	172.07	31.66	0.77
	18393.7	FuturePh3[4]	1760	65.96	75.27		76.89	0.001574	10.23	172.07	31.66	0.77
	17507.7	Existing[1]	1760	64.97	74.99	72.02	75.84	0.000603	7.38	238.38	37.63	0.52
	17507.7	PropPh1[2]	1760	64.97	74.99	72.02	75.84	0.000603	7.38	238.38	37.63	0.52
	17507.7	FuturePh2[3]	1760	64.97	74.99	72.02	75.84	0.000603	7.38	238.38	37.63	0.52
	17507.7	FuturePh3[4]	1760	64.97	74.99	72.02	75.84	0.000603	7.38	238.38	37.63	0.52
	17444.3	Existing[1]	1760	64.9	74.34	72.9	75.65	0.00119	9.19	191.53	34.12	0.68
	17444.3	PropPh1[2]	1760	64.9	74.34	72.9	75.65	0.00119	9.19	191.53	34.12	0.68
	17444.3	FuturePh2[3]	1760	64.9	74.34	72.9	75.65	0.00119	9.19	191.53	34.12	0.68
	17444.3	FuturePh3[4]	1760	64.9	74.34	72.9	75.65	0.00119	9.19	191.53	34.12	0.68
	17433.3		Bridge									
	17431.8	Existing[1]	1760	64.89	74.4	72.59	75.57	0.001274	8.69	202.48	34.34	0.63
	17431.8	PropPh1[2]	1760	64.89	74.4	72.59	75.57	0.001274	8.69	202.48	34.34	0.63
	17431.8	FuturePh2[3]	1760	64.89	74.4	72.59	75.57	0.001274	8.69	202.48	34.34	0.63
	17431.8	FuturePh3[4]	1760	64.89	74.4	72.59	75.57	0.001274	8.69	202.48	34.34	0.63
	17383.8		Bridge									
	17335.8	Existing[1]	1760	64.71	72.62	72.43	74.76	0.002989	11.74	149.9	31.35	0.95
	17335.8	PropPh1[2]	1760	64.71	72.62	72.43	74.76	0.002989	11.74	149.9	31.35	0.95
	17335.8	FuturePh2[3]	1760	64.71	72.62	72.43	74.76	0.002989	11.74	149.9	31.35	0.95
	17335.8	FuturePh3[4]	1760	64.71	72.62	72.43	74.76	0.002989	11.74	149.9	31.35	0.95
	17139	Existing[1]	1760	63.93	71.49	71.49	74.04	0.002694	12.81	138.59	33.28	1
	17139	PropPh1[2]	1760	63.93	71.49	71.49	74.04	0.002694	12.81	138.59	33.28	1
	17139	FuturePh2[3]	1760	63.93	71.49	71.49	74.04	0.002694	12.81	138.59	33.28	1
	17139	FuturePh3[4]	1760	63.93	71.49	71.49	74.04	0.002694	12.81	138.59	33.28	1
	16368.5	Existing[1]	1760	60.87	71.16		72.23	0.000639	8.31	227.45	42.56	0.52
	16368.5	PropPh1[2]	1760	60.87	71.16		72.23	0.000639	8.31	227.45	42.56	0.52
	16368.5	FuturePh2[3]	1760	60.87	71.16		72.23	0.000639	8.31	227.45	42.56	0.52
	16368.5	FuturePh3[4]	1760	60.87	71.16		72.23	0.000639	8.31	227.45	42.56	0.52
	15380.2	Existing[1]	2106	59.59	69.66	68.1	71.19	0.001638	9.91	212.48	37.44	0.72
	15380.2	PropPh1[2]	2106	59.59	69.66	68.1	71.19	0.001638	9.91	212.48	37.44	0.72
	15380.2	FuturePh2[3]	2106	59.59	69.66	68.1	71.19	0.001638	9.91	212.48	37.44	0.72
	15380.2	FuturePh3[4]	2106	59.59	69.66	68.1	71.19	0.001638	9.91	212.48	37.44	0.72
	15029.4	Existing[1]	2106	59.02	67.6	67.6	70.28	0.003353	13.14	160.31	30.03	1
	15029.4	PropPh1[2]	2106	59.02	67.6	67.6	70.28	0.003353	13.14	160.31	30.03	1
	15029.4	FuturePh2[3]	2106	59.02	67.6	67.6	70.28	0.003353	13.14	160.31	30.03	1
	15029.4	FuturePh3[4]	2106	59.02	67.6	67.6	70.28	0.003353	13.14	160.31	30.03	1
	14479.9	Existing[1]	2106	58.14	67.43	65.42	68.75	0.000887	9.23	228.22	34.56	0.63
	14479.9	PropPh1[2]	2106	58.14	67.43	65.42	68.75	0.000887	9.23	228.22	34.56	0.63
	14479.9	FuturePh2[3]	2106	58.14	67.43	65.42	68.75	0.000887	9.23	228.22	34.56	0.63
	14479.9	FuturePh3[4]	2106	58.14	67.43	65.42	68.75	0.000887	9.23	228.22	34.56	0.63
	14449.4		Bridge									
	14418.9	Existing[1]	2106	57.97	67.22	65.25	68.56	0.000903	9.29	226.73	34.48	0.64
	14418.9	PropPh1[2]	2106	57.97	67.22	65.25	68.56	0.000903	9.29	226.73	34.48	0.64
	14418.9	FuturePh2[3]	2106	57.97	67.22	65.25	68.56	0.000903	9.29	226.73	34.48	0.64
	14418.9	FuturePh3[4]	2106	57.97	67.22	65.25	68.56	0.000903	9.29	226.73	34.48	0.64

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	13972.2	Existing[1]	2106	56.53	67.31		67.92	0.00044	6.3	334.31	53.71	0.44
	13972.2	PropPh1[2]	2106	56.53	67.31		67.92	0.00044	6.3	334.31	53.71	0.44
	13972.2	FuturePh2[3]	2106	56.53	67.31		67.92	0.00044	6.3	334.31	53.71	0.44
	13972.2	FuturePh3[4]	2106	56.53	67.31		67.92	0.00044	6.3	334.31	53.71	0.44
	13404.1	Existing[1]	2888	54.71	65.83		67.39	0.001341	10.03	287.84	41.46	0.67
	13404.1	PropPh1[2]	2888	54.71	65.83		67.39	0.001341	10.03	287.84	41.46	0.67
	13404.1	FuturePh2[3]	2888	54.71	65.83		67.39	0.001341	10.03	287.84	41.46	0.67
	13404.1	FuturePh3[4]	2888	54.71	65.83		67.39	0.001341	10.03	287.84	41.46	0.67
	12959.9	Existing[1]	2888	53.36	66.38		66.82	0.000283	5.3	544.53	73.63	0.34
	12959.9	PropPh1[2]	2888	53.36	66.38		66.82	0.000283	5.3	544.53	73.63	0.34
	12959.9	FuturePh2[3]	2888	53.36	66.38		66.82	0.000283	5.3	544.53	73.63	0.34
	12959.9	FuturePh3[4]	2888	53.36	66.38		66.82	0.000283	5.3	544.53	73.63	0.34
	12859.9	Existing[1]	3151	53.06	65.37	62.86	66.53	0.002281	8.65	364.4	57.21	0.6
	12859.9	PropPh1[2]	3151	53.06	65.37	62.86	66.53	0.002281	8.65	364.4	57.21	0.6
	12859.9	FuturePh2[3]	3151	53.06	65.37	62.86	66.53	0.002281	8.65	364.4	57.21	0.6
	12859.9	FuturePh3[4]	3151	53.06	65.37	62.86	66.53	0.002281	8.65	364.4	57.21	0.6
	12817.9		Bridge									
	12775.9	Existing[1]	3151	52.87	64.48	62.67	65.93	0.003066	9.68	325.49	53.43	0.69
	12775.9	PropPh1[2]	3151	52.87	64.48	62.67	65.93	0.003066	9.68	325.49	53.43	0.69
	12775.9	FuturePh2[3]	3151	52.87	64.48	62.67	65.93	0.003066	9.68	325.49	53.43	0.69
	12775.9	FuturePh3[4]	3151	52.87	64.48	62.67	65.93	0.003066	9.68	325.48	53.43	0.69
	12490	Existing[1]	3151	52.01	64.24	61.16	65.06	0.001302	7.27	433.32	74.81	0.53
	12490	PropPh1[2]	3151	52.01	64.24	61.16	65.06	0.001302	7.27	433.32	74.81	0.53
	12490	FuturePh2[3]	3151	52.01	64.24	61.16	65.06	0.001302	7.27	433.32	74.81	0.53
	12490	FuturePh3[4]	3151	52.01	64.24	61.16	65.06	0.001302	7.27	433.31	74.81	0.53
	12193.4	Existing[1]	3394	51.11	60.83	60.83	64.01	0.008358	14.3	237.26	37.59	1
	12193.4	PropPh1[2]	3394	51.11	60.83	60.83	64.01	0.008358	14.3	237.26	37.59	1
	12193.4	FuturePh2[3]	3394	51.11	60.83	60.83	64.01	0.008358	14.3	237.26	37.59	1
	12193.4	FuturePh3[4]	3394	51.11	60.83	60.83	64.01	0.008358	14.3	237.26	37.59	1
	11598.5	Existing[1]	3394	49.79	61.25		61.73	0.000768	5.55	611.22	78.44	0.35
	11598.5	PropPh1[2]	3394	49.79	61.25		61.73	0.000768	5.55	611.16	78.44	0.35
	11598.5	FuturePh2[3]	3394	49.79	61.25		61.73	0.000768	5.55	611.18	78.44	0.35
	11598.5	FuturePh3[4]	3394	49.79	61.25		61.73	0.000768	5.56	610.96	78.43	0.35
	11492.6	Existing[1]	3394	49.55	61.17	55.99	61.63	0.000726	5.44	623.93	79.14	0.34
	11492.6	PropPh1[2]	3394	49.55	61.17	55.99	61.63	0.000726	5.44	623.87	79.14	0.34
	11492.6	FuturePh2[3]	3394	49.55	61.17	55.99	61.63	0.000726	5.44	623.89	79.14	0.34
	11492.6	FuturePh3[4]	3394	49.55	61.17	55.99	61.63	0.000726	5.44	623.66	79.13	0.34
	11443.6		Bridge									
	11394.6	Existing[1]	3394	49.2	60.67	55.64	61.14	0.000766	5.55	611.55	78.46	0.35
	11394.6	PropPh1[2]	3394	49.2	60.67	55.64	61.14	0.000767	5.55	611.48	78.46	0.35
	11394.6	FuturePh2[3]	3394	49.2	60.67	55.64	61.14	0.000767	5.55	611.5	78.46	0.35
	11394.6	FuturePh3[4]	3394	49.2	60.66	55.64	61.14	0.000767	5.55	611.26	78.45	0.35
	11197.6	Existing[1]	3394	48.43	60.69		61.01	0.000139	4.55	854.9	106.52	0.25
	11197.6	PropPh1[2]	3394	48.43	60.69		61.01	0.000139	4.55	854.81	106.51	0.25
	11197.6	FuturePh2[3]	3394	48.43	60.69		61.01	0.000139	4.55	854.85	106.51	0.25
	11197.6	FuturePh3[4]	3394	48.43	60.69		61.01	0.000139	4.55	854.52	106.5	0.25
	11108	Existing[1]	3394	48.08	60.58	54.32	60.98	0.000163	5.05	774.26	93.84	0.27
	11108	PropPh1[2]	3394	48.08	60.58	54.32	60.97	0.000163	5.05	774.18	93.84	0.27
	11108	FuturePh2[3]	3394	48.08	60.58	54.32	60.97	0.000163	5.05	774.21	93.84	0.27
	11108	FuturePh3[4]	3394	48.08	60.58	54.32	60.97	0.000163	5.05	773.92	93.82	0.27
	11097		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	11095.7	Existing[1]	3394	48.04	60.57	54.41	60.96	0.000325	5.07	768.48	93.95	0.27
	11095.7	PropPh1[2]	3394	48.04	60.57	54.41	60.96	0.000325	5.07	768.4	93.95	0.27
	11095.7	FuturePh2[3]	3394	48.04	60.57	54.41	60.96	0.000325	5.07	768.43	93.95	0.27
	11095.7	FuturePh3[4]	3394	48.04	60.56	54.41	60.96	0.000326	5.07	768.14	93.94	0.27
	11073		Bridge									
	11050.3	Existing[1]	3394	47.71	60.17	54.08	60.57	0.000333	5.11	761.93	93.61	0.28
	11050.3	PropPh1[2]	3394	47.71	60.17	54.08	60.57	0.000333	5.11	761.85	93.61	0.28
	11050.3	FuturePh2[3]	3394	47.71	60.17	54.08	60.57	0.000333	5.11	761.88	93.61	0.28
	11050.3	FuturePh3[4]	3394	47.71	60.16	54.08	60.56	0.000333	5.11	761.58	93.6	0.28
	11007.9	Existing[1]	3898	47.75	60.12	54.03	60.53	0.001637	5.19	801.72	87.97	0.28
	11007.9	PropPh1[2]	3898	47.75	60.12	54.03	60.53	0.001637	5.19	801.64	87.96	0.28
	11007.9	FuturePh2[3]	3898	47.75	60.12	54.03	60.53	0.001637	5.19	801.67	87.97	0.28
	11007.9	FuturePh3[4]	3898	47.75	60.12	54.03	60.53	0.001639	5.19	801.38	87.96	0.28
	10997.4		Bridge									
	10986.9	Existing[1]	3898	47.72	60.01	54	60.43	0.00168	5.23	794.54	87.72	0.28
	10986.9	PropPh1[2]	3898	47.72	60.01	54	60.43	0.00168	5.23	794.46	87.72	0.28
	10986.9	FuturePh2[3]	3898	47.72	60.01	54	60.43	0.00168	5.23	794.49	87.72	0.28
	10986.9	FuturePh3[4]	3898	47.72	60.01	54	60.43	0.001682	5.23	794.2	87.71	0.28
	10363.6	Existing[1]	4158	44.94	57.59		58.54	0.005161	8.17	655.65	108.64	0.47
	10363.6	PropPh1[2]	4158	44.94	57.59		58.54	0.005168	8.17	655.33	108.62	0.47
	10363.6	FuturePh2[3]	4158	44.94	57.59		58.54	0.005165	8.17	655.44	108.63	0.47
	10363.6	FuturePh3[4]	4158	44.94	57.58		58.53	0.005189	8.18	654.26	108.58	0.48
	9604.7	Existing[1]	4475	41.43	55.79		56.19	0.001895	5.64	1208.41	167.05	0.3
	9604.7	PropPh1[2]	4475	41.43	55.78		56.18	0.001899	5.64	1207.16	166.97	0.3
	9604.7	FuturePh2[3]	4475	41.43	55.79		56.18	0.001898	5.64	1207.63	167	0.3
	9604.7	FuturePh3[4]	4475	41.43	55.76		56.16	0.001916	5.66	1203.01	166.72	0.3
	9178.3	Existing[1]	4475	38.89	54.69		55.29	0.002238	6.36	794.43	88.62	0.33
	9178.3	PropPh1[2]	4475	38.89	54.68		55.29	0.002245	6.36	793.5	88.58	0.33
	9178.3	FuturePh2[3]	4475	38.89	54.68		55.29	0.002242	6.36	793.85	88.6	0.33
	9178.3	FuturePh3[4]	4475	38.89	54.64		55.25	0.002269	6.38	790.38	88.44	0.33
	8486.4	Existing[1]	4942	34.77	53.35		53.85	0.001887	6.26	1101.75	109.5	0.3
	8486.4	PropPh1[2]	4942	34.77	53.33		53.84	0.001896	6.27	1099.99	109.46	0.3
	8486.4	FuturePh2[3]	4942	34.77	53.34		53.84	0.001893	6.27	1100.64	109.48	0.3
	8486.4	FuturePh3[4]	4942	34.77	53.28		53.79	0.001924	6.3	1094.06	109.31	0.3
	8058.8	Existing[1]	4942	34.42	52.91		53.22	0.001004	4.63	1289.37	143.93	0.22
	8058.8	PropPh1[2]	4942	34.42	52.89		53.21	0.001009	4.63	1286.72	143.83	0.22
	8058.8	FuturePh2[3]	4942	34.42	52.9		53.21	0.001007	4.63	1287.71	143.87	0.22
	8058.8	FuturePh3[4]	4942	34.42	52.83		53.15	0.001027	4.66	1277.79	143.5	0.23
	7626	Existing[1]	5301	34.07	52.48		52.79	0.001028	4.82	1410.86	110.88	0.22
	7626	PropPh1[2]	5301	34.07	52.46		52.77	0.001033	4.83	1408.6	110.81	0.22
	7626	FuturePh2[3]	5301	34.07	52.47		52.78	0.001032	4.82	1409.44	110.84	0.22
	7626	FuturePh3[4]	5301	34.07	52.39		52.71	0.00105	4.85	1400.96	110.55	0.23
	6629.4	Existing[1]	5717	31.18	50.75		51.37	0.001943	6.49	1090.43	133.36	0.3
	6629.4	PropPh1[2]	5717	31.18	50.72		51.34	0.00196	6.51	1086.09	133.06	0.3
	6629.4	FuturePh2[3]	5717	31.18	50.73		51.35	0.001954	6.5	1087.7	133.17	0.3
	6629.4	FuturePh3[4]	5717	31.18	50.61		51.24	0.002018	6.57	1071.34	132.04	0.3
	5764.3	Existing[1]	5717	29.94	49.59		50.03	0.00117	5.79	1509.53	160.55	0.25
	5764.3	PropPh1[2]	5717	29.94	49.55		49.99	0.001182	5.81	1502.3	160.13	0.25
	5764.3	FuturePh2[3]	5717	29.94	49.56		50	0.001178	5.8	1505	160.29	0.25
	5764.3	FuturePh3[4]	5717	29.94	49.39		49.85	0.001227	5.88	1477.57	158.68	0.26

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	5522.1	Existing[1]	5717	29.59	49.08	40.15	49.67	0.001472	6.45	1135.38	101.73	0.28
	5522.1	PropPh1[2]	5717	29.59	49.03	40.15	49.62	0.001489	6.47	1130.32	101.52	0.28
	5522.1	FuturePh2[3]	5717	29.59	49.04	40.15	49.64	0.001483	6.47	1132.21	101.6	0.28
	5522.1	FuturePh3[4]	5717	29.59	48.85	40.15	49.47	0.001547	6.55	1112.93	100.79	0.29
	5499.1		Bridge									
	5485.3	Existing[1]	5717	29.57	48.98	39.18	49.43	0.001075	5.51	1246.88	105.57	0.24
	5485.3	PropPh1[2]	5717	29.57	48.93	39.18	49.38	0.001087	5.53	1241.68	105.38	0.24
	5485.3	FuturePh2[3]	5717	29.57	48.95	39.18	49.4	0.001082	5.52	1243.63	105.45	0.24
	5485.3	FuturePh3[4]	5717	29.57	48.76	39.18	49.22	0.001128	5.6	1223.93	104.71	0.25
	5417.8		Bridge									
	5350.3	Existing[1]	5717	30.24	48.32	39.85	48.86	0.001452	6.06	1109.89	100.32	0.27
	5350.3	PropPh1[2]	5717	30.24	48.27	39.85	48.82	0.00147	6.08	1104.64	100.11	0.28
	5350.3	FuturePh2[3]	5717	30.24	48.29	39.85	48.83	0.001463	6.07	1106.68	100.19	0.28
	5350.3	FuturePh3[4]	5717	30.24	48.08	39.85	48.65	0.001536	6.16	1086.3	99.38	0.28
	5343.7	Existing[1]	5717	30.34	48.22	39.53	48.84	0.001543	6.57	1095.14	98.45	0.29
	5343.7	PropPh1[2]	5717	30.34	48.16	39.53	48.79	0.001562	6.6	1089.86	98.23	0.29
	5343.7	FuturePh2[3]	5717	30.34	48.18	39.53	48.81	0.001554	6.59	1091.92	98.32	0.29
	5343.7	FuturePh3[4]	5717	30.34	47.98	39.53	48.62	0.00163	6.69	1071.45	97.46	0.29
	5314.7		Bridge									
	5285.7	Existing[1]	5717	30.19	47.76	39.38	48.41	0.001654	6.72	1065.12	97.19	0.3
	5285.7	PropPh1[2]	5717	30.19	47.7	39.38	48.36	0.001676	6.75	1059.45	96.95	0.3
	5285.7	FuturePh2[3]	5717	30.19	47.73	39.38	48.38	0.001667	6.73	1061.85	97.05	0.3
	5285.7	FuturePh3[4]	5717	30.19	47.5	39.38	48.18	0.001755	6.84	1040.14	96.12	0.31
	4805.3	Existing[1]	5717	28.79	46.86		47.56	0.001876	6.93	1018.18	97.17	0.31
	4805.3	PropPh1[2]	5717	28.79	46.78		47.49	0.00191	6.97	1010.87	96.83	0.32
	4805.3	FuturePh2[3]	5717	28.79	46.81		47.52	0.001896	6.95	1013.97	96.97	0.31
	4805.3	FuturePh3[4]	5717	28.79	46.52		47.26	0.002034	7.11	985.64	95.67	0.32
	4470.3	Existing[1]	5717	27.81	46.48		46.93	0.001525	6.47	1448.87	123.17	0.28
	4470.3	PropPh1[2]	5717	27.81	46.39		46.85	0.001554	6.51	1438.55	122.65	0.28
	4470.3	FuturePh2[3]	5717	27.81	46.43		46.89	0.001542	6.49	1442.93	122.87	0.28
	4470.3	FuturePh3[4]	5717	27.81	46.1		46.58	0.001662	6.65	1402.77	120.85	0.29
	4332	Existing[1]	5717	27.41	45.64	38.36	46.54	0.002443	7.87	899.44	85.15	0.35
	4332	PropPh1[2]	5717	27.41	45.54	38.36	46.45	0.002501	7.93	890.9	84.77	0.36
	4332	FuturePh2[3]	5717	27.41	45.58	38.36	46.49	0.002476	7.9	894.53	84.93	0.36
	4332	FuturePh3[4]	5717	27.41	45.18	38.36	46.15	0.002723	8.15	860.96	83.4	0.37
	4321.5		Bridge									
	4320.7	Existing[1]	5717	27.38	45.5	38.33	46.42	0.002506	7.93	890.27	84.74	0.36
	4320.7	PropPh1[2]	5717	27.38	45.4	38.33	46.33	0.002567	7.99	881.6	84.34	0.36
	4320.7	FuturePh2[3]	5717	27.38	45.44	38.33	46.37	0.002541	7.97	885.29	84.51	0.36
	4320.7	FuturePh3[4]	5717	27.38	45.03	38.33	46.01	0.002807	8.22	850.62	82.92	0.38
	4273.2		Bridge									
	4225.7	Existing[1]	5717	26.96	44.56	37.91	45.55	0.002842	8.26	846.34	82.72	0.38
	4225.7	PropPh1[2]	5717	26.96	44.44	37.91	45.45	0.002925	8.33	836.66	82.27	0.38
	4225.7	FuturePh2[3]	5717	26.96	44.49	37.91	45.49	0.002889	8.3	840.78	82.46	0.38
	4225.7	FuturePh3[4]	5717	26.96	44	37.91	45.09	0.003263	8.62	800.96	80.59	0.4
	3807.1	Existing[1]	5717	25.2	44.63		44.77	0.000398	3.51	2576.14	215.37	0.15
	3807.1	PropPh1[2]	5717	25.2	44.51		44.66	0.000408	3.54	2550.62	214.61	0.15
	3807.1	FuturePh2[3]	5717	25.2	44.56		44.7	0.000404	3.53	2561.49	214.93	0.15
	3807.1	FuturePh3[4]	5717	25.2	44.06		44.22	0.000452	3.66	2455.77	211.76	0.16

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	3403.8	Existing[1]	7125	23.47	44.09	33	44.46	0.000869	4.98	1600.48	133.33	0.21
	3403.8	PropPh1[2]	7031	23.47	43.98	32.94	44.35	0.000867	4.95	1585.51	132.65	0.21
	3403.8	FuturePh2[3]	7071	23.47	44.02	32.97	44.4	0.000868	4.96	1591.89	132.94	0.21
	3403.8	FuturePh3[4]	6680	23.47	43.55	32.68	43.91	0.000856	4.84	1530.32	130.12	0.21
	3306.3		Bridge									
	3208.8	Existing[1]	7125	22.18	42.4	31.71	42.79	0.000946	5.11	1547.6	130.92	0.22
	3208.8	PropPh1[2]	7031	22.18	42.29	31.66	42.68	0.000944	5.08	1533.24	130.25	0.22
	3208.8	FuturePh2[3]	7071	22.18	42.33	31.69	42.73	0.000945	5.1	1539.36	130.54	0.22
	3208.8	FuturePh3[4]	6680	22.18	41.87	31.4	42.25	0.000932	4.97	1480.02	127.76	0.22
	2790.6	Existing[1]	7121	22	38.57		41.16	0.012955	13.03	589.29	73.51	0.72
	2790.6	PropPh1[2]	7027	22	38.48		41.05	0.013003	12.97	582.74	73.12	0.72
	2790.6	FuturePh2[3]	7067	22	38.51		41.09	0.012981	13	585.54	73.28	0.72
	2790.6	FuturePh3[4]	6679	22	38.14		40.64	0.013172	12.77	558.69	71.64	0.72
	2557.7	Existing[1]	7121	21.48	37.79		39.14	0.004435	9.49	858.25	92.35	0.47
	2557.7	PropPh1[2]	7027	21.48	37.69		39.03	0.004437	9.44	849.3	91.95	0.47
	2557.7	FuturePh2[3]	7067	21.48	37.74		39.08	0.004436	9.46	853.14	92.12	0.47
	2557.7	FuturePh3[4]	6679	21.48	37.33		38.63	0.004437	9.26	816.49	90.5	0.46
	2427.7	Existing[1]	7121	21.18	36.11	32.84	38.17	0.008097	11.6	654.04	71.5	0.6
	2427.7	PropPh1[2]	7027	21.18	36.03	32.76	38.07	0.008081	11.53	648.12	71.12	0.6
	2427.7	FuturePh2[3]	7067	21.18	36.06	32.79	38.11	0.008086	11.56	650.68	71.28	0.6
	2427.7	FuturePh3[4]	6679	21.18	35.73	32.47	37.68	0.008	11.27	626.8	69.73	0.59
	2416.7		Bridge									
	2405.7	Existing[1]	7121	20.97	35.56	32.63	37.76	0.008972	11.97	629.87	69.93	0.63
	2405.7	PropPh1[2]	7027	20.97	35.48	32.55	37.65	0.008944	11.9	624.53	69.58	0.63
	2405.7	FuturePh2[3]	7067	20.97	35.52	32.58	37.7	0.008954	11.93	626.86	69.74	0.63
	2405.7	FuturePh3[4]	6679	20.97	35.21	32.26	37.28	0.008799	11.6	605.55	68.32	0.62
	2340.9	Existing[1]	7117	19.76	35.92	30.48	36.76	0.003063	7.42	1012.23	104.62	0.38
	2340.9	PropPh1[2]	7023	19.76	35.83	30.42	36.67	0.003058	7.37	1003.44	104.27	0.38
	2340.9	FuturePh2[3]	7063	19.76	35.87	30.45	36.71	0.00306	7.39	1007.27	104.42	0.38
	2340.9	FuturePh3[4]	6678	19.76	35.53	30.17	36.33	0.003031	7.21	971.89	103.04	0.38
	2279.4		Bridge									
	2217.9	Existing[1]	7117	18.97	34.15	29.69	35.16	0.004143	8.13	911.62	100.65	0.44
	2217.9	PropPh1[2]	7023	18.97	34.07	29.63	35.08	0.004134	8.08	904.02	100.34	0.44
	2217.9	FuturePh2[3]	7063	18.97	34.1	29.66	35.12	0.004137	8.1	907.31	100.48	0.44
	2217.9	FuturePh3[4]	6678	18.97	33.8	29.38	34.76	0.004088	7.9	876.74	99.24	0.43
	1752.3	Existing[1]	7113	17.74	32.25		33.21	0.004129	8.5	1300.07	241.55	0.45
	1752.3	PropPh1[2]	7018	17.74	32.17		33.13	0.004142	8.47	1280.67	239.48	0.45
	1752.3	FuturePh2[3]	7059	17.74	32.21		33.16	0.004136	8.48	1289.13	240.39	0.45
	1752.3	FuturePh3[4]	6678	17.74	31.89		32.83	0.004177	8.36	1213.35	232.14	0.45
	781.2	Existing[1]	7104	16.28	29.35	24.01	29.99	0.002603	6.46	1206.85	156.4	0.35
	781.2	PropPh1[2]	7008	16.28	29.26	23.96	29.9	0.002603	6.43	1193.86	155.01	0.35
	781.2	FuturePh2[3]	7050	16.28	29.3	23.98	29.94	0.002603	6.45	1199.54	155.62	0.35
	781.2	FuturePh3[4]	6676	16.28	28.97	23.78	29.58	0.002603	6.31	1149.16	150.11	0.35

Existing Conditions[1]: Model includes FEMA Effective geometry data with the Existing Conditions HMS model flows.

PropPh1[2]: Model includes FEMA Effective geometry data with the Proposed Phase 1 (Pond-Only) HMS model flows.

FuturePh2[3]: Model includes FEMA Effective geometry data with the Future Phase 2 (Channel Impvs) HMS model flows.

FuturePh3[4]: Model includes FEMA Effective geometry data with the Future Phase 3 (Storm Sew Impvs) HMS model flows.

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	248647.7	Existing[1]	1765	56.61	70.9		70.97	0.000045	2.01	878.52	104.4	0.12
	248647.7	PropPh1[2]	1765	56.61	70.9		70.97	0.000045	2.01	878.51	104.4	0.12
	248647.7	FuturePh2[3]	1765	56.61	70.9		70.97	0.000045	2.01	878.51	104.4	0.12
	248647.7	FuturePh3[4]	1765	56.61	70.9		70.97	0.000045	2.01	878.51	104.4	0.12
	248547.8	Existing[1]	1765	56.16	70.9	61.11	70.96	0.000158	1.91	925.49	107.1	0.11
	248547.8	PropPh1[2]	1765	56.16	70.9	61.11	70.96	0.000158	1.91	925.49	107.1	0.11
	248547.8	FuturePh2[3]	1765	56.16	70.9	61.11	70.96	0.000158	1.91	925.49	107.1	0.11
	248547.8	FuturePh3[4]	1765	56.16	70.9	61.11	70.96	0.000158	1.91	925.49	107.1	0.11
	248481.1		Bridge									
	248414.4	Existing[1]	1765	55.9	70.65	60.84	70.71	0.000157	1.9	926.94	107.18	0.11
	248414.4	PropPh1[2]	1765	55.9	70.65	60.84	70.71	0.000157	1.9	926.93	107.18	0.11
	248414.4	FuturePh2[3]	1765	55.9	70.65	60.84	70.71	0.000157	1.9	926.94	107.18	0.11
	248414.4	FuturePh3[4]	1765	55.9	70.65	60.84	70.71	0.000157	1.9	926.94	107.18	0.11
	247502	Existing[1]	1752	50.81	70.5		70.53	0.000214	1.43	1223.85	119.14	0.08
	247502	PropPh1[2]	1752	50.81	70.5		70.53	0.000214	1.43	1223.85	119.14	0.08
	247502	FuturePh2[3]	1752	50.81	70.5		70.53	0.000214	1.43	1223.85	119.14	0.08
	247502	FuturePh3[4]	1752	50.81	70.5		70.53	0.000214	1.43	1223.85	119.14	0.08
	246449.8	Existing[1]	1752	52.3	70.31		70.34	0.000151	1.46	1203.47	123.34	0.08
	246449.8	PropPh1[2]	1752	52.3	70.31		70.34	0.000151	1.46	1203.46	123.34	0.08
	246449.8	FuturePh2[3]	1752	52.3	70.31		70.34	0.000151	1.46	1203.46	123.34	0.08
	246449.8	FuturePh3[4]	1752	52.3	70.31		70.34	0.000151	1.46	1203.46	123.34	0.08
	245413.7	Existing[1]	1724	51.09	70.13		70.16	0.000214	1.37	1258.83	123.15	0.08
	245413.7	PropPh1[2]	1724	51.09	70.13		70.16	0.000214	1.37	1258.82	123.15	0.08
	245413.7	FuturePh2[3]	1724	51.09	70.13		70.16	0.000214	1.37	1258.83	123.15	0.08
	245413.7	FuturePh3[4]	1724	51.09	70.13		70.16	0.000214	1.37	1258.83	123.15	0.08
	244345.5	Existing[1]	1724	49	69.98		70	0.000105	1.22	1412.46	136.72	0.07
	244345.5	PropPh1[2]	1724	49	69.98		70	0.000105	1.22	1412.46	136.72	0.07
	244345.5	FuturePh2[3]	1724	49	69.98		70	0.000105	1.22	1412.46	136.72	0.07
	244345.5	FuturePh3[4]	1724	49	69.98		70	0.000105	1.22	1412.46	136.72	0.07
	243452.9	Existing[1]	1698	49	69.89		69.91	0.000095	1.07	1586.77	167.59	0.06
	243452.9	PropPh1[2]	1698	49	69.89		69.91	0.000095	1.07	1586.77	167.59	0.06
	243452.9	FuturePh2[3]	1698	49	69.89		69.91	0.000095	1.07	1586.77	167.59	0.06
	243452.9	FuturePh3[4]	1698	49	69.89		69.91	0.000095	1.07	1586.77	167.59	0.06
	242655.3	Existing[1]	1698	49.31	69.76		69.79	0.000271	1.3	1303.53	127.56	0.07
	242655.3	PropPh1[2]	1698	49.31	69.76		69.79	0.000271	1.3	1303.52	127.56	0.07
	242655.3	FuturePh2[3]	1698	49.31	69.76		69.79	0.000271	1.3	1303.53	127.56	0.07
	242655.3	FuturePh3[4]	1698	49.31	69.76		69.79	0.000271	1.3	1303.53	127.56	0.07
	241917.5	Existing[1]	1698	48.64	69.61	54.21	69.63	0.000184	1.12	1522.22	152.25	0.06
	241917.5	PropPh1[2]	1698	48.64	69.61	54.21	69.63	0.000184	1.12	1522.22	152.25	0.06
	241917.5	FuturePh2[3]	1698	48.64	69.61	54.21	69.63	0.000184	1.12	1522.22	152.25	0.06
	241917.5	FuturePh3[4]	1698	48.64	69.61	54.21	69.63	0.000184	1.12	1522.22	152.25	0.06
	241646.1	Existing[1]	1698	48.4	69.56	53.97	69.58	0.000134	1.08	1577.5	140.56	0.06
	241646.1	PropPh1[2]	1698	48.4	69.56	53.97	69.58	0.000134	1.08	1577.5	140.56	0.06
	241646.1	FuturePh2[3]	1698	48.4	69.56	53.97	69.58	0.000134	1.08	1577.5	140.56	0.06
	241646.1	FuturePh3[4]	1698	48.4	69.56	53.97	69.58	0.000134	1.08	1577.5	140.56	0.06
	241632.7		Bridge									
	241619.3	Existing[1]	1698	48.33	69.49	53.9	69.51	0.000134	1.08	1576.74	140.53	0.06
	241619.3	PropPh1[2]	1698	48.33	69.49	53.9	69.51	0.000134	1.08	1576.73	140.53	0.06
	241619.3	FuturePh2[3]	1698	48.33	69.49	53.9	69.51	0.000134	1.08	1576.73	140.53	0.06
	241619.3	FuturePh3[4]	1698	48.33	69.49	53.9	69.51	0.000134	1.08	1576.73	140.53	0.06
	241079	Existing[1]	1665	49.13	69.46		69.46	0.000042	0.62	2667.76	210.17	0.03
	241079	PropPh1[2]	1665	49.13	69.46		69.46	0.000042	0.62	2667.75	210.17	0.03

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	241079	FuturePh2[3]	1665	49.13	69.46		69.46	0.000042	0.62	2667.75	210.17	0.03
	241079	FuturePh3[4]	1665	49.13	69.46		69.46	0.000042	0.62	2667.75	210.17	0.03
	240579	Existing[1]	1665	48.94	69.43		69.44	0.000069	0.8	2081.12	198.23	0.04
	240579	PropPh1[2]	1665	48.94	69.43		69.44	0.000069	0.8	2081.11	198.23	0.04
	240579	FuturePh2[3]	1665	48.94	69.43		69.44	0.000069	0.8	2081.12	198.23	0.04
	240579	FuturePh3[4]	1665	48.94	69.43		69.44	0.000069	0.8	2081.12	198.23	0.04
	240376.3	Existing[1]	1665	48.86	69.41	53.01	69.42	0.000099	0.8	2093.73	198.62	0.04
	240376.3	PropPh1[2]	1665	48.86	69.41	53.01	69.42	0.000099	0.8	2093.72	198.62	0.04
	240376.3	FuturePh2[3]	1665	48.86	69.41	53.01	69.42	0.000099	0.8	2093.72	198.62	0.04
	240376.3	FuturePh3[4]	1665	48.86	69.41	53.01	69.42	0.000099	0.8	2093.72	198.62	0.04
	240315.3		Bridge									
	240254.3	Existing[1]	1665	48.68	69.28	52.82	69.29	0.000098	0.79	2102.92	198.9	0.04
	240254.3	PropPh1[2]	1665	48.68	69.28	52.82	69.29	0.000098	0.79	2102.91	198.9	0.04
	240254.3	FuturePh2[3]	1665	48.68	69.28	52.82	69.29	0.000098	0.79	2102.91	198.9	0.04
	240254.3	FuturePh3[4]	1665	48.68	69.28	52.82	69.29	0.000098	0.79	2102.91	198.9	0.04
	239993.6	Existing[1]	3152	47	69.17		69.21	0.000502	1.69	1862.08	161.6	0.09
	239993.6	PropPh1[2]	3152	47	69.17		69.21	0.000502	1.69	1862.07	161.6	0.09
	239993.6	FuturePh2[3]	3152	47	69.17		69.21	0.000502	1.69	1862.08	161.6	0.09
	239993.6	FuturePh3[4]	3152	47	69.17		69.21	0.000502	1.69	1862.08	161.6	0.09
	239036.8	Existing[1]	3152	47.67	68.71		68.76	0.000447	1.74	1814.47	153.94	0.09
	239036.8	PropPh1[2]	3152	47.67	68.71		68.76	0.000447	1.74	1814.47	153.94	0.09
	239036.8	FuturePh2[3]	3152	47.67	68.71		68.76	0.000447	1.74	1814.47	153.94	0.09
	239036.8	FuturePh3[4]	3152	47.67	68.71		68.76	0.000447	1.74	1814.47	153.94	0.09
	238060.4	Existing[1]	3152	45.2	68.27		68.31	0.000468	1.77	1777.6	158.47	0.09
	238060.4	PropPh1[2]	3152	45.2	68.27		68.31	0.000468	1.77	1777.59	158.47	0.09
	238060.4	FuturePh2[3]	3152	45.2	68.27		68.31	0.000468	1.77	1777.59	158.47	0.09
	238060.4	FuturePh3[4]	3152	45.2	68.27		68.31	0.000468	1.77	1777.59	158.47	0.09
	237276.3	Existing[1]	3152	44.89	67.84		67.88	0.000653	1.73	1824.14	160.31	0.09
	237276.3	PropPh1[2]	3152	44.89	67.84		67.88	0.000653	1.73	1824.13	160.31	0.09
	237276.3	FuturePh2[3]	3152	44.89	67.84		67.88	0.000653	1.73	1824.14	160.31	0.09
	237276.3	FuturePh3[4]	3152	44.89	67.84		67.88	0.000653	1.73	1824.14	160.31	0.09
	236611	Existing[1]	3361	44.63	67.41		67.46	0.000607	1.87	1797.4	159.56	0.1
	236611	PropPh1[2]	3361	44.63	67.41		67.46	0.000607	1.87	1797.4	159.56	0.1
	236611	FuturePh2[3]	3361	44.63	67.41		67.46	0.000607	1.87	1797.4	159.56	0.1
	236611	FuturePh3[4]	3361	44.63	67.41		67.46	0.000607	1.87	1797.4	159.56	0.1
	235706.9	Existing[1]	3361	44.41	66.86		66.92	0.000585	1.98	1700.25	163.07	0.11
	235706.9	PropPh1[2]	3361	44.41	66.86		66.92	0.000585	1.98	1700.25	163.07	0.11
	235706.9	FuturePh2[3]	3361	44.41	66.86		66.92	0.000585	1.98	1700.25	163.07	0.11
	235706.9	FuturePh3[4]	3361	44.41	66.86		66.92	0.000585	1.98	1700.25	163.07	0.11
	234807.9	Existing[1]	3539	44.91	66.62		66.66	0.000177	1.61	2851.98	366.42	0.08
	234807.9	PropPh1[2]	3539	44.91	66.62		66.66	0.000177	1.61	2851.97	366.42	0.08
	234807.9	FuturePh2[3]	3539	44.91	66.62		66.66	0.000177	1.61	2851.97	366.42	0.08
	234807.9	FuturePh3[4]	3539	44.91	66.62		66.66	0.000177	1.61	2851.97	366.42	0.08
	233698.4	Existing[1]	3539	45.45	66.35	51.63	66.39	0.000343	1.64	2153.21	640.96	0.08
	233698.4	PropPh1[2]	3539	45.45	66.35	51.63	66.39	0.000343	1.64	2153.21	640.96	0.08
	233698.4	FuturePh2[3]	3539	45.45	66.35	51.63	66.39	0.000343	1.64	2153.21	640.96	0.08
	233698.4	FuturePh3[4]	3539	45.45	66.35	51.63	66.39	0.000343	1.64	2153.21	640.96	0.08
	233029.3	Existing[1]	3539	43.15	66.06		66.13	0.000442	2.05	1728.55	149.9	0.11
	233029.3	PropPh1[2]	3539	43.15	66.06		66.13	0.000443	2.05	1728.55	149.9	0.11
	233029.3	FuturePh2[3]	3539	43.15	66.06		66.13	0.000443	2.05	1728.55	149.9	0.11
	233029.3	FuturePh3[4]	3539	43.15	66.06		66.13	0.000443	2.05	1728.55	149.9	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	232816.9	Existing[1]	3634	42.42	65.97	50.55	66.03	0.000417	1.94	1873.68	278.55	0.1
	232816.9	PropPh1[2]	3634	42.42	65.97	50.55	66.03	0.000417	1.94	1873.67	278.55	0.1
	232816.9	FuturePh2[3]	3634	42.42	65.97	50.55	66.03	0.000417	1.94	1873.67	278.55	0.1
	232816.9	FuturePh3[4]	3634	42.42	65.97	50.55	66.03	0.000417	1.94	1873.67	278.55	0.1
	232805.9		Bridge									
	232794.9	Existing[1]	3634	42.38	65.96	50.5	66.02	0.000415	1.94	1877.5	279	0.1
	232794.9	PropPh1[2]	3634	42.38	65.96	50.5	66.01	0.000415	1.94	1877.49	279	0.1
	232794.9	FuturePh2[3]	3634	42.38	65.96	50.5	66.01	0.000415	1.94	1877.49	279	0.1
	232794.9	FuturePh3[4]	3634	42.38	65.96	50.5	66.01	0.000415	1.94	1877.49	279	0.1
	232790.8	Existing[1]	3634	42.38	65.95	50.46	66.01	0.000341	1.99	1828.07	272.07	0.1
	232790.8	PropPh1[2]	3634	42.38	65.95	50.46	66.01	0.000341	1.99	1828.06	272.07	0.1
	232790.8	FuturePh2[3]	3634	42.38	65.95	50.46	66.01	0.000341	1.99	1828.06	272.07	0.1
	232790.8	FuturePh3[4]	3634	42.38	65.95	50.46	66.01	0.000341	1.99	1828.06	272.07	0.1
	232732.9		Bridge									
	232681.7	Existing[1]	3634	43.64	65.82	51.22	65.88	0.000183	1.99	1828.32	146.83	0.1
	232681.7	PropPh1[2]	3634	43.64	65.82	51.22	65.88	0.000183	1.99	1828.31	146.83	0.1
	232681.7	FuturePh2[3]	3634	43.64	65.82	51.22	65.88	0.000183	1.99	1828.32	146.83	0.1
	232681.7	FuturePh3[4]	3634	43.64	65.82	51.22	65.88	0.000183	1.99	1828.31	146.83	0.1
	232669.7		Bridge									
	232657.7	Existing[1]	3634	44.33	65.8	51.91	65.86	0.000199	2.11	1725.11	142.49	0.11
	232657.7	PropPh1[2]	3634	44.33	65.8	51.91	65.86	0.000199	2.11	1725.1	142.49	0.11
	232657.7	FuturePh2[3]	3634	44.33	65.8	51.91	65.86	0.000199	2.11	1725.1	142.49	0.11
	232657.7	FuturePh3[4]	3634	44.33	65.8	51.91	65.86	0.000199	2.11	1725.1	142.49	0.11
	232645.3		Bridge									
	232632.3	Existing[1]	3634	44.3	65.79	51.89	65.86	0.000199	2.1	1728.77	142.8	0.11
	232632.3	PropPh1[2]	3634	44.3	65.79	51.89	65.86	0.000199	2.1	1728.77	142.8	0.11
	232632.3	FuturePh2[3]	3634	44.3	65.79	51.89	65.86	0.000199	2.1	1728.77	142.8	0.11
	232632.3	FuturePh3[4]	3634	44.3	65.79	51.89	65.86	0.000199	2.1	1728.77	142.8	0.11
	231798	Existing[1]	3708	41.92	65.48		65.55	0.000882	2.11	1756.07	177.58	0.12
	231798	PropPh1[2]	3708	41.92	65.48		65.55	0.000882	2.11	1756.06	177.58	0.12
	231798	FuturePh2[3]	3708	41.92	65.48		65.55	0.000882	2.11	1756.06	177.58	0.12
	231798	FuturePh3[4]	3708	41.92	65.48		65.55	0.000882	2.11	1756.06	177.58	0.12
	230908	Existing[1]	3878	42.68	64.98		65.02	0.000425	1.63	2928.83	394.78	0.08
	230908	PropPh1[2]	3878	42.68	64.98		65.02	0.000425	1.63	2928.8	394.77	0.08
	230908	FuturePh2[3]	3878	42.68	64.98		65.02	0.000425	1.63	2928.82	394.77	0.08
	230908	FuturePh3[4]	3878	42.68	64.98		65.02	0.000425	1.63	2928.81	394.77	0.08
	229882.5	Existing[1]	3878	41.58	64.71		64.75	0.000175	1.73	2662.83	456.07	0.09
	229882.5	PropPh1[2]	3878	41.58	64.71		64.75	0.000175	1.73	2662.79	456.06	0.09
	229882.5	FuturePh2[3]	3878	41.58	64.71		64.75	0.000175	1.73	2662.82	456.07	0.09
	229882.5	FuturePh3[4]	3878	41.58	64.71		64.75	0.000175	1.73	2662.8	456.06	0.09
	228917.1	Existing[1]	4040	41.61	64.56		64.59	0.000155	1.46	4318.44	599.84	0.07
	228917.1	PropPh1[2]	4040	41.61	64.56		64.59	0.000155	1.46	4318.39	599.84	0.07
	228917.1	FuturePh2[3]	4040	41.61	64.56		64.59	0.000155	1.46	4318.42	599.84	0.07
	228917.1	FuturePh3[4]	4040	41.61	64.56		64.59	0.000155	1.46	4318.4	599.84	0.07
	228060.7	Existing[1]	4040	40.89	64.4		64.42	0.000251	1.47	4817.55	940.71	0.07
	228060.7	PropPh1[2]	4040	40.89	64.4		64.42	0.000251	1.47	4817.46	940.7	0.07
	228060.7	FuturePh2[3]	4040	40.89	64.4		64.42	0.000251	1.47	4817.52	940.71	0.07
	228060.7	FuturePh3[4]	4040	40.89	64.4		64.42	0.000251	1.47	4817.48	940.71	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	227524.1	Existing[1]	4040	40.54	64.29	48.6	64.32	0.000141	1.47	2751.38	264.17	0.07
	227524.1	PropPh1[2]	4040	40.54	64.29	48.6	64.32	0.000141	1.47	2751.37	264.17	0.07
	227524.1	FuturePh2[3]	4040	40.54	64.29	48.6	64.32	0.000141	1.47	2751.38	264.17	0.07
	227524.1	FuturePh3[4]	4040	40.54	64.29	48.6	64.32	0.000141	1.47	2751.37	264.17	0.07
	227144.7	Existing[1]	4139	40.3	64.24	48.48	64.27	0.000125	1.34	3379.21	397.4	0.06
	227144.7	PropPh1[2]	4139	40.3	64.24	48.48	64.27	0.000125	1.34	3379.18	397.4	0.06
	227144.7	FuturePh2[3]	4139	40.3	64.24	48.48	64.27	0.000125	1.34	3379.2	397.4	0.06
	227144.7	FuturePh3[4]	4139	40.3	64.24	48.48	64.27	0.000125	1.34	3379.19	397.4	0.06
	227088.2		Bridge									
	227031.7	Existing[1]	4139	40.22	64.22	48.39	64.25	0.000123	1.33	3402.82	398.54	0.06
	227031.7	PropPh1[2]	4139	40.22	64.22	48.39	64.25	0.000123	1.33	3402.78	398.54	0.06
	227031.7	FuturePh2[3]	4139	40.22	64.22	48.39	64.25	0.000123	1.33	3402.81	398.54	0.06
	227031.7	FuturePh3[4]	4139	40.22	64.22	48.39	64.25	0.000123	1.33	3402.79	398.54	0.06
	225979.2	Existing[1]	4297	40.46	64.03		64.06	0.000259	1.58	3201.8	309.55	0.08
	225979.2	PropPh1[2]	4297	40.46	64.03		64.06	0.000259	1.58	3201.77	309.55	0.08
	225979.2	FuturePh2[3]	4297	40.46	64.03		64.06	0.000259	1.58	3201.79	309.55	0.08
	225979.2	FuturePh3[4]	4297	40.46	64.03		64.06	0.000259	1.58	3201.78	309.55	0.08
	224981.6	Existing[1]	4484	40.72	63.61		63.66	0.000693	1.97	3083.28	398.54	0.1
	224981.6	PropPh1[2]	4484	40.72	63.61		63.66	0.000693	1.97	3083.24	398.54	0.1
	224981.6	FuturePh2[3]	4484	40.72	63.61		63.66	0.000693	1.97	3083.26	398.54	0.1
	224981.6	FuturePh3[4]	4484	40.72	63.61		63.66	0.000693	1.97	3083.25	398.54	0.1
	224198	Existing[1]	4484	39.2	63.19		63.24	0.000419	1.8	2909.4	383.9	0.09
	224198	PropPh1[2]	4484	39.2	63.19		63.24	0.000419	1.8	2909.36	383.89	0.09
	224198	FuturePh2[3]	4484	39.2	63.19		63.24	0.000419	1.8	2909.38	383.9	0.09
	224198	FuturePh3[4]	4484	39.2	63.19		63.24	0.000419	1.8	2909.37	383.89	0.09
	223061.1	Existing[1]	4580	37.26	62.83	46.44	62.89	0.00024	1.87	2450.83	473.23	0.09
	223061.1	PropPh1[2]	4580	37.26	62.83	46.44	62.89	0.00024	1.87	2450.81	473.22	0.09
	223061.1	FuturePh2[3]	4580	37.26	62.83	46.44	62.89	0.00024	1.87	2450.83	473.23	0.09
	223061.1	FuturePh3[4]	4580	37.26	62.83	46.44	62.89	0.00024	1.87	2450.82	473.23	0.09
	222172.8	Existing[1]	4580	38.92	62.5	48.19	62.55	0.000659	1.82	2732.8	701.9	0.09
	222172.8	PropPh1[2]	4580	38.92	62.5	48.19	62.55	0.000659	1.82	2732.76	701.88	0.09
	222172.8	FuturePh2[3]	4580	38.92	62.5	48.19	62.55	0.000659	1.82	2732.79	701.89	0.09
	222172.8	FuturePh3[4]	4580	38.92	62.5	48.19	62.55	0.000659	1.82	2732.77	701.88	0.09
	221721.3	Existing[1]	4580	38.24	62.38		62.45	0.0001	2.12	2469.19	187.4	0.08
	221721.3	PropPh1[2]	4580	38.24	62.38		62.45	0.0001	2.12	2469.17	187.4	0.08
	221721.3	FuturePh2[3]	4580	38.24	62.38		62.45	0.0001	2.12	2469.19	187.4	0.08
	221721.3	FuturePh3[4]	4580	38.24	62.38		62.45	0.0001	2.12	2469.18	187.4	0.08
	221523.4	Existing[1]	4616	37.95	62.37	44.28	62.42	0.000081	1.92	3225.65	254.59	0.07
	221523.4	PropPh1[2]	4616	37.95	62.37	44.28	62.42	0.000081	1.92	3225.62	254.59	0.07
	221523.4	FuturePh2[3]	4616	37.95	62.37	44.28	62.42	0.000081	1.92	3225.64	254.59	0.07
	221523.4	FuturePh3[4]	4616	37.95	62.37	44.28	62.42	0.000081	1.92	3225.62	254.59	0.07
	221469.5		Bridge									
	221415.6	Existing[1]	4616	37.86	62.27	44.19	62.32	0.000081	1.92	3222.66	254.49	0.07
	221415.6	PropPh1[2]	4616	37.86	62.27	44.19	62.32	0.000081	1.92	3222.63	254.49	0.07
	221415.6	FuturePh2[3]	4616	37.86	62.27	44.19	62.32	0.000081	1.92	3222.65	254.49	0.07
	221415.6	FuturePh3[4]	4616	37.86	62.27	44.19	62.32	0.000081	1.92	3222.64	254.49	0.07
	220426.4	Existing[1]	4748	36.86	62.1		62.15	0.000615	1.82	3090.17	438.15	0.09
	220426.4	PropPh1[2]	4748	36.86	62.1		62.15	0.000615	1.82	3090.12	438.15	0.09
	220426.4	FuturePh2[3]	4748	36.86	62.1		62.15	0.000615	1.82	3090.16	438.15	0.09
	220426.4	FuturePh3[4]	4748	36.86	62.1		62.15	0.000615	1.82	3090.13	438.15	0.09

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	219577.1	Existing[1]	4748	35.81	61.36		61.43	0.001221	2.2	3237.89	328.16	0.11
	219577.1	PropPh1[2]	4748	35.81	61.36		61.43	0.001221	2.2	3237.85	328.16	0.11
	219577.1	FuturePh2[3]	4748	35.81	61.36		61.43	0.001221	2.2	3237.88	328.16	0.11
	219577.1	FuturePh3[4]	4748	35.81	61.36		61.43	0.001221	2.2	3237.86	328.16	0.11
	218625.5	Existing[1]	4748	33.78	61.05		61.06	0.000171	1.15	7224.96	765.97	0.05
	218625.5	PropPh1[2]	4748	33.78	61.05		61.06	0.000171	1.15	7224.83	765.96	0.05
	218625.5	FuturePh2[3]	4748	33.78	61.05		61.06	0.000171	1.15	7224.92	765.96	0.05
	218625.5	FuturePh3[4]	4748	33.78	61.05		61.06	0.000171	1.15	7224.88	765.96	0.05
	217899.8	Existing[1]	4835	35.59	60.68	44.3	60.76	0.001944	2.18	2215.29	181.16	0.11
	217899.8	PropPh1[2]	4835	35.59	60.68	44.3	60.76	0.001944	2.18	2215.25	181.16	0.11
	217899.8	FuturePh2[3]	4835	35.59	60.68	44.3	60.76	0.001944	2.18	2215.28	181.16	0.11
	217899.8	FuturePh3[4]	4835	35.59	60.68	44.3	60.76	0.001944	2.18	2215.27	181.16	0.11
	216802.9	Existing[1]	4835	33.28	60.21	42.5	60.22	0.000209	0.83	8700.94	868.28	0.04
	216802.9	PropPh1[2]	4835	33.28	60.21	42.5	60.22	0.000209	0.83	8700.77	868.28	0.04
	216802.9	FuturePh2[3]	4835	33.28	60.21	42.5	60.22	0.000209	0.83	8700.89	868.28	0.04
	216802.9	FuturePh3[4]	4835	33.28	60.21	42.5	60.22	0.000209	0.83	8700.83	868.28	0.04
	216040.3	Existing[1]	4835	33.72	59.92	42.93	59.94	0.000653	1.17	4649.52	422.97	0.06
	216040.3	PropPh1[2]	4835	33.72	59.92	42.93	59.94	0.000653	1.17	4649.42	422.97	0.06
	216040.3	FuturePh2[3]	4835	33.72	59.92	42.93	59.94	0.000653	1.17	4649.49	422.97	0.06
	216040.3	FuturePh3[4]	4835	33.72	59.92	42.93	59.94	0.000653	1.17	4649.46	422.97	0.06
	214968	Existing[1]	4922	34.34	59.9	40.69	59.91	0.000009	0.85	9081.02	944.47	0.03
	214968	PropPh1[2]	4922	34.34	59.9	40.69	59.91	0.000009	0.85	9080.84	944.46	0.03
	214968	FuturePh2[3]	4922	34.34	59.9	40.69	59.91	0.000009	0.85	9080.97	944.46	0.03
	214968	FuturePh3[4]	4922	34.34	59.9	40.69	59.91	0.000009	0.85	9080.91	944.46	0.03
	214945		Bridge									
	214922	Existing[1]	4922	33.55	59	39.9	59.01	0.00001	0.86	8992.25	942.21	0.03
	214922	PropPh1[2]	4922	33.55	59	39.9	59.01	0.00001	0.86	8992.07	942.21	0.03
	214922	FuturePh2[3]	4922	33.55	59	39.9	59.01	0.00001	0.86	8992.21	942.21	0.03
	214922	FuturePh3[4]	4922	33.55	59	39.9	59.01	0.00001	0.86	8992.15	942.21	0.03
	214866.8	Existing[1]	4922	34.09	58.9	42.58	58.98	0.000091	2.4	2688.09	222.53	0.1
	214866.8	PropPh1[2]	4922	34.09	58.9	42.58	58.98	0.000091	2.4	2688.04	222.53	0.1
	214866.8	FuturePh2[3]	4922	34.09	58.9	42.58	58.98	0.000091	2.4	2688.08	222.53	0.1
	214866.8	FuturePh3[4]	4922	34.09	58.9	42.58	58.98	0.000091	2.4	2688.06	222.53	0.1
	214821.3		Bridge									
	214775.8	Existing[1]	4922	34.17	58.86	42.65	58.95	0.000093	2.42	2663.08	221.6	0.1
	214775.8	PropPh1[2]	4922	34.17	58.86	42.65	58.95	0.000093	2.42	2663.03	221.59	0.1
	214775.8	FuturePh2[3]	4922	34.17	58.86	42.65	58.95	0.000093	2.42	2663.07	221.6	0.1
	214775.8	FuturePh3[4]	4922	34.17	58.86	42.65	58.95	0.000093	2.42	2663.05	221.6	0.1
	214672.8	Existing[1]	4942	34.45	58.85	41.97	58.94	0.000089	2.48	2487.15	178.64	0.1
	214672.8	PropPh1[2]	4942	34.45	58.85	41.97	58.94	0.000089	2.48	2487.11	178.64	0.1
	214672.8	FuturePh2[3]	4942	34.45	58.85	41.97	58.94	0.000089	2.48	2487.14	178.64	0.1
	214672.8	FuturePh3[4]	4942	34.45	58.85	41.97	58.94	0.000089	2.48	2487.12	178.64	0.1
	214628.5		Bridge									
	214584.2	Existing[1]	4942	34.14	58.51	41.66	58.6	0.000089	2.48	2481.72	178.46	0.1
	214584.2	PropPh1[2]	4942	34.14	58.51	41.66	58.6	0.000089	2.48	2481.68	178.45	0.1
	214584.2	FuturePh2[3]	4942	34.14	58.51	41.66	58.6	0.000089	2.48	2481.71	178.45	0.1
	214584.2	FuturePh3[4]	4942	34.14	58.51	41.66	58.6	0.000089	2.48	2481.69	178.45	0.1
	213687.7	Existing[1]	5040	32.8	58.37		58.44	0.000401	2.24	3001.39	237.31	0.09
	213687.7	PropPh1[2]	5040	32.8	58.37		58.44	0.000401	2.24	3001.33	237.31	0.09
	213687.7	FuturePh2[3]	5040	32.8	58.37		58.44	0.000401	2.24	3001.38	237.31	0.09
	213687.7	FuturePh3[4]	5040	32.8	58.37		58.44	0.000401	2.24	3001.36	237.31	0.09

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	212742.1	Existing[1]	5040	32.47	58.22		58.28	0.000094	2.07	3931.41	294.3	0.08
	212742.1	PropPh1[2]	5040	32.47	58.22		58.28	0.000094	2.07	3931.34	294.3	0.08
	212742.1	FuturePh2[3]	5040	32.47	58.22		58.28	0.000094	2.07	3931.39	294.3	0.08
	212742.1	FuturePh3[4]	5040	32.47	58.22		58.28	0.000094	2.07	3931.37	294.3	0.08
	211631.3	Existing[1]	5116	32.47	58.14		58.18	0.00008	1.94	7007.88	670.37	0.07
	211631.3	PropPh1[2]	5116	32.47	58.14		58.18	0.00008	1.94	7007.71	670.37	0.07
	211631.3	FuturePh2[3]	5116	32.47	58.14		58.18	0.00008	1.94	7007.83	670.37	0.07
	211631.3	FuturePh3[4]	5116	32.47	58.14		58.18	0.00008	1.94	7007.78	670.37	0.07
	210975.8	Existing[1]	5116	30.49	57.99		58.1	0.000197	2.71	2739	188.21	0.11
	210975.8	PropPh1[2]	5116	30.49	57.99		58.1	0.000197	2.71	2738.95	188.21	0.11
	210975.8	FuturePh2[3]	5116	30.49	57.99		58.1	0.000197	2.71	2738.99	188.21	0.11
	210975.8	FuturePh3[4]	5116	30.49	57.99		58.1	0.000197	2.71	2738.97	188.21	0.11
	209864.1	Existing[1]	5230	28.37	57.8		57.84	0.000262	1.9	4327.74	404.34	0.08
	209864.1	PropPh1[2]	5230	28.37	57.8		57.84	0.000262	1.9	4327.62	404.34	0.08
	209864.1	FuturePh2[3]	5230	28.37	57.8		57.84	0.000262	1.9	4327.71	404.34	0.08
	209864.1	FuturePh3[4]	5230	28.37	57.8		57.84	0.000262	1.9	4327.67	404.34	0.08
	208924.8	Existing[1]	5230	31.48	57.41		57.48	0.000618	2.03	2611.27	226.06	0.1
	208924.8	PropPh1[2]	5230	31.48	57.41		57.48	0.000618	2.03	2611.2	226.05	0.1
	208924.8	FuturePh2[3]	5230	31.48	57.41		57.48	0.000618	2.03	2611.25	226.06	0.1
	208924.8	FuturePh3[4]	5230	31.48	57.41		57.48	0.000618	2.03	2611.23	226.05	0.1
	207774.7	Existing[1]	5230	26.21	56.87		56.91	0.000406	1.88	4164.21	510.49	0.08
	207774.7	PropPh1[2]	5230	26.21	56.87		56.91	0.000406	1.88	4164.04	510.47	0.08
	207774.7	FuturePh2[3]	5230	26.21	56.87		56.91	0.000406	1.88	4164.17	510.48	0.08
	207774.7	FuturePh3[4]	5230	26.21	56.87		56.91	0.000406	1.88	4164.11	510.48	0.08
	206741.3	Existing[1]	5230	31.91	56.5		56.55	0.000321	1.89	3216.83	308.24	0.08
	206741.3	PropPh1[2]	5230	31.91	56.5		56.55	0.000321	1.89	3216.72	308.23	0.08
	206741.3	FuturePh2[3]	5230	31.91	56.5		56.55	0.000321	1.89	3216.8	308.24	0.08
	206741.3	FuturePh3[4]	5230	31.91	56.5		56.55	0.000321	1.89	3216.76	308.24	0.08
	205679.6	Existing[1]	5288	28.19	56.31		56.38	0.000101	2.24	4279.13	397.6	0.08
	205679.6	PropPh1[2]	5288	28.19	56.31		56.38	0.000101	2.24	4278.98	397.6	0.08
	205679.6	FuturePh2[3]	5288	28.19	56.31		56.38	0.000101	2.24	4279.1	397.6	0.08
	205679.6	FuturePh3[4]	5288	28.19	56.31		56.38	0.000101	2.24	4279.05	397.6	0.08
	205102.2	Existing[1]	5288	28.33	56.26		56.32	0.000094	2.21	3937.32	305.44	0.08
	205102.2	PropPh1[2]	5288	28.33	56.26		56.32	0.000094	2.21	3937.2	305.44	0.08
	205102.2	FuturePh2[3]	5288	28.33	56.26		56.32	0.000094	2.21	3937.29	305.44	0.08
	205102.2	FuturePh3[4]	5288	28.33	56.26		56.32	0.000094	2.21	3937.25	305.44	0.08
	204727.6	Existing[1]	5288	28.33	56.2	37	56.28	0.000109	2.37	3282.2	258.21	0.09
	204727.6	PropPh1[2]	5288	28.33	56.2	37	56.28	0.000109	2.37	3282.1	258.2	0.09
	204727.6	FuturePh2[3]	5288	28.33	56.2	37	56.28	0.000109	2.37	3282.17	258.21	0.09
	204727.6	FuturePh3[4]	5288	28.33	56.2	37	56.28	0.000109	2.37	3282.14	258.2	0.09
	204673.8		Bridge									
	204620	Existing[1]	5288	28.15	55.98	36.81	56.06	0.00011	2.38	3271.47	257.26	0.09
	204620	PropPh1[2]	5288	28.15	55.98	36.81	56.05	0.00011	2.38	3271.37	257.25	0.09
	204620	FuturePh2[3]	5288	28.15	55.98	36.81	56.05	0.00011	2.38	3271.44	257.25	0.09
	204620	FuturePh3[4]	5288	28.15	55.98	36.81	56.05	0.00011	2.38	3271.41	257.25	0.09
	203658.9	Existing[1]	5497	28.97	55.79		55.83	0.000575	1.44	3824.69	305.77	0.07
	203658.9	PropPh1[2]	5497	28.97	55.79		55.83	0.000575	1.44	3824.57	305.76	0.07
	203658.9	FuturePh2[3]	5497	28.97	55.79		55.83	0.000575	1.44	3824.65	305.76	0.07
	203658.9	FuturePh3[4]	5497	28.97	55.79		55.83	0.000575	1.44	3824.62	305.76	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	202834.1	Existing[1]	5497	27.57	55.39		55.44	0.000392	1.79	3288.11	306.75	0.08
	202834.1	PropPh1[2]	5497	27.57	55.39		55.44	0.000392	1.79	3287.98	306.74	0.08
	202834.1	FuturePh2[3]	5497	27.57	55.39		55.44	0.000392	1.79	3288.08	306.75	0.08
	202834.1	FuturePh3[4]	5497	27.57	55.39		55.44	0.000392	1.79	3288.04	306.75	0.08
	201783.6	Existing[1]	5620	27.98	54.87		54.93	0.000595	1.98	2854.79	278.39	0.1
	201783.6	PropPh1[2]	5620	27.98	54.87		54.93	0.000595	1.98	2854.65	278.29	0.1
	201783.6	FuturePh2[3]	5620	27.98	54.87		54.93	0.000595	1.98	2854.75	278.36	0.1
	201783.6	FuturePh3[4]	5620	27.98	54.87		54.93	0.000595	1.98	2854.71	278.33	0.1
	201212.1	Existing[1]	5620	27.61	54.54	36.35	54.59	0.000593	1.74	3229.84	368.54	0.09
	201212.1	PropPh1[2]	5620	27.61	54.54	36.35	54.59	0.000593	1.74	3229.68	368.52	0.09
	201212.1	FuturePh2[3]	5620	27.61	54.54	36.35	54.59	0.000593	1.74	3229.79	368.53	0.09
	201212.1	FuturePh3[4]	5620	27.61	54.54	36.35	54.59	0.000593	1.74	3229.75	368.53	0.09
	200299.3	Existing[1]	5620	27.02	54.1		54.17	0.000356	2.19	2643.47	214.15	0.09
	200299.3	PropPh1[2]	5620	27.02	54.1		54.17	0.000357	2.19	2643.34	214.15	0.09
	200299.3	FuturePh2[3]	5620	27.02	54.1		54.17	0.000357	2.19	2643.43	214.15	0.09
	200299.3	FuturePh3[4]	5620	27.02	54.1		54.17	0.000357	2.19	2643.39	214.15	0.09
	200076.4	Existing[1]	5833	27.02	54.03	36.45	54.1	0.000305	2.1	2771.59	199.58	0.1
	200076.4	PropPh1[2]	5833	27.02	54.03	36.45	54.1	0.000305	2.1	2771.47	199.58	0.1
	200076.4	FuturePh2[3]	5833	27.02	54.03	36.45	54.1	0.000305	2.1	2771.55	199.58	0.1
	200076.4	FuturePh3[4]	5833	27.02	54.03	36.45	54.1	0.000305	2.1	2771.52	199.58	0.1
	200020.5		Bridge									
	199964.6	Existing[1]	5833	26.77	53.7	36.2	53.77	0.000309	2.12	2756.71	199.19	0.1
	199964.6	PropPh1[2]	5833	26.77	53.7	36.2	53.77	0.000309	2.12	2756.6	199.19	0.1
	199964.6	FuturePh2[3]	5833	26.77	53.7	36.2	53.77	0.000309	2.12	2756.68	199.19	0.1
	199964.6	FuturePh3[4]	5833	26.77	53.7	36.2	53.77	0.000309	2.12	2756.65	199.19	0.1
	199440.6	Existing[1]	5977	27.48	53.52		53.58	0.000425	1.98	4106.16	450.15	0.09
	199440.6	PropPh1[2]	5977	27.48	53.52		53.58	0.000425	1.98	4105.88	450.15	0.09
	199440.6	FuturePh2[3]	5977	27.48	53.52		53.58	0.000425	1.98	4106.08	450.15	0.09
	199440.6	FuturePh3[4]	5977	27.48	53.52		53.58	0.000425	1.98	4106	450.15	0.09
	198496.4	Existing[1]	5977	27.21	53.05		53.12	0.000523	2.13	2805.01	213.23	0.1
	198496.4	PropPh1[2]	5977	27.21	53.05		53.12	0.000523	2.13	2804.86	213.23	0.1
	198496.4	FuturePh2[3]	5977	27.21	53.05		53.12	0.000523	2.13	2804.96	213.23	0.1
	198496.4	FuturePh3[4]	5977	27.21	53.05		53.12	0.000523	2.13	2804.92	213.23	0.1
	197506.8	Existing[1]	5977	26.73	52.62		52.71	0.000342	2.58	3442.26	371.33	0.1
	197506.8	PropPh1[2]	5977	26.73	52.62		52.71	0.000342	2.58	3441.99	371.32	0.1
	197506.8	FuturePh2[3]	5977	26.73	52.62		52.71	0.000342	2.58	3442.18	371.33	0.1
	197506.8	FuturePh3[4]	5977	26.73	52.62		52.71	0.000342	2.58	3442.1	371.33	0.1
	196463.1	Existing[1]	5977	26.19	52.08		52.2	0.000806	2.78	2205.5	242.88	0.13
	196463.1	PropPh1[2]	5977	26.19	52.07		52.19	0.000806	2.78	2205.3	242.85	0.13
	196463.1	FuturePh2[3]	5977	26.19	52.08		52.2	0.000806	2.78	2205.44	242.87	0.13
	196463.1	FuturePh3[4]	5977	26.19	52.08		52.19	0.000806	2.78	2205.38	242.86	0.13
	196182.3	Existing[1]	6059	25.3	51.87	36.3	52.03	0.000423	3.38	2562.92	392.5	0.14
	196182.3	PropPh1[2]	6059	25.3	51.86	36.3	52.03	0.000423	3.38	2562.72	392.49	0.14
	196182.3	FuturePh2[3]	6059	25.3	51.86	36.3	52.03	0.000423	3.38	2562.86	392.5	0.14
	196182.3	FuturePh3[4]	6059	25.3	51.86	36.3	52.03	0.000423	3.38	2562.8	392.49	0.14
	196149		Bridge									
	196115.7	Existing[1]	6059	25.16	51.74	36.15	51.91	0.000421	3.38	2566.95	392.77	0.14
	196115.7	PropPh1[2]	6059	25.16	51.74	36.15	51.9	0.000421	3.38	2566.76	392.76	0.14
	196115.7	FuturePh2[3]	6059	25.16	51.74	36.15	51.9	0.000421	3.38	2566.9	392.76	0.14
	196115.7	FuturePh3[4]	6059	25.16	51.74	36.15	51.9	0.000421	3.38	2566.84	392.76	0.14

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	195567.4	Existing[1]	6140	23.51	51.66		51.68	0.000205	1.29	7617.48	656.97	0.05
	195567.4	PropPh1[2]	6140	23.51	51.66		51.68	0.000205	1.29	7616.91	656.95	0.05
	195567.4	FuturePh2[3]	6140	23.51	51.66		51.68	0.000205	1.29	7617.31	656.96	0.05
	195567.4	FuturePh3[4]	6140	23.51	51.66		51.68	0.000205	1.29	7617.15	656.96	0.05
	194614.1	Existing[1]	6140	26.15	51.41		51.46	0.000301	2.16	5320.82	475.03	0.09
	194614.1	PropPh1[2]	6140	26.15	51.41		51.46	0.000301	2.16	5320.39	475.02	0.09
	194614.1	FuturePh2[3]	6140	26.15	51.41		51.46	0.000301	2.16	5320.69	475.03	0.09
	194614.1	FuturePh3[4]	6140	26.15	51.41		51.46	0.000301	2.16	5320.57	475.03	0.09
	193675.6	Existing[1]	6140	23.35	51.42		51.42	0.000009	0.57	14418.29	933.55	0.02
	193675.6	PropPh1[2]	6140	23.35	51.42		51.42	0.000009	0.57	14417.44	933.55	0.02
	193675.6	FuturePh2[3]	6140	23.35	51.42		51.42	0.000009	0.57	14418.04	933.55	0.02
	193675.6	FuturePh3[4]	6140	23.35	51.42		51.42	0.000009	0.57	14417.79	933.55	0.02
	192820.3	Existing[1]	6303	24.17	51.33		51.39	0.000584	2.13	3333.51	278.37	0.09
	192820.3	PropPh1[2]	6303	24.17	51.33		51.39	0.000584	2.13	3333.26	278.34	0.09
	192820.3	FuturePh2[3]	6303	24.17	51.33		51.39	0.000584	2.13	3333.44	278.36	0.09
	192820.3	FuturePh3[4]	6303	24.17	51.33		51.39	0.000584	2.13	3333.36	278.35	0.09
	191722.7	Existing[1]	6303	20.85	50.52		50.58	0.000994	2.02	3269.41	418.37	0.1
	191722.7	PropPh1[2]	6303	20.85	50.52		50.58	0.000994	2.02	3268.93	418.35	0.1
	191722.7	FuturePh2[3]	6303	20.85	50.52		50.58	0.000994	2.02	3269.26	418.36	0.1
	191722.7	FuturePh3[4]	6303	20.85	50.52		50.58	0.000994	2.02	3269.12	418.36	0.1
	190794	Existing[1]	6303	20.58	49.91		50	0.000441	2.6	3698.63	339.36	0.11
	190794	PropPh1[2]	6303	20.58	49.91		49.99	0.000441	2.6	3698.18	339.35	0.11
	190794	FuturePh2[3]	6303	20.58	49.91		50	0.000441	2.6	3698.49	339.36	0.11
	190794	FuturePh3[4]	6303	20.58	49.91		49.99	0.000441	2.6	3698.37	339.35	0.11
	189869.8	Existing[1]	6303	17.5	49.63		49.72	0.000227	2.61	3991.28	430.78	0.1
	189869.8	PropPh1[2]	6303	17.5	49.63		49.72	0.000227	2.61	3990.68	430.76	0.1
	189869.8	FuturePh2[3]	6303	17.5	49.63		49.72	0.000227	2.61	3991.1	430.77	0.1
	189869.8	FuturePh3[4]	6303	17.5	49.63		49.72	0.000227	2.61	3990.93	430.77	0.1
	188903.7	Existing[1]	6388	21.71	49.43		49.48	0.000273	2.02	5088.61	570.65	0.08
	188903.7	PropPh1[2]	6388	21.71	49.42		49.47	0.000273	2.02	5087.77	570.63	0.08
	188903.7	FuturePh2[3]	6388	21.71	49.43		49.48	0.000273	2.02	5088.35	570.64	0.08
	188903.7	FuturePh3[4]	6388	21.71	49.43		49.48	0.000273	2.02	5088.11	570.64	0.08
	187878.1	Existing[1]	6388	23.78	48.96		49.06	0.000692	2.74	2842.88	202.06	0.11
	187878.1	PropPh1[2]	6388	23.78	48.95		49.05	0.000692	2.74	2842.55	202.06	0.11
	187878.1	FuturePh2[3]	6388	23.78	48.96		49.05	0.000692	2.74	2842.78	202.06	0.11
	187878.1	FuturePh3[4]	6388	23.78	48.95		49.05	0.000692	2.74	2842.69	202.06	0.11
	186536.1	Existing[1]	6388	20.17	48.12		48.2	0.000629	2.47	3463.87	478.88	0.12
	186536.1	PropPh1[2]	6388	20.17	48.11		48.2	0.000629	2.47	3462.91	478.42	0.12
	186536.1	FuturePh2[3]	6388	20.17	48.12		48.2	0.000629	2.47	3463.57	478.74	0.12
	186536.1	FuturePh3[4]	6388	20.17	48.12		48.2	0.000629	2.47	3463.3	478.61	0.12
	185293.8	Existing[1]	6388	20.84	47.8		47.83	0.000187	1.72	5798.55	423.25	0.07
	185293.8	PropPh1[2]	6388	20.84	47.8		47.83	0.000187	1.72	5797.63	423.23	0.07
	185293.8	FuturePh2[3]	6388	20.84	47.8		47.83	0.000187	1.72	5798.26	423.25	0.07
	185293.8	FuturePh3[4]	6388	20.84	47.8		47.83	0.000187	1.72	5798	423.24	0.07
	184862.8	Existing[1]	6500	21.37	47.61	31.25	47.72	0.00025	2.89	3096.44	231.22	0.11
	184862.8	PropPh1[2]	6500	21.37	47.61	31.25	47.71	0.00025	2.89	3095.92	231.2	0.11
	184862.8	FuturePh2[3]	6500	21.37	47.61	31.25	47.72	0.00025	2.89	3096.28	231.21	0.11
	184862.8	FuturePh3[4]	6500	21.37	47.61	31.25	47.72	0.00025	2.89	3096.13	231.21	0.11
	184807.6		Bridge									
	184752.4	Existing[1]	6500	21.24	47.47	31.11	47.58	0.00025	2.89	3094.52	231.17	0.11
	184752.4	PropPh1[2]	6500	21.24	47.47	31.11	47.58	0.00025	2.89	3093.99	231.16	0.11
	184752.4	FuturePh2[3]	6500	21.24	47.47	31.11	47.58	0.00025	2.89	3094.36	231.17	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
	184752.4	FuturePh3[4]	6500	21.24	47.47	31.11	47.58	0.00025	2.89	3094.21	231.16	0.11
	184295.8	Existing[1]	6500	18.27	47.31		47.4	0.000634	2.61	3232.24	261.78	0.11
	184295.8	PropPh1[2]	6500	18.27	47.31		47.4	0.000634	2.61	3231.64	261.76	0.11
	184295.8	FuturePh2[3]	6500	18.27	47.31		47.4	0.000634	2.61	3232.06	261.77	0.11
	184295.8	FuturePh3[4]	6500	18.27	47.31		47.4	0.000634	2.61	3231.88	261.77	0.11
	183335.1	Existing[1]	6500	20.58	46.79	30.65	46.95	0.00036	3.45	2492.21	170.3	0.13
	183335.1	PropPh1[2]	6500	20.58	46.79	30.65	46.95	0.00036	3.45	2491.78	170.29	0.13
	183335.1	FuturePh2[3]	6500	20.58	46.79	30.65	46.95	0.00036	3.45	2492.08	170.3	0.13
	183335.1	FuturePh3[4]	6500	20.58	46.79	30.65	46.95	0.00036	3.45	2491.95	170.3	0.13
	182381.6	Existing[1]	6625	18.93	46.43		46.49	0.00062	2.12	3492.22	286.18	0.1
	182381.6	PropPh1[2]	6625	18.93	46.43		46.49	0.00062	2.12	3491.45	286.16	0.1
	182381.6	FuturePh2[3]	6625	18.93	46.43		46.49	0.00062	2.12	3491.98	286.18	0.1
	182381.6	FuturePh3[4]	6625	18.93	46.43		46.49	0.00062	2.12	3491.76	286.17	0.1
	181623	Existing[1]	6625	18.35	46.23		46.26	0.000183	1.58	8447.37	899.73	0.07
	181623	PropPh1[2]	6625	18.35	46.23		46.25	0.000183	1.58	8444.81	899.69	0.07
	181623	FuturePh2[3]	6625	18.35	46.23		46.26	0.000183	1.58	8446.58	899.72	0.07
	181623	FuturePh3[4]	6625	18.35	46.23		46.25	0.000183	1.58	8445.85	899.71	0.07
	180731.2	Existing[1]	6625	19.12	45.94		46	0.000646	1.92	3510.24	295.83	0.09
	180731.2	PropPh1[2]	6625	19.12	45.94		46	0.000646	1.92	3509.35	295.72	0.09
	180731.2	FuturePh2[3]	6625	19.12	45.94		46	0.000646	1.92	3509.97	295.8	0.09
	180731.2	FuturePh3[4]	6625	19.12	45.94		46	0.000646	1.92	3509.71	295.76	0.09
	179838.1	Existing[1]	6625	17.65	45.22		45.29	0.000998	2.06	3213.74	239.53	0.1
	179838.1	PropPh1[2]	6625	17.65	45.22		45.29	0.000998	2.06	3212.92	239.51	0.1
	179838.1	FuturePh2[3]	6625	17.65	45.22		45.29	0.000998	2.06	3213.49	239.53	0.1
	179838.1	FuturePh3[4]	6625	17.65	45.22		45.29	0.000998	2.06	3213.25	239.52	0.1
	179305.6	Existing[1]	6625	17.48	44.8		44.97	0.000383	3.49	2612.24	221.2	0.13
	179305.6	PropPh1[2]	6625	17.48	44.8		44.96	0.000383	3.49	2611.43	221.16	0.13
	179305.6	FuturePh2[3]	6625	17.48	44.8		44.96	0.000383	3.49	2611.99	221.19	0.13
	179305.6	FuturePh3[4]	6625	17.48	44.8		44.96	0.000383	3.49	2611.76	221.18	0.13
	178955.5	Existing[1]	6660	17.37	44.68	29.31	44.83	0.000357	3.37	3102.14	301.43	0.13
	178955.5	PropPh1[2]	6660	17.37	44.68	29.31	44.82	0.000357	3.37	3101	301.34	0.13
	178955.5	FuturePh2[3]	6660	17.37	44.68	29.31	44.82	0.000357	3.37	3101.79	301.4	0.13
	178955.5	FuturePh3[4]	6660	17.37	44.68	29.31	44.82	0.000357	3.37	3101.47	301.38	0.13
	178899.3		Bridge									
	178843.1	Existing[1]	6660	17.13	44.38	29.08	44.53	0.000361	3.39	3084.52	300.05	0.13
	178843.1	PropPh1[2]	6660	17.13	44.38	29.08	44.53	0.000362	3.39	3083.37	299.96	0.13
	178843.1	FuturePh2[3]	6660	17.13	44.38	29.08	44.53	0.000361	3.39	3084.17	300.02	0.13
	178843.1	FuturePh3[4]	6660	17.13	44.38	29.08	44.53	0.000362	3.39	3083.84	300	0.13
	177732.9	Existing[1]	6893	16.54	43.99		44.05	0.000419	2.1	3671.89	273.34	0.09
	177732.9	PropPh1[2]	6893	16.54	43.99		44.05	0.000419	2.1	3670.76	273.31	0.09
	177732.9	FuturePh2[3]	6893	16.54	43.99		44.05	0.000419	2.1	3671.54	273.33	0.09
	177732.9	FuturePh3[4]	6893	16.54	43.99		44.05	0.000419	2.1	3671.22	273.32	0.09
	176644.1	Existing[1]	6893	17.41	43.69	27.24	43.75	0.000213	2.24	5324.84	568.27	0.1
	176644.1	PropPh1[2]	6893	17.41	43.69	27.24	43.75	0.000213	2.24	5322.34	568.05	0.1
	176644.1	FuturePh2[3]	6893	17.41	43.69	27.24	43.75	0.000213	2.24	5324.06	568.2	0.1
	176644.1	FuturePh3[4]	6893	17.41	43.69	27.24	43.75	0.000213	2.24	5323.35	568.14	0.1
	175675.6	Existing[1]	6958	16.27	43.43	24.71	43.49	0.000373	1.95	3578.99	242.39	0.09
	175675.6	PropPh1[2]	6958	16.27	43.42	24.71	43.48	0.000373	1.95	3577.87	242.35	0.09
	175675.6	FuturePh2[3]	6958	16.27	43.43	24.71	43.48	0.000373	1.95	3578.64	242.38	0.09
	175675.6	FuturePh3[4]	6958	16.27	43.42	24.71	43.48	0.000373	1.95	3578.32	242.37	0.09

10PCT_10yr

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	173819.4	Existing[1]	6958	14.97	42.72		42.74	0.000416	1.33	6531.82	602.79	0.07
	173819.4	PropPh1[2]	6958	14.97	42.72		42.74	0.000417	1.33	6528.6	602.67	0.07
	173819.4	FuturePh2[3]	6958	14.97	42.72		42.74	0.000417	1.33	6530.82	602.75	0.07
	173819.4	FuturePh3[4]	6958	14.97	42.72		42.74	0.000417	1.33	6529.9	602.72	0.07
	172846.5	Existing[1]	6958	11.61	42.37		42.4	0.000471	1.69	6004.03	641.88	0.07
	172846.5	PropPh1[2]	6958	11.61	42.36		42.39	0.000471	1.69	6000.24	641.86	0.07
	172846.5	FuturePh2[3]	6958	11.61	42.36		42.4	0.000471	1.69	6002.85	641.87	0.07
	172846.5	FuturePh3[4]	6958	11.61	42.36		42.39	0.000471	1.69	6001.76	641.87	0.07
	171967.4	Existing[1]	6958	14.04	42.15		42.18	0.000201	1.66	7601.51	678.48	0.07
	171967.4	PropPh1[2]	6958	14.04	42.15		42.17	0.000201	1.67	7597.27	678.45	0.07
	171967.4	FuturePh2[3]	6958	14.04	42.15		42.18	0.000201	1.66	7600.2	678.47	0.07
	171967.4	FuturePh3[4]	6958	14.04	42.15		42.18	0.000201	1.67	7598.98	678.46	0.07
	171168.9	Existing[1]	6958	6.86	42.04		42.07	0.000129	1.57	7042.2	502.49	0.06
	171168.9	PropPh1[2]	6958	6.86	42.04		42.07	0.000129	1.58	7039	502.45	0.06
	171168.9	FuturePh2[3]	6958	6.86	42.04		42.07	0.000129	1.57	7041.21	502.48	0.06
	171168.9	FuturePh3[4]	6958	6.86	42.04		42.07	0.000129	1.57	7040.29	502.47	0.06
	170256	Existing[1]	6958	13.83	41.82		41.9	0.000319	2.31	3543.6	250.91	0.1
	170256	PropPh1[2]	6958	13.83	41.82		41.89	0.00032	2.31	3541.94	250.87	0.1
	170256	FuturePh2[3]	6958	13.83	41.82		41.9	0.00032	2.31	3543.09	250.9	0.1
	170256	FuturePh3[4]	6958	13.83	41.82		41.9	0.00032	2.31	3542.61	250.89	0.1
	169087.1	Existing[1]	6979	11.36	41.59		41.61	0.000185	1.36	8533.92	674.7	0.05
	169087.1	PropPh1[2]	6979	11.36	41.59		41.61	0.000185	1.36	8529.24	674.62	0.05
	169087.1	FuturePh2[3]	6979	11.36	41.59		41.61	0.000185	1.36	8532.47	674.68	0.05
	169087.1	FuturePh3[4]	6979	11.36	41.59		41.61	0.000185	1.36	8531.13	674.65	0.05
	168169.9	Existing[1]	6979	14.35	41.35		41.4	0.000362	1.93	4563.9	352.07	0.08
	168169.9	PropPh1[2]	6979	14.35	41.35		41.39	0.000362	1.93	4561.34	352.02	0.08
	168169.9	FuturePh2[3]	6979	14.35	41.35		41.4	0.000362	1.93	4563.1	352.05	0.08
	168169.9	FuturePh3[4]	6979	14.35	41.35		41.4	0.000362	1.93	4562.37	352.04	0.08
	167249.9	Existing[1]	6989	11.5	40.93	21.9	41.01	0.000542	2.22	3151.01	203.76	0.1
	167249.9	PropPh1[2]	6989	11.5	40.92	21.9	41	0.000543	2.22	3149.41	203.73	0.1
	167249.9	FuturePh2[3]	6989	11.5	40.93	21.9	41	0.000542	2.22	3150.52	203.75	0.1
	167249.9	FuturePh3[4]	6989	11.5	40.92	21.9	41	0.000542	2.22	3150.06	203.74	0.1
	166879.7	Existing[1]	6989	10.84	40.71		40.83	0.000373	3.44	4448.86	511.03	0.12
	166879.7	PropPh1[2]	6989	10.84	40.7		40.82	0.000373	3.45	4444.62	510.97	0.12
	166879.7	FuturePh2[3]	6989	10.84	40.7		40.83	0.000373	3.44	4447.54	511.01	0.12
	166879.7	FuturePh3[4]	6989	10.84	40.7		40.82	0.000373	3.44	4446.32	510.99	0.12
	166613	Existing[1]	7041	10.36	40.61	23.36	40.73	0.00034	3.48	4098.42	305.29	0.12
	166613	PropPh1[2]	7041	10.36	40.6	23.36	40.72	0.00034	3.48	4095.87	305.21	0.12
	166613	FuturePh2[3]	7041	10.36	40.6	23.36	40.73	0.00034	3.48	4097.63	305.26	0.12
	166613	FuturePh3[4]	7041	10.36	40.6	23.36	40.72	0.00034	3.48	4096.9	305.24	0.12
	166585.6		Bridge									
	166558.2	Existing[1]	7041	10.11	40.49	23.11	40.62	0.000332	3.45	4140.82	306.61	0.12
	166558.2	PropPh1[2]	7041	10.11	40.49	23.11	40.61	0.000332	3.45	4138.22	306.53	0.12
	166558.2	FuturePh2[3]	7041	10.11	40.49	23.11	40.61	0.000332	3.45	4140.01	306.58	0.12
	166558.2	FuturePh3[4]	7041	10.11	40.49	23.11	40.61	0.000332	3.45	4139.27	306.56	0.12
	166297.3	Existing[1]	7261	8.4	40.44		40.51	0.000272	2.17	4240.96	264.05	0.08
	166297.3	PropPh1[2]	7261	8.4	40.44		40.5	0.000272	2.17	4238.69	264.03	0.08
	166297.3	FuturePh2[3]	7261	8.4	40.44		40.51	0.000272	2.17	4240.25	264.05	0.08
	166297.3	FuturePh3[4]	7261	8.4	40.44		40.5	0.000272	2.17	4239.6	264.04	0.08

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	165903.2	Existing[1]	7261	10.27	40.33		40.39	0.000323	2.23	4529.54	354.11	0.08
	165903.2	PropPh1[2]	7261	10.27	40.32		40.38	0.000324	2.23	4526.43	354.01	0.08
	165903.2	FuturePh2[3]	7261	10.27	40.32		40.39	0.000323	2.23	4528.57	354.08	0.08
	165903.2	FuturePh3[4]	7261	10.27	40.32		40.39	0.000323	2.23	4527.68	354.05	0.08
	165476.1	Existing[1]	7961	12.3	40.07	21.53	40.23	0.000302	3.41	3137.69	211.13	0.12
	165476.1	PropPh1[2]	7961	12.3	40.06	21.53	40.22	0.000302	3.42	3135.77	211.07	0.12
	165476.1	FuturePh2[3]	7961	12.3	40.07	21.53	40.23	0.000302	3.42	3137.09	211.11	0.12
	165476.1	FuturePh3[4]	7961	12.3	40.07	21.53	40.22	0.000302	3.42	3136.54	211.09	0.12
	165428.1		Bridge									
	165380.1	Existing[1]	7961	11.69	39.43	20.92	39.58	0.000304	3.42	3130.08	210.88	0.12
	165380.1	PropPh1[2]	7961	11.69	39.42	20.92	39.58	0.000304	3.42	3128.14	210.81	0.12
	165380.1	FuturePh2[3]	7961	11.69	39.42	20.92	39.58	0.000304	3.42	3129.48	210.86	0.12
	165380.1	FuturePh3[4]	7961	11.69	39.42	20.92	39.58	0.000304	3.42	3128.92	210.84	0.12
	164555.2	Existing[1]	7953	8.31	39.16		39.27	0.000416	2.85	3173.29	207.67	0.12
	164555.2	PropPh1[2]	7951	8.31	39.15		39.26	0.000417	2.85	3171.31	207.63	0.12
	164555.2	FuturePh2[3]	7953	8.31	39.15		39.27	0.000416	2.85	3172.67	207.65	0.12
	164555.2	FuturePh3[4]	7952	8.31	39.15		39.26	0.000416	2.85	3172.11	207.64	0.12
	163635.5	Existing[1]	7953	11.2	38.92		38.99	0.000242	2.64	5366.75	551.56	0.11
	163635.5	PropPh1[2]	7951	11.2	38.91		38.98	0.000243	2.64	5361.24	551.49	0.11
	163635.5	FuturePh2[3]	7953	11.2	38.91		38.99	0.000243	2.64	5365	551.54	0.11
	163635.5	FuturePh3[4]	7952	11.2	38.91		38.99	0.000243	2.64	5363.45	551.52	0.11
	162811.9	Existing[1]	8155	8.08	38.74		38.82	0.000196	2.51	4595.43	289.78	0.1
	162811.9	PropPh1[2]	8153	8.08	38.73		38.81	0.000196	2.52	4592.47	289.72	0.1
	162811.9	FuturePh2[3]	8155	8.08	38.73		38.81	0.000196	2.52	4594.48	289.76	0.1
	162811.9	FuturePh3[4]	8154	8.08	38.73		38.81	0.000196	2.52	4593.66	289.75	0.1
	161822.3	Existing[1]	8155	6.55	38.42		38.53	0.000485	2.84	3687.23	272.42	0.11
	161822.3	PropPh1[2]	8153	6.55	38.41		38.52	0.000486	2.85	3684.33	272.36	0.11
	161822.3	FuturePh2[3]	8155	6.55	38.42		38.52	0.000486	2.84	3686.29	272.4	0.11
	161822.3	FuturePh3[4]	8154	6.55	38.41		38.52	0.000486	2.84	3685.49	272.39	0.11
	160630.7	Existing[1]	8155	6.96	37.76		37.89	0.000583	2.97	3084.01	255.07	0.12
	160630.7	PropPh1[2]	8153	6.96	37.75		37.88	0.000584	2.97	3081.06	254.99	0.12
	160630.7	FuturePh2[3]	8155	6.96	37.75		37.88	0.000583	2.97	3083.02	255.04	0.12
	160630.7	FuturePh3[4]	8154	6.96	37.75		37.88	0.000583	2.97	3082.22	255.02	0.12
	159757.4	Existing[1]	8155	9.2	37.12		37.22	0.001009	2.56	3191.23	180.32	0.11
	159757.4	PropPh1[2]	8153	9.2	37.11		37.21	0.001011	2.56	3188.96	180.14	0.11
	159757.4	FuturePh2[3]	8155	9.2	37.12		37.22	0.00101	2.56	3190.45	180.26	0.11
	159757.4	FuturePh3[4]	8154	9.2	37.11		37.21	0.00101	2.56	3189.85	180.21	0.11
	158811.6	Existing[1]	8152	7.94	36.73		36.79	0.000253	2.01	4950.42	442.02	0.08
	158811.6	PropPh1[2]	8150	7.94	36.72		36.77	0.000254	2.01	4944.46	441.86	0.08
	158811.6	FuturePh2[3]	8152	7.94	36.72		36.78	0.000253	2.01	4948.34	441.97	0.08
	158811.6	FuturePh3[4]	8151	7.94	36.72		36.78	0.000253	2.01	4946.78	441.92	0.08
	157933.4	Existing[1]	8152	5.48	36.41	17.48	36.54	0.000307	3.13	3982.38	401.05	0.12
	157933.4	PropPh1[2]	8150	5.48	36.4	17.48	36.53	0.000308	3.13	3976.66	400.9	0.12
	157933.4	FuturePh2[3]	8152	5.48	36.41	17.48	36.54	0.000308	3.13	3980.35	400.99	0.12
	157933.4	FuturePh3[4]	8151	5.48	36.4	17.48	36.53	0.000308	3.13	3978.88	400.96	0.12
	156882.1	Existing[1]	8152	5.55	36.17		36.28	0.000205	2.71	3500	231.25	0.1
	156882.1	PropPh1[2]	8150	5.55	36.15		36.26	0.000205	2.71	3496.59	231.11	0.1
	156882.1	FuturePh2[3]	8152	5.55	36.16		36.27	0.000205	2.71	3498.79	231.2	0.1
	156882.1	FuturePh3[4]	8151	5.55	36.16		36.27	0.000205	2.71	3497.91	231.16	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	156116.3	Existing[1]	8152	5.91	36.04		36.09	0.000242	1.76	4628.36	282.66	0.08
	156116.3	PropPh1[2]	8150	5.91	36.02		36.07	0.000243	1.76	4624.1	282.62	0.08
	156116.3	FuturePh2[3]	8152	5.91	36.03		36.08	0.000242	1.76	4626.83	282.65	0.08
	156116.3	FuturePh3[4]	8151	5.91	36.03		36.08	0.000242	1.76	4625.75	282.64	0.08
	155861.6	Existing[1]	8431	6.03	35.96	16.29	36.01	0.000307	1.88	4478.07	292.89	0.08
	155861.6	PropPh1[2]	8428	6.03	35.94	16.29	36	0.000308	1.88	4473.61	292.79	0.08
	155861.6	FuturePh2[3]	8431	6.03	35.95	16.29	36.01	0.000307	1.88	4476.47	292.85	0.08
	155861.6	FuturePh3[4]	8429	6.03	35.95	16.29	36.01	0.000307	1.88	4475.34	292.83	0.08
	155805.1		Bridge									
	155748.6	Existing[1]	8431	5.79	35.62	16.04	35.68	0.000312	1.89	4449.28	292.29	0.09
	155748.6	PropPh1[2]	8428	5.79	35.61	16.04	35.66	0.000313	1.9	4444.78	292.19	0.09
	155748.6	FuturePh2[3]	8431	5.79	35.62	16.04	35.67	0.000313	1.9	4447.65	292.25	0.09
	155748.6	FuturePh3[4]	8429	5.79	35.61	16.04	35.67	0.000313	1.9	4446.52	292.23	0.09
	154890.7	Existing[1]	8587	5.42	35.26	15.79	35.39	0.000304	2.97	3296.94	472.25	0.12
	154890.7	PropPh1[2]	8575	5.42	35.24	15.79	35.37	0.000304	2.97	3292.94	471.93	0.12
	154890.7	FuturePh2[3]	8583	5.42	35.25	15.79	35.38	0.000304	2.97	3295.49	472.14	0.12
	154890.7	FuturePh3[4]	8579	5.42	35.25	15.79	35.38	0.000304	2.97	3294.51	472.06	0.12
	153992.6	Existing[1]	8587	3.83	35.05	16.2	35.14	0.000246	2.5	4839.77	849.02	0.11
	153992.6	PropPh1[2]	8575	3.83	35.03	16.19	35.12	0.000246	2.5	4830.73	848.4	0.11
	153992.6	FuturePh2[3]	8583	3.83	35.04	16.2	35.13	0.000246	2.5	4836.47	848.79	0.11
	153992.6	FuturePh3[4]	8579	3.83	35.04	16.2	35.13	0.000246	2.5	4834.28	848.64	0.11
	153119.9	Existing[1]	8587	4.13	34.77	14.46	34.86	0.000435	2.37	3982.81	686.98	0.09
	153119.9	PropPh1[2]	8575	4.13	34.76	14.45	34.84	0.000435	2.37	3978.29	686.55	0.09
	153119.9	FuturePh2[3]	8583	4.13	34.77	14.46	34.85	0.000435	2.37	3981.15	686.82	0.09
	153119.9	FuturePh3[4]	8579	4.13	34.76	14.46	34.85	0.000435	2.37	3980.08	686.72	0.09
	153108.9		Bridge									
	153097.9	Existing[1]	8587	4.13	34.76	14.46	34.84	0.000436	2.37	3977.93	686.52	0.09
	153097.9	PropPh1[2]	8575	4.13	34.74	14.45	34.82	0.000436	2.37	3973.42	686.1	0.09
	153097.9	FuturePh2[3]	8583	4.13	34.75	14.45	34.83	0.000436	2.37	3976.27	686.36	0.09
	153097.9	FuturePh3[4]	8579	4.13	34.75	14.45	34.83	0.000436	2.37	3975.2	686.26	0.09
	152376.3	Existing[1]	8587	3.84	34.52	15.82	34.61	0.000251	2.68	4588.96	983.03	0.1
	152376.3	PropPh1[2]	8575	3.84	34.51	15.81	34.59	0.000251	2.68	4580.22	981.15	0.1
	152376.3	FuturePh2[3]	8583	3.84	34.52	15.81	34.6	0.000251	2.68	4585.73	982.34	0.1
	152376.3	FuturePh3[4]	8579	3.84	34.51	15.81	34.6	0.000251	2.68	4583.7	981.9	0.1
	151996.2	Existing[1]	8587	4.14	34.5	14.34	34.53	0.000075	1.47	6526.17	473.02	0.06
	151996.2	PropPh1[2]	8575	4.14	34.49	14.33	34.52	0.000075	1.47	6519.25	472.91	0.06
	151996.2	FuturePh2[3]	8583	4.14	34.5	14.34	34.53	0.000075	1.47	6523.62	472.98	0.06
	151996.2	FuturePh3[4]	8579	4.14	34.49	14.33	34.52	0.000075	1.47	6522.01	472.95	0.06
	151963.3		Bridge									
	151930.4	Existing[1]	8587	3.37	34.47	13.56	34.5	0.000066	1.41	6854.21	478.32	0.06
	151930.4	PropPh1[2]	8575	3.37	34.46	13.55	34.49	0.000066	1.41	6847.25	478.21	0.06
	151930.4	FuturePh2[3]	8583	3.37	34.47	13.56	34.5	0.000066	1.41	6851.64	478.28	0.06
	151930.4	FuturePh3[4]	8579	3.37	34.46	13.56	34.49	0.000066	1.41	6850.02	478.25	0.06
	151925.3	Existing[1]	8587	2.99	34.48	11.76	34.5	0.000033	1.15	7948.89	608.96	0.04
	151925.3	PropPh1[2]	8575	2.99	34.46	11.75	34.48	0.000033	1.15	7942.76	608.82	0.04
	151925.3	FuturePh2[3]	8583	2.99	34.47	11.75	34.49	0.000033	1.15	7946.63	608.91	0.04
	151925.3	FuturePh3[4]	8579	2.99	34.47	11.75	34.49	0.000033	1.15	7945.2	608.88	0.04
	151846.3		Bridge									
	151767.3	Existing[1]	8587	1.3	33.7	10.07	33.72	0.000029	1.1	8309.14	617.7	0.04
	151767.3	PropPh1[2]	8575	1.3	33.69	10.06	33.7	0.000029	1.1	8302.82	617.55	0.04
	151767.3	FuturePh2[3]	8583	1.3	33.7	10.07	33.72	0.000029	1.1	8306.81	617.65	0.04
	151767.3	FuturePh3[4]	8579	1.3	33.69	10.06	33.71	0.000029	1.1	8305.35	617.61	0.04

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10PCT_10yr	151736.6	Existing[1]	8587	3.46	33.64	12.82	33.71	0.000112	2.08	4698.2	308.27	0.08
	151736.6	PropPh1[2]	8575	3.46	33.62	12.82	33.69	0.000111	2.07	4693.97	308.15	0.08
	151736.6	FuturePh2[3]	8583	3.46	33.63	12.82	33.7	0.000112	2.08	4696.64	308.22	0.08
	151736.6	FuturePh3[4]	8579	3.46	33.63	12.82	33.7	0.000111	2.07	4695.67	308.2	0.08
	151711.1		Bridge									
	151685.6	Existing[1]	8587	4.19	33.61	13.55	33.69	0.000125	2.15	4497.79	302.78	0.08
	151685.6	PropPh1[2]	8575	4.19	33.6	13.55	33.67	0.000125	2.15	4493.59	302.66	0.08
	151685.6	FuturePh2[3]	8583	4.19	33.61	13.55	33.68	0.000125	2.15	4496.24	302.74	0.08
	151685.6	FuturePh3[4]	8579	4.19	33.61	13.55	33.68	0.000125	2.15	4495.28	302.71	0.08
	151353.8	Existing[1]	8690	4.9	33.59	15.51	33.63	0.000119	1.71	7902.28	868.46	0.07
	151353.8	PropPh1[2]	8671	4.9	33.58	15.5	33.61	0.000119	1.71	7892.17	867.84	0.07
	151353.8	FuturePh2[3]	8683	4.9	33.59	15.51	33.62	0.000119	1.71	7898.55	868.23	0.07
	151353.8	FuturePh3[4]	8678	4.9	33.58	15.51	33.62	0.000119	1.71	7896.22	868.09	0.07
	150358.8	Existing[1]	8797	3.31	33.39		33.47	0.00019	2.42	4197.64	371.94	0.1
	150358.8	PropPh1[2]	8772	3.31	33.37		33.46	0.000189	2.42	4191.94	371.67	0.1
	150358.8	FuturePh2[3]	8788	3.31	33.38		33.47	0.00019	2.42	4195.53	371.84	0.1
	150358.8	FuturePh3[4]	8782	3.31	33.38		33.47	0.00019	2.42	4194.23	371.78	0.1
	149526.4	Existing[1]	8797	3.15	33.27	14.02	33.33	0.00015	2.16	5927.99	465.04	0.09
	149526.4	PropPh1[2]	8772	3.15	33.25	14.01	33.31	0.00015	2.16	5921	464.93	0.08
	149526.4	FuturePh2[3]	8788	3.15	33.26	14.02	33.32	0.00015	2.16	5925.4	465	0.08
	149526.4	FuturePh3[4]	8782	3.15	33.26	14.01	33.32	0.00015	2.16	5923.8	464.97	0.08
	149122.7	Existing[1]	8797	3.15	33.19		33.27	0.000132	2.32	4429	267.64	0.08
	149122.7	PropPh1[2]	8772	3.15	33.18		33.26	0.000132	2.31	4425.07	267.48	0.08
	149122.7	FuturePh2[3]	8788	3.15	33.19		33.27	0.000132	2.32	4427.54	267.58	0.08
	149122.7	FuturePh3[4]	8782	3.15	33.18		33.26	0.000132	2.32	4426.64	267.55	0.08
	148795.4	Existing[1]	8840	3.15	33.14	13.59	33.21	0.000268	2.35	4804.26	1004.37	0.09
	148795.4	PropPh1[2]	8813	3.15	33.12	13.57	33.19	0.000267	2.34	4799.62	1003.3	0.09
	148795.4	FuturePh2[3]	8830	3.15	33.13	13.58	33.2	0.000267	2.35	4802.54	1003.97	0.09
	148795.4	FuturePh3[4]	8824	3.15	33.13	13.58	33.2	0.000267	2.34	4801.48	1003.73	0.09
	148768.4		Bridge									
	148741.4	Existing[1]	8840	3.04	33.03	13.47	33.11	0.000267	2.35	4806.51	1004.89	0.09
	148741.4	PropPh1[2]	8813	3.04	33.02	13.45	33.09	0.000266	2.34	4801.91	1003.83	0.09
	148741.4	FuturePh2[3]	8830	3.04	33.03	13.46	33.1	0.000267	2.34	4804.81	1004.49	0.09
	148741.4	FuturePh3[4]	8824	3.04	33.02	13.46	33.1	0.000267	2.34	4803.75	1004.25	0.09
	147632.4	Existing[1]	8840	-1.17	32.87	10.73	32.94	0.000098	2.16	4848.23	397.3	0.09
	147632.4	PropPh1[2]	8813	-1.17	32.85	10.72	32.92	0.000098	2.16	4842.74	397.2	0.09
	147632.4	FuturePh2[3]	8830	-1.17	32.86	10.73	32.93	0.000098	2.16	4846.19	397.27	0.09
	147632.4	FuturePh3[4]	8824	-1.17	32.86	10.72	32.93	0.000098	2.16	4844.93	397.24	0.09
	146698	Existing[1]	8840	1.88	32.75	10.63	32.83	0.000116	2.5	4864.62	325.23	0.1
	146698	PropPh1[2]	8813	1.88	32.73	10.61	32.82	0.000116	2.5	4860.28	325.14	0.1
	146698	FuturePh2[3]	8830	1.88	32.74	10.62	32.83	0.000116	2.5	4863.01	325.2	0.1
	146698	FuturePh3[4]	8824	1.88	32.74	10.62	32.83	0.000116	2.5	4862.01	325.17	0.1
	145723.9	Existing[1]	8840	1.61	32.56		32.7	0.000165	3.25	4516.72	380.23	0.12
	145723.9	PropPh1[2]	8813	1.61	32.54		32.68	0.000165	3.24	4511.95	380.11	0.12
	145723.9	FuturePh2[3]	8830	1.61	32.55		32.69	0.000165	3.25	4514.95	380.19	0.12
	145723.9	FuturePh3[4]	8824	1.61	32.55		32.69	0.000165	3.25	4513.85	380.16	0.12
	144753.5	Existing[1]	8840	0.07	32.42	11.07	32.54	0.000141	2.83	3876.39	296.23	0.11
	144753.5	PropPh1[2]	8813	0.07	32.41	11.05	32.53	0.000141	2.82	3872.84	296.02	0.11
	144753.5	FuturePh2[3]	8830	0.07	32.42	11.06	32.54	0.000141	2.83	3875.07	296.15	0.11
	144753.5	FuturePh3[4]	8824	0.07	32.42	11.06	32.53	0.000141	2.83	3874.25	296.11	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	143966.8	Existing[1]	8840	-7.47	32.28	11.16	32.41	0.000191	3.05	4107.88	435.6	0.12
	143966.8	PropPh1[2]	8813	-7.47	32.27	11.13	32.4	0.00019	3.04	4103.51	435.2	0.12
	143966.8	FuturePh2[3]	8830	-7.47	32.28	11.15	32.41	0.00019	3.05	4106.26	435.45	0.12
	143966.8	FuturePh3[4]	8824	-7.47	32.27	11.14	32.41	0.00019	3.05	4105.24	435.36	0.12
	143078.2	Existing[1]	8840	-4.19	32.16		32.26	0.00014	2.59	5309.01	508.25	0.11
	143078.2	PropPh1[2]	8813	-4.19	32.15		32.25	0.000139	2.58	5303.44	507.9	0.11
	143078.2	FuturePh2[3]	8830	-4.19	32.16		32.26	0.00014	2.58	5306.94	508.12	0.11
	143078.2	FuturePh3[4]	8824	-4.19	32.16		32.25	0.00014	2.58	5305.64	508.04	0.11
	142061.4	Existing[1]	8840	0.55	32.07		32.14	0.000083	2.3	5548.23	449.9	0.09
	142061.4	PropPh1[2]	8813	0.55	32.06		32.13	0.000083	2.29	5543.47	449.8	0.09
	142061.4	FuturePh2[3]	8830	0.55	32.07		32.14	0.000083	2.3	5546.46	449.86	0.09
	142061.4	FuturePh3[4]	8824	0.55	32.06		32.14	0.000083	2.3	5545.35	449.84	0.09
	141320.1	Existing[1]	8840	-2.7	32.06	9.02	32.09	0.000046	1.58	10145.84	740.92	0.06
	141320.1	PropPh1[2]	8813	-2.7	32.05	9.01	32.08	0.000046	1.58	10138.03	740.82	0.06
	141320.1	FuturePh2[3]	8830	-2.7	32.05	9.02	32.08	0.000046	1.58	10142.94	740.88	0.06
	141320.1	FuturePh3[4]	8824	-2.7	32.05	9.01	32.08	0.000046	1.58	10141.12	740.86	0.06
	140116.2	Existing[1]	8840	-1.31	31.91	9.76	32	0.000118	2.55	5346.67	587.78	0.09
	140116.2	PropPh1[2]	8813	-1.31	31.9	9.74	31.99	0.000117	2.54	5340.88	587.53	0.09
	140116.2	FuturePh2[3]	8830	-1.31	31.9	9.76	32	0.000118	2.55	5344.52	587.69	0.09
	140116.2	FuturePh3[4]	8824	-1.31	31.9	9.75	31.99	0.000118	2.54	5343.16	587.63	0.09
	139320	Existing[1]	8840	-2.14	31.85	9.42	31.91	0.000087	2.07	6196.82	581.05	0.08
	139320	PropPh1[2]	8813	-2.14	31.84	9.4	31.9	0.000087	2.07	6191.24	580.72	0.08
	139320	FuturePh2[3]	8830	-2.14	31.85	9.41	31.91	0.000087	2.07	6194.75	580.93	0.08
	139320	FuturePh3[4]	8824	-2.14	31.84	9.41	31.91	0.000087	2.07	6193.44	580.85	0.08
	138607.9	Existing[1]	8717	-2.08	31.86	10.3	31.87	0.000021	1.12	15749.22	1061.55	0.04
	138607.9	PropPh1[2]	8698	-2.08	31.85	10.29	31.86	0.000021	1.12	15739.01	1060.81	0.04
	138607.9	FuturePh2[3]	8710	-2.08	31.86	10.29	31.87	0.000021	1.12	15745.43	1061.28	0.04
	138607.9	FuturePh3[4]	8705	-2.08	31.86	10.29	31.87	0.000021	1.12	15743.03	1061.1	0.04
	137732	Existing[1]	8717	-2.4	31.79	9.67	31.84	0.000063	2.16	9103.22	863.69	0.07
	137732	PropPh1[2]	8698	-2.4	31.78	9.66	31.83	0.000063	2.15	9095.5	863.35	0.07
	137732	FuturePh2[3]	8710	-2.4	31.79	9.66	31.84	0.000063	2.16	9100.35	863.56	0.07
	137732	FuturePh3[4]	8705	-2.4	31.79	9.66	31.84	0.000063	2.15	9098.55	863.48	0.07
	137113	Existing[1]	8717	-2.62	31.71	9.45	31.8	0.000089	2.57	5879.69	438.14	0.09
	137113	PropPh1[2]	8698	-2.62	31.7	9.43	31.79	0.000089	2.56	5876.16	437.92	0.09
	137113	FuturePh2[3]	8710	-2.62	31.7	9.44	31.79	0.000089	2.57	5878.38	438.06	0.09
	137113	FuturePh3[4]	8705	-2.62	31.7	9.44	31.79	0.000089	2.56	5877.56	438.01	0.09
	136331.2	Existing[1]	8717	-2.09	31.66	9.32	31.68	0.000168	1.42	8880.56	632.41	0.05
	136331.2	PropPh1[2]	8698	-2.09	31.65	9.31	31.67	0.000168	1.42	8874.79	632.32	0.05
	136331.2	FuturePh2[3]	8710	-2.09	31.65	9.32	31.67	0.000168	1.42	8878.41	632.37	0.05
	136331.2	FuturePh3[4]	8705	-2.09	31.65	9.32	31.67	0.000168	1.42	8877.08	632.35	0.05
	135666.2	Existing[1]	8717	-1.47	31.53		31.6	0.00008	2.21	6545.7	542.87	0.08
	135666.2	PropPh1[2]	8698	-1.47	31.53		31.59	0.00008	2.21	6540.95	542.7	0.08
	135666.2	FuturePh2[3]	8710	-1.47	31.53		31.6	0.00008	2.21	6543.93	542.81	0.08
	135666.2	FuturePh3[4]	8705	-1.47	31.53		31.6	0.00008	2.21	6542.84	542.77	0.08
	134706.7	Existing[1]	8717	-1.93	31.52		31.54	0.000037	1.55	12263.28	856.26	0.06
	134706.7	PropPh1[2]	8698	-1.93	31.51		31.53	0.000037	1.55	12255.82	856.09	0.06
	134706.7	FuturePh2[3]	8710	-1.93	31.51		31.54	0.000037	1.55	12260.5	856.2	0.06
	134706.7	FuturePh3[4]	8705	-1.93	31.51		31.53	0.000037	1.55	12258.79	856.16	0.06
	134090.6	Existing[1]	8717	-1.59	31.47		31.52	0.00005	1.9	9679.35	714.05	0.07
	134090.6	PropPh1[2]	8698	-1.59	31.47		31.51	0.00005	1.89	9673.22	713.91	0.07
	134090.6	FuturePh2[3]	8710	-1.59	31.47		31.51	0.00005	1.89	9677.07	714	0.07
	134090.6	FuturePh3[4]	8705	-1.59	31.47		31.51	0.00005	1.89	9675.67	713.96	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	133772.1	Existing[1]	8717	-0.79	31.42	8.82	31.49	0.000073	2.44	8080.37	799.79	0.08
	133772.1	PropPh1[2]	8698	-0.79	31.41	8.81	31.48	0.000073	2.44	8073.63	799.45	0.08
	133772.1	FuturePh2[3]	8710	-0.79	31.41	8.82	31.49	0.000073	2.44	8077.86	799.66	0.08
	133772.1	FuturePh3[4]	8705	-0.79	31.41	8.81	31.49	0.000073	2.44	8076.33	799.59	0.08
	133760.1		Bridge									
	133748.1	Existing[1]	8717	-0.46	31.41	9.15	31.49	0.000077	2.49	7812.35	786.48	0.08
	133748.1	PropPh1[2]	8698	-0.46	31.4	9.14	31.48	0.000077	2.49	7805.74	785.92	0.08
	133748.1	FuturePh2[3]	8710	-0.46	31.41	9.15	31.48	0.000077	2.49	7809.9	786.27	0.08
	133748.1	FuturePh3[4]	8705	-0.46	31.4	9.14	31.48	0.000077	2.49	7808.39	786.14	0.08
	132963.8	Existing[1]	8717	-1.98	31.33	8.66	31.42	0.0001	2.46	4850.32	441.34	0.09
	132963.8	PropPh1[2]	8698	-1.98	31.32	8.65	31.41	0.000099	2.46	4846.74	439.59	0.09
	132963.8	FuturePh2[3]	8710	-1.98	31.33	8.66	31.41	0.0001	2.46	4848.98	440.69	0.09
	132963.8	FuturePh3[4]	8705	-1.98	31.32	8.65	31.41	0.000099	2.46	4848.18	440.29	0.09
	131789.8	Existing[1]	8717	-2.31	31.21	7.48	31.3	0.000096	2.58	5499.48	482.13	0.09
	131789.8	PropPh1[2]	8698	-2.31	31.2	7.47	31.29	0.000096	2.57	5495.74	482.06	0.09
	131789.8	FuturePh2[3]	8710	-2.31	31.21	7.47	31.3	0.000096	2.58	5498.09	482.1	0.09
	131789.8	FuturePh3[4]	8705	-2.31	31.2	7.47	31.3	0.000096	2.58	5497.25	482.09	0.09
	130765.5	Existing[1]	8717	-3.81	31.19		31.23	0.000038	1.76	8162.38	487.03	0.06
	130765.5	PropPh1[2]	8698	-3.81	31.18		31.22	0.000038	1.76	8158.64	486.97	0.06
	130765.5	FuturePh2[3]	8710	-3.81	31.18		31.22	0.000038	1.76	8160.99	487.01	0.06
	130765.5	FuturePh3[4]	8705	-3.81	31.18		31.22	0.000038	1.76	8160.15	486.99	0.06
	129725.3	Existing[1]	8717	-3.71	31.1		31.17	0.00007	2.38	7765.94	683.97	0.08
	129725.3	PropPh1[2]	8698	-3.71	31.09		31.16	0.00007	2.37	7760.85	683.91	0.08
	129725.3	FuturePh2[3]	8710	-3.71	31.1		31.17	0.00007	2.38	7764.04	683.95	0.08
	129725.3	FuturePh3[4]	8705	-3.71	31.1		31.17	0.00007	2.37	7762.92	683.94	0.08
	129163.2	Existing[1]	8717	-3.13	31.07		31.13	0.000061	2.13	5876.5	477.5	0.07
	129163.2	PropPh1[2]	8698	-3.13	31.06		31.12	0.000061	2.13	5873.01	477.32	0.07
	129163.2	FuturePh2[3]	8710	-3.13	31.06		31.13	0.000061	2.13	5875.2	477.43	0.07
	129163.2	FuturePh3[4]	8705	-3.13	31.06		31.13	0.000061	2.13	5874.44	477.39	0.07
	128326.9	Existing[1]	8717	-4.05	31.04	6.09	31.08	0.000042	1.88	8407.04	810.19	0.06
	128326.9	PropPh1[2]	8698	-4.05	31.03	6.08	31.08	0.000042	1.88	8403.11	809.97	0.06
	128326.9	FuturePh2[3]	8710	-4.05	31.03	6.09	31.08	0.000042	1.88	8405.58	810.11	0.06
	128326.9	FuturePh3[4]	8705	-4.05	31.03	6.08	31.08	0.000042	1.88	8404.72	810.06	0.06
	128104.6	Existing[1]	8588	-4.29	31.03	5.79	31.08	0.000041	1.87	6694.96	384.88	0.06
	128104.6	PropPh1[2]	8577	-4.29	31.02	5.78	31.07	0.000041	1.87	6692.4	384.8	0.06
	128104.6	FuturePh2[3]	8584	-4.29	31.03	5.79	31.07	0.000041	1.87	6694.01	384.85	0.06
	128104.6	FuturePh3[4]	8581	-4.29	31.02	5.79	31.07	0.000041	1.87	6693.45	384.83	0.06
	128066.7		Bridge									
	128028.8	Existing[1]	8588	-4.51	30.81	5.57	30.85	0.000041	1.87	6694.47	384.86	0.06
	128028.8	PropPh1[2]	8577	-4.51	30.8	5.56	30.85	0.000041	1.87	6691.92	384.79	0.06
	128028.8	FuturePh2[3]	8584	-4.51	30.8	5.57	30.85	0.000041	1.87	6693.52	384.84	0.06
	128028.8	FuturePh3[4]	8581	-4.51	30.8	5.56	30.85	0.000041	1.87	6692.96	384.82	0.06
	126647	Existing[1]	8588	-3.93	30.77		30.79	0.00003	1.63	11094.66	739	0.05
	126647	PropPh1[2]	8577	-3.93	30.76		30.79	0.00003	1.63	11089.31	738.37	0.05
	126647	FuturePh2[3]	8584	-3.93	30.77		30.79	0.00003	1.63	11092.67	738.77	0.05
	126647	FuturePh3[4]	8581	-3.93	30.77		30.79	0.00003	1.63	11091.5	738.63	0.05
	125376.9	Existing[1]	8588	-4.05	30.67		30.74	0.000056	2.28	5521.74	329.13	0.07
	125376.9	PropPh1[2]	8577	-4.05	30.66		30.73	0.000056	2.28	5519.41	329.05	0.07
	125376.9	FuturePh2[3]	8584	-4.05	30.66		30.73	0.000056	2.28	5520.87	329.1	0.07
	125376.9	FuturePh3[4]	8581	-4.05	30.66		30.73	0.000056	2.28	5520.37	329.08	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	124983.5	Existing[1]	8588	-3.86	30.66	7.84	30.71	0.000054	2.2	5734.26	979.78	0.07
	124983.5	PropPh1[2]	8577	-3.86	30.65	7.83	30.7	0.000054	2.2	5731.67	979.47	0.07
	124983.5	FuturePh2[3]	8584	-3.86	30.66	7.83	30.71	0.000054	2.2	5733.29	979.66	0.07
	124983.5	FuturePh3[4]	8581	-3.86	30.66	7.83	30.71	0.000054	2.2	5732.73	979.6	0.07
	124644.1	Existing[1]	8588	-3.69	30.63	7.98	30.69	0.000058	2.28	5512.93	484.25	0.07
	124644.1	PropPh1[2]	8577	-3.69	30.63	7.97	30.68	0.000058	2.27	5510.72	484.18	0.07
	124644.1	FuturePh2[3]	8584	-3.69	30.63	7.98	30.69	0.000058	2.28	5512.11	484.22	0.07
	124644.1	FuturePh3[4]	8581	-3.69	30.63	7.97	30.69	0.000058	2.28	5511.63	484.21	0.07
	124591.8		Bridge									
	124539.5	Existing[1]	8588	-3.74	30.62	7.93	30.68	0.000058	2.27	5524.39	484.63	0.07
	124539.5	PropPh1[2]	8577	-3.74	30.61	7.92	30.67	0.000058	2.27	5522.19	484.55	0.07
	124539.5	FuturePh2[3]	8584	-3.74	30.62	7.93	30.67	0.000058	2.27	5523.57	484.6	0.07
	124539.5	FuturePh3[4]	8581	-3.74	30.62	7.92	30.67	0.000058	2.27	5523.1	484.58	0.07
	123658.2	Existing[1]	8535	-2.04	30.59		30.62	0.000036	1.72	11053.55	1134.85	0.06
	123658.2	PropPh1[2]	8527	-2.04	30.59		30.62	0.000036	1.72	11045.61	1133.63	0.06
	123658.2	FuturePh2[3]	8533	-2.04	30.59		30.62	0.000036	1.72	11050.57	1134.4	0.06
	123658.2	FuturePh3[4]	8530	-2.04	30.59		30.62	0.000036	1.72	11048.88	1134.14	0.06
	123138.8	Existing[1]	8535	-4.08	30.6		30.61	0.000016	1.11	14706.36	944.62	0.04
	123138.8	PropPh1[2]	8527	-4.08	30.59		30.6	0.000016	1.11	14699.75	944.13	0.04
	123138.8	FuturePh2[3]	8533	-4.08	30.59		30.6	0.000016	1.11	14703.89	944.44	0.04
	123138.8	FuturePh3[4]	8530	-4.08	30.59		30.6	0.000016	1.11	14702.48	944.33	0.04
	122627.1	Existing[1]	8535	-6.08	30.57	3.66	30.59	0.000027	1.41	8230.19	628.37	0.05
	122627.1	PropPh1[2]	8527	-6.08	30.56	3.66	30.59	0.000027	1.4	8225.82	627.98	0.05
	122627.1	FuturePh2[3]	8533	-6.08	30.56	3.66	30.59	0.000027	1.41	8228.55	628.22	0.05
	122627.1	FuturePh3[4]	8530	-6.08	30.56	3.66	30.59	0.000027	1.41	8227.62	628.14	0.05
	122572.1		Mult Open									
	122517.1	Existing[1]	8535	-5.38	30.55	4.36	30.58	0.00003	1.45	7794.86	584.21	0.05
	122517.1	PropPh1[2]	8527	-5.38	30.54	4.36	30.57	0.00003	1.45	7790.8	583.54	0.05
	122517.1	FuturePh2[3]	8533	-5.38	30.55	4.36	30.58	0.00003	1.45	7793.33	583.96	0.05
	122517.1	FuturePh3[4]	8530	-5.38	30.55	4.36	30.57	0.00003	1.45	7792.48	583.82	0.05
	121229.5	Existing[1]	8535	-11.37	30.48		30.53	0.000043	1.94	8222.25	832.23	0.06
	121229.5	PropPh1[2]	8527	-11.37	30.48		30.52	0.000043	1.94	8216.35	832.14	0.06
	121229.5	FuturePh2[3]	8533	-11.37	30.48		30.52	0.000043	1.94	8219.94	832.19	0.06
	121229.5	FuturePh3[4]	8530	-11.37	30.48		30.52	0.000043	1.94	8218.74	832.17	0.06
	120962.2	Existing[1]	8535	-10.59	30.45		30.51	0.000056	2.2	6245.76	651.75	0.07
	120962.2	PropPh1[2]	8527	-10.59	30.44		30.5	0.000056	2.19	6241.16	651.62	0.07
	120962.2	FuturePh2[3]	8533	-10.59	30.45		30.51	0.000056	2.2	6243.95	651.7	0.07
	120962.2	FuturePh3[4]	8530	-10.59	30.44		30.51	0.000056	2.2	6243.03	651.67	0.07
	120005.2	Existing[1]	8535	-7.78	30.45	3.1	30.46	0.000015	1.14	13451.35	899.79	0.04
	120005.2	PropPh1[2]	8527	-7.78	30.45	3.1	30.46	0.000015	1.14	13445.03	898.78	0.04
	120005.2	FuturePh2[3]	8533	-7.78	30.45	3.1	30.46	0.000015	1.14	13448.87	899.4	0.04
	120005.2	FuturePh3[4]	8530	-7.78	30.45	3.1	30.46	0.000015	1.14	13447.59	899.19	0.04
	119952.6		Bridge									
	119900	Existing[1]	8535	-7.64	30.44	3.25	30.45	0.000015	1.15	13310.04	891.64	0.04
	119900	PropPh1[2]	8527	-7.64	30.43	3.24	30.44	0.000015	1.15	13303.8	891.45	0.04
	119900	FuturePh2[3]	8533	-7.64	30.43	3.24	30.44	0.000015	1.15	13307.6	891.57	0.04
	119900	FuturePh3[4]	8530	-7.64	30.43	3.25	30.44	0.000015	1.15	13306.33	891.53	0.04
	119495.9	Existing[1]	8535	-7.21	30.43		30.44	0.000009	0.97	20397.1	1226.89	0.03
	119495.9	PropPh1[2]	8527	-7.21	30.43		30.43	0.000009	0.97	20388.51	1226.58	0.03
	119495.9	FuturePh2[3]	8533	-7.21	30.43		30.44	0.000009	0.97	20393.72	1226.77	0.03
	119495.9	FuturePh3[4]	8530	-7.21	30.43		30.44	0.000009	0.97	20392	1226.71	0.03

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	118667.7	Existing[1]	8535	-8.56	30.4		30.42	0.000022	1.56	10520.76	697.84	0.05
	118667.7	PropPh1[2]	8527	-8.56	30.39		30.42	0.000022	1.56	10515.9	697.55	0.05
	118667.7	FuturePh2[3]	8533	-8.56	30.39		30.42	0.000022	1.56	10518.84	697.72	0.05
	118667.7	FuturePh3[4]	8530	-8.56	30.39		30.42	0.000022	1.56	10517.87	697.66	0.05
	118466.1	Existing[1]	8535	-8.89	30.38	1.23	30.42	0.000028	1.77	8188.02	789.5	0.05
	118466.1	PropPh1[2]	8527	-8.89	30.37	1.22	30.41	0.000028	1.77	8182.53	789.38	0.05
	118466.1	FuturePh2[3]	8533	-8.89	30.37	1.23	30.41	0.000028	1.77	8185.85	789.45	0.05
	118466.1	FuturePh3[4]	8530	-8.89	30.37	1.23	30.41	0.000028	1.77	8184.77	789.43	0.05
	118418.1		Bridge									
	118370.1	Existing[1]	8535	-8.87	30.35	1.23	30.39	0.000029	1.77	8149.54	788.64	0.05
	118370.1	PropPh1[2]	8527	-8.87	30.34	1.22	30.38	0.000029	1.77	8144.07	788.52	0.05
	118370.1	FuturePh2[3]	8533	-8.87	30.35	1.23	30.39	0.000029	1.77	8147.38	788.59	0.05
	118370.1	FuturePh3[4]	8530	-8.87	30.34	1.22	30.38	0.000029	1.77	8146.3	788.57	0.05
	117845.4	Existing[1]	8535	-7.26	30.34		30.37	0.000027	1.63	8947.12	567.24	0.05
	117845.4	PropPh1[2]	8527	-7.26	30.33		30.36	0.000027	1.63	8943.19	567.17	0.05
	117845.4	FuturePh2[3]	8533	-7.26	30.34		30.37	0.000027	1.63	8945.56	567.21	0.05
	117845.4	FuturePh3[4]	8530	-7.26	30.34		30.36	0.000027	1.63	8944.79	567.2	0.05
	117204.3	Existing[1]	8535	-4.6	30.33		30.35	0.000026	1.54	10724.17	646.04	0.05
	117204.3	PropPh1[2]	8527	-4.6	30.32		30.34	0.000026	1.54	10719.7	645.99	0.05
	117204.3	FuturePh2[3]	8533	-4.6	30.32		30.35	0.000026	1.54	10722.4	646.02	0.05
	117204.3	FuturePh3[4]	8530	-4.6	30.32		30.34	0.000026	1.54	10721.52	646.01	0.05
	116395.7	Existing[1]	8535	-3.88	30.3		30.33	0.000023	1.53	9636.8	499.26	0.05
	116395.7	PropPh1[2]	8527	-3.88	30.29		30.32	0.000023	1.53	9633.35	499.22	0.05
	116395.7	FuturePh2[3]	8533	-3.88	30.3		30.33	0.000023	1.53	9635.43	499.25	0.05
	116395.7	FuturePh3[4]	8530	-3.88	30.3		30.32	0.000023	1.53	9634.76	499.24	0.05
	116167.6	Existing[1]	8535	-3.68	30.26	3.79	30.31	0.000037	1.92	5861.92	270.07	0.06
	116167.6	PropPh1[2]	8527	-3.68	30.25	3.79	30.31	0.000037	1.92	5860.16	270.05	0.06
	116167.6	FuturePh2[3]	8533	-3.68	30.26	3.79	30.31	0.000037	1.92	5861.22	270.06	0.06
	116167.6	FuturePh3[4]	8530	-3.68	30.26	3.79	30.31	0.000037	1.92	5860.88	270.06	0.06
	116121.9		Bridge									
	116076.2	Existing[1]	8535	-3.86	30.08	3.62	30.14	0.000037	1.92	5862.64	270.08	0.06
	116076.2	PropPh1[2]	8527	-3.86	30.08	3.61	30.13	0.000037	1.92	5860.89	270.06	0.06
	116076.2	FuturePh2[3]	8533	-3.86	30.08	3.61	30.13	0.000037	1.92	5861.94	270.07	0.06
	116076.2	FuturePh3[4]	8530	-3.86	30.08	3.61	30.13	0.000037	1.92	5861.61	270.07	0.06
	115655.5	Existing[1]	8535	-5.03	30.06	4.01	30.12	0.000033	2.06	6063.02	536.39	0.07
	115655.5	PropPh1[2]	8527	-5.03	30.05	4.01	30.11	0.000033	2.06	6059.38	536.17	0.07
	115655.5	FuturePh2[3]	8533	-5.03	30.06	4	30.12	0.000033	2.06	6061.56	536.3	0.07
	115655.5	FuturePh3[4]	8530	-5.03	30.06	4.01	30.12	0.000033	2.06	6060.87	536.26	0.07
	115635.5		Bridge									
	115615.5	Existing[1]	8535	-5.27	30.06	3.77	30.12	0.000032	2.04	6192.46	544.21	0.06
	115615.5	PropPh1[2]	8527	-5.27	30.05	3.76	30.11	0.000032	2.04	6188.77	543.98	0.06
	115615.5	FuturePh2[3]	8533	-5.27	30.06	3.77	30.11	0.000032	2.04	6190.98	544.12	0.06
	115615.5	FuturePh3[4]	8530	-5.27	30.06	3.76	30.11	0.000032	2.04	6190.28	544.07	0.06
	115573.5	Existing[1]	8535	-5.72	30.07	2.7	30.11	0.000024	1.73	7393.93	493.74	0.05
	115573.5	PropPh1[2]	8527	-5.72	30.06	2.7	30.1	0.000024	1.73	7390.58	493.72	0.05
	115573.5	FuturePh2[3]	8533	-5.72	30.06	2.7	30.1	0.000024	1.73	7392.59	493.73	0.05
	115573.5	FuturePh3[4]	8530	-5.72	30.06	2.7	30.1	0.000024	1.73	7391.95	493.73	0.05
	115553.5		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	115533.5	Existing[1]	8535	-6.77	30.06	1.65	30.1	0.000021	1.64	7912.02	496.78	0.05
	115533.5	PropPh1[2]	8527	-6.77	30.06	1.64	30.09	0.000021	1.64	7908.65	496.76	0.05
	115533.5	FuturePh2[3]	8533	-6.77	30.06	1.65	30.09	0.000021	1.64	7910.67	496.77	0.05
	115533.5	FuturePh3[4]	8530	-6.77	30.06	1.64	30.09	0.000021	1.64	7910.03	496.77	0.05
	115214	Existing[1]	8535	-7.96	30.05	0.66	30.09	0.00002	1.63	6506.6	326.95	0.05
	115214	PropPh1[2]	8527	-7.96	30.04	0.66	30.08	0.00002	1.63	6504.6	326.91	0.05
	115214	FuturePh2[3]	8533	-7.96	30.05	0.66	30.09	0.00002	1.63	6505.8	326.94	0.05
	115214	FuturePh3[4]	8530	-7.96	30.05	0.66	30.08	0.00002	1.63	6505.42	326.93	0.05
	115168.5		Bridge									
	115123	Existing[1]	8535	-8.12	30.03	0.5	30.06	0.00002	1.63	6546.76	327.77	0.05
	115123	PropPh1[2]	8527	-8.12	30.02	0.49	30.06	0.00002	1.63	6544.78	327.73	0.05
	115123	FuturePh2[3]	8533	-8.12	30.02	0.49	30.06	0.00002	1.63	6545.96	327.76	0.05
	115123	FuturePh3[4]	8530	-8.12	30.02	0.49	30.06	0.00002	1.63	6545.59	327.75	0.05
	114890.5	Existing[1]	8535	-8.56	30.01	1.24	30.06	0.000025	1.74	6828.36	416.9	0.06
	114890.5	PropPh1[2]	8527	-8.56	30.01	1.23	30.05	0.000025	1.74	6825.72	416.81	0.06
	114890.5	FuturePh2[3]	8533	-8.56	30.01	1.24	30.06	0.000025	1.74	6827.29	416.86	0.06
	114890.5	FuturePh3[4]	8530	-8.56	30.01	1.24	30.05	0.000025	1.74	6826.8	416.85	0.06
	114864.5		Bridge									
	114838.5	Existing[1]	8535	-9.27	29.36	0.52	29.4	0.000025	1.74	6849.4	417.57	0.06
	114838.5	PropPh1[2]	8527	-9.27	29.35	0.52	29.39	0.000025	1.74	6846.78	417.49	0.06
	114838.5	FuturePh2[3]	8533	-9.27	29.35	0.52	29.4	0.000025	1.74	6848.34	417.54	0.06
	114838.5	FuturePh3[4]	8530	-9.27	29.35	0.52	29.4	0.000025	1.74	6847.85	417.52	0.06
	114492	Existing[1]	8535	-10.48	29.35		29.39	0.00003	1.77	6380.26	347.92	0.06
	114492	PropPh1[2]	8527	-10.48	29.34		29.39	0.00003	1.76	6377.94	347.84	0.06
	114492	FuturePh2[3]	8533	-10.48	29.34		29.39	0.00003	1.76	6379.32	347.88	0.06
	114492	FuturePh3[4]	8530	-10.48	29.34		29.39	0.00003	1.76	6378.89	347.87	0.06
	114195.9	Existing[1]	8535	-11.52	29.34	0.75	29.38	0.000027	1.71	5843.05	321.97	0.06
	114195.9	PropPh1[2]	8527	-11.52	29.33	0.75	29.37	0.000027	1.71	5840.98	321.93	0.06
	114195.9	FuturePh2[3]	8533	-11.52	29.34	0.75	29.38	0.000027	1.71	5842.21	321.96	0.06
	114195.9	FuturePh3[4]	8530	-11.52	29.33	0.75	29.38	0.000027	1.71	5841.82	321.95	0.06
	114168.9		Bridge									
	114141.9	Existing[1]	8535	-10.83	29.33	1.43	29.37	0.00003	1.76	5625.98	317.56	0.06
	114141.9	PropPh1[2]	8527	-10.83	29.32	1.43	29.37	0.00003	1.76	5623.93	317.53	0.06
	114141.9	FuturePh2[3]	8533	-10.83	29.32	1.43	29.37	0.00003	1.76	5625.14	317.55	0.06
	114141.9	FuturePh3[4]	8530	-10.83	29.32	1.43	29.37	0.00003	1.76	5624.76	317.54	0.06
	114097.4	Existing[1]	8535	-7.46	29.33	2.8	29.37	0.000025	1.59	6481.61	379.43	0.05
	114097.4	PropPh1[2]	8527	-7.46	29.32	2.8	29.36	0.000025	1.59	6479.08	379.41	0.05
	114097.4	FuturePh2[3]	8533	-7.46	29.33	2.8	29.36	0.000025	1.59	6480.58	379.42	0.05
	114097.4	FuturePh3[4]	8530	-7.46	29.33	2.8	29.36	0.000025	1.59	6480.12	379.42	0.05
	114070.4		Bridge									
	114043.4	Existing[1]	8535	-7.72	28.33	2.53	28.37	0.000028	1.65	6199.54	377.74	0.06
	114043.4	PropPh1[2]	8527	-7.72	28.32	2.53	28.36	0.000028	1.65	6197.03	377.73	0.06
	114043.4	FuturePh2[3]	8533	-7.72	28.32	2.53	28.36	0.000028	1.65	6198.52	377.74	0.06
	114043.4	FuturePh3[4]	8530	-7.72	28.32	2.53	28.36	0.000028	1.65	6198.05	377.73	0.06
	113644	Existing[1]	8535	-8.91	28.29		28.35	0.000047	1.91	5130.59	360.2	0.07
	113644	PropPh1[2]	8527	-8.91	28.28		28.34	0.000047	1.91	5128.22	359.84	0.07
	113644	FuturePh2[3]	8533	-8.91	28.29		28.34	0.000047	1.91	5129.62	360.05	0.07
	113644	FuturePh3[4]	8530	-8.91	28.29		28.34	0.000047	1.91	5129.18	359.99	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	113411.6	Existing[1]	8535	-9.61	28.29	-0.01	28.33	0.000025	1.75	5295.84	370.53	0.05
	113411.6	PropPh1[2]	8527	-9.61	28.28	-0.01	28.33	0.000025	1.75	5294.62	370.51	0.05
	113411.6	FuturePh2[3]	8533	-9.61	28.29	-0.01	28.33	0.000025	1.75	5295.34	370.52	0.05
	113411.6	FuturePh3[4]	8530	-9.61	28.29	-0.01	28.33	0.000025	1.75	5295.12	370.52	0.05
	113374.3		Bridge									
	113337	Existing[1]	8535	-9.65	28.17	-0.05	28.22	0.000025	1.75	5281.44	370.32	0.05
	113337	PropPh1[2]	8527	-9.65	28.16	-0.05	28.21	0.000025	1.75	5280.23	370.3	0.05
	113337	FuturePh2[3]	8533	-9.65	28.17	-0.05	28.21	0.000025	1.75	5280.94	370.31	0.05
	113337	FuturePh3[4]	8530	-9.65	28.17	-0.05	28.21	0.000025	1.75	5280.73	370.31	0.05
	113266.4	Existing[1]	8535	-9.11	28.12	2.42	28.2	0.000055	2.35	4305.92	237.88	0.08
	113266.4	PropPh1[2]	8527	-9.11	28.11	2.41	28.2	0.000055	2.35	4304.37	237.86	0.08
	113266.4	FuturePh2[3]	8533	-9.11	28.12	2.41	28.2	0.000055	2.35	4305.28	237.87	0.08
	113266.4	FuturePh3[4]	8530	-9.11	28.12	2.41	28.2	0.000055	2.35	4305.01	237.87	0.08
	113238.6		Bridge									
	113210.8	Existing[1]	8535	-9.46	27.72	2.06	27.8	0.000056	2.36	4293.9	237.69	0.08
	113210.8	PropPh1[2]	8527	-9.46	27.71	2.05	27.8	0.000056	2.35	4292.37	237.67	0.08
	113210.8	FuturePh2[3]	8533	-9.46	27.72	2.05	27.8	0.000056	2.35	4293.27	237.68	0.08
	113210.8	FuturePh3[4]	8530	-9.46	27.71	2.05	27.8	0.000056	2.35	4293	237.68	0.08
	112974	Existing[1]	8535	-10.69	27.71	0.5	27.79	0.000066	2.33	4105.83	199.72	0.08
	112974	PropPh1[2]	8527	-10.69	27.7	0.49	27.78	0.000065	2.33	4104.54	199.7	0.08
	112974	FuturePh2[3]	8533	-10.69	27.7	0.48	27.78	0.000066	2.33	4105.3	199.71	0.08
	112974	FuturePh3[4]	8530	-10.69	27.7	0.5	27.78	0.000065	2.33	4105.07	199.71	0.08
	112944.9		Bridge									
	112915.8	Existing[1]	8535	-10.82	27.56	0.36	27.64	0.000066	2.33	4102.09	199.68	0.08
	112915.8	PropPh1[2]	8527	-10.82	27.55	0.36	27.63	0.000066	2.33	4100.8	199.67	0.08
	112915.8	FuturePh2[3]	8533	-10.82	27.55	0.34	27.64	0.000066	2.33	4101.55	199.67	0.08
	112915.8	FuturePh3[4]	8530	-10.82	27.55	0.36	27.64	0.000066	2.33	4101.33	199.67	0.08
	112575.5	Existing[1]	8535	-9.2	27.55	1.97	27.61	0.000049	2.1	4867.87	239.49	0.07
	112575.5	PropPh1[2]	8527	-9.2	27.54	1.96	27.6	0.000049	2.1	4866.49	239.48	0.07
	112575.5	FuturePh2[3]	8533	-9.2	27.54	1.94	27.61	0.000049	2.1	4867.29	239.48	0.07
	112575.5	FuturePh3[4]	8530	-9.2	27.54	1.8	27.61	0.000049	2.1	4867.06	239.48	0.07
	112534.5		Bridge									
	112493.5	Existing[1]	8535	-9.47	27.22	1.7	27.28	0.000049	2.11	4854.56	239.38	0.07
	112493.5	PropPh1[2]	8527	-9.47	27.21	1.68	27.27	0.000049	2.11	4853.19	239.37	0.07
	112493.5	FuturePh2[3]	8533	-9.47	27.21	1.66	27.28	0.000049	2.11	4853.99	239.38	0.07
	112493.5	FuturePh3[4]	8530	-9.47	27.21	1.52	27.28	0.000049	2.11	4853.76	239.37	0.07
	112003.3	Existing[1]	8535	-9.69	27.21	1.56	27.25	0.000027	1.66	5818.32	284.59	0.06
	112003.3	PropPh1[2]	8527	-9.69	27.2	1.56	27.24	0.000027	1.66	5816.56	284.56	0.06
	112003.3	FuturePh2[3]	8533	-9.69	27.21	1.56	27.25	0.000027	1.66	5817.59	284.58	0.06
	112003.3	FuturePh3[4]	8530	-9.69	27.2	1.56	27.25	0.000027	1.66	5817.29	284.57	0.06
	111953.3		Bridge									
	111903.3	Existing[1]	8535	-9.84	27.19	1.4	27.23	0.000027	1.65	5853.15	285.09	0.05
	111903.3	PropPh1[2]	8527	-9.84	27.18	1.4	27.22	0.000027	1.65	5851.4	285.07	0.05
	111903.3	FuturePh2[3]	8533	-9.84	27.18	1.4	27.22	0.000027	1.65	5852.41	285.08	0.05
	111903.3	FuturePh3[4]	8530	-9.84	27.18	1.4	27.22	0.000027	1.65	5852.13	285.08	0.05
	111853.5	Existing[1]	8535	-9.86	27.18	1.12	27.22	0.000024	1.6	5516.44	225.94	0.05
	111853.5	PropPh1[2]	8527	-9.86	27.18	1.11	27.22	0.000024	1.6	5515.01	225.92	0.05
	111853.5	FuturePh2[3]	8533	-9.86	27.18	1.11	27.22	0.000024	1.6	5515.84	225.93	0.05
	111853.5	FuturePh3[4]	8530	-9.86	27.18	1.12	27.22	0.000024	1.6	5515.6	225.93	0.05
	111818.6		Bridge									

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10PCT_10yr	111783.7	Existing[1]	8535	-8.67	27.17	2.3	27.21	0.000028	1.67	5245.89	222.29	0.06
	111783.7	PropPh1[2]	8527	-8.67	27.16	2.3	27.2	0.000028	1.67	5244.48	222.27	0.06
	111783.7	FuturePh2[3]	8533	-8.67	27.16	2.3	27.21	0.000028	1.67	5245.29	222.29	0.06
	111783.7	FuturePh3[4]	8530	-8.67	27.16	2.3	27.21	0.000028	1.67	5245.06	222.28	0.06
	111626.7	Existing[1]	8535	-11.83	27.15	0.78	27.2	0.000034	1.84	5442.34	229.27	0.06
	111626.7	PropPh1[2]	8527	-11.83	27.15	0.77	27.2	0.000034	1.84	5440.89	229.26	0.06
	111626.7	FuturePh2[3]	8533	-11.83	27.15	0.77	27.2	0.000034	1.84	5441.73	229.26	0.06
	111626.7	FuturePh3[4]	8530	-11.83	27.15	0.77	27.2	0.000034	1.84	5441.5	229.26	0.06
	111518.6		Bridge									
	111410.5	Existing[1]	8535	-11.23	27.12	1.37	27.17	0.000037	1.89	5297.8	228.21	0.06
	111410.5	PropPh1[2]	8527	-11.23	27.11	1.36	27.17	0.000037	1.89	5296.38	228.2	0.06
	111410.5	FuturePh2[3]	8533	-11.23	27.12	1.37	27.17	0.000037	1.89	5297.2	228.2	0.06
	111410.5	FuturePh3[4]	8530	-11.23	27.12	1.36	27.17	0.000037	1.89	5296.97	228.2	0.06
	110876.6	Existing[1]	8535	-10.43	27.11	-0.98	27.15	0.000023	1.75	6847.38	331.24	0.05
	110876.6	PropPh1[2]	8527	-10.43	27.1	-0.98	27.15	0.000023	1.75	6845.32	330.97	0.05
	110876.6	FuturePh2[3]	8533	-10.43	27.11	-0.98	27.15	0.000023	1.75	6846.51	331.12	0.05
	110876.6	FuturePh3[4]	8530	-10.43	27.11	-0.98	27.15	0.000023	1.75	6846.18	331.08	0.05
	110837.8		Bridge									
	110799	Existing[1]	8535	-10.72	27.08	-1.27	27.12	0.000023	1.73	6899.34	342.78	0.05
	110799	PropPh1[2]	8527	-10.72	27.08	-1.28	27.12	0.000023	1.73	6897.41	342.45	0.05
	110799	FuturePh2[3]	8533	-10.72	27.08	-1.27	27.12	0.000023	1.73	6898.53	342.64	0.05
	110799	FuturePh3[4]	8530	-10.72	27.08	-1.28	27.12	0.000023	1.73	6898.22	342.59	0.05
	110672.7	Existing[1]	8535	-13.25	27.07	-1.88	27.12	0.000032	1.82	7112.78	659.18	0.06
	110672.7	PropPh1[2]	8527	-13.25	27.07	-1.88	27.11	0.000032	1.82	7109.12	658.88	0.06
	110672.7	FuturePh2[3]	8533	-13.25	27.07	-1.88	27.12	0.000032	1.82	7111.24	659.05	0.06
	110672.7	FuturePh3[4]	8530	-13.25	27.07	-1.88	27.12	0.000032	1.82	7110.66	659.01	0.06
	110643.7		Bridge									
	110614.7	Existing[1]	8535	-12.75	27.06	-1.4	27.11	0.000034	1.86	6813.24	639.85	0.06
	110614.7	PropPh1[2]	8527	-12.75	27.06	-1.41	27.11	0.000034	1.86	6809.62	639.64	0.06
	110614.7	FuturePh2[3]	8533	-12.75	27.06	-1.4	27.11	0.000034	1.86	6811.71	639.77	0.06
	110614.7	FuturePh3[4]	8530	-12.75	27.06	-1.4	27.11	0.000034	1.86	6811.14	639.73	0.06
	110200.2	Existing[1]	38442	-9.11	25.88	11.11	26.76	0.000661	8.12	6776.93	438.81	0.28
	110200.2	PropPh1[2]	38427	-9.11	25.87	11.1	26.75	0.000661	8.12	6774.28	438.67	0.28
	110200.2	FuturePh2[3]	38436	-9.11	25.88	11.1	26.76	0.000661	8.12	6775.81	438.75	0.28
	110200.2	FuturePh3[4]	38433	-9.11	25.88	11.1	26.76	0.000661	8.12	6775.4	438.73	0.28
	110154.2		Bridge									
	110108.2	Existing[1]	38442	-9.31	25.47	10.91	26.37	0.000681	8.2	6685.69	433.83	0.28
	110108.2	PropPh1[2]	38427	-9.31	25.46	10.9	26.36	0.000681	8.19	6683.07	433.69	0.28
	110108.2	FuturePh2[3]	38436	-9.31	25.47	10.9	26.37	0.000681	8.19	6684.58	433.77	0.28
	110108.2	FuturePh3[4]	38433	-9.31	25.47	10.9	26.37	0.000681	8.19	6684.18	433.75	0.28
	109551.7	Existing[1]	38442	-14.28	25.27	4.9	25.98	0.000424	6.95	6872.54	334.15	0.22
	109551.7	PropPh1[2]	38427	-14.28	25.27	4.89	25.97	0.000424	6.95	6870.53	334.12	0.22
	109551.7	FuturePh2[3]	38436	-14.28	25.27	4.89	25.97	0.000424	6.95	6871.68	334.14	0.22
	109551.7	FuturePh3[4]	38433	-14.28	25.27	4.9	25.97	0.000424	6.95	6871.38	334.13	0.22
	109518.7		Bridge									
	109485.7	Existing[1]	38442	-15.31	24.45	3.87	25.14	0.000413	6.89	6940.98	334.92	0.22
	109485.7	PropPh1[2]	38427	-15.31	24.44	3.86	25.13	0.000413	6.89	6938.97	334.9	0.22
	109485.7	FuturePh2[3]	38436	-15.31	24.45	3.87	25.14	0.000413	6.89	6940.13	334.91	0.22
	109485.7	FuturePh3[4]	38433	-15.31	24.44	3.87	25.14	0.000413	6.89	6939.82	334.91	0.22

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	109440.2	Existing[1]	38442	-16.48	24.22	4.29	25.07	0.000475	7.65	6469.06	320.56	0.24
	109440.2	PropPh1[2]	38427	-16.48	24.22	4.29	25.07	0.000475	7.65	6467.16	320.55	0.24
	109440.2	FuturePh2[3]	38436	-16.48	24.22	4.29	25.07	0.000475	7.65	6468.26	320.55	0.24
	109440.2	FuturePh3[4]	38433	-16.48	24.22	4.29	25.07	0.000475	7.65	6467.97	320.55	0.24
	109395.2		Bridge									
	109350.2	Existing[1]	38442	-16.89	23.89	3.88	24.73	0.000471	7.63	6491.89	320.66	0.24
	109350.2	PropPh1[2]	38427	-16.89	23.88	3.88	24.72	0.000471	7.63	6490	320.65	0.24
	109350.2	FuturePh2[3]	38436	-16.89	23.88	3.88	24.73	0.000471	7.63	6491.09	320.66	0.24
	109350.2	FuturePh3[4]	38433	-16.89	23.88	3.88	24.73	0.000471	7.63	6490.81	320.66	0.24
	109119	Existing[1]	38442	-17.14	23.53	5.51	24.55	0.000684	8.27	5167.31	340.57	0.27
	109119	PropPh1[2]	38427	-17.14	23.53	5.51	24.54	0.000684	8.27	5165.5	340.48	0.27
	109119	FuturePh2[3]	38436	-17.14	23.53	5.5	24.55	0.000684	8.27	5166.53	340.53	0.27
	109119	FuturePh3[4]	38433	-17.14	23.53	5.51	24.54	0.000684	8.27	5166.27	340.52	0.27
	109103.1		Bridge									
	109087.2	Existing[1]	38442	-17.55	23.29	5.1	24.29	0.000669	8.2	5218.54	342.88	0.27
	109087.2	PropPh1[2]	38427	-17.55	23.28	5.1	24.28	0.000669	8.2	5216.72	342.8	0.27
	109087.2	FuturePh2[3]	38436	-17.55	23.29	5.1	24.29	0.000669	8.2	5217.76	342.85	0.27
	109087.2	FuturePh3[4]	38433	-17.55	23.29	5.1	24.29	0.000669	8.2	5217.5	342.83	0.27
	108565.3	Existing[1]	38442	-12.77	23.21	4.31	23.82	0.00043	6.28	6121.74	248.09	0.22
	108565.3	PropPh1[2]	38427	-12.77	23.2	4.31	23.81	0.00043	6.28	6120.26	248.07	0.22
	108565.3	FuturePh2[3]	38436	-12.77	23.2	4.31	23.82	0.00043	6.28	6121.11	248.08	0.22
	108565.3	FuturePh3[4]	38433	-12.77	23.2	4.31	23.82	0.00043	6.28	6120.9	248.07	0.22
	108334	Existing[1]	38442	-14.06	23.17		23.71	0.000356	5.88	6568.21	271.66	0.2
	108334	PropPh1[2]	38427	-14.06	23.16		23.7	0.000356	5.88	6566.6	271.61	0.2
	108334	FuturePh2[3]	38436	-14.06	23.17		23.7	0.000356	5.88	6567.52	271.64	0.2
	108334	FuturePh3[4]	38433	-14.06	23.17		23.7	0.000356	5.88	6567.29	271.63	0.2
	107179.4	Existing[1]	38563	-20.52	22.33	1.35	23.09	0.000676	7	5795.33	336.11	0.24
	107179.4	PropPh1[2]	38549	-20.52	22.32	1.35	23.08	0.000676	7	5793.34	335.94	0.24
	107179.4	FuturePh2[3]	38557	-20.52	22.33	1.35	23.08	0.000676	7	5794.47	336.04	0.24
	107179.4	FuturePh3[4]	38555	-20.52	22.33	1.35	23.08	0.000676	7	5794.19	336.02	0.24
	107158.9		Bridge									
	107138.4	Existing[1]	38563	-20.19	22.15	1.68	22.94	0.000723	7.14	5629.31	321.54	0.25
	107138.4	PropPh1[2]	38549	-20.19	22.15	1.67	22.94	0.000723	7.14	5627.42	321.37	0.25
	107138.4	FuturePh2[3]	38557	-20.19	22.15	1.67	22.94	0.000723	7.14	5628.5	321.47	0.25
	107138.4	FuturePh3[4]	38555	-20.19	22.15	1.67	22.94	0.000723	7.14	5628.22	321.45	0.25
	106594	Existing[1]	38563	-16.7	21.99	0.71	22.58	0.000342	6.2	6402.65	247.39	0.2
	106594	PropPh1[2]	38549	-16.7	21.98	0.71	22.58	0.000342	6.2	6401.19	247.37	0.2
	106594	FuturePh2[3]	38557	-16.7	21.99	0.71	22.58	0.000342	6.2	6402.02	247.38	0.2
	106594	FuturePh3[4]	38555	-16.7	21.99	0.71	22.58	0.000342	6.2	6401.81	247.38	0.2
	106151.4	Existing[1]	38563	-13.85	21.62	3.57	22.36	0.000486	6.94	5888.06	254.91	0.24
	106151.4	PropPh1[2]	38549	-13.85	21.61	3.56	22.35	0.000486	6.94	5886.57	254.88	0.24
	106151.4	FuturePh2[3]	38557	-13.85	21.62	3.57	22.36	0.000486	6.94	5887.42	254.9	0.24
	106151.4	FuturePh3[4]	38555	-13.85	21.61	3.57	22.36	0.000486	6.94	5887.21	254.89	0.24
	106131.1		Bridge									
	106110.8	Existing[1]	38563	-12.53	21.4	4.88	22.24	0.000585	7.37	5500.11	248.35	0.26
	106110.8	PropPh1[2]	38549	-12.53	21.39	4.88	22.23	0.000585	7.37	5498.67	248.33	0.26
	106110.8	FuturePh2[3]	38557	-12.53	21.39	4.88	22.23	0.000585	7.37	5499.49	248.34	0.26
	106110.8	FuturePh3[4]	38555	-12.53	21.39	4.88	22.23	0.000585	7.37	5499.28	248.34	0.26

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	105705.4	Existing[1]	38563	-18.22	21.25	2.11	21.97	0.000431	6.79	5678.14	254	0.25
	105705.4	PropPh1[2]	38549	-18.22	21.25	2.11	21.97	0.000431	6.79	5676.66	253.94	0.25
	105705.4	FuturePh2[3]	38557	-18.22	21.25	2.11	21.97	0.000431	6.79	5677.5	253.97	0.25
	105705.4	FuturePh3[4]	38555	-18.22	21.25	2.11	21.97	0.000431	6.79	5677.29	253.96	0.25
	105667.4		Bridge									
	105629.4	Existing[1]	38563	-18.43	20.95	1.89	21.68	0.000437	6.82	5655.12	252.93	0.25
	105629.4	PropPh1[2]	38549	-18.43	20.95	1.89	21.67	0.000437	6.82	5653.64	252.86	0.25
	105629.4	FuturePh2[3]	38557	-18.43	20.95	1.89	21.67	0.000437	6.82	5654.48	252.9	0.25
	105629.4	FuturePh3[4]	38555	-18.43	20.95	1.89	21.67	0.000437	6.82	5654.27	252.89	0.25
	105211	Existing[1]	38563	-16.14	20.6	2.27	21.45	0.000484	7.39	5215.42	217.49	0.27
	105211	PropPh1[2]	38549	-16.14	20.59	2.27	21.44	0.000484	7.39	5214.17	217.47	0.27
	105211	FuturePh2[3]	38557	-16.14	20.59	2.27	21.44	0.000484	7.39	5214.89	217.48	0.27
	105211	FuturePh3[4]	38555	-16.14	20.59	2.27	21.44	0.000484	7.39	5214.7	217.48	0.27
	104608.2	Existing[1]	38563	-18.46	20.43		21.06	0.0006	6.37	6053.55	386.44	0.28
	104608.2	PropPh1[2]	38549	-18.46	20.42		21.05	0.0006	6.37	6051.24	386.39	0.28
	104608.2	FuturePh2[3]	38557	-18.46	20.42		21.05	0.0006	6.37	6052.56	386.42	0.28
	104608.2	FuturePh3[4]	38555	-18.46	20.42		21.05	0.0006	6.37	6052.22	386.41	0.28
	104370.8	Existing[1]	38563	-19.99	19.8	3.71	20.81	0.00054	8.46	6377.4	436.14	0.28
	104370.8	PropPh1[2]	38549	-19.99	19.8	3.71	20.8	0.00054	8.46	6374.83	436.11	0.28
	104370.8	FuturePh2[3]	38557	-19.99	19.8	3.71	20.81	0.00054	8.46	6376.3	436.13	0.28
	104370.8	FuturePh3[4]	38555	-19.99	19.8	3.71	20.81	0.00054	8.46	6375.93	436.12	0.28
	104350		Bridge									
	104329.2	Existing[1]	38563	-20.2	19.03	3.5	20.1	0.000587	8.7	6131.51	433.76	0.3
	104329.2	PropPh1[2]	38549	-20.2	19.02	3.5	20.09	0.000587	8.7	6129.07	433.73	0.3
	104329.2	FuturePh2[3]	38557	-20.2	19.03	3.5	20.1	0.000587	8.7	6130.46	433.75	0.3
	104329.2	FuturePh3[4]	38555	-20.2	19.03	3.5	20.1	0.000587	8.7	6130.11	433.74	0.3
	103664	Existing[1]	38563	-23.03	16.67		19.11	0.001445	13.24	4062.63	258.56	0.42
	103664	PropPh1[2]	38549	-23.03	16.66		19.1	0.001445	13.24	4061.29	258.54	0.42
	103664	FuturePh2[3]	38557	-23.03	16.66		19.1	0.001445	13.24	4062.06	258.55	0.42
	103664	FuturePh3[4]	38555	-23.03	16.66		19.1	0.001445	13.24	4061.86	258.55	0.42
	102875.3	Existing[1]	38563	-26.39	16.13	0.65	17.86	0.000959	11.43	4870.27	338.71	0.35
	102875.3	PropPh1[2]	38549	-26.39	16.12	0.65	17.85	0.000959	11.43	4868.43	338.68	0.35
	102875.3	FuturePh2[3]	38557	-26.39	16.12	0.65	17.85	0.000959	11.43	4869.48	338.7	0.35
	102875.3	FuturePh3[4]	38555	-26.39	16.12	0.65	17.85	0.000959	11.43	4869.21	338.69	0.35
	102847.5		Bridge									
	102819.7	Existing[1]	38563	-26.43	15.6	0.57	17.44	0.00103	11.73	4705.86	335.22	0.36
	102819.7	PropPh1[2]	38549	-26.43	15.59	0.56	17.43	0.00103	11.73	4704.22	335.18	0.36
	102819.7	FuturePh2[3]	38557	-26.43	15.6	0.57	17.44	0.00103	11.73	4705.16	335.2	0.36
	102819.7	FuturePh3[4]	38555	-26.43	15.59	0.56	17.43	0.00103	11.73	4704.92	335.19	0.36
	102309	Existing[1]	38563	-23.48	15.91		16.58	0.000329	6.59	5855.86	216.46	0.22
	102309	PropPh1[2]	38549	-23.48	15.9		16.58	0.000329	6.59	5854.81	216.45	0.22
	102309	FuturePh2[3]	38557	-23.48	15.9		16.58	0.000329	6.59	5855.41	216.46	0.22
	102309	FuturePh3[4]	38555	-23.48	15.9		16.58	0.000329	6.59	5855.26	216.46	0.22
	101828	Existing[1]	38563	-20.7	15.46	-0.83	16.33	0.0005	7.47	5162.75	219.19	0.27
	101828	PropPh1[2]	38549	-20.7	15.46	-0.83	16.32	0.0005	7.47	5161.69	219.09	0.27
	101828	FuturePh2[3]	38557	-20.7	15.46	-0.83	16.33	0.0005	7.47	5162.29	219.15	0.27
	101828	FuturePh3[4]	38555	-20.7	15.46	-0.83	16.33	0.0005	7.47	5162.14	219.13	0.27
	101790.1		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	101752.2	Existing[1]	38563	-20.69	15.28	-0.83	16.16	0.000513	7.53	5120.89	217.53	0.27
	101752.2	PropPh1[2]	38549	-20.69	15.28	-0.83	16.16	0.000513	7.53	5119.86	217.51	0.27
	101752.2	FuturePh2[3]	38557	-20.69	15.28	-0.83	16.16	0.000513	7.53	5120.45	217.52	0.27
	101752.2	FuturePh3[4]	38555	-20.69	15.28	-0.83	16.16	0.000513	7.53	5120.3	217.52	0.27
	101007.3	Existing[1]	38563	-16.93	15.02		15.72	0.000435	6.76	5704.31	255.99	0.25
	101007.3	PropPh1[2]	38549	-16.93	15.01		15.72	0.000435	6.76	5703.1	255.97	0.25
	101007.3	FuturePh2[3]	38557	-16.93	15.01		15.72	0.000435	6.76	5703.79	255.98	0.25
	101007.3	FuturePh3[4]	38555	-16.93	15.01		15.72	0.000435	6.76	5703.61	255.98	0.25
	99992.6	Existing[1]	38910	-18.9	14.45		15.25	0.000492	7.16	5432.93	238.49	0.26
	99992.6	PropPh1[2]	38896	-18.9	14.45		15.24	0.000492	7.16	5431.81	238.48	0.26
	99992.6	FuturePh2[3]	38904	-18.9	14.45		15.24	0.000492	7.16	5432.45	238.48	0.26
	99992.6	FuturePh3[4]	38902	-18.9	14.45		15.24	0.000492	7.16	5432.28	238.48	0.26
	98399.4	Existing[1]	38910	-20.26	13.71		14.46	0.000482	6.95	5601.47	250.78	0.26
	98399.4	PropPh1[2]	38896	-20.26	13.7		14.45	0.000482	6.95	5600.32	250.76	0.26
	98399.4	FuturePh2[3]	38904	-20.26	13.71		14.45	0.000482	6.95	5600.98	250.77	0.26
	98399.4	FuturePh3[4]	38902	-20.26	13.7		14.45	0.000482	6.95	5600.8	250.77	0.26
	97517.4	Existing[1]	38910	-19.35	13.65		14.07	0.000233	5.24	7438.03	311.01	0.19
	97517.4	PropPh1[2]	38896	-19.35	13.64		14.07	0.000233	5.24	7436.6	311	0.19
	97517.4	FuturePh2[3]	38904	-19.35	13.65		14.07	0.000233	5.24	7437.42	311	0.19
	97517.4	FuturePh3[4]	38902	-19.35	13.64		14.07	0.000233	5.24	7437.21	311	0.19
	96028.6	Existing[1]	38910	-17.81	12.83	-3.24	13.52	0.000446	6.7	5820.59	277.04	0.25
	96028.6	PropPh1[2]	38896	-17.81	12.82	-3.25	13.52	0.000446	6.7	5819.34	277.01	0.25
	96028.6	FuturePh2[3]	38904	-17.81	12.83	-3.24	13.52	0.000446	6.7	5820.06	277.03	0.25
	96028.6	FuturePh3[4]	38902	-17.81	12.82	-3.25	13.52	0.000446	6.7	5819.87	277.02	0.25
	95985.1		Bridge									
	95941.6	Existing[1]	38910	-17.87	12.67	-3.31	13.38	0.000452	6.73	5794.5	276.45	0.25
	95941.6	PropPh1[2]	38896	-17.87	12.67	-3.31	13.37	0.000452	6.73	5793.27	276.42	0.25
	95941.6	FuturePh2[3]	38904	-17.87	12.67	-3.31	13.37	0.000452	6.73	5793.98	276.44	0.25
	95941.6	FuturePh3[4]	38902	-17.87	12.67	-3.31	13.37	0.000452	6.73	5793.79	276.44	0.25
	95362.9	Existing[1]	38910	-15.97	12.47		13.08	0.000419	6.26	6213.07	313	0.25
	95362.9	PropPh1[2]	38896	-15.97	12.46		13.07	0.000419	6.26	6211.67	312.97	0.25
	95362.9	FuturePh2[3]	38904	-15.97	12.47		13.07	0.000419	6.26	6212.47	312.99	0.25
	95362.9	FuturePh3[4]	38902	-15.97	12.47		13.07	0.000419	6.26	6212.26	312.98	0.25
	94280.7	Existing[1]	39073	-19.82	11.41		12.47	0.000664	8.25	4733.69	202.44	0.3
	94280.7	PropPh1[2]	39059	-19.82	11.41		12.46	0.000664	8.25	4732.84	202.43	0.3
	94280.7	FuturePh2[3]	39068	-19.82	11.41		12.47	0.000664	8.25	4733.31	202.44	0.3
	94280.7	FuturePh3[4]	39065	-19.82	11.41		12.47	0.000664	8.25	4733.2	202.43	0.3
	93495.6	Existing[1]	39073	-20.43	11.18		11.9	0.00053	6.8	5749.72	300.96	0.27
	93495.6	PropPh1[2]	39059	-20.43	11.18		11.9	0.00053	6.79	5748.45	300.93	0.27
	93495.6	FuturePh2[3]	39068	-20.43	11.18		11.9	0.00053	6.8	5749.15	300.95	0.27
	93495.6	FuturePh3[4]	39065	-20.43	11.18		11.9	0.00053	6.8	5748.98	300.94	0.27
	92795.6	Existing[1]	39136	-20.98	10.81	-5.19	11.54	0.00049	6.84	5719.03	277.86	0.27
	92795.6	PropPh1[2]	39122	-20.98	10.81	-5.2	11.54	0.00049	6.84	5717.88	277.83	0.27
	92795.6	FuturePh2[3]	39131	-20.98	10.81	-5.19	11.54	0.00049	6.84	5718.5	277.85	0.27
	92795.6	FuturePh3[4]	39128	-20.98	10.81	-5.2	11.54	0.00049	6.84	5718.36	277.84	0.27
	92741.1		Bridge									
	92686.6	Existing[1]	39136	-21.08	10.59	-5.3	11.33	0.000498	6.88	5684.93	277.1	0.27
	92686.6	PropPh1[2]	39122	-21.08	10.59	-5.3	11.32	0.000498	6.88	5683.69	277.07	0.27
	92686.6	FuturePh2[3]	39131	-21.08	10.59	-5.3	11.33	0.000498	6.88	5684.41	277.09	0.27
	92686.6	FuturePh3[4]	39128	-21.08	10.59	-5.3	11.32	0.000498	6.88	5684.17	277.08	0.27

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	90936.7	Existing[1]	39136	-18.64	9.61		10.3	0.000667	6.68	5861.68	382.23	0.3
	90936.7	PropPh1[2]	39122	-18.64	9.6		10.3	0.000667	6.68	5859.94	382.2	0.3
	90936.7	FuturePh2[3]	39131	-18.64	9.61		10.3	0.000667	6.68	5860.93	382.21	0.3
	90936.7	FuturePh3[4]	39128	-18.64	9.61		10.3	0.000667	6.68	5860.6	382.21	0.3
	89918.4	Existing[1]	39247	-17.23	8.44		9.46	0.000949	8.12	4832.24	305.26	0.36
	89918.4	PropPh1[2]	39233	-17.23	8.43		9.46	0.00095	8.12	4830.83	305.24	0.36
	89918.4	FuturePh2[3]	39241	-17.23	8.44		9.46	0.00095	8.12	4831.63	305.25	0.36
	89918.4	FuturePh3[4]	39238	-17.23	8.44		9.46	0.00095	8.12	4831.37	305.25	0.36
	88579	Existing[1]	39247	-20.97	7.25		8.22	0.000883	7.94	4943.2	306.28	0.35
	88579	PropPh1[2]	39233	-20.97	7.24		8.22	0.000883	7.94	4941.72	306.25	0.35
	88579	FuturePh2[3]	39241	-20.97	7.24		8.22	0.000883	7.94	4942.57	306.26	0.35
	88579	FuturePh3[4]	39238	-20.97	7.24		8.22	0.000883	7.94	4942.3	306.26	0.35
	87591.9	Existing[1]	39247	-23.72	6.69		7.46	0.000585	7.04	5573.68	298.66	0.29
	87591.9	PropPh1[2]	39233	-23.72	6.68		7.45	0.000585	7.04	5572.21	298.65	0.29
	87591.9	FuturePh2[3]	39241	-23.72	6.69		7.46	0.000585	7.04	5573.05	298.66	0.29
	87591.9	FuturePh3[4]	39238	-23.72	6.69		7.46	0.000585	7.04	5572.8	298.66	0.29
	86660.2	Existing[1]	39247	-23.42	6.35	-10.08	6.95	0.000359	6.2	6334.66	286.28	0.23
	86660.2	PropPh1[2]	39233	-23.42	6.35	-10.08	6.95	0.000359	6.2	6333.25	286.27	0.23
	86660.2	FuturePh2[3]	39241	-23.42	6.35	-10.07	6.95	0.000359	6.2	6334.06	286.27	0.23
	86660.2	FuturePh3[4]	39238	-23.42	6.35	-10.08	6.95	0.000359	6.2	6333.81	286.27	0.23
	86641.7		Bridge									
	86623.2	Existing[1]	39247	-23.61	5.99	-10.27	6.59	0.000368	6.25	6283.94	285.2	0.23
	86623.2	PropPh1[2]	39233	-23.61	5.98	-10.27	6.59	0.000368	6.25	6282.56	285.17	0.23
	86623.2	FuturePh2[3]	39241	-23.61	5.99	-10.27	6.59	0.000368	6.25	6283.35	285.19	0.23
	86623.2	FuturePh3[4]	39238	-23.61	5.98	-10.27	6.59	0.000368	6.25	6283.12	285.18	0.23
	85855.2	Existing[1]	39247	-26.84	4.61		5.95	0.000906	9.31	4217.41	200.58	0.36
	85855.2	PropPh1[2]	39233	-26.84	4.6		5.95	0.000906	9.3	4216.5	200.57	0.36
	85855.2	FuturePh2[3]	39241	-26.84	4.6		5.95	0.000906	9.31	4217.02	200.58	0.36
	85855.2	FuturePh3[4]	39238	-26.84	4.6		5.95	0.000906	9.31	4216.87	200.58	0.36
	85238.7	Existing[1]	39247	-29.43	4.31		5.4	0.000671	8.38	4686.02	215.54	0.31
	85238.7	PropPh1[2]	39233	-29.43	4.3		5.39	0.000671	8.38	4685.05	215.43	0.31
	85238.7	FuturePh2[3]	39241	-29.43	4.3		5.39	0.000671	8.38	4685.6	215.5	0.31
	85238.7	FuturePh3[4]	39238	-29.43	4.3		5.39	0.000671	8.38	4685.45	215.48	0.31
	84561.7	Existing[1]	39247	-32.27	4.03	-13.2	4.9	0.000492	7.51	5223.9	214.37	0.27
	84561.7	PropPh1[2]	39233	-32.27	4.02	-13.21	4.9	0.000491	7.51	5222.95	214.36	0.27
	84561.7	FuturePh2[3]	39241	-32.27	4.02	-13.21	4.9	0.000492	7.51	5223.49	214.37	0.27
	84561.7	FuturePh3[4]	39238	-32.27	4.02	-13.21	4.9	0.000491	7.51	5223.35	214.36	0.27
	84531.4		Bridge									
	84501.1	Existing[1]	39247	-28.97	3.54	-9.91	4.76	0.000785	8.85	4433.35	203.63	0.33
	84501.1	PropPh1[2]	39233	-28.97	3.54	-9.92	4.76	0.000785	8.85	4432.46	203.62	0.33
	84501.1	FuturePh2[3]	39241	-28.97	3.54	-9.91	4.76	0.000785	8.85	4432.97	203.63	0.33
	84501.1	FuturePh3[4]	39238	-28.97	3.54	-9.92	4.76	0.000785	8.85	4432.84	203.63	0.33
	84252.6	Existing[1]	39247	-26.9	3.45	-9.61	4.49	0.000697	8.16	4809.4	232.73	0.32
	84252.6	PropPh1[2]	39233	-26.9	3.45	-9.62	4.48	0.000697	8.16	4808.38	232.71	0.32
	84252.6	FuturePh2[3]	39241	-26.9	3.45	-9.62	4.48	0.000697	8.16	4808.96	232.72	0.32
	84252.6	FuturePh3[4]	39238	-26.9	3.45	-9.62	4.48	0.000697	8.16	4808.82	232.72	0.32
	84222.3		Bridge									
	84192	Existing[1]	39247	-24.1	2.82	-6.82	4.3	0.001168	9.74	4030.05	222.16	0.4
	84192	PropPh1[2]	39233	-24.1	2.82	-6.82	4.29	0.001168	9.74	4029.09	222.15	0.4
	84192	FuturePh2[3]	39241	-24.1	2.82	-6.81	4.3	0.001168	9.74	4029.64	222.16	0.4
	84192	FuturePh3[4]	39238	-24.1	2.82	-6.81	4.29	0.001168	9.74	4029.51	222.15	0.4

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
10PCT_10yr	83635.7	Existing[1]	39496	-21.72	2.49		3.47	0.000938	7.91	4990.28	326.21	0.36
	83635.7	PropPh1[2]	39482	-21.72	2.49		3.46	0.000938	7.91	4988.82	326.19	0.36
	83635.7	FuturePh2[3]	39490	-21.72	2.49		3.47	0.000938	7.91	4989.66	326.2	0.36
	83635.7	FuturePh3[4]	39488	-21.72	2.49		3.46	0.000938	7.91	4989.45	326.2	0.36
	81786.1	Existing[1]	39496	-31.97	1.01		1.87	0.000763	7.47	5290.74	322.19	0.32
	81786.1	PropPh1[2]	39482	-31.97	1		1.87	0.000763	7.46	5289.24	322.14	0.32
	81786.1	FuturePh2[3]	39490	-31.97	1.01		1.87	0.000763	7.46	5290.1	322.17	0.32
	81786.1	FuturePh3[4]	39488	-31.97	1.01		1.87	0.000763	7.46	5289.88	322.16	0.32
	80903.1	Existing[1]	39606	-27.77	0.49	-12.43	1.18	0.000625	6.65	5953.04	365.19	0.29
	80903.1	PropPh1[2]	39592	-27.77	0.48	-12.43	1.17	0.000625	6.65	5951.32	365.14	0.29
	80903.1	FuturePh2[3]	39600	-27.77	0.49	-12.43	1.17	0.000625	6.65	5952.3	365.17	0.29
	80903.1	FuturePh3[4]	39598	-27.77	0.49	-12.43	1.17	0.000625	6.65	5952.06	365.16	0.29
	80883.1		Bridge									
	80863.1	Existing[1]	39606	-28.1	-0.06	-12.77	0.64	0.000648	6.74	5872.5	362.82	0.3
	80863.1	PropPh1[2]	39592	-28.1	-0.07	-12.77	0.64	0.000648	6.74	5870.8	362.77	0.3
	80863.1	FuturePh2[3]	39600	-28.1	-0.06	-12.77	0.64	0.000648	6.74	5871.77	362.8	0.3
	80863.1	FuturePh3[4]	39598	-28.1	-0.06	-12.77	0.64	0.000648	6.74	5871.53	362.8	0.3
	80538	Existing[1]	39606	-33.12	0.08	-20.17	0.32	0.00015	3.95	10017.38	472.21	0.15
	80538	PropPh1[2]	39592	-33.12	0.08	-20.17	0.32	0.00015	3.95	10015.17	472.17	0.15
	80538	FuturePh2[3]	39600	-33.12	0.08	-20.17	0.32	0.00015	3.95	10016.44	472.19	0.15
	80538	FuturePh3[4]	39598	-33.12	0.08	-20.17	0.32	0.00015	3.95	10016.12	472.19	0.15
	248647.7	Existing[1]	3803	56.61	77.37		77.44	0.000037	2.26	1682.29	152.59	0.12
	248647.7	PropPh1[2]	3803	56.61	77.36		77.44	0.000037	2.26	1682.27	152.59	0.12
	248647.7	FuturePh2[3]	3803	56.61	77.36		77.44	0.000037	2.26	1682.27	152.59	0.12
	248647.7	FuturePh3[4]	3803	56.61	77.36		77.44	0.000037	2.26	1682.27	152.59	0.12
1PCT_100yr	248547.8	Existing[1]	3803	56.16	77.36	63.56	77.43	0.000133	2.18	1750.71	157.6	0.11
	248547.8	PropPh1[2]	3803	56.16	77.36	63.56	77.43	0.000133	2.18	1750.69	157.59	0.11
	248547.8	FuturePh2[3]	3803	56.16	77.36	63.56	77.43	0.000133	2.18	1750.7	157.6	0.11
	248547.8	FuturePh3[4]	3803	56.16	77.36	63.56	77.43	0.000133	2.18	1750.7	157.6	0.11
	248481.1		Bridge									
	248414.4	Existing[1]	3803	55.9	77.12	63.31	77.19	0.000132	2.18	1753.27	158.54	0.11
	248414.4	PropPh1[2]	3803	55.9	77.12	63.31	77.19	0.000132	2.18	1753.25	158.53	0.11
	248414.4	FuturePh2[3]	3803	55.9	77.12	63.31	77.19	0.000132	2.18	1753.25	158.53	0.11
	248414.4	FuturePh3[4]	3803	55.9	77.12	63.31	77.19	0.000132	2.18	1753.25	158.53	0.11
	247502	Existing[1]	3797	50.81	76.96		77.01	0.000291	1.8	2111.43	156.36	0.09
	247502	PropPh1[2]	3797	50.81	76.96		77.01	0.000291	1.8	2111.41	156.36	0.09
	247502	FuturePh2[3]	3797	50.81	76.96		77.01	0.000291	1.8	2111.42	156.36	0.09
	247502	FuturePh3[4]	3797	50.81	76.96		77.01	0.000291	1.8	2111.42	156.36	0.09
	246449.8	Existing[1]	3797	52.3	76.7		76.75	0.000214	1.79	2144.02	238.31	0.09
	246449.8	PropPh1[2]	3797	52.3	76.7		76.75	0.000214	1.79	2143.99	238.3	0.09
	246449.8	FuturePh2[3]	3797	52.3	76.7		76.75	0.000214	1.79	2144	238.3	0.09
	246449.8	FuturePh3[4]	3797	52.3	76.7		76.75	0.000214	1.79	2144	238.3	0.09
	245413.7	Existing[1]	3784	51.09	76.46		76.5	0.000255	1.76	2144.91	157.27	0.08
	245413.7	PropPh1[2]	3784	51.09	76.46		76.5	0.000256	1.76	2144.89	157.27	0.08
	245413.7	FuturePh2[3]	3784	51.09	76.46		76.5	0.000256	1.76	2144.9	157.27	0.08
	245413.7	FuturePh3[4]	3784	51.09	76.46		76.5	0.000256	1.76	2144.9	157.27	0.08
	244345.5	Existing[1]	3784	49	76.22		76.26	0.000202	1.57	2427.36	194.92	0.08
	244345.5	PropPh1[2]	3784	49	76.22		76.26	0.000202	1.57	2427.33	194.91	0.08
	244345.5	FuturePh2[3]	3784	49	76.22		76.26	0.000202	1.57	2427.34	194.91	0.08
	244345.5	FuturePh3[4]	3784	49	76.22		76.26	0.000202	1.57	2427.34	194.91	0.08

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	243452.9	Existing[1]	3772	49	76.08		76.11	0.000135	1.37	3550.04	589	0.06
	243452.9	PropPh1[2]	3772	49	76.08		76.11	0.000135	1.37	3549.95	588.99	0.06
	243452.9	FuturePh2[3]	3772	49	76.08		76.11	0.000135	1.37	3549.99	588.99	0.06
	243452.9	FuturePh3[4]	3772	49	76.08		76.11	0.000135	1.37	3549.99	588.99	0.06
	242655.3	Existing[1]	3772	49.31	75.91		75.95	0.000338	1.63	2909.99	702.78	0.08
	242655.3	PropPh1[2]	3772	49.31	75.91		75.95	0.000338	1.63	2909.88	702.75	0.08
	242655.3	FuturePh2[3]	3772	49.31	75.91		75.95	0.000338	1.63	2909.91	702.76	0.08
	242655.3	FuturePh3[4]	3772	49.31	75.91		75.95	0.000338	1.63	2909.91	702.76	0.08
	241917.5	Existing[1]	3772	48.64	75.74	57.62	75.77	0.000174	1.31	3558.05	1278.14	0.06
	241917.5	PropPh1[2]	3772	48.64	75.74	57.62	75.77	0.000174	1.31	3557.89	1277.98	0.06
	241917.5	FuturePh2[3]	3772	48.64	75.74	57.62	75.77	0.000174	1.31	3557.95	1278.04	0.06
	241917.5	FuturePh3[4]	3772	48.64	75.74	57.62	75.77	0.000174	1.31	3557.95	1278.04	0.06
	241646.1	Existing[1]	3772	48.4	75.69	57.39	75.72	0.000158	1.47	3518.78	1233.18	0.06
	241646.1	PropPh1[2]	3772	48.4	75.69	57.39	75.72	0.000158	1.47	3518.55	1233.09	0.06
	241646.1	FuturePh2[3]	3772	48.4	75.69	57.39	75.72	0.000158	1.47	3518.65	1233.13	0.06
	241646.1	FuturePh3[4]	3772	48.4	75.69	57.39	75.72	0.000158	1.47	3518.65	1233.13	0.06
	241632.7		Bridge									
	241619.3	Existing[1]	3772	48.33	75.68	57.3	75.71	0.000155	1.46	3598.74	1264.78	0.06
	241619.3	PropPh1[2]	3772	48.33	75.68	57.3	75.71	0.000155	1.46	3598.5	1264.69	0.06
	241619.3	FuturePh2[3]	3772	48.33	75.68	57.3	75.71	0.000155	1.46	3598.6	1264.73	0.06
	241619.3	FuturePh3[4]	3772	48.33	75.68	57.3	75.71	0.000155	1.46	3598.6	1264.73	0.06
	241079	Existing[1]	3758	49.13	75.64		75.65	0.000062	0.89	5548.05	952.69	0.04
	241079	PropPh1[2]	3758	49.13	75.64		75.65	0.000062	0.89	5547.88	952.67	0.04
	241079	FuturePh2[3]	3758	49.13	75.64		75.65	0.000062	0.89	5547.95	952.67	0.04
	241079	FuturePh3[4]	3758	49.13	75.64		75.65	0.000062	0.89	5547.95	952.67	0.04
	240579	Existing[1]	3758	48.94	75.6		75.61	0.0001	1.07	3815.06	933.32	0.05
	240579	PropPh1[2]	3758	48.94	75.6		75.61	0.0001	1.07	3814.89	933.27	0.05
	240579	FuturePh2[3]	3758	48.94	75.6		75.61	0.0001	1.07	3814.96	933.29	0.05
	240579	FuturePh3[4]	3758	48.94	75.6		75.61	0.0001	1.07	3814.96	933.29	0.05
	240376.3	Existing[1]	3758	48.86	75.57	55.58	75.59	0.000147	1.09	3661.78	808.59	0.05
	240376.3	PropPh1[2]	3758	48.86	75.57	55.58	75.59	0.000147	1.09	3661.67	808.49	0.05
	240376.3	FuturePh2[3]	3758	48.86	75.57	55.58	75.59	0.000147	1.09	3661.71	808.53	0.05
	240376.3	FuturePh3[4]	3758	48.86	75.57	55.58	75.59	0.000147	1.09	3661.71	808.53	0.05
	240315.3		Bridge									
	240254.3	Existing[1]	3758	48.68	75.54	55.39	75.56	0.000143	1.08	3754.02	861.55	0.05
	240254.3	PropPh1[2]	3758	48.68	75.54	55.39	75.56	0.000143	1.08	3753.91	861.46	0.05
	240254.3	FuturePh2[3]	3758	48.68	75.54	55.39	75.56	0.000143	1.08	3753.95	861.5	0.05
	240254.3	FuturePh3[4]	3758	48.68	75.54	55.39	75.56	0.000143	1.08	3753.95	861.5	0.05
	239993.6	Existing[1]	6670	47	75.42		75.47	0.000535	1.93	5026.41	1685.18	0.09
	239993.6	PropPh1[2]	6670	47	75.42		75.47	0.000535	1.93	5026.1	1685.15	0.09
	239993.6	FuturePh2[3]	6670	47	75.42		75.47	0.000535	1.93	5026.22	1685.16	0.09
	239993.6	FuturePh3[4]	6670	47	75.42		75.47	0.000535	1.93	5026.22	1685.16	0.09
	239036.8	Existing[1]	6670	47.67	74.85		74.93	0.000587	2.29	3313.1	839.79	0.1
	239036.8	PropPh1[2]	6670	47.67	74.85		74.93	0.000587	2.29	3312.92	839.67	0.1
	239036.8	FuturePh2[3]	6670	47.67	74.85		74.93	0.000587	2.29	3312.99	839.71	0.1
	239036.8	FuturePh3[4]	6670	47.67	74.85		74.93	0.000587	2.29	3312.99	839.71	0.1
	238060.4	Existing[1]	6670	45.2	74.28		74.36	0.000581	2.25	3444.21	661.3	0.1
	238060.4	PropPh1[2]	6670	45.2	74.28		74.36	0.000581	2.25	3444.04	661.26	0.1
	238060.4	FuturePh2[3]	6670	45.2	74.28		74.36	0.000581	2.25	3444.1	661.27	0.1
	238060.4	FuturePh3[4]	6670	45.2	74.28		74.36	0.000581	2.25	3444.1	661.27	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	237276.3	Existing[1]	6670	44.89	73.84		73.9	0.000579	2.01	3943.48	789.43	0.09
	237276.3	PropPh1[2]	6670	44.89	73.84		73.9	0.00058	2.01	3943.24	789.35	0.09
	237276.3	FuturePh2[3]	6670	44.89	73.84		73.9	0.000579	2.01	3943.33	789.38	0.09
	237276.3	FuturePh3[4]	6670	44.89	73.84		73.9	0.000579	2.01	3943.33	789.38	0.09
	236611	Existing[1]	6923	44.63	73.44		73.51	0.000589	2.25	3751.08	722.06	0.1
	236611	PropPh1[2]	6923	44.63	73.44		73.51	0.000589	2.25	3750.84	722	0.1
	236611	FuturePh2[3]	6923	44.63	73.44		73.51	0.000589	2.25	3750.93	722.03	0.1
	236611	FuturePh3[4]	6923	44.63	73.44		73.51	0.000589	2.25	3750.93	722.02	0.1
	235706.9	Existing[1]	6923	44.41	72.88		72.97	0.000611	2.44	3300.96	738.52	0.11
	235706.9	PropPh1[2]	6923	44.41	72.87		72.97	0.000611	2.44	3300.66	738.4	0.11
	235706.9	FuturePh2[3]	6923	44.41	72.88		72.97	0.000611	2.44	3300.78	738.45	0.11
	235706.9	FuturePh3[4]	6923	44.41	72.88		72.97	0.000611	2.44	3300.77	738.44	0.11
	234807.9	Existing[1]	7139	44.91	72.64		72.69	0.000174	1.85	5219.36	438.57	0.08
	234807.9	PropPh1[2]	7139	44.91	72.64		72.69	0.000174	1.85	5219.18	438.55	0.08
	234807.9	FuturePh2[3]	7139	44.91	72.64		72.69	0.000174	1.85	5219.25	438.56	0.08
	234807.9	FuturePh3[4]	7139	44.91	72.64		72.69	0.000174	1.85	5219.25	438.56	0.08
	233698.4	Existing[1]	7139	45.45	72.48	54.6	72.5	0.000154	1.33	8497.34	875.59	0.06
	233698.4	PropPh1[2]	7139	45.45	72.48	54.6	72.49	0.000154	1.33	8496.97	875.58	0.06
	233698.4	FuturePh2[3]	7139	45.45	72.48	54.6	72.49	0.000154	1.33	8497.12	875.58	0.06
	233698.4	FuturePh3[4]	7139	45.45	72.48	54.6	72.49	0.000154	1.33	8497.11	875.58	0.06
	233029.3	Existing[1]	7139	43.15	72.2		72.31	0.000556	2.64	2761.12	321.23	0.12
	233029.3	PropPh1[2]	7139	43.15	72.2		72.31	0.000556	2.64	2760.98	320.57	0.12
	233029.3	FuturePh2[3]	7139	43.15	72.2		72.31	0.000556	2.64	2761.04	320.85	0.12
	233029.3	FuturePh3[4]	7139	43.15	72.2		72.31	0.000556	2.64	2761.04	320.83	0.12
	232816.9	Existing[1]	7254	42.42	72.09	53.75	72.19	0.00052	2.51	2889.33	542.9	0.11
	232816.9	PropPh1[2]	7254	42.42	72.09	53.75	72.19	0.00052	2.51	2889.25	542.86	0.11
	232816.9	FuturePh2[3]	7254	42.42	72.09	53.75	72.19	0.00052	2.51	2889.29	542.88	0.11
	232816.9	FuturePh3[4]	7254	42.42	72.09	53.75	72.19	0.00052	2.51	2889.29	542.88	0.11
	232805.9		Bridge									
	232794.9	Existing[1]	7254	42.38	72.07	53.7	72.17	0.000518	2.51	2892.47	544.11	0.11
	232794.9	PropPh1[2]	7254	42.38	72.07	53.7	72.17	0.000518	2.51	2892.39	544.07	0.11
	232794.9	FuturePh2[3]	7254	42.38	72.07	53.7	72.17	0.000518	2.51	2892.43	544.09	0.11
	232794.9	FuturePh3[4]	7254	42.38	72.07	53.7	72.17	0.000518	2.51	2892.42	544.09	0.11
	232790.8	Existing[1]	7254	42.38	72.06	53.59	72.16	0.000464	2.58	2813.85	539.48	0.11
	232790.8	PropPh1[2]	7254	42.38	72.06	53.59	72.16	0.000464	2.58	2813.77	539.45	0.11
	232790.8	FuturePh2[3]	7254	42.38	72.06	53.59	72.16	0.000464	2.58	2813.81	539.47	0.11
	232790.8	FuturePh3[4]	7254	42.38	72.06	53.59	72.16	0.000464	2.58	2813.8	539.46	0.11
	232732.9		Bridge									
	232681.7	Existing[1]	7254	43.64	71.82	54.17	71.92	0.000335	2.57	2817.97	182.89	0.12
	232681.7	PropPh1[2]	7254	43.64	71.82	54.17	71.92	0.000335	2.57	2817.88	182.89	0.12
	232681.7	FuturePh2[3]	7254	43.64	71.82	54.17	71.92	0.000335	2.57	2817.92	182.89	0.12
	232681.7	FuturePh3[4]	7254	43.64	71.82	54.17	71.92	0.000335	2.57	2817.92	182.89	0.12
	232669.7		Bridge									
	232657.7	Existing[1]	7254	44.33	71.76	54.86	71.87	0.00037	2.7	2682.26	178.5	0.12
	232657.7	PropPh1[2]	7254	44.33	71.76	54.86	71.87	0.00037	2.7	2682.18	178.5	0.12
	232657.7	FuturePh2[3]	7254	44.33	71.76	54.86	71.87	0.00037	2.7	2682.22	178.5	0.12
	232657.7	FuturePh3[4]	7254	44.33	71.76	54.86	71.87	0.00037	2.7	2682.21	178.5	0.12
	232645.3		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	232632.3	Existing[1]	7254	44.3	71.74	54.83	71.85	0.000371	2.7	2685.87	179.04	0.12
	232632.3	PropPh1[2]	7254	44.3	71.73	54.83	71.85	0.000371	2.7	2685.79	179.04	0.12
	232632.3	FuturePh2[3]	7254	44.3	71.73	54.83	71.85	0.000371	2.7	2685.83	179.04	0.12
	232632.3	FuturePh3[4]	7254	44.3	71.73	54.83	71.85	0.000371	2.7	2685.83	179.04	0.12
	231798	Existing[1]	7344	41.92	71.28		71.37	0.000935	2.52	3024.92	377.07	0.12
	231798	PropPh1[2]	7344	41.92	71.27		71.37	0.000935	2.52	3024.73	377.02	0.12
	231798	FuturePh2[3]	7344	41.92	71.27		71.37	0.000935	2.52	3024.81	377.04	0.12
	231798	FuturePh3[4]	7344	41.92	71.27		71.37	0.000935	2.52	3024.8	377.04	0.12
	230908	Existing[1]	7549	42.68	70.85		70.89	0.000346	1.68	7278.64	1133.1	0.07
	230908	PropPh1[2]	7549	42.68	70.85		70.89	0.000346	1.68	7278	1132.87	0.07
	230908	FuturePh2[3]	7549	42.68	70.85		70.89	0.000346	1.68	7278.28	1132.97	0.07
	230908	FuturePh3[4]	7549	42.68	70.85		70.89	0.000346	1.68	7278.26	1132.97	0.07
	229882.5	Existing[1]	7549	41.58	70.67		70.7	0.000112	1.68	8359.18	1871.91	0.07
	229882.5	PropPh1[2]	7549	41.58	70.67		70.7	0.000112	1.68	8358.05	1871.57	0.07
	229882.5	FuturePh2[3]	7549	41.58	70.67		70.7	0.000112	1.68	8358.55	1871.72	0.07
	229882.5	FuturePh3[4]	7549	41.58	70.67		70.7	0.000112	1.68	8358.51	1871.71	0.07
	228917.1	Existing[1]	7745	41.61	70.56		70.59	0.000125	1.57	8766.52	1106.76	0.06
	228917.1	PropPh1[2]	7745	41.61	70.56		70.59	0.000125	1.57	8765.83	1106.53	0.06
	228917.1	FuturePh2[3]	7745	41.61	70.56		70.59	0.000125	1.57	8766.14	1106.63	0.06
	228917.1	FuturePh3[4]	7745	41.61	70.56		70.59	0.000125	1.57	8766.11	1106.62	0.06
	228060.7	Existing[1]	7745	40.89	70.47		70.48	0.000115	1.28	13566.57	2312.74	0.05
	228060.7	PropPh1[2]	7745	40.89	70.47		70.48	0.000115	1.28	13565.11	2312.62	0.05
	228060.7	FuturePh2[3]	7745	40.89	70.47		70.48	0.000115	1.28	13565.76	2312.67	0.05
	228060.7	FuturePh3[4]	7745	40.89	70.47		70.48	0.000115	1.28	13565.71	2312.66	0.05
	227524.1	Existing[1]	7745	40.54	70.36	50.84	70.41	0.000156	1.81	7598.05	2168.6	0.07
	227524.1	PropPh1[2]	7745	40.54	70.36	50.84	70.41	0.000156	1.81	7596.65	2167.71	0.07
	227524.1	FuturePh2[3]	7745	40.54	70.36	50.84	70.41	0.000156	1.81	7597.27	2168.11	0.07
	227524.1	FuturePh3[4]	7745	40.54	70.36	50.84	70.41	0.000156	1.81	7597.23	2168.08	0.07
	227144.7	Existing[1]	7870	40.3	70.31	50.67	70.35	0.000126	1.68	7363.05	1483.59	0.06
	227144.7	PropPh1[2]	7870	40.3	70.31	50.67	70.35	0.000126	1.68	7362.12	1483.06	0.06
	227144.7	FuturePh2[3]	7870	40.3	70.31	50.67	70.35	0.000126	1.68	7362.53	1483.3	0.06
	227144.7	FuturePh3[4]	7870	40.3	70.31	50.67	70.35	0.000126	1.68	7362.5	1483.28	0.06
	227088.2		Bridge									
	227031.7	Existing[1]	7870	40.22	70.29	50.58	70.33	0.000125	1.67	7448.62	1531.08	0.06
	227031.7	PropPh1[2]	7870	40.22	70.29	50.58	70.33	0.000125	1.67	7447.63	1530.55	0.06
	227031.7	FuturePh2[3]	7870	40.22	70.29	50.58	70.33	0.000125	1.67	7448.08	1530.79	0.06
	227031.7	FuturePh3[4]	7870	40.22	70.29	50.58	70.33	0.000125	1.67	7448.05	1530.77	0.06
	225979.2	Existing[1]	8117	40.46	70.1		70.15	0.000256	1.84	5391.47	627.27	0.08
	225979.2	PropPh1[2]	8117	40.46	70.1		70.14	0.000256	1.84	5391.04	626.93	0.08
	225979.2	FuturePh2[3]	8117	40.46	70.1		70.15	0.000256	1.84	5391.23	627.08	0.08
	225979.2	FuturePh3[4]	8117	40.46	70.1		70.15	0.000256	1.84	5391.21	627.07	0.08
	224981.6	Existing[1]	8422	40.72	69.79		69.83	0.000402	1.92	7440.06	1144.61	0.08
	224981.6	PropPh1[2]	8422	40.72	69.79		69.83	0.000402	1.92	7439.21	1144.36	0.08
	224981.6	FuturePh2[3]	8422	40.72	69.79		69.83	0.000402	1.92	7439.59	1144.47	0.08
	224981.6	FuturePh3[4]	8422	40.72	69.79		69.83	0.000402	1.92	7439.56	1144.46	0.08
	224198	Existing[1]	8422	39.2	69.49		69.54	0.000333	1.91	5707.33	556.33	0.08
	224198	PropPh1[2]	8422	39.2	69.49		69.54	0.000333	1.91	5706.89	556.18	0.08
	224198	FuturePh2[3]	8422	39.2	69.49		69.54	0.000333	1.91	5707.09	556.25	0.08
	224198	FuturePh3[4]	8422	39.2	69.49		69.54	0.000333	1.91	5707.08	556.24	0.08

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	223061.1	Existing[1]	8606	37.26	69.12	50.72	69.2	0.000263	2.24	4099.71	1262.21	0.1
	223061.1	PropPh1[2]	8606	37.26	69.12	50.72	69.2	0.000263	2.24	4099.43	1261.81	0.1
	223061.1	FuturePh2[3]	8606	37.26	69.12	50.72	69.2	0.000263	2.24	4099.56	1261.99	0.1
	223061.1	FuturePh3[4]	8606	37.26	69.12	50.72	69.2	0.000263	2.24	4099.55	1261.98	0.1
	222172.8	Existing[1]	8606	38.92	68.8	53.17	68.86	0.000549	1.9	4629.58	1498.48	0.08
	222172.8	PropPh1[2]	8606	38.92	68.8	53.17	68.86	0.000549	1.9	4629.29	1498.4	0.08
	222172.8	FuturePh2[3]	8606	38.92	68.8	53.17	68.86	0.000549	1.9	4629.42	1498.44	0.08
	222172.8	FuturePh3[4]	8606	38.92	68.8	53.17	68.86	0.000549	1.9	4629.41	1498.43	0.08
	221721.3	Existing[1]	8606	38.24	68.62		68.74	0.000131	2.89	4060.23	694.29	0.1
	221721.3	PropPh1[2]	8606	38.24	68.62		68.74	0.000131	2.89	4059.6	693.61	0.1
	221721.3	FuturePh2[3]	8606	38.24	68.62		68.74	0.000131	2.89	4059.89	693.93	0.1
	221721.3	FuturePh3[4]	8606	38.24	68.62		68.74	0.000131	2.89	4059.87	693.91	0.1
	221523.4	Existing[1]	8675	37.95	68.63	47.07	68.69	0.000083	2.32	9595.29	2064.69	0.08
	221523.4	PropPh1[2]	8675	37.95	68.63	47.07	68.69	0.000083	2.32	9593.42	2064.41	0.08
	221523.4	FuturePh2[3]	8675	37.95	68.63	47.07	68.69	0.000083	2.32	9594.28	2064.54	0.08
	221523.4	FuturePh3[4]	8675	37.95	68.63	47.07	68.69	0.000083	2.32	9594.24	2064.53	0.08
	221469.5		Bridge									
	221415.6	Existing[1]	8675	37.86	68.59	46.98	68.65	0.000082	2.31	9693.17	2079.81	0.08
	221415.6	PropPh1[2]	8675	37.86	68.58	46.98	68.65	0.000082	2.31	9691.28	2079.52	0.08
	221415.6	FuturePh2[3]	8675	37.86	68.58	46.98	68.65	0.000082	2.31	9692.15	2079.65	0.08
	221415.6	FuturePh3[4]	8675	37.86	68.58	46.98	68.65	0.000082	2.31	9692.11	2079.64	0.08
	220426.4	Existing[1]	8930	36.86	68.44		68.48	0.000414	1.78	6861.48	1138.12	0.08
	220426.4	PropPh1[2]	8930	36.86	68.44		68.48	0.000414	1.78	6860.42	1137.26	0.08
	220426.4	FuturePh2[3]	8930	36.86	68.44		68.48	0.000414	1.78	6860.91	1137.66	0.08
	220426.4	FuturePh3[4]	8930	36.86	68.44		68.48	0.000414	1.78	6860.89	1137.64	0.08
	219577.1	Existing[1]	8930	35.81	67.8		67.89	0.001311	2.55	7036.07	778.23	0.11
	219577.1	PropPh1[2]	8930	35.81	67.8		67.89	0.001312	2.55	7035.22	778.19	0.11
	219577.1	FuturePh2[3]	8930	35.81	67.8		67.89	0.001311	2.55	7035.61	778.21	0.11
	219577.1	FuturePh3[4]	8930	35.81	67.8		67.89	0.001311	2.55	7035.59	778.21	0.11
	218625.5	Existing[1]	8930	33.78	67.51		67.53	0.000163	1.23	12762.25	1120.24	0.05
	218625.5	PropPh1[2]	8930	33.78	67.51		67.53	0.000163	1.23	12760.96	1120.11	0.05
	218625.5	FuturePh2[3]	8930	33.78	67.51		67.53	0.000163	1.23	12761.55	1120.17	0.05
	218625.5	FuturePh3[4]	8930	33.78	67.51		67.53	0.000163	1.23	12761.53	1120.17	0.05
	217899.8	Existing[1]	9096	35.59	67.13	47.82	67.23	0.001872	2.56	4000.73	680.75	0.11
	217899.8	PropPh1[2]	9096	35.59	67.13	47.82	67.23	0.001873	2.56	4000.03	680.6	0.11
	217899.8	FuturePh2[3]	9096	35.59	67.13	47.82	67.23	0.001873	2.56	4000.35	680.67	0.11
	217899.8	FuturePh3[4]	9096	35.59	67.13	47.82	67.23	0.001873	2.56	4000.34	680.67	0.11
	216802.9	Existing[1]	9096	33.28	66.78	46.05	66.79	0.000159	0.81	14577.16	970.32	0.03
	216802.9	PropPh1[2]	9096	33.28	66.78	46.05	66.79	0.000159	0.81	14575.95	970.27	0.03
	216802.9	FuturePh2[3]	9096	33.28	66.78	46.05	66.79	0.000159	0.81	14576.5	970.29	0.03
	216802.9	FuturePh3[4]	9096	33.28	66.78	46.05	66.79	0.000159	0.81	14576.48	970.29	0.03
	216040.3	Existing[1]	9096	33.72	66.54	46.49	66.57	0.000539	1.3	7673.73	544.3	0.06
	216040.3	PropPh1[2]	9096	33.72	66.54	46.49	66.57	0.000539	1.3	7673.05	544.19	0.06
	216040.3	FuturePh2[3]	9096	33.72	66.54	46.49	66.57	0.000539	1.3	7673.36	544.24	0.06
	216040.3	FuturePh3[4]	9096	33.72	66.54	46.49	66.57	0.000539	1.3	7673.34	544.24	0.06
	214968	Existing[1]	9264	34.34	66.53	42.71	66.54	0.000009	1	14709.64	1520.79	0.03
	214968	PropPh1[2]	9264	34.34	66.53	42.71	66.53	0.000009	1	14708.41	1520.61	0.03
	214968	FuturePh2[3]	9264	34.34	66.53	42.71	66.54	0.000009	1	14708.98	1520.69	0.03
	214968	FuturePh3[4]	9264	34.34	66.53	42.71	66.54	0.000009	1	14708.95	1520.69	0.03
	214945		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	214922	Existing[1]	9264	33.55	65.63	41.92	65.64	0.000009	1.01	14611.41	1506.13	0.03
	214922	PropPh1[2]	9264	33.55	65.63	41.92	65.63	0.000009	1.01	14610.18	1505.95	0.03
	214922	FuturePh2[3]	9264	33.55	65.63	41.92	65.63	0.000009	1.01	14610.75	1506.03	0.03
	214922	FuturePh3[4]	9264	33.55	65.63	41.92	65.63	0.000009	1.01	14610.72	1506.03	0.03
	214866.8	Existing[1]	9264	34.09	65.45	45.71	65.59	0.000107	3.19	4901.69	873.52	0.11
	214866.8	PropPh1[2]	9264	34.09	65.45	45.71	65.59	0.000107	3.19	4900.92	873.42	0.11
	214866.8	FuturePh2[3]	9264	34.09	65.45	45.71	65.59	0.000107	3.19	4901.28	873.47	0.11
	214866.8	FuturePh3[4]	9264	34.09	65.45	45.71	65.59	0.000107	3.19	4901.26	873.47	0.11
	214821.3		Bridge									
	214775.8	Existing[1]	9264	34.17	65.38	45.79	65.53	0.00011	3.21	4822.38	863.57	0.11
	214775.8	PropPh1[2]	9264	34.17	65.38	45.79	65.53	0.00011	3.21	4821.61	863.47	0.11
	214775.8	FuturePh2[3]	9264	34.17	65.38	45.79	65.53	0.00011	3.21	4821.97	863.52	0.11
	214775.8	FuturePh3[4]	9264	34.17	65.38	45.79	65.53	0.00011	3.21	4821.95	863.51	0.11
	214672.8	Existing[1]	9299	34.45	65.34	44.91	65.51	0.000118	3.44	3790.43	456.36	0.12
	214672.8	PropPh1[2]	9299	34.45	65.34	44.91	65.51	0.000118	3.44	3790.09	456.1	0.12
	214672.8	FuturePh2[3]	9299	34.45	65.34	44.91	65.51	0.000118	3.44	3790.25	456.22	0.12
	214672.8	FuturePh3[4]	9299	34.45	65.34	44.91	65.51	0.000118	3.44	3790.24	456.22	0.12
	214628.5		Bridge									
	214584.2	Existing[1]	9299	34.14	65.31	44.6	65.48	0.000114	3.4	3859.96	505.23	0.12
	214584.2	PropPh1[2]	9299	34.14	65.31	44.6	65.48	0.000114	3.4	3859.61	505	0.12
	214584.2	FuturePh2[3]	9299	34.14	65.31	44.6	65.48	0.000114	3.4	3859.77	505.11	0.12
	214584.2	FuturePh3[4]	9299	34.14	65.31	44.6	65.48	0.000114	3.4	3859.76	505.1	0.12
	213687.7	Existing[1]	9467	32.8	65.17		65.26	0.000459	2.7	4662.5	257.56	0.1
	213687.7	PropPh1[2]	9467	32.8	65.17		65.25	0.000459	2.7	4662.13	257.55	0.1
	213687.7	FuturePh2[3]	9467	32.8	65.17		65.26	0.000459	2.7	4662.31	257.56	0.1
	213687.7	FuturePh3[4]	9467	32.8	65.17		65.26	0.000459	2.7	4662.3	257.55	0.1
	212742.1	Existing[1]	9467	32.47	64.96		65.06	0.000116	2.79	6033.09	334.03	0.09
	212742.1	PropPh1[2]	9467	32.47	64.96		65.06	0.000116	2.79	6032.59	334	0.09
	212742.1	FuturePh2[3]	9467	32.47	64.96		65.06	0.000116	2.79	6032.82	334.01	0.09
	212742.1	FuturePh3[4]	9467	32.47	64.96		65.06	0.000116	2.79	6032.81	334.01	0.09
	211631.3	Existing[1]	9600	32.47	64.9		64.95	0.000079	2.31	11868.33	897.24	0.08
	211631.3	PropPh1[2]	9600	32.47	64.9		64.95	0.000079	2.31	11866.98	897.06	0.08
	211631.3	FuturePh2[3]	9600	32.47	64.9		64.95	0.000079	2.31	11867.6	897.14	0.08
	211631.3	FuturePh3[4]	9600	32.47	64.9		64.95	0.000079	2.31	11867.58	897.14	0.08
	210975.8	Existing[1]	9600	30.49	64.67		64.85	0.000256	3.67	4554.02	562.43	0.13
	210975.8	PropPh1[2]	9600	30.49	64.67		64.85	0.000256	3.67	4553.16	562.19	0.13
	210975.8	FuturePh2[3]	9600	30.49	64.67		64.85	0.000256	3.67	4553.56	562.31	0.13
	210975.8	FuturePh3[4]	9600	30.49	64.67		64.85	0.000256	3.67	4553.55	562.3	0.13
	209864.1	Existing[1]	9809	28.37	64.5		64.55	0.000236	2.23	7572.25	715.1	0.08
	209864.1	PropPh1[2]	9809	28.37	64.5		64.55	0.000236	2.23	7571.12	714.92	0.08
	209864.1	FuturePh2[3]	9809	28.37	64.5		64.55	0.000236	2.23	7571.65	715	0.08
	209864.1	FuturePh3[4]	9809	28.37	64.5		64.55	0.000236	2.23	7571.62	715	0.08
	208924.8	Existing[1]	9809	31.48	64.14		64.22	0.000602	2.36	4946.68	685.81	0.1
	208924.8	PropPh1[2]	9809	31.48	64.13		64.22	0.000602	2.36	4945.51	685.65	0.1
	208924.8	FuturePh2[3]	9809	31.48	64.13		64.22	0.000602	2.36	4946.04	685.72	0.1
	208924.8	FuturePh3[4]	9809	31.48	64.13		64.22	0.000602	2.36	4946.02	685.72	0.1
	207774.7	Existing[1]	9809	26.21	63.7		63.73	0.000313	1.72	8657.7	923.1	0.07
	207774.7	PropPh1[2]	9809	26.21	63.7		63.73	0.000313	1.72	8655.94	922.24	0.07
	207774.7	FuturePh2[3]	9809	26.21	63.7		63.73	0.000313	1.72	8656.74	922.63	0.07
	207774.7	FuturePh3[4]	9809	26.21	63.7		63.73	0.000313	1.72	8656.73	922.62	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	206741.3	Existing[1]	9809	31.91	63.32		63.38	0.000431	2.19	5999.5	731.73	0.09
	206741.3	PropPh1[2]	9809	31.91	63.31		63.38	0.000432	2.19	5997.98	731.51	0.09
	206741.3	FuturePh2[3]	9809	31.91	63.32		63.38	0.000432	2.19	5998.67	731.61	0.09
	206741.3	FuturePh3[4]	9809	31.91	63.32		63.38	0.000432	2.19	5998.66	731.61	0.09
	205679.6	Existing[1]	9914	28.19	63.08		63.17	0.000113	2.83	7680.63	794.62	0.09
	205679.6	PropPh1[2]	9914	28.19	63.08		63.17	0.000113	2.83	7678.92	793.85	0.09
	205679.6	FuturePh2[3]	9914	28.19	63.08		63.17	0.000113	2.83	7679.71	794.2	0.09
	205679.6	FuturePh3[4]	9914	28.19	63.08		63.17	0.000113	2.83	7679.69	794.19	0.09
	205102.2	Existing[1]	9914	28.33	63.01		63.1	0.000111	2.85	6352.49	610.69	0.09
	205102.2	PropPh1[2]	9914	28.33	63.01		63.1	0.000111	2.85	6351.16	610.29	0.09
	205102.2	FuturePh2[3]	9914	28.33	63.01		63.1	0.000111	2.85	6351.77	610.47	0.09
	205102.2	FuturePh3[4]	9914	28.33	63.01		63.1	0.000111	2.85	6351.76	610.47	0.09
	204727.6	Existing[1]	9914	28.33	62.94	40.42	63.05	0.00013	3.08	5436.44	443.41	0.1
	204727.6	PropPh1[2]	9914	28.33	62.93	40.42	63.05	0.00013	3.08	5435.69	442.48	0.1
	204727.6	FuturePh2[3]	9914	28.33	62.93	40.42	63.05	0.00013	3.08	5436.04	442.91	0.1
	204727.6	FuturePh3[4]	9914	28.33	62.93	40.42	63.05	0.00013	3.08	5436.03	442.9	0.1
	204673.8		Bridge									
	204620	Existing[1]	9914	28.15	62.77	40.24	62.89	0.00013	3.08	5442.42	450.77	0.1
	204620	PropPh1[2]	9914	28.15	62.77	40.24	62.89	0.00013	3.08	5441.68	449.85	0.1
	204620	FuturePh2[3]	9914	28.15	62.77	40.24	62.89	0.00013	3.08	5442.02	450.27	0.1
	204620	FuturePh3[4]	9914	28.15	62.77	40.24	62.89	0.00013	3.08	5442.01	450.26	0.1
	203658.9	Existing[1]	10276	28.97	62.57		62.62	0.000611	1.68	6133.67	378.06	0.07
	203658.9	PropPh1[2]	10276	28.97	62.57		62.61	0.000612	1.68	6132.83	378.03	0.07
	203658.9	FuturePh2[3]	10276	28.97	62.57		62.61	0.000612	1.68	6133.21	378.04	0.07
	203658.9	FuturePh3[4]	10276	28.97	62.57		62.61	0.000612	1.68	6133.2	378.04	0.07
	202834.1	Existing[1]	10276	27.57	62.18		62.25	0.000333	2.15	5574.36	372.2	0.08
	202834.1	PropPh1[2]	10276	27.57	62.18		62.25	0.000333	2.15	5573.47	372.17	0.08
	202834.1	FuturePh2[3]	10276	27.57	62.18		62.25	0.000333	2.15	5573.88	372.18	0.08
	202834.1	FuturePh3[4]	10276	27.57	62.18		62.25	0.000333	2.15	5573.86	372.18	0.08
	201783.6	Existing[1]	10489	27.98	61.75		61.81	0.000546	2.17	6178.58	610.42	0.09
	201783.6	PropPh1[2]	10489	27.98	61.74		61.81	0.000546	2.17	6176.98	610.35	0.09
	201783.6	FuturePh2[3]	10489	27.98	61.74		61.81	0.000546	2.17	6177.72	610.38	0.09
	201783.6	FuturePh3[4]	10489	27.98	61.74		61.81	0.000546	2.17	6177.7	610.38	0.09
	201212.1	Existing[1]	10489	27.61	61.46	39.37	61.52	0.00047	1.92	5503.73	567.55	0.09
	201212.1	PropPh1[2]	10489	27.61	61.46	39.37	61.51	0.00047	1.92	5502.73	567.41	0.09
	201212.1	FuturePh2[3]	10489	27.61	61.46	39.37	61.51	0.00047	1.92	5503.19	567.48	0.09
	201212.1	FuturePh3[4]	10489	27.61	61.46	39.37	61.51	0.00047	1.92	5503.18	567.47	0.09
	200299.3	Existing[1]	10489	27.02	61		61.11	0.000426	2.75	4786.18	493.45	0.1
	200299.3	PropPh1[2]	10489	27.02	60.99		61.1	0.000426	2.75	4784.71	493.32	0.1
	200299.3	FuturePh2[3]	10489	27.02	60.99		61.11	0.000426	2.75	4785.38	493.38	0.1
	200299.3	FuturePh3[4]	10489	27.02	60.99		61.11	0.000426	2.75	4785.37	493.38	0.1
	200076.4	Existing[1]	10859	27.02	60.92	39.55	61.02	0.000313	2.55	4257.51	235.92	0.1
	200076.4	PropPh1[2]	10859	27.02	60.92	39.55	61.02	0.000313	2.55	4256.83	235.91	0.1
	200076.4	FuturePh2[3]	10859	27.02	60.92	39.55	61.02	0.000313	2.55	4257.14	235.91	0.1
	200076.4	FuturePh3[4]	10859	27.02	60.92	39.55	61.02	0.000313	2.55	4257.13	235.91	0.1
	200020.5		Bridge									
	199964.6	Existing[1]	10859	26.77	60.57	39.3	60.67	0.000318	2.56	4235.21	235.4	0.1
	199964.6	PropPh1[2]	10859	26.77	60.57	39.3	60.67	0.000318	2.56	4234.54	235.39	0.1
	199964.6	FuturePh2[3]	10859	26.77	60.57	39.3	60.67	0.000318	2.56	4234.85	235.4	0.1
	199964.6	FuturePh3[4]	10859	26.77	60.57	39.3	60.67	0.000318	2.56	4234.84	235.39	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	199440.6	Existing[1]	11113	27.48	60.42		60.48	0.000352	2.17	7814.58	842.57	0.08
	199440.6	PropPh1[2]	11113	27.48	60.42		60.47	0.000352	2.17	7812.04	842.38	0.08
	199440.6	FuturePh2[3]	11113	27.48	60.42		60.48	0.000352	2.17	7813.21	842.47	0.08
	199440.6	FuturePh3[4]	11113	27.48	60.42		60.48	0.000352	2.17	7813.18	842.47	0.08
	198496.4	Existing[1]	11113	27.21	59.92		60.02	0.000663	2.52	4449.22	313.47	0.1
	198496.4	PropPh1[2]	11113	27.21	59.92		60.01	0.000664	2.52	4448.19	313.27	0.1
	198496.4	FuturePh2[3]	11113	27.21	59.92		60.02	0.000664	2.52	4448.67	313.37	0.1
	198496.4	FuturePh3[4]	11113	27.21	59.92		60.02	0.000664	2.52	4448.66	313.36	0.1
	197506.8	Existing[1]	11113	26.73	59.47		59.58	0.000319	3.06	6466.67	541.85	0.11
	197506.8	PropPh1[2]	11113	26.73	59.46		59.58	0.000319	3.06	6464.73	541.75	0.11
	197506.8	FuturePh2[3]	11113	26.73	59.46		59.58	0.000319	3.06	6465.62	541.79	0.11
	197506.8	FuturePh3[4]	11113	26.73	59.46		59.58	0.000319	3.06	6465.6	541.79	0.11
	196463.1	Existing[1]	11113	26.19	59		59.15	0.00062	3.19	4678.78	431.97	0.12
	196463.1	PropPh1[2]	11113	26.19	59		59.14	0.000621	3.2	4677.09	431.93	0.12
	196463.1	FuturePh2[3]	11113	26.19	59		59.14	0.00062	3.2	4677.87	431.95	0.12
	196463.1	FuturePh3[4]	11113	26.19	59		59.14	0.00062	3.2	4677.84	431.95	0.12
	196182.3	Existing[1]	11262	25.3	58.73	40.04	58.98	0.000452	4.29	4257.46	670.71	0.15
	196182.3	PropPh1[2]	11262	25.3	58.73	40.04	58.97	0.000452	4.29	4256.38	670.49	0.15
	196182.3	FuturePh2[3]	11262	25.3	58.73	40.04	58.98	0.000452	4.29	4256.88	670.59	0.15
	196182.3	FuturePh3[4]	11262	25.3	58.73	40.04	58.98	0.000452	4.29	4256.87	670.59	0.15
	196149		Bridge									
	196115.7	Existing[1]	11262	25.16	58.6	39.9	58.84	0.000452	4.29	4258.83	671	0.15
	196115.7	PropPh1[2]	11262	25.16	58.6	39.9	58.84	0.000452	4.29	4257.75	670.77	0.15
	196115.7	FuturePh2[3]	11262	25.16	58.6	39.9	58.84	0.000452	4.29	4258.25	670.88	0.15
	196115.7	FuturePh3[4]	11262	25.16	58.6	39.9	58.84	0.000452	4.29	4258.24	670.87	0.15
	195567.4	Existing[1]	11407	23.51	58.56		58.58	0.000183	1.5	12509.82	798.67	0.05
	195567.4	PropPh1[2]	11407	23.51	58.56		58.58	0.000183	1.5	12506.53	798.52	0.05
	195567.4	FuturePh2[3]	11407	23.51	58.56		58.58	0.000183	1.5	12508.04	798.59	0.05
	195567.4	FuturePh3[4]	11407	23.51	58.56		58.58	0.000183	1.5	12508.01	798.59	0.05
	194614.1	Existing[1]	11407	26.15	58.32		58.39	0.000293	2.61	8925.77	590.17	0.09
	194614.1	PropPh1[2]	11407	26.15	58.31		58.38	0.000293	2.62	8923.25	590.04	0.09
	194614.1	FuturePh2[3]	11407	26.15	58.31		58.38	0.000293	2.61	8924.41	590.1	0.09
	194614.1	FuturePh3[4]	11407	26.15	58.31		58.38	0.000293	2.61	8924.38	590.1	0.09
	193675.6	Existing[1]	11407	23.35	58.34		58.34	0.00001	0.69	21067.37	991.98	0.02
	193675.6	PropPh1[2]	11407	23.35	58.33		58.34	0.00001	0.69	21063.14	991.93	0.02
	193675.6	FuturePh2[3]	11407	23.35	58.33		58.34	0.00001	0.69	21065.09	991.95	0.02
	193675.6	FuturePh3[4]	11407	23.35	58.33		58.34	0.00001	0.69	21065.04	991.95	0.02
	192820.3	Existing[1]	11699	24.17	58.23		58.31	0.000518	2.52	6151.85	575.04	0.09
	192820.3	PropPh1[2]	11699	24.17	58.22		58.31	0.000519	2.52	6149.36	574.85	0.09
	192820.3	FuturePh2[3]	11699	24.17	58.22		58.31	0.000518	2.52	6150.51	574.94	0.09
	192820.3	FuturePh3[4]	11699	24.17	58.22		58.31	0.000518	2.52	6150.48	574.93	0.09
	191722.7	Existing[1]	11699	20.85	57.64		57.7	0.00065	2.16	6775.64	633.82	0.09
	191722.7	PropPh1[2]	11699	20.85	57.63		57.7	0.000651	2.16	6772.55	633.26	0.09
	191722.7	FuturePh2[3]	11699	20.85	57.63		57.7	0.000651	2.16	6773.97	633.52	0.09
	191722.7	FuturePh3[4]	11699	20.85	57.63		57.7	0.000651	2.16	6773.94	633.51	0.09
	190794	Existing[1]	11699	20.58	57.14		57.24	0.000394	3.05	6469.6	461.92	0.1
	190794	PropPh1[2]	11699	20.58	57.13		57.24	0.000394	3.05	6467.15	461.7	0.11
	190794	FuturePh2[3]	11699	20.58	57.14		57.24	0.000394	3.05	6468.28	461.8	0.11
	190794	FuturePh3[4]	11699	20.58	57.14		57.24	0.000394	3.05	6468.25	461.8	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	189869.8	Existing[1]	11699	17.5	56.91		57.01	0.000204	3	7818.78	603.38	0.1
	189869.8	PropPh1[2]	11699	17.5	56.9		57	0.000204	3	7815.44	603.28	0.1
	189869.8	FuturePh2[3]	11699	17.5	56.91		57.01	0.000204	3	7816.98	603.32	0.1
	189869.8	FuturePh3[4]	11699	17.5	56.91		57.01	0.000204	3	7816.95	603.32	0.1
	188903.7	Existing[1]	11852	21.71	56.75		56.8	0.00021	2.2	9661.09	717.24	0.08
	188903.7	PropPh1[2]	11852	21.71	56.74		56.79	0.00021	2.2	9657.01	716.97	0.08
	188903.7	FuturePh2[3]	11852	21.71	56.75		56.8	0.00021	2.2	9658.89	717.09	0.08
	188903.7	FuturePh3[4]	11852	21.71	56.75		56.8	0.00021	2.2	9658.84	717.09	0.08
	187878.1	Existing[1]	11852	23.78	56.3		56.44	0.000671	3.39	4573.45	288.3	0.12
	187878.1	PropPh1[2]	11852	23.78	56.29		56.44	0.000671	3.39	4571.71	288.21	0.12
	187878.1	FuturePh2[3]	11852	23.78	56.3		56.44	0.000671	3.39	4572.51	288.25	0.12
	187878.1	FuturePh3[4]	11852	23.78	56.3		56.44	0.000671	3.39	4572.49	288.25	0.12
	186536.1	Existing[1]	11852	20.17	55.76		55.83	0.000352	2.5	7995.83	650.63	0.1
	186536.1	PropPh1[2]	11852	20.17	55.75		55.82	0.000352	2.5	7991.43	650.55	0.1
	186536.1	FuturePh2[3]	11852	20.17	55.75		55.83	0.000352	2.5	7993.46	650.59	0.1
	186536.1	FuturePh3[4]	11852	20.17	55.75		55.83	0.000352	2.5	7993.41	650.59	0.1
	185293.8	Existing[1]	11852	20.84	55.52		55.56	0.000175	2.07	9307.72	490.06	0.07
	185293.8	PropPh1[2]	11852	20.84	55.51		55.55	0.000175	2.07	9304.27	489.99	0.07
	185293.8	FuturePh2[3]	11852	20.84	55.51		55.55	0.000175	2.07	9305.86	490.02	0.07
	185293.8	FuturePh3[4]	11852	20.84	55.51		55.55	0.000175	2.07	9305.82	490.02	0.07
	184862.8	Existing[1]	12103	21.37	55.29	34.78	55.44	0.000249	3.53	5035.27	489.06	0.11
	184862.8	PropPh1[2]	12103	21.37	55.29	34.78	55.43	0.000249	3.53	5033.31	488.25	0.11
	184862.8	FuturePh2[3]	12103	21.37	55.29	34.78	55.44	0.000249	3.53	5034.22	488.62	0.11
	184862.8	FuturePh3[4]	12103	21.37	55.29	34.78	55.44	0.000249	3.53	5034.19	488.61	0.11
	184807.6		Bridge									
	184752.4	Existing[1]	12103	21.24	55.23	34.65	55.38	0.000246	3.52	5054.13	496.89	0.11
	184752.4	PropPh1[2]	12103	21.24	55.23	34.65	55.37	0.000247	3.52	5052.21	496.09	0.11
	184752.4	FuturePh2[3]	12103	21.24	55.23	34.65	55.37	0.000246	3.52	5053.09	496.46	0.11
	184752.4	FuturePh3[4]	12103	21.24	55.23	34.65	55.37	0.000246	3.52	5053.07	496.45	0.11
	184295.8	Existing[1]	12103	18.27	55.08		55.18	0.000714	2.85	5551.95	469.42	0.1
	184295.8	PropPh1[2]	12103	18.27	55.07		55.17	0.000715	2.85	5548.54	466.12	0.1
	184295.8	FuturePh2[3]	12103	18.27	55.08		55.17	0.000714	2.85	5550.11	467.64	0.1
	184295.8	FuturePh3[4]	12103	18.27	55.08		55.17	0.000714	2.85	5550.07	467.6	0.1
	183335.1	Existing[1]	12103	20.58	54.42	34.68	54.67	0.000406	4.48	4050.16	553.13	0.15
	183335.1	PropPh1[2]	12103	20.58	54.41	34.68	54.66	0.000406	4.48	4047.94	552.68	0.15
	183335.1	FuturePh2[3]	12103	20.58	54.41	34.68	54.67	0.000406	4.48	4048.96	552.88	0.15
	183335.1	FuturePh3[4]	12103	20.58	54.41	34.68	54.67	0.000406	4.48	4048.93	552.88	0.15
	182381.6	Existing[1]	12379	18.93	54.1		54.18	0.000583	2.38	5937.02	364.34	0.09
	182381.6	PropPh1[2]	12379	18.93	54.09		54.17	0.000584	2.38	5933.98	364.22	0.09
	182381.6	FuturePh2[3]	12379	18.93	54.1		54.17	0.000584	2.38	5935.38	364.28	0.09
	182381.6	FuturePh3[4]	12379	18.93	54.1		54.17	0.000584	2.38	5935.34	364.27	0.09
	181623	Existing[1]	12379	18.35	53.97		53.99	0.000127	1.67	15837.79	1012.79	0.06
	181623	PropPh1[2]	12379	18.35	53.96		53.98	0.000127	1.67	15829.12	1012.63	0.06
	181623	FuturePh2[3]	12379	18.35	53.96		53.99	0.000127	1.67	15833.11	1012.71	0.06
	181623	FuturePh3[4]	12379	18.35	53.96		53.99	0.000127	1.67	15833.01	1012.7	0.06
	180731.2	Existing[1]	12379	19.12	53.72		53.8	0.000616	2.2	6106.2	385.79	0.09
	180731.2	PropPh1[2]	12379	19.12	53.72		53.79	0.000617	2.2	6102.77	385.54	0.09
	180731.2	FuturePh2[3]	12379	19.12	53.72		53.79	0.000617	2.2	6104.34	385.65	0.09
	180731.2	FuturePh3[4]	12379	19.12	53.72		53.79	0.000617	2.2	6104.31	385.65	0.09

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	179838.1	Existing[1]	12379	17.65	52.97		53.05	0.001208	2.32	5341.14	329.67	0.1
	179838.1	PropPh1[2]	12379	17.65	52.96		53.04	0.001209	2.32	5337.86	329.39	0.1
	179838.1	FuturePh2[3]	12379	17.65	52.96		53.05	0.001208	2.32	5339.37	329.52	0.1
	179838.1	FuturePh3[4]	12379	17.65	52.96		53.05	0.001208	2.32	5339.33	329.52	0.1
	179305.6	Existing[1]	12379	17.48	52.49		52.71	0.000372	4.24	4653.98	312.5	0.14
	179305.6	PropPh1[2]	12379	17.48	52.48		52.7	0.000373	4.25	4650.67	312.29	0.14
	179305.6	FuturePh2[3]	12379	17.48	52.49		52.71	0.000373	4.25	4652.19	312.39	0.14
	179305.6	FuturePh3[4]	12379	17.48	52.49		52.71	0.000373	4.25	4652.16	312.39	0.14
	178955.5	Existing[1]	12457	17.37	52.4	33.01	52.57	0.000314	3.9	5708.74	869.01	0.13
	178955.5	PropPh1[2]	12457	17.37	52.39	33.01	52.56	0.000314	3.9	5704.86	866.86	0.13
	178955.5	FuturePh2[3]	12457	17.37	52.39	33.01	52.56	0.000314	3.9	5706.65	867.85	0.13
	178955.5	FuturePh3[4]	12457	17.37	52.39	33.01	52.56	0.000314	3.9	5706.6	867.82	0.13
	178899.3		Bridge									
	178843.1	Existing[1]	12457	17.13	52.1	32.77	52.27	0.000316	3.91	5687.47	857.2	0.13
	178843.1	PropPh1[2]	12457	17.13	52.09	32.77	52.26	0.000317	3.91	5683.55	855.02	0.13
	178843.1	FuturePh2[3]	12457	17.13	52.09	32.77	52.26	0.000317	3.91	5685.35	856.03	0.13
	178843.1	FuturePh3[4]	12457	17.13	52.09	32.77	52.26	0.000317	3.91	5685.31	856	0.13
	177732.9	Existing[1]	12967	16.54	51.73		51.81	0.000447	2.44	6112.93	376.05	0.09
	177732.9	PropPh1[2]	12967	16.54	51.71		51.8	0.000448	2.44	6108.6	376	0.09
	177732.9	FuturePh2[3]	12967	16.54	51.72		51.8	0.000447	2.44	6110.6	376.02	0.09
	177732.9	FuturePh3[4]	12967	16.54	51.72		51.8	0.000447	2.44	6110.54	376.02	0.09
	176644.1	Existing[1]	12967	17.41	51.48	30.63	51.54	0.000169	2.34	10360.17	826.67	0.08
	176644.1	PropPh1[2]	12967	17.41	51.47	30.63	51.52	0.000169	2.35	10351.85	826.23	0.08
	176644.1	FuturePh2[3]	12967	17.41	51.47	30.63	51.53	0.000169	2.34	10355.68	826.43	0.08
	176644.1	FuturePh3[4]	12967	17.41	51.47	30.63	51.53	0.000169	2.34	10355.59	826.43	0.08
	175675.6	Existing[1]	13131	16.27	51.22	28.53	51.3	0.000386	2.22	5796.27	322.44	0.09
	175675.6	PropPh1[2]	13131	16.27	51.21	28.53	51.29	0.000387	2.22	5792.26	322.33	0.09
	175675.6	FuturePh2[3]	13131	16.27	51.21	28.53	51.29	0.000386	2.22	5794.1	322.38	0.09
	175675.6	FuturePh3[4]	13131	16.27	51.21	28.53	51.29	0.000386	2.22	5794.06	322.38	0.09
	173819.4	Existing[1]	13131	14.97	50.66		50.68	0.000277	1.37	12313.01	880.29	0.06
	173819.4	PropPh1[2]	13131	14.97	50.64		50.66	0.000277	1.37	12300.93	879.77	0.06
	173819.4	FuturePh2[3]	13131	14.97	50.65		50.67	0.000277	1.37	12306.49	880.01	0.06
	173819.4	FuturePh3[4]	13131	14.97	50.65		50.67	0.000277	1.37	12306.35	880	0.06
	172846.5	Existing[1]	13131	11.61	50.45		50.48	0.000266	1.67	11343.29	683.15	0.06
	172846.5	PropPh1[2]	13131	11.61	50.43		50.46	0.000266	1.67	11333.55	683.02	0.06
	172846.5	FuturePh2[3]	13131	11.61	50.44		50.47	0.000266	1.67	11338.04	683.08	0.06
	172846.5	FuturePh3[4]	13131	11.61	50.44		50.47	0.000266	1.67	11337.92	683.08	0.06
	171967.4	Existing[1]	13131	14.04	50.32		50.34	0.000153	1.71	13328.57	727.51	0.06
	171967.4	PropPh1[2]	13131	14.04	50.3		50.33	0.000153	1.71	13317.96	727.41	0.06
	171967.4	FuturePh2[3]	13131	14.04	50.31		50.33	0.000153	1.71	13322.84	727.45	0.06
	171967.4	FuturePh3[4]	13131	14.04	50.31		50.33	0.000153	1.71	13322.72	727.45	0.06
	171168.9	Existing[1]	13131	6.86	50.21		50.25	0.000141	1.94	11488.72	656.5	0.07
	171168.9	PropPh1[2]	13131	6.86	50.19		50.23	0.000142	1.94	11479	656.16	0.07
	171168.9	FuturePh2[3]	13131	6.86	50.2		50.24	0.000141	1.94	11483.47	656.32	0.07
	171168.9	FuturePh3[4]	13131	6.86	50.2		50.24	0.000141	1.94	11483.36	656.32	0.07
	170256	Existing[1]	13131	13.83	49.96		50.07	0.000303	2.8	6268.36	448.85	0.1
	170256	PropPh1[2]	13131	13.83	49.95		50.06	0.000304	2.81	6261.48	448.59	0.1
	170256	FuturePh2[3]	13131	13.83	49.96		50.06	0.000304	2.8	6264.64	448.71	0.1
	170256	FuturePh3[4]	13131	13.83	49.96		50.06	0.000304	2.8	6264.56	448.7	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	169087.1	Existing[1]	13185	11.36	49.79		49.81	0.000152	1.54	14808.95	868.47	0.05
	169087.1	PropPh1[2]	13185	11.36	49.77		49.8	0.000153	1.54	14795.25	868.25	0.05
	169087.1	FuturePh2[3]	13185	11.36	49.78		49.8	0.000153	1.54	14801.55	868.35	0.05
	169087.1	FuturePh3[4]	13185	11.36	49.78		49.8	0.000153	1.54	14801.39	868.35	0.05
	168169.9	Existing[1]	13185	14.35	49.59		49.64	0.000302	2.08	7861.8	455.09	0.07
	168169.9	PropPh1[2]	13185	14.35	49.57		49.62	0.000303	2.09	7854.4	454.69	0.07
	168169.9	FuturePh2[3]	13185	14.35	49.58		49.63	0.000303	2.09	7857.8	454.88	0.07
	168169.9	FuturePh3[4]	13185	14.35	49.58		49.63	0.000303	2.09	7857.71	454.87	0.07
	167249.9	Existing[1]	13209	11.5	49.18	25.79	49.28	0.000541	2.64	5515.75	632.41	0.1
	167249.9	PropPh1[2]	13209	11.5	49.16	25.79	49.27	0.000543	2.65	5504.78	631.73	0.1
	167249.9	FuturePh2[3]	13209	11.5	49.17	25.79	49.27	0.000542	2.65	5509.82	632.04	0.1
	167249.9	FuturePh3[4]	13209	11.5	49.17	25.79	49.27	0.000542	2.65	5509.69	632.03	0.1
	166879.7	Existing[1]	13209	10.84	49.05		49.14	0.000251	3.43	9018.61	643.42	0.11
	166879.7	PropPh1[2]	13209	10.84	49.03		49.13	0.000251	3.43	9007.2	642.43	0.11
	166879.7	FuturePh2[3]	13209	10.84	49.04		49.13	0.000251	3.43	9012.45	642.88	0.11
	166879.7	FuturePh3[4]	13209	10.84	49.04		49.13	0.000251	3.43	9012.31	642.87	0.11
	166613	Existing[1]	13331	10.36	48.84	28.16	49.03	0.000387	4.47	7934.13	857.12	0.14
	166613	PropPh1[2]	13331	10.36	48.83	28.16	49.01	0.000388	4.48	7919.41	853.83	0.14
	166613	FuturePh2[3]	13331	10.36	48.83	28.16	49.02	0.000387	4.48	7926.18	855.35	0.14
	166613	FuturePh3[4]	13331	10.36	48.83	28.16	49.02	0.000387	4.48	7926	855.31	0.14
	166585.6		Bridge									
	166558.2	Existing[1]	13331	10.11	48.66	27.91	48.84	0.000383	4.46	7988.56	869.18	0.14
	166558.2	PropPh1[2]	13331	10.11	48.64	27.91	48.83	0.000384	4.46	7973.63	865.89	0.14
	166558.2	FuturePh2[3]	13331	10.11	48.65	27.91	48.83	0.000383	4.46	7980.49	867.4	0.14
	166558.2	FuturePh3[4]	13331	10.11	48.65	27.91	48.83	0.000383	4.46	7980.31	867.36	0.14
	166297.3	Existing[1]	13835	8.4	48.61		48.71	0.000308	2.81	6769.79	357.58	0.09
	166297.3	PropPh1[2]	13835	8.4	48.59		48.69	0.000308	2.81	6763.2	357.37	0.09
	166297.3	FuturePh2[3]	13835	8.4	48.6		48.7	0.000308	2.81	6766.23	357.47	0.09
	166297.3	FuturePh3[4]	13835	8.4	48.6		48.7	0.000308	2.81	6766.15	357.47	0.09
	165903.2	Existing[1]	13835	10.27	48.5		48.59	0.000313	2.72	8201.88	589.53	0.09
	165903.2	PropPh1[2]	13835	10.27	48.48		48.57	0.000314	2.72	8190.85	588.35	0.09
	165903.2	FuturePh2[3]	13835	10.27	48.49		48.57	0.000314	2.72	8195.92	588.9	0.09
	165903.2	FuturePh3[4]	13835	10.27	48.49		48.57	0.000314	2.72	8195.78	588.88	0.09
	165476.1	Existing[1]	15440	12.3	48.13	25.43	48.39	0.000366	4.53	5067.85	288.52	0.14
	165476.1	PropPh1[2]	15440	12.3	48.11	25.43	48.37	0.000367	4.53	5062.63	287.73	0.14
	165476.1	FuturePh2[3]	15440	12.3	48.12	25.43	48.38	0.000367	4.53	5065.03	288.1	0.14
	165476.1	FuturePh3[4]	15440	12.3	48.12	25.43	48.38	0.000367	4.53	5064.97	288.09	0.14
	165428.1		Bridge									
	165380.1	Existing[1]	15440	11.69	47.47	24.82	47.72	0.000369	4.54	5052.53	286.19	0.14
	165380.1	PropPh1[2]	15440	11.69	47.45	24.82	47.7	0.00037	4.54	5047.21	285.38	0.14
	165380.1	FuturePh2[3]	15440	11.69	47.46	24.82	47.71	0.000369	4.54	5049.69	285.76	0.14
	165380.1	FuturePh3[4]	15440	11.69	47.46	24.82	47.71	0.000369	4.54	5049.62	285.75	0.14
	164555.2	Existing[1]	15423	8.31	47.14		47.32	0.000541	3.56	4937.19	238.18	0.13
	164555.2	PropPh1[2]	15405	8.31	47.12		47.3	0.000541	3.56	4932.43	238.03	0.13
	164555.2	FuturePh2[3]	15414	8.31	47.13		47.31	0.000541	3.56	4934.64	238.1	0.13
	164555.2	FuturePh3[4]	15414	8.31	47.13		47.31	0.000541	3.56	4934.59	238.1	0.13
	163635.5	Existing[1]	15423	11.2	46.97		47.05	0.000179	2.86	10038.66	610.38	0.1
	163635.5	PropPh1[2]	15405	11.2	46.95		47.03	0.000179	2.86	10026.36	610.22	0.1
	163635.5	FuturePh2[3]	15414	11.2	46.96		47.04	0.000179	2.86	10032.06	610.29	0.1
	163635.5	FuturePh3[4]	15414	11.2	46.96		47.04	0.000179	2.86	10031.91	610.29	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	162811.9	Existing[1]	15905	8.08	46.75		46.88	0.000224	3.33	7107.68	340.4	0.11
	162811.9	PropPh1[2]	15888	8.08	46.73		46.86	0.000225	3.33	7100.8	340.21	0.11
	162811.9	FuturePh2[3]	15896	8.08	46.74		46.87	0.000224	3.33	7103.99	340.3	0.11
	162811.9	FuturePh3[4]	15896	8.08	46.74		46.87	0.000224	3.33	7103.9	340.3	0.11
	161822.3	Existing[1]	15905	6.55	46.41		46.55	0.000593	3.38	6029.14	314.25	0.11
	161822.3	PropPh1[2]	15888	6.55	46.39		46.53	0.000593	3.38	6022.7	313.97	0.11
	161822.3	FuturePh2[3]	15896	6.55	46.4		46.54	0.000593	3.38	6025.68	314.1	0.11
	161822.3	FuturePh3[4]	15896	6.55	46.4		46.54	0.000593	3.38	6025.6	314.1	0.11
	160630.7	Existing[1]	15905	6.96	45.62		45.79	0.000661	3.57	5344.93	406.87	0.13
	160630.7	PropPh1[2]	15888	6.96	45.6		45.77	0.000661	3.57	5336.34	404.84	0.13
	160630.7	FuturePh2[3]	15896	6.96	45.61		45.78	0.000661	3.57	5340.31	405.78	0.13
	160630.7	FuturePh3[4]	15896	6.96	45.6		45.78	0.000661	3.57	5340.19	405.75	0.13
	159757.4	Existing[1]	15905	9.2	44.89		45.05	0.001119	3.32	5450.26	347.72	0.12
	159757.4	PropPh1[2]	15888	9.2	44.86		45.03	0.00112	3.32	5442.69	347.54	0.12
	159757.4	FuturePh2[3]	15896	9.2	44.87		45.04	0.00112	3.32	5446.19	347.62	0.12
	159757.4	FuturePh3[4]	15896	9.2	44.87		45.04	0.00112	3.32	5446.07	347.62	0.12
	158811.6	Existing[1]	15903	7.94	44.52		44.6	0.000247	2.46	9193.7	691.25	0.08
	158811.6	PropPh1[2]	15884	7.94	44.5		44.57	0.000247	2.46	9178.4	689.19	0.08
	158811.6	FuturePh2[3]	15893	7.94	44.51		44.58	0.000247	2.46	9185.46	689.98	0.08
	158811.6	FuturePh3[4]	15893	7.94	44.51		44.58	0.000247	2.46	9185.22	689.94	0.08
	157933.4	Existing[1]	15903	5.48	44.21	22.05	44.37	0.000291	3.73	7434.72	485.24	0.12
	157933.4	PropPh1[2]	15884	5.48	44.19	22.04	44.34	0.000291	3.73	7423.83	484.99	0.12
	157933.4	FuturePh2[3]	15893	5.48	44.2	22.04	44.35	0.000291	3.73	7428.86	485.1	0.12
	157933.4	FuturePh3[4]	15893	5.48	44.2	22.04	44.35	0.000291	3.73	7428.68	485.1	0.12
	156882.1	Existing[1]	15903	5.55	43.89		44.08	0.000259	3.7	5950.1	470.63	0.12
	156882.1	PropPh1[2]	15884	5.55	43.86		44.06	0.000259	3.7	5939.5	469.29	0.12
	156882.1	FuturePh2[3]	15893	5.55	43.87		44.07	0.000259	3.7	5944.39	469.91	0.12
	156882.1	FuturePh3[4]	15893	5.55	43.87		44.07	0.000259	3.7	5944.21	469.89	0.12
	156116.3	Existing[1]	15903	5.91	43.77		43.85	0.000261	2.29	7424.88	455.9	0.08
	156116.3	PropPh1[2]	15884	5.91	43.74		43.82	0.000261	2.29	7414.53	455.35	0.08
	156116.3	FuturePh2[3]	15893	5.91	43.75		43.83	0.000261	2.29	7419.3	455.6	0.08
	156116.3	FuturePh3[4]	15893	5.91	43.75		43.83	0.000261	2.29	7419.12	455.6	0.08
	155861.6	Existing[1]	16676	6.03	43.68	20.87	43.77	0.000317	2.43	7004.29	428.16	0.09
	155861.6	PropPh1[2]	16656	6.03	43.66	20.86	43.75	0.000317	2.43	6994.76	427.39	0.09
	155861.6	FuturePh2[3]	16666	6.03	43.67	20.87	43.76	0.000317	2.43	6999.15	427.75	0.09
	155861.6	FuturePh3[4]	16666	6.03	43.67	20.87	43.76	0.000317	2.43	6998.98	427.73	0.09
	155805.1		Bridge									
	155748.6	Existing[1]	16676	5.79	43.35	20.63	43.44	0.000322	2.44	6965.78	425.03	0.09
	155748.6	PropPh1[2]	16656	5.79	43.32	20.62	43.42	0.000322	2.44	6956.7	424.29	0.09
	155748.6	FuturePh2[3]	16666	5.79	43.33	20.62	43.43	0.000322	2.44	6960.87	424.63	0.09
	155748.6	FuturePh3[4]	16666	5.79	43.33	20.62	43.43	0.000322	2.44	6960.71	424.62	0.09
	154890.7	Existing[1]	16989	5.42	42.9	20.32	43.11	0.00036	3.9	5780.54	900.77	0.13
	154890.7	PropPh1[2]	16969	5.42	42.87	20.31	43.09	0.00036	3.9	5771.13	899.45	0.13
	154890.7	FuturePh2[3]	16978	5.42	42.88	20.31	43.1	0.00036	3.9	5775.46	900.06	0.13
	154890.7	FuturePh3[4]	16978	5.42	42.88	20.31	43.1	0.00036	3.9	5775.28	900.03	0.13
	153992.6	Existing[1]	16989	3.83	42.75	21.39	42.84	0.000217	2.79	10284.98	1336.18	0.1
	153992.6	PropPh1[2]	16969	3.83	42.73	21.38	42.82	0.000217	2.79	10266.13	1335.39	0.1
	153992.6	FuturePh2[3]	16978	3.83	42.74	21.39	42.83	0.000217	2.79	10274.8	1335.75	0.1
	153992.6	FuturePh3[4]	16978	3.83	42.74	21.39	42.83	0.000217	2.79	10274.43	1335.74	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	153119.9	Existing[1]	16989	4.13	42.42	19.16	42.55	0.000533	3.08	6676.03	966.12	0.11
	153119.9	PropPh1[2]	16969	4.13	42.4	19.15	42.53	0.000534	3.08	6666.66	964.48	0.11
	153119.9	FuturePh2[3]	16978	4.13	42.41	19.15	42.54	0.000534	3.08	6670.98	965.24	0.11
	153119.9	FuturePh3[4]	16978	4.13	42.41	19.15	42.54	0.000534	3.08	6670.79	965.2	0.11
	153108.9		Bridge									
	153097.9	Existing[1]	16989	4.13	42.4	19.16	42.53	0.000535	3.08	6665.88	964.35	0.11
	153097.9	PropPh1[2]	16969	4.13	42.37	19.15	42.5	0.000536	3.08	6656.52	962.7	0.11
	153097.9	FuturePh2[3]	16978	4.13	42.38	19.15	42.51	0.000536	3.08	6660.83	963.46	0.11
	153097.9	FuturePh3[4]	16978	4.13	42.38	19.15	42.51	0.000536	3.08	6660.64	963.43	0.11
	152376.3	Existing[1]	16989	3.84	42.22	22.15	42.29	0.000173	2.75	10137.56	1365.9	0.09
	152376.3	PropPh1[2]	16969	3.84	42.2	22.13	42.27	0.000173	2.75	10118.55	1364.11	0.09
	152376.3	FuturePh2[3]	16978	3.84	42.21	22.14	42.28	0.000173	2.75	10127.31	1364.93	0.09
	152376.3	FuturePh3[4]	16978	3.84	42.21	22.14	42.28	0.000173	2.75	10126.92	1364.9	0.09
	151996.2	Existing[1]	16989	4.14	42.19	18.15	42.24	0.000089	1.99	9939.74	1127.26	0.07
	151996.2	PropPh1[2]	16969	4.14	42.16	18.14	42.22	0.000089	1.99	9929.38	1126.48	0.07
	151996.2	FuturePh2[3]	16978	4.14	42.17	18.14	42.23	0.000089	1.99	9934.15	1126.84	0.07
	151996.2	FuturePh3[4]	16978	4.14	42.17	18.14	42.23	0.000089	1.99	9933.94	1126.83	0.07
	151963.3		Bridge									
	151930.4	Existing[1]	16989	3.37	42.15	17.37	42.21	0.000081	1.94	10268.48	1156.42	0.06
	151930.4	PropPh1[2]	16969	3.37	42.13	17.36	42.18	0.000081	1.94	10258.06	1155.48	0.06
	151930.4	FuturePh2[3]	16978	3.37	42.14	17.37	42.2	0.000081	1.94	10262.86	1155.91	0.06
	151930.4	FuturePh3[4]	16978	3.37	42.14	17.37	42.19	0.000081	1.94	10262.64	1155.89	0.06
	151925.3	Existing[1]	16989	2.99	42.16	14.11	42.2	0.000049	1.68	11090.25	1275.02	0.05
	151925.3	PropPh1[2]	16969	2.99	42.14	14.1	42.18	0.000049	1.68	11080.5	1274.13	0.05
	151925.3	FuturePh2[3]	16978	2.99	42.15	14.1	42.19	0.000049	1.68	11085	1274.54	0.05
	151925.3	FuturePh3[4]	16978	2.99	42.15	14.1	42.19	0.000049	1.68	11084.79	1274.52	0.05
	151846.3		Bridge									
	151767.3	Existing[1]	16989	1.3	41.54	12.42	41.58	0.000043	1.62	11540.45	1315.93	0.05
	151767.3	PropPh1[2]	16969	1.3	41.52	12.41	41.56	0.000043	1.62	11530.49	1315.02	0.05
	151767.3	FuturePh2[3]	16978	1.3	41.53	12.41	41.57	0.000043	1.62	11535.08	1315.44	0.05
	151767.3	FuturePh3[4]	16978	1.3	41.53	12.41	41.57	0.000043	1.62	11534.87	1315.42	0.05
	151736.6	Existing[1]	16989	3.46	41.41	15.79	41.55	0.000162	3.02	6857.22	649.46	0.1
	151736.6	PropPh1[2]	16969	3.46	41.39	15.79	41.52	0.000162	3.02	6849.85	648.38	0.1
	151736.6	FuturePh2[3]	16978	3.46	41.4	15.79	41.54	0.000162	3.02	6853.25	648.88	0.1
	151736.6	FuturePh3[4]	16978	3.46	41.4	15.79	41.54	0.000162	3.02	6853.09	648.86	0.1
	151711.1		Bridge									
	151685.6	Existing[1]	16989	4.19	41.37	16.52	41.51	0.000176	3.1	6623.59	611.17	0.1
	151685.6	PropPh1[2]	16969	4.19	41.34	16.52	41.49	0.000176	3.1	6616.63	607.19	0.1
	151685.6	FuturePh2[3]	16978	4.19	41.35	16.52	41.5	0.000176	3.1	6619.84	609.03	0.1
	151685.6	FuturePh3[4]	16978	4.19	41.35	16.52	41.5	0.000176	3.1	6619.69	608.94	0.1
	151353.8	Existing[1]	17195	4.9	41.37	20.11	41.42	0.000105	2.07	13217.61	1157.51	0.07
	151353.8	PropPh1[2]	17174	4.9	41.35	20.1	41.39	0.000105	2.07	13200.84	1157.28	0.07
	151353.8	FuturePh2[3]	17183	4.9	41.36	20.11	41.4	0.000105	2.07	13208.57	1157.39	0.07
	151353.8	FuturePh3[4]	17183	4.9	41.36	20.11	41.4	0.000105	2.07	13208.22	1157.38	0.07
	150358.8	Existing[1]	17410	3.31	41.13		41.27	0.000211	3.18	7254.9	413.06	0.11
	150358.8	PropPh1[2]	17389	3.31	41.1		41.24	0.000211	3.18	7245.03	412.97	0.11
	150358.8	FuturePh2[3]	17399	3.31	41.11		41.25	0.000211	3.18	7249.58	413.01	0.11
	150358.8	FuturePh3[4]	17398	3.31	41.11		41.25	0.000211	3.18	7249.38	413.01	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	149526.4	Existing[1]	17410	3.15	41.01	18.03	41.1	0.000159	2.76	9847.91	546.82	0.09
	149526.4	PropPh1[2]	17389	3.15	40.99	18.03	41.08	0.000159	2.76	9834.76	546.67	0.09
	149526.4	FuturePh2[3]	17399	3.15	41	18.03	41.09	0.000159	2.76	9840.81	546.74	0.09
	149526.4	FuturePh3[4]	17398	3.15	41	18.03	41.09	0.000159	2.76	9840.55	546.74	0.09
	149122.7	Existing[1]	17410	3.15	40.87		41.03	0.00019	3.34	6810.2	360.2	0.1
	149122.7	PropPh1[2]	17389	3.15	40.85		41.01	0.00019	3.34	6801.56	358.85	0.1
	149122.7	FuturePh2[3]	17399	3.15	40.86		41.02	0.00019	3.34	6805.53	359.47	0.1
	149122.7	FuturePh3[4]	17398	3.15	40.86		41.02	0.00019	3.34	6805.37	359.44	0.1
	148795.4	Existing[1]	17497	3.15	40.81	17.93	40.94	0.000328	3.18	7334.8	1799.63	0.1
	148795.4	PropPh1[2]	17475	3.15	40.78	17.92	40.91	0.000328	3.18	7326.77	1799.39	0.1
	148795.4	FuturePh2[3]	17485	3.15	40.79	17.93	40.92	0.000328	3.18	7330.47	1799.5	0.1
	148795.4	FuturePh3[4]	17485	3.15	40.79	17.93	40.92	0.000328	3.18	7330.31	1799.5	0.1
	148768.4		Bridge									
	148741.4	Existing[1]	17497	3.04	40.68	17.82	40.81	0.000328	3.19	7329.47	1799.47	0.1
	148741.4	PropPh1[2]	17475	3.04	40.66	17.81	40.79	0.000329	3.19	7321.45	1799.23	0.1
	148741.4	FuturePh2[3]	17485	3.04	40.67	17.82	40.8	0.000329	3.19	7325.14	1799.34	0.1
	148741.4	FuturePh3[4]	17485	3.04	40.67	17.82	40.8	0.000329	3.19	7324.99	1799.34	0.1
	147632.4	Existing[1]	17497	-1.17	40.49	15.08	40.6	0.000114	2.79	8153.86	490.51	0.1
	147632.4	PropPh1[2]	17475	-1.17	40.47	15.07	40.58	0.000114	2.79	8142.58	490	0.1
	147632.4	FuturePh2[3]	17485	-1.17	40.48	15.07	40.59	0.000114	2.79	8147.78	490.24	0.1
	147632.4	FuturePh3[4]	17485	-1.17	40.48	15.07	40.59	0.000114	2.79	8147.55	490.23	0.1
	146698	Existing[1]	17497	1.88	40.33	14.88	40.48	0.000157	3.3	7668.89	663.37	0.12
	146698	PropPh1[2]	17475	1.88	40.31	14.87	40.45	0.000157	3.3	7658.67	662.28	0.12
	146698	FuturePh2[3]	17485	1.88	40.32	14.88	40.46	0.000157	3.3	7663.38	662.78	0.12
	146698	FuturePh3[4]	17485	1.88	40.32	14.88	40.46	0.000157	3.3	7663.17	662.76	0.12
	145723.9	Existing[1]	17497	1.61	40.08		40.3	0.000199	4.3	7599.37	441.85	0.14
	145723.9	PropPh1[2]	17475	1.61	40.06		40.27	0.000199	4.3	7588.62	441.52	0.14
	145723.9	FuturePh2[3]	17485	1.61	40.07		40.29	0.000199	4.3	7593.57	441.67	0.14
	145723.9	FuturePh3[4]	17485	1.61	40.07		40.29	0.000199	4.3	7593.35	441.66	0.14
	144753.5	Existing[1]	17497	0.07	39.9	15.81	40.1	0.000198	3.81	6572.02	417.94	0.13
	144753.5	PropPh1[2]	17475	0.07	39.88	15.8	40.08	0.000198	3.81	6561.8	417.66	0.13
	144753.5	FuturePh2[3]	17485	0.07	39.89	15.81	40.09	0.000198	3.81	6566.51	417.79	0.13
	144753.5	FuturePh3[4]	17485	0.07	39.89	15.81	40.09	0.000198	3.81	6566.29	417.78	0.13
	143966.8	Existing[1]	17497	-7.47	39.76	17.08	39.95	0.000208	3.86	8379.08	1052.7	0.13
	143966.8	PropPh1[2]	17475	-7.47	39.73	17.07	39.92	0.000208	3.86	8356.39	1048.89	0.13
	143966.8	FuturePh2[3]	17485	-7.47	39.75	17.08	39.93	0.000208	3.86	8366.84	1050.65	0.13
	143966.8	FuturePh3[4]	17485	-7.47	39.75	17.08	39.93	0.000208	3.86	8366.35	1050.56	0.13
	143078.2	Existing[1]	17497	-4.19	39.62		39.78	0.000157	3.43	9744.29	677.86	0.12
	143078.2	PropPh1[2]	17475	-4.19	39.59		39.75	0.000158	3.43	9727.53	677.11	0.12
	143078.2	FuturePh2[3]	17485	-4.19	39.61		39.76	0.000157	3.43	9735.26	677.45	0.12
	143078.2	FuturePh3[4]	17485	-4.19	39.61		39.76	0.000157	3.43	9734.89	677.44	0.12
	142061.4	Existing[1]	17497	0.55	39.51		39.64	0.000106	3.15	9171.24	517.66	0.1
	142061.4	PropPh1[2]	17475	0.55	39.48		39.61	0.000106	3.15	9158.38	517.51	0.1
	142061.4	FuturePh2[3]	17485	0.55	39.5		39.63	0.000106	3.15	9164.31	517.58	0.1
	142061.4	FuturePh3[4]	17485	0.55	39.5		39.62	0.000106	3.15	9164.03	517.58	0.1
	141320.1	Existing[1]	17497	-2.7	39.51	13.23	39.56	0.000055	2.03	16138.09	866.73	0.07
	141320.1	PropPh1[2]	17475	-2.7	39.49	13.22	39.54	0.000055	2.03	16116.5	866.41	0.07
	141320.1	FuturePh2[3]	17485	-2.7	39.5	13.22	39.55	0.000055	2.03	16126.46	866.56	0.07
	141320.1	FuturePh3[4]	17485	-2.7	39.5	13.22	39.55	0.000055	2.03	16125.98	866.55	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	140116.2	Existing[1]	17497	-1.31	39.31	14.6	39.46	0.000143	3.36	10369.47	803.62	0.11
	140116.2	PropPh1[2]	17475	-1.31	39.29	14.59	39.43	0.000143	3.36	10350.3	802.75	0.11
	140116.2	FuturePh2[3]	17485	-1.31	39.3	14.59	39.44	0.000143	3.36	10359.14	803.16	0.11
	140116.2	FuturePh3[4]	17485	-1.31	39.3	14.59	39.44	0.000143	3.36	10358.7	803.14	0.11
	139320	Existing[1]	17497	-2.14	39.25	13.67	39.35	0.000114	2.75	11729.4	920.35	0.09
	139320	PropPh1[2]	17475	-2.14	39.22	13.65	39.32	0.000114	2.75	11706.21	920.15	0.09
	139320	FuturePh2[3]	17485	-2.14	39.23	13.66	39.33	0.000114	2.75	11716.9	920.24	0.09
	139320	FuturePh3[4]	17485	-2.14	39.23	13.66	39.33	0.000114	2.75	11716.38	920.24	0.09
	138607.9	Existing[1]	17455	-2.08	39.28	14.61	39.29	0.000026	1.46	23780.56	1319.43	0.05
	138607.9	PropPh1[2]	17429	-2.08	39.25	14.47	39.27	0.000026	1.46	23752.34	1318.65	0.05
	138607.9	FuturePh2[3]	17441	-2.08	39.26	14.48	39.28	0.000026	1.46	23765.34	1319.01	0.05
	138607.9	FuturePh3[4]	17440	-2.08	39.26	14.48	39.28	0.000026	1.46	23764.71	1318.99	0.05
	137732	Existing[1]	17455	-2.4	39.18	14.16	39.26	0.000077	2.81	15488.5	1159.28	0.09
	137732	PropPh1[2]	17429	-2.4	39.16	14.14	39.23	0.000077	2.81	15464.39	1155.91	0.09
	137732	FuturePh2[3]	17441	-2.4	39.17	14.15	39.25	0.000077	2.81	15475.49	1157.46	0.09
	137732	FuturePh3[4]	17440	-2.4	39.17	14.15	39.25	0.000077	2.81	15474.96	1157.39	0.09
	137113	Existing[1]	17455	-2.62	39.01	13.93	39.19	0.000137	3.75	9049.63	1117.9	0.11
	137113	PropPh1[2]	17429	-2.62	38.98	13.92	39.16	0.000137	3.75	9037.11	1115.22	0.11
	137113	FuturePh2[3]	17441	-2.62	39	13.93	39.18	0.000137	3.75	9042.87	1116.09	0.11
	137113	FuturePh3[4]	17440	-2.62	38.99	13.92	39.17	0.000137	3.75	9042.6	1116.05	0.11
	136331.2	Existing[1]	17455	-2.09	38.98	13.21	39.01	0.000207	1.76	13810.95	713.79	0.06
	136331.2	PropPh1[2]	17429	-2.09	38.95	13.2	38.98	0.000207	1.76	13792.97	713.57	0.06
	136331.2	FuturePh2[3]	17441	-2.09	38.96	13.2	38.99	0.000207	1.76	13801.25	713.67	0.06
	136331.2	FuturePh3[4]	17440	-2.09	38.96	13.2	38.99	0.000207	1.76	13800.86	713.67	0.06
	135666.2	Existing[1]	17455	-1.47	38.8		38.91	0.0001	2.99	11079.29	694.12	0.1
	135666.2	PropPh1[2]	17429	-1.47	38.78		38.89	0.0001	2.99	11061.78	693.69	0.1
	135666.2	FuturePh2[3]	17441	-1.47	38.79		38.9	0.0001	2.99	11069.85	693.89	0.1
	135666.2	FuturePh3[4]	17440	-1.47	38.79		38.9	0.0001	2.99	11069.47	693.88	0.1
	134706.7	Existing[1]	17455	-1.93	38.79		38.83	0.000049	2.13	19376.96	1100.74	0.07
	134706.7	PropPh1[2]	17429	-1.93	38.76		38.8	0.000049	2.13	19349.13	1100.17	0.07
	134706.7	FuturePh2[3]	17441	-1.93	38.77		38.82	0.000049	2.13	19361.95	1100.43	0.07
	134706.7	FuturePh3[4]	17440	-1.93	38.77		38.82	0.000049	2.13	19361.35	1100.42	0.07
	134090.6	Existing[1]	17455	-1.59	38.72		38.8	0.000069	2.64	15312.83	828.05	0.08
	134090.6	PropPh1[2]	17429	-1.59	38.7		38.77	0.000069	2.64	15291.88	827.87	0.08
	134090.6	FuturePh2[3]	17441	-1.59	38.71		38.79	0.000069	2.64	15301.53	827.95	0.08
	134090.6	FuturePh3[4]	17440	-1.59	38.71		38.78	0.000069	2.64	15301.08	827.95	0.08
	133772.1	Existing[1]	17455	-0.79	38.66	13.2	38.77	0.000092	3.2	14426.19	909.94	0.1
	133772.1	PropPh1[2]	17429	-0.79	38.64	13.19	38.74	0.000092	3.2	14403.11	909.62	0.1
	133772.1	FuturePh2[3]	17441	-0.79	38.65	13.2	38.76	0.000092	3.2	14413.75	909.77	0.1
	133772.1	FuturePh3[4]	17440	-0.79	38.65	13.19	38.76	0.000092	3.2	14413.26	909.76	0.1
	133760.1		Bridge									
	133748.1	Existing[1]	17455	-0.46	38.61	13.53	38.72	0.000097	3.27	14077.37	905.15	0.1
	133748.1	PropPh1[2]	17429	-0.46	38.58	13.52	38.7	0.000097	3.27	14054.4	904.84	0.1
	133748.1	FuturePh2[3]	17441	-0.46	38.6	13.52	38.71	0.000097	3.27	14064.99	904.98	0.1
	133748.1	FuturePh3[4]	17440	-0.46	38.6	13.52	38.71	0.000097	3.27	14064.51	904.97	0.1
	132963.8	Existing[1]	17455	-1.98	38.46	13.46	38.61	0.000146	3.43	8567.06	561.99	0.11
	132963.8	PropPh1[2]	17429	-1.98	38.43	13.44	38.59	0.000146	3.43	8553.03	558.46	0.11
	132963.8	FuturePh2[3]	17441	-1.98	38.44	13.45	38.6	0.000146	3.43	8559.5	560.09	0.11
	132963.8	FuturePh3[4]	17440	-1.98	38.44	13.45	38.6	0.000146	3.43	8559.21	560.02	0.11

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	131789.8	Existing[1]	17455	-2.31	38.29	12.06	38.45	0.000133	3.59	9143.51	617.44	0.11
	131789.8	PropPh1[2]	17429	-2.31	38.27	12.05	38.43	0.000133	3.59	9129.33	616.76	0.11
	131789.8	FuturePh2[3]	17441	-2.31	38.28	12.06	38.44	0.000133	3.59	9135.87	617.07	0.11
	131789.8	FuturePh3[4]	17440	-2.31	38.28	12.06	38.44	0.000133	3.59	9135.58	617.06	0.11
	130765.5	Existing[1]	17455	-3.81	38.25		38.34	0.000062	2.62	11818.92	558.56	0.08
	130765.5	PropPh1[2]	17429	-3.81	38.23		38.31	0.000062	2.62	11804.77	558.15	0.08
	130765.5	FuturePh2[3]	17441	-3.81	38.24		38.33	0.000062	2.62	11811.29	558.34	0.08
	130765.5	FuturePh3[4]	17440	-3.81	38.24		38.33	0.000062	2.62	11811	558.33	0.08
	129725.3	Existing[1]	17455	-3.71	38.15		38.26	0.000095	3.23	13232.32	897.01	0.1
	129725.3	PropPh1[2]	17429	-3.71	38.12		38.24	0.000096	3.23	13209.51	895.48	0.1
	129725.3	FuturePh2[3]	17441	-3.71	38.14		38.25	0.000095	3.23	13220.02	896.19	0.1
	129725.3	FuturePh3[4]	17440	-3.71	38.13		38.25	0.000095	3.23	13219.56	896.16	0.1
	129163.2	Existing[1]	17455	-3.13	38.07		38.2	0.000093	3.1	9829.66	666.17	0.1
	129163.2	PropPh1[2]	17429	-3.13	38.05		38.18	0.000093	3.09	9812.76	665.26	0.1
	129163.2	FuturePh2[3]	17441	-3.13	38.06		38.19	0.000093	3.1	9820.55	665.68	0.1
	129163.2	FuturePh3[4]	17440	-3.13	38.06		38.19	0.000093	3.1	9820.21	665.66	0.1
	128326.9	Existing[1]	17455	-4.05	38.03	10.31	38.13	0.000069	2.8	12532.2	1203.21	0.08
	128326.9	PropPh1[2]	17429	-4.05	38	10.3	38.1	0.000069	2.8	12516.06	1202.44	0.08
	128326.9	FuturePh2[3]	17441	-4.05	38.01	10.31	38.11	0.000069	2.8	12523.5	1202.79	0.08
	128326.9	FuturePh3[4]	17440	-4.05	38.01	10.31	38.11	0.000069	2.8	12523.18	1202.78	0.08
	128104.6	Existing[1]	17411	-4.29	38	10.07	38.11	0.000072	2.87	9135.51	605.74	0.09
	128104.6	PropPh1[2]	17380	-4.29	37.98	10.06	38.08	0.000072	2.87	9126.71	598.31	0.09
	128104.6	FuturePh2[3]	17395	-4.29	37.99	10.06	38.09	0.000072	2.87	9130.77	601.74	0.09
	128104.6	FuturePh3[4]	17394	-4.29	37.99	10.06	38.09	0.000072	2.87	9130.59	601.59	0.09
	128066.7		Bridge									
	128028.8	Existing[1]	17411	-4.51	37.99	9.85	38.1	0.00007	2.85	9208.7	641.52	0.09
	128028.8	PropPh1[2]	17380	-4.51	37.97	9.84	38.07	0.00007	2.85	9199.98	640.61	0.09
	128028.8	FuturePh2[3]	17395	-4.51	37.98	9.84	38.08	0.00007	2.85	9204	641.03	0.09
	128028.8	FuturePh3[4]	17394	-4.51	37.98	9.84	38.08	0.00007	2.85	9203.82	641.01	0.09
	126647	Existing[1]	17411	-3.93	37.94		37.99	0.000045	2.31	17549.99	995.94	0.07
	126647	PropPh1[2]	17380	-3.93	37.92		37.96	0.000045	2.31	17525.21	995.02	0.07
	126647	FuturePh2[3]	17395	-3.93	37.93		37.97	0.000045	2.31	17536.63	995.44	0.07
	126647	FuturePh3[4]	17394	-3.93	37.93		37.97	0.000045	2.31	17536.12	995.42	0.07
	125376.9	Existing[1]	17411	-4.05	37.74		37.89	0.000098	3.49	8108.93	514.2	0.1
	125376.9	PropPh1[2]	17380	-4.05	37.71		37.87	0.000098	3.48	8096.42	501.35	0.1
	125376.9	FuturePh2[3]	17395	-4.05	37.72		37.88	0.000098	3.49	8102.14	507.27	0.1
	125376.9	FuturePh3[4]	17394	-4.05	37.72		37.88	0.000098	3.49	8101.89	507.01	0.1
	124983.5	Existing[1]	17411	-3.86	37.75	13.17	37.84	0.000082	3.13	8802.85	1282.9	0.09
	124983.5	PropPh1[2]	17380	-3.86	37.72	13.15	37.81	0.000082	3.13	8788.91	1276.62	0.09
	124983.5	FuturePh2[3]	17395	-3.86	37.73	13.16	37.83	0.000082	3.13	8795.31	1279.51	0.09
	124983.5	FuturePh3[4]	17394	-3.86	37.73	13.16	37.83	0.000082	3.13	8795.03	1279.39	0.09
	124644.1	Existing[1]	17411	-3.69	37.7	12.94	37.81	0.000091	3.29	7839.34	560.61	0.1
	124644.1	PropPh1[2]	17380	-3.69	37.67	12.92	37.78	0.000091	3.29	7830.85	560.3	0.1
	124644.1	FuturePh2[3]	17395	-3.69	37.68	12.93	37.79	0.000091	3.29	7834.76	560.44	0.1
	124644.1	FuturePh3[4]	17394	-3.69	37.68	12.93	37.79	0.000091	3.29	7834.59	560.44	0.1
	124591.8		Bridge									
	124539.5	Existing[1]	17411	-3.74	37.67	12.89	37.78	0.000091	3.29	7848.52	560.93	0.1
	124539.5	PropPh1[2]	17380	-3.74	37.65	12.87	37.76	0.000091	3.28	7840.03	560.63	0.1
	124539.5	FuturePh2[3]	17395	-3.74	37.66	12.88	37.77	0.000091	3.29	7843.93	560.77	0.1
	124539.5	FuturePh3[4]	17394	-3.74	37.66	12.88	37.77	0.000091	3.29	7843.76	560.76	0.1

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	123658.2	Existing[1]	17393	-2.04	37.66		37.7	0.000039	2.1	22368.29	2048	0.06
	123658.2	PropPh1[2]	17361	-2.04	37.64		37.67	0.000039	2.1	22317.75	2043.67	0.06
	123658.2	FuturePh2[3]	17376	-2.04	37.65		37.68	0.000039	2.1	22340.99	2045.66	0.06
	123658.2	FuturePh3[4]	17375	-2.04	37.65		37.68	0.000039	2.1	22339.99	2045.58	0.06
	123138.8	Existing[1]	17393	-4.08	37.65		37.68	0.000024	1.59	22568.75	1452.05	0.05
	123138.8	PropPh1[2]	17361	-4.08	37.63		37.65	0.000024	1.59	22532.96	1449.43	0.05
	123138.8	FuturePh2[3]	17376	-4.08	37.64		37.66	0.000024	1.59	22549.43	1450.64	0.05
	123138.8	FuturePh3[4]	17375	-4.08	37.64		37.66	0.000024	1.59	22548.71	1450.58	0.05
	122627.1	Existing[1]	17393	-6.08	37.61	8.11	37.65	0.000038	1.96	14326.96	1058.65	0.06
	122627.1	PropPh1[2]	17361	-6.08	37.59	8.09	37.63	0.000038	1.96	14300.88	1056.52	0.06
	122627.1	FuturePh2[3]	17376	-6.08	37.6	8.1	37.64	0.000038	1.96	14312.87	1057.5	0.06
	122627.1	FuturePh3[4]	17375	-6.08	37.6	8.1	37.64	0.000038	1.96	14312.36	1057.46	0.06
	122572.1		Mult Open									
	122517.1	Existing[1]	17393	-5.38	37.58	8.84	37.62	0.000042	2.04	13571.41	1000.37	0.06
	122517.1	PropPh1[2]	17361	-5.38	37.55	8.82	37.6	0.000042	2.04	13546.81	998.52	0.06
	122517.1	FuturePh2[3]	17376	-5.38	37.56	8.83	37.61	0.000042	2.04	13558.13	999.37	0.06
	122517.1	FuturePh3[4]	17375	-5.38	37.56	8.83	37.61	0.000042	2.04	13557.64	999.34	0.06
	121229.5	Existing[1]	17393	-11.37	37.5		37.56	0.000053	2.45	14307.13	901.56	0.07
	121229.5	PropPh1[2]	17361	-11.37	37.48		37.54	0.000053	2.45	14284.93	900.73	0.07
	121229.5	FuturePh2[3]	17376	-11.37	37.49		37.55	0.000053	2.45	14295.15	900.84	0.07
	121229.5	FuturePh3[4]	17375	-11.37	37.49		37.55	0.000053	2.45	14294.7	900.83	0.07
	120962.2	Existing[1]	17393	-10.59	37.45		37.54	0.000077	2.94	11106.27	728.27	0.08
	120962.2	PropPh1[2]	17361	-10.59	37.42		37.51	0.000077	2.94	11088.36	728.02	0.08
	120962.2	FuturePh2[3]	17376	-10.59	37.43		37.53	0.000077	2.94	11096.61	728.13	0.08
	120962.2	FuturePh3[4]	17375	-10.59	37.43		37.53	0.000077	2.94	11096.25	728.13	0.08
	120005.2	Existing[1]	17393	-7.78	37.45	7.73	37.47	0.000023	1.65	20402.65	1036.65	0.05
	120005.2	PropPh1[2]	17361	-7.78	37.43	7.72	37.45	0.000023	1.65	20377.15	1036.42	0.05
	120005.2	FuturePh2[3]	17376	-7.78	37.44	7.73	37.46	0.000023	1.65	20388.89	1036.53	0.05
	120005.2	FuturePh3[4]	17375	-7.78	37.44	7.73	37.46	0.000023	1.65	20388.39	1036.52	0.05
	119952.6		Bridge									
	119900	Existing[1]	17393	-7.64	37.41	7.84	37.43	0.000024	1.67	20215.12	1034.93	0.05
	119900	PropPh1[2]	17361	-7.64	37.39	7.82	37.41	0.000024	1.67	20189.6	1034.69	0.05
	119900	FuturePh2[3]	17376	-7.64	37.4	7.83	37.42	0.000024	1.67	20201.35	1034.8	0.05
	119900	FuturePh3[4]	17375	-7.64	37.4	7.83	37.42	0.000024	1.67	20200.84	1034.8	0.05
	119495.9	Existing[1]	17393	-7.21	37.41		37.42	0.000014	1.36	29407.87	1337.43	0.04
	119495.9	PropPh1[2]	17361	-7.21	37.38		37.4	0.000014	1.36	29374.88	1337.17	0.04
	119495.9	FuturePh2[3]	17376	-7.21	37.39		37.41	0.000014	1.36	29390.08	1337.29	0.04
	119495.9	FuturePh3[4]	17375	-7.21	37.39		37.41	0.000014	1.36	29389.43	1337.29	0.04
	118667.7	Existing[1]	17393	-8.56	37.35		37.4	0.000036	2.24	16162.81	924.51	0.06
	118667.7	PropPh1[2]	17361	-8.56	37.32		37.37	0.000036	2.24	16140.05	923.73	0.06
	118667.7	FuturePh2[3]	17376	-8.56	37.33		37.38	0.000036	2.24	16150.53	924.09	0.06
	118667.7	FuturePh3[4]	17375	-8.56	37.33		37.38	0.000036	2.24	16150.08	924.07	0.06
	118466.1	Existing[1]	17393	-8.89	37.31	5.29	37.38	0.000046	2.55	14400.66	1130.71	0.07
	118466.1	PropPh1[2]	17361	-8.89	37.29	5.27	37.36	0.000046	2.55	14372.84	1128.76	0.07
	118466.1	FuturePh2[3]	17376	-8.89	37.3	5.28	37.37	0.000046	2.55	14385.64	1129.65	0.07
	118466.1	FuturePh3[4]	17375	-8.89	37.3	5.28	37.37	0.000046	2.55	14385.09	1129.62	0.07
	118418.1		Bridge									
	118370.1	Existing[1]	17393	-8.87	37.28	5.3	37.35	0.000046	2.56	14342.54	1126.63	0.07
	118370.1	PropPh1[2]	17361	-8.87	37.26	5.29	37.33	0.000046	2.56	14315.04	1124.69	0.07
	118370.1	FuturePh2[3]	17376	-8.87	37.27	5.29	37.34	0.000046	2.56	14327.69	1125.58	0.07
	118370.1	FuturePh3[4]	17375	-8.87	37.27	5.29	37.34	0.000046	2.56	14327.15	1125.54	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	117845.4	Existing[1]	17393	-7.26	37.27		37.32	0.000043	2.34	13775.29	833.7	0.07
	117845.4	PropPh1[2]	17361	-7.26	37.24		37.29	0.000043	2.34	13754.94	833.41	0.07
	117845.4	FuturePh2[3]	17376	-7.26	37.25		37.31	0.000043	2.34	13764.31	833.54	0.07
	117845.4	FuturePh3[4]	17375	-7.26	37.25		37.3	0.000043	2.34	13763.91	833.54	0.07
	117204.3	Existing[1]	17393	-4.6	37.25		37.29	0.000041	2.21	15744.75	1090.88	0.06
	117204.3	PropPh1[2]	17361	-4.6	37.22		37.26	0.000041	2.21	15718.16	1087.95	0.06
	117204.3	FuturePh2[3]	17376	-4.6	37.23		37.27	0.000041	2.21	15730.39	1089.3	0.06
	117204.3	FuturePh3[4]	17375	-4.6	37.23		37.27	0.000041	2.21	15729.87	1089.24	0.06
	116395.7	Existing[1]	17393	-3.88	37.19		37.25	0.000043	2.38	13225.78	544.07	0.07
	116395.7	PropPh1[2]	17361	-3.88	37.17		37.23	0.000043	2.38	13212.57	543.78	0.07
	116395.7	FuturePh2[3]	17376	-3.88	37.18		37.24	0.000043	2.38	13218.65	543.9	0.07
	116395.7	FuturePh3[4]	17375	-3.88	37.18		37.24	0.000043	2.38	13218.39	543.89	0.07
	116167.6	Existing[1]	17393	-3.68	37.09	7.23	37.22	0.000074	3.1	7622.62	290.98	0.09
	116167.6	PropPh1[2]	17361	-3.68	37.06	7.21	37.19	0.000074	3.1	7616.42	290.91	0.09
	116167.6	FuturePh2[3]	17376	-3.68	37.07	7.22	37.21	0.000074	3.1	7619.27	290.94	0.09
	116167.6	FuturePh3[4]	17375	-3.68	37.07	7.22	37.2	0.000074	3.1	7619.15	290.94	0.09
	116121.9		Bridge									
	116076.2	Existing[1]	17393	-3.86	36.98	7.05	37.11	0.000074	3.09	7641.34	291.21	0.09
	116076.2	PropPh1[2]	17361	-3.86	36.96	7.03	37.09	0.000074	3.09	7635.29	291.13	0.09
	116076.2	FuturePh2[3]	17376	-3.86	36.97	7.04	37.1	0.000074	3.09	7638.07	291.17	0.09
	116076.2	FuturePh3[4]	17375	-3.86	36.97	7.04	37.1	0.000074	3.09	7637.96	291.17	0.09
	115655.5	Existing[1]	17393	-5.03	36.96	7.63	37.07	0.000053	2.99	10265.09	732.64	0.09
	115655.5	PropPh1[2]	17361	-5.03	36.94	7.62	37.05	0.000053	2.99	10247.91	731.56	0.09
	115655.5	FuturePh2[3]	17376	-5.03	36.95	7.63	37.06	0.000053	2.99	10255.81	732.05	0.09
	115655.5	FuturePh3[4]	17375	-5.03	36.95	7.62	37.06	0.000053	2.99	10255.48	732.03	0.09
	115635.5		Bridge									
	115615.5	Existing[1]	17393	-5.27	36.95	7.39	37.06	0.000052	2.96	10433.02	750.34	0.08
	115615.5	PropPh1[2]	17361	-5.27	36.93	7.38	37.03	0.000052	2.96	10415.48	747.37	0.08
	115615.5	FuturePh2[3]	17376	-5.27	36.94	7.38	37.04	0.000052	2.96	10423.54	748.74	0.08
	115615.5	FuturePh3[4]	17375	-5.27	36.94	7.38	37.04	0.000052	2.96	10423.21	748.68	0.08
	115573.5	Existing[1]	17393	-5.72	36.96	6.44	37.04	0.000041	2.59	10866.93	513.77	0.07
	115573.5	PropPh1[2]	17361	-5.72	36.94	6.43	37.02	0.000041	2.59	10854.91	513.71	0.07
	115573.5	FuturePh2[3]	17376	-5.72	36.95	6.44	37.03	0.000041	2.59	10860.44	513.74	0.07
	115573.5	FuturePh3[4]	17375	-5.72	36.95	6.44	37.03	0.000041	2.59	10860.21	513.74	0.07
	115553.5		Bridge									
	115533.5	Existing[1]	17393	-6.77	36.95	5.39	37.02	0.000037	2.49	11404.3	663.24	0.07
	115533.5	PropPh1[2]	17361	-6.77	36.93	5.38	37	0.000037	2.48	11392.21	662.27	0.07
	115533.5	FuturePh2[3]	17376	-6.77	36.94	5.39	37.01	0.000037	2.48	11397.77	662.71	0.07
	115533.5	FuturePh3[4]	17375	-6.77	36.94	5.39	37.01	0.000037	2.48	11397.54	662.69	0.07
	115214	Existing[1]	17393	-7.96	36.9	3.92	37	0.000042	2.67	9314.26	617.23	0.07
	115214	PropPh1[2]	17361	-7.96	36.88	3.91	36.98	0.000042	2.66	9299.96	613.82	0.07
	115214	FuturePh2[3]	17376	-7.96	36.89	3.91	36.99	0.000042	2.67	9306.52	615.39	0.07
	115214	FuturePh3[4]	17375	-7.96	36.89	3.91	36.99	0.000042	2.67	9306.26	615.32	0.07
	115168.5		Bridge									
	115123	Existing[1]	17393	-8.12	36.84	3.75	36.94	0.000042	2.66	9376.4	631.85	0.07
	115123	PropPh1[2]	17361	-8.12	36.82	3.74	36.92	0.000042	2.66	9361.85	628.45	0.07
	115123	FuturePh2[3]	17376	-8.12	36.83	3.75	36.93	0.000042	2.66	9368.53	630.01	0.07
	115123	FuturePh3[4]	17375	-8.12	36.83	3.75	36.93	0.000042	2.66	9368.26	629.95	0.07

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	114890.5	Existing[1]	17393	-8.56	36.82	4.81	36.93	0.00005	2.8	11632.13	1285.02	0.08
	114890.5	PropPh1[2]	17361	-8.56	36.79	4.8	36.9	0.00005	2.79	11604.9	1282.08	0.08
	114890.5	FuturePh2[3]	17376	-8.56	36.8	4.81	36.91	0.00005	2.8	11617.41	1283.43	0.08
	114890.5	FuturePh3[4]	17375	-8.56	36.8	4.81	36.91	0.00005	2.8	11616.91	1283.38	0.08
	114864.5		Bridge									
	114838.5	Existing[1]	17393	-9.27	36.78	4.1	36.88	0.000047	2.73	12447.14	1370.35	0.08
	114838.5	PropPh1[2]	17361	-9.27	36.75	4.09	36.86	0.000046	2.73	12418.27	1367.41	0.08
	114838.5	FuturePh2[3]	17376	-9.27	36.76	4.1	36.87	0.000047	2.73	12431.54	1368.76	0.08
	114838.5	FuturePh3[4]	17375	-9.27	36.76	4.1	36.87	0.000047	2.73	12431.01	1368.71	0.08
	114492	Existing[1]	17393	-10.48	36.76		36.86	0.000053	2.75	9916.67	931	0.08
	114492	PropPh1[2]	17361	-10.48	36.73		36.84	0.000053	2.75	9895.3	927.4	0.08
	114492	FuturePh2[3]	17376	-10.48	36.74		36.85	0.000053	2.75	9905.11	929.05	0.08
	114492	FuturePh3[4]	17375	-10.48	36.74		36.85	0.000053	2.75	9904.72	928.99	0.08
	114195.9	Existing[1]	17393	-11.52	36.75	5.13	36.84	0.000046	2.62	8907.06	800.48	0.08
	114195.9	PropPh1[2]	17361	-11.52	36.72	5.11	36.82	0.000046	2.61	8888.71	796.45	0.08
	114195.9	FuturePh2[3]	17376	-11.52	36.73	5.12	36.83	0.000046	2.62	8897.14	798.3	0.08
	114195.9	FuturePh3[4]	17375	-11.52	36.73	5.12	36.83	0.000046	2.62	8896.8	798.23	0.08
	114168.9		Bridge									
	114141.9	Existing[1]	17393	-10.83	36.63	5.81	36.73	0.000051	2.69	8327.56	597.09	0.08
	114141.9	PropPh1[2]	17361	-10.83	36.6	5.8	36.71	0.000051	2.69	8313.33	588.54	0.08
	114141.9	FuturePh2[3]	17376	-10.83	36.61	5.8	36.72	0.000051	2.69	8319.84	592.47	0.08
	114141.9	FuturePh3[4]	17375	-10.83	36.61	5.8	36.72	0.000051	2.69	8319.58	592.31	0.08
	114097.4	Existing[1]	17393	-7.46	36.64	6.54	36.71	0.00004	2.36	10128.26	969.03	0.07
	114097.4	PropPh1[2]	17361	-7.46	36.61	6.53	36.69	0.00004	2.36	10105.27	964.73	0.07
	114097.4	FuturePh2[3]	17376	-7.46	36.63	6.53	36.7	0.00004	2.36	10115.82	966.71	0.07
	114097.4	FuturePh3[4]	17375	-7.46	36.62	6.53	36.7	0.00004	2.36	10115.41	966.63	0.07
	114070.4		Bridge									
	114043.4	Existing[1]	17393	-7.72	36.57	6.25	36.64	0.000039	2.34	10313.39	1002.99	0.07
	114043.4	PropPh1[2]	17361	-7.72	36.54	6.24	36.62	0.000039	2.34	10289.12	998.6	0.07
	114043.4	FuturePh2[3]	17376	-7.72	36.55	6.24	36.63	0.000039	2.34	10300.25	1000.62	0.07
	114043.4	FuturePh3[4]	17375	-7.72	36.55	6.24	36.63	0.000039	2.34	10299.81	1000.54	0.07
	113644	Existing[1]	17393	-8.91	36.51		36.61	0.000062	2.7	9504.64	628.59	0.09
	113644	PropPh1[2]	17361	-8.91	36.48		36.59	0.000062	2.7	9489.28	628.21	0.09
	113644	FuturePh2[3]	17376	-8.91	36.49		36.6	0.000062	2.7	9496.33	628.38	0.09
	113644	FuturePh3[4]	17375	-8.91	36.49		36.6	0.000062	2.7	9496.06	628.38	0.09
	113411.6	Existing[1]	17393	-9.61	36.49	3.67	36.6	0.000046	2.77	6812.94	563.79	0.08
	113411.6	PropPh1[2]	17361	-9.61	36.47	3.66	36.58	0.000046	2.77	6808.44	562.95	0.08
	113411.6	FuturePh2[3]	17376	-9.61	36.48	3.67	36.59	0.000046	2.77	6810.51	563.33	0.08
	113411.6	FuturePh3[4]	17375	-9.61	36.48	3.67	36.59	0.000046	2.77	6810.43	563.32	0.08
	113374.3		Bridge									
	113337	Existing[1]	17393	-9.65	36.35	3.63	36.46	0.000046	2.78	6793.97	560.27	0.08
	113337	PropPh1[2]	17361	-9.65	36.32	3.62	36.43	0.000046	2.78	6789.59	559.46	0.08
	113337	FuturePh2[3]	17376	-9.65	36.33	3.62	36.45	0.000046	2.78	6791.6	559.83	0.08
	113337	FuturePh3[4]	17375	-9.65	36.33	3.62	36.45	0.000046	2.78	6791.52	559.82	0.08
	113266.4	Existing[1]	17393	-9.11	36.25	6.93	36.43	0.000089	3.55	6896.16	493.45	0.11
	113266.4	PropPh1[2]	17361	-9.11	36.23	6.91	36.41	0.000089	3.55	6884.57	490.96	0.11
	113266.4	FuturePh2[3]	17376	-9.11	36.24	6.92	36.42	0.000089	3.55	6889.88	492.1	0.11
	113266.4	FuturePh3[4]	17375	-9.11	36.24	6.92	36.42	0.000089	3.55	6889.68	492.06	0.11
	113238.6		Bridge									

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	113210.8	Existing[1]	17393	-9.46	36.18	6.57	36.36	0.000087	3.52	7041.37	583.09	0.1
	113210.8	PropPh1[2]	17361	-9.46	36.15	6.56	36.33	0.000086	3.51	7028.08	568.79	0.1
	113210.8	FuturePh2[3]	17376	-9.46	36.17	6.56	36.34	0.000087	3.52	7034.13	575.35	0.1
	113210.8	FuturePh3[4]	17375	-9.46	36.17	6.56	36.34	0.000087	3.52	7033.9	575.1	0.1
	112974	Existing[1]	17393	-10.69	36.15	6	36.33	0.000101	3.49	5881.96	266.25	0.11
	112974	PropPh1[2]	17361	-10.69	36.13	5.98	36.31	0.000101	3.49	5875.6	265.15	0.1
	112974	FuturePh2[3]	17376	-10.69	36.14	5.99	36.32	0.000101	3.49	5878.4	265.63	0.11
	112974	FuturePh3[4]	17375	-10.69	36.14	5.99	36.32	0.000101	3.49	5878.29	265.62	0.11
	112944.9		Bridge									
	112915.8	Existing[1]	17393	-10.82	36.09	5.86	36.27	0.0001	3.49	5900.42	269.42	0.1
	112915.8	PropPh1[2]	17361	-10.82	36.07	5.85	36.25	0.0001	3.48	5894.1	268.34	0.1
	112915.8	FuturePh2[3]	17376	-10.82	36.08	5.85	36.26	0.0001	3.48	5896.88	268.81	0.1
	112915.8	FuturePh3[4]	17375	-10.82	36.08	5.85	36.26	0.0001	3.48	5896.77	268.8	0.1
	112575.5	Existing[1]	17393	-9.2	36.09	7.47	36.22	0.000076	3.13	9236.1	939.52	0.09
	112575.5	PropPh1[2]	17361	-9.2	36.06	7.46	36.2	0.000076	3.13	9214	937.92	0.09
	112575.5	FuturePh2[3]	17376	-9.2	36.07	7.46	36.21	0.000076	3.13	9223.72	938.63	0.09
	112575.5	FuturePh3[4]	17375	-9.2	36.07	7.47	36.21	0.000076	3.13	9223.36	938.6	0.09
	112534.5		Bridge									
	112493.5	Existing[1]	17393	-9.47	36.02	7.2	36.15	0.000074	3.11	9426.08	953.08	0.09
	112493.5	PropPh1[2]	17361	-9.47	35.99	7.19	36.13	0.000074	3.11	9403.57	951.48	0.09
	112493.5	FuturePh2[3]	17376	-9.47	36	7.2	36.14	0.000074	3.11	9413.47	952.18	0.09
	112493.5	FuturePh3[4]	17375	-9.47	36	7.19	36.14	0.000074	3.11	9413.11	952.16	0.09
	112003.3	Existing[1]	17393	-9.69	36.01	4.74	36.1	0.000042	2.49	8807.88	481.2	0.07
	112003.3	PropPh1[2]	17361	-9.69	35.99	4.72	36.08	0.000042	2.49	8796.52	480.46	0.07
	112003.3	FuturePh2[3]	17376	-9.69	36	4.73	36.09	0.000042	2.49	8801.52	480.79	0.07
	112003.3	FuturePh3[4]	17375	-9.69	36	4.72	36.09	0.000042	2.49	8801.33	480.78	0.07
	111953.3		Bridge									
	111903.3	Existing[1]	17393	-9.84	35.93	4.58	36.02	0.000042	2.49	8841.75	483.39	0.07
	111903.3	PropPh1[2]	17361	-9.84	35.91	4.57	36	0.000042	2.48	8830.25	482.65	0.07
	111903.3	FuturePh2[3]	17376	-9.84	35.92	4.57	36.01	0.000042	2.48	8835.31	482.98	0.07
	111903.3	FuturePh3[4]	17375	-9.84	35.92	4.57	36.01	0.000042	2.48	8835.12	482.96	0.07
	111853.5	Existing[1]	17393	-9.86	35.92	4.69	36.02	0.000039	2.46	8122.19	478.2	0.07
	111853.5	PropPh1[2]	17361	-9.86	35.9	4.68	35.99	0.000039	2.46	8110.83	477.46	0.07
	111853.5	FuturePh2[3]	17376	-9.86	35.91	4.68	36	0.000039	2.46	8115.82	477.78	0.07
	111853.5	FuturePh3[4]	17375	-9.86	35.91	4.68	36	0.000039	2.46	8115.64	477.77	0.07
	111818.6		Bridge									
	111783.7	Existing[1]	17393	-8.67	35.86	5.87	35.96	0.000044	2.55	7548.99	429.75	0.08
	111783.7	PropPh1[2]	17361	-8.67	35.84	5.86	35.94	0.000044	2.55	7538.82	428.44	0.08
	111783.7	FuturePh2[3]	17376	-8.67	35.85	5.87	35.95	0.000044	2.55	7543.29	429.02	0.08
	111783.7	FuturePh3[4]	17375	-8.67	35.85	5.87	35.95	0.000044	2.55	7543.13	429	0.08
	111626.7	Existing[1]	17393	-11.83	35.83	4.88	35.95	0.000056	2.83	8429.75	574.53	0.08
	111626.7	PropPh1[2]	17361	-11.83	35.81	4.86	35.92	0.000056	2.82	8416.19	571.23	0.08
	111626.7	FuturePh2[3]	17376	-11.83	35.82	4.87	35.94	0.000056	2.82	8422.14	572.68	0.08
	111626.7	FuturePh3[4]	17375	-11.83	35.82	4.87	35.93	0.000056	2.82	8421.92	572.63	0.08
	111518.6		Bridge									
	111410.5	Existing[1]	17393	-11.23	35.67	5.42	35.79	0.00006	2.89	8018.83	517.83	0.09
	111410.5	PropPh1[2]	17361	-11.23	35.65	5.4	35.77	0.00006	2.89	8006.64	516.75	0.08
	111410.5	FuturePh2[3]	17376	-11.23	35.66	5.41	35.78	0.00006	2.89	8011.99	517.22	0.08
	111410.5	FuturePh3[4]	17375	-11.23	35.66	5.41	35.78	0.00006	2.89	8011.8	517.21	0.08

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1PCT_100yr	110876.6	Existing[1]	17393	-10.43	35.66	2.4	35.75	0.000038	2.61	14187.62	1377.45	0.07
	110876.6	PropPh1[2]	17361	-10.43	35.64	2.39	35.72	0.000038	2.61	14155.12	1375.98	0.07
	110876.6	FuturePh2[3]	17376	-10.43	35.65	2.39	35.74	0.000038	2.61	14169.37	1376.62	0.07
	110876.6	FuturePh3[4]	17375	-10.43	35.65	2.4	35.73	0.000038	2.61	14168.87	1376.6	0.07
	110837.8		Bridge									
	110799	Existing[1]	17393	-10.72	35.63	2.1	35.71	0.000037	2.58	14542.08	1393.35	0.07
	110799	PropPh1[2]	17361	-10.72	35.6	2.09	35.69	0.000037	2.58	14509.3	1391.89	0.07
	110799	FuturePh2[3]	17376	-10.72	35.61	2.09	35.7	0.000037	2.58	14523.67	1392.53	0.07
	110799	FuturePh3[4]	17375	-10.72	35.61	2.09	35.7	0.000037	2.58	14523.17	1392.51	0.07
	110672.7	Existing[1]	17393	-13.25	35.62	2.5	35.71	0.000045	2.56	15708.1	1341.78	0.07
	110672.7	PropPh1[2]	17361	-13.25	35.6	2.48	35.68	0.000045	2.56	15676.44	1340.88	0.07
	110672.7	FuturePh2[3]	17376	-13.25	35.61	2.49	35.69	0.000045	2.56	15690.32	1341.27	0.07
	110672.7	FuturePh3[4]	17375	-13.25	35.61	2.48	35.69	0.000045	2.56	15689.84	1341.26	0.07
	110643.7		Bridge									
	110614.7	Existing[1]	17393	-12.75	35.6	2.99	35.69	0.000048	2.62	15014.15	1321.89	0.08
	110614.7	PropPh1[2]	17361	-12.75	35.58	2.98	35.67	0.000048	2.62	14982.8	1320.98	0.08
	110614.7	FuturePh2[3]	17376	-12.75	35.59	2.98	35.68	0.000048	2.62	14996.56	1321.38	0.08
	110614.7	FuturePh3[4]	17375	-12.75	35.59	2.98	35.68	0.000048	2.62	14996.07	1321.37	0.08
	110200.2	Existing[1]	59250	-9.11	34.35	14.71	35.33	0.000539	8.83	11065.68	566.44	0.26
	110200.2	PropPh1[2]	59189	-9.11	34.33	14.71	35.31	0.000539	8.83	11052.58	566.06	0.26
	110200.2	FuturePh2[3]	59216	-9.11	34.34	14.71	35.32	0.000539	8.83	11058.33	566.22	0.26
	110200.2	FuturePh3[4]	59215	-9.11	34.34	14.71	35.32	0.000539	8.83	11058.12	566.22	0.26
	110154.2		Bridge									
	110108.2	Existing[1]	59250	-9.31	33.9	14.51	34.9	0.000554	8.91	10928.22	562.46	0.27
	110108.2	PropPh1[2]	59189	-9.31	33.88	14.51	34.88	0.000554	8.91	10915.35	562.09	0.27
	110108.2	FuturePh2[3]	59216	-9.31	33.89	14.51	34.89	0.000554	8.91	10921	562.25	0.27
	110108.2	FuturePh3[4]	59215	-9.31	33.89	14.51	34.89	0.000554	8.91	10920.8	562.25	0.27
	109551.7	Existing[1]	59250	-14.28	33.69	10.42	34.59	0.000403	7.99	9820.34	366.02	0.23
	109551.7	PropPh1[2]	59189	-14.28	33.67	10.4	34.56	0.000403	7.99	9811.83	365.93	0.23
	109551.7	FuturePh2[3]	59216	-14.28	33.68	10.41	34.57	0.000403	7.99	9815.57	365.97	0.23
	109551.7	FuturePh3[4]	59215	-14.28	33.68	10.41	34.57	0.000403	7.99	9815.43	365.97	0.23
	109518.7		Bridge									
	109485.7	Existing[1]	59250	-15.31	32.85	9.39	33.74	0.000396	7.95	9890.32	366.74	0.23
	109485.7	PropPh1[2]	59189	-15.31	32.83	9.37	33.71	0.000396	7.95	9881.77	366.66	0.23
	109485.7	FuturePh2[3]	59216	-15.31	32.84	9.38	33.72	0.000396	7.95	9885.56	366.7	0.23
	109485.7	FuturePh3[4]	59215	-15.31	32.84	9.38	33.72	0.000396	7.95	9885.43	366.69	0.23
	109440.2	Existing[1]	59250	-16.48	32.56	9.25	33.65	0.000473	8.9	9190.43	332.74	0.25
	109440.2	PropPh1[2]	59189	-16.48	32.53	9.23	33.63	0.000473	8.9	9182.74	332.7	0.25
	109440.2	FuturePh2[3]	59216	-16.48	32.54	9.24	33.64	0.000473	8.9	9186.16	332.72	0.25
	109440.2	FuturePh3[4]	59215	-16.48	32.54	9.24	33.64	0.000473	8.9	9186.04	332.72	0.25
	109395.2		Bridge									
	109350.2	Existing[1]	59250	-16.89	31.83	8.84	32.95	0.000487	8.98	9085.09	332.27	0.25
	109350.2	PropPh1[2]	59189	-16.89	31.81	8.82	32.93	0.000487	8.98	9078.44	332.24	0.25
	109350.2	FuturePh2[3]	59216	-16.89	31.82	8.83	32.94	0.000487	8.98	9081.4	332.26	0.25
	109350.2	FuturePh3[4]	59215	-16.89	31.82	8.83	32.94	0.000487	8.98	9081.29	332.26	0.25
	109119	Existing[1]	59250	-17.14	31.73	10.83	32.8	0.000566	8.86	7976.75	502.97	0.25
	109119	PropPh1[2]	59189	-17.14	31.71	10.82	32.78	0.000566	8.85	7969.1	502.47	0.25
	109119	FuturePh2[3]	59216	-17.14	31.72	10.82	32.79	0.000566	8.86	7972.5	502.69	0.25
	109119	FuturePh3[4]	59215	-17.14	31.72	10.82	32.79	0.000566	8.86	7972.38	502.68	0.25
	109103.1		Bridge									

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	109087.2	Existing[1]	59250	-17.55	31.48	10.52	32.53	0.000555	8.8	8034.57	506.73	0.25
	109087.2	PropPh1[2]	59189	-17.55	31.46	10.51	32.51	0.000556	8.8	8027.02	506.24	0.25
	109087.2	FuturePh2[3]	59216	-17.55	31.47	10.52	32.52	0.000555	8.8	8030.37	506.46	0.25
	109087.2	FuturePh3[4]	59215	-17.55	31.47	10.52	32.52	0.000555	8.8	8030.25	506.45	0.25
	108565.3	Existing[1]	59250	-12.77	31.37	8.21	32.15	0.000401	7.14	9686.57	546.88	0.22
	108565.3	PropPh1[2]	59189	-12.77	31.35	8.2	32.13	0.000401	7.14	9675.72	546.56	0.22
	108565.3	FuturePh2[3]	59216	-12.77	31.36	8.2	32.14	0.000401	7.14	9680.53	546.7	0.22
	108565.3	FuturePh3[4]	59215	-12.77	31.36	8.2	32.14	0.000401	7.14	9680.36	546.7	0.22
	108334	Existing[1]	59250	-14.06	31.36		32.03	0.00034	6.65	12206.85	840.6	0.21
	108334	PropPh1[2]	59189	-14.06	31.34		32.01	0.00034	6.65	12190.07	839.94	0.21
	108334	FuturePh2[3]	59216	-14.06	31.35		32.02	0.00034	6.65	12197.52	840.23	0.21
	108334	FuturePh3[4]	59215	-14.06	31.35		32.02	0.00034	6.65	12197.26	840.22	0.21
	107179.4	Existing[1]	59499	-20.52	30.44	5.99	31.42	0.000627	8.07	8971.74	396.54	0.24
	107179.4	PropPh1[2]	59438	-20.52	30.42	5.97	31.4	0.000627	8.06	8964.01	396.53	0.24
	107179.4	FuturePh2[3]	59465	-20.52	30.43	5.98	31.41	0.000627	8.06	8967.44	396.53	0.24
	107179.4	FuturePh3[4]	59464	-20.52	30.43	5.98	31.41	0.000627	8.06	8967.32	396.53	0.24
	107158.9		Bridge									
	107138.4	Existing[1]	59499	-20.19	30.22	6.31	31.24	0.000664	8.21	8754.7	396.31	0.25
	107138.4	PropPh1[2]	59438	-20.19	30.2	6.3	31.22	0.000664	8.21	8747.03	396.3	0.25
	107138.4	FuturePh2[3]	59465	-20.19	30.21	6.3	31.23	0.000664	8.21	8750.44	396.3	0.25
	107138.4	FuturePh3[4]	59464	-20.19	30.21	6.3	31.23	0.000664	8.21	8750.32	396.3	0.25
	106594	Existing[1]	59499	-16.7	30.04	5.23	30.89	0.000378	7.41	8518.04	278.16	0.22
	106594	PropPh1[2]	59438	-16.7	30.02	5.22	30.87	0.000378	7.41	8512.67	278.08	0.22
	106594	FuturePh2[3]	59465	-16.7	30.03	5.22	30.87	0.000378	7.41	8515.06	278.11	0.22
	106594	FuturePh3[4]	59464	-16.7	30.03	5.22	30.87	0.000378	7.41	8514.97	278.11	0.22
	106151.4	Existing[1]	59499	-13.85	29.63	8.08	30.64	0.000502	8.14	8070.87	291.24	0.25
	106151.4	PropPh1[2]	59438	-13.85	29.61	8.07	30.62	0.000502	8.13	8065.3	291.15	0.25
	106151.4	FuturePh2[3]	59465	-13.85	29.62	8.07	30.63	0.000502	8.13	8067.77	291.19	0.25
	106151.4	FuturePh3[4]	59464	-13.85	29.62	8.07	30.63	0.000502	8.13	8067.69	291.19	0.25
	106131.1		Bridge									
	106110.8	Existing[1]	59499	-12.53	29.37	9.4	30.5	0.000583	8.55	7618.3	283.68	0.27
	106110.8	PropPh1[2]	59438	-12.53	29.35	9.39	30.48	0.000582	8.54	7612.92	283.59	0.27
	106110.8	FuturePh2[3]	59465	-12.53	29.36	9.39	30.48	0.000582	8.55	7615.31	283.63	0.27
	106110.8	FuturePh3[4]	59464	-12.53	29.36	9.39	30.48	0.000582	8.55	7615.23	283.63	0.27
	105705.4	Existing[1]	59499	-18.22	29.29	6.68	30.2	0.000393	7.69	8052.73	340.33	0.25
	105705.4	PropPh1[2]	59438	-18.22	29.27	6.67	30.18	0.000393	7.68	8046.24	340.07	0.25
	105705.4	FuturePh2[3]	59465	-18.22	29.27	6.68	30.19	0.000393	7.69	8049.12	340.18	0.25
	105705.4	FuturePh3[4]	59464	-18.22	29.27	6.67	30.19	0.000393	7.69	8049.02	340.18	0.25
	105667.4		Bridge									
	105629.4	Existing[1]	59499	-18.43	28.97	6.47	29.89	0.000397	7.71	8017.7	338.9	0.25
	105629.4	PropPh1[2]	59438	-18.43	28.95	6.46	29.87	0.000397	7.71	8011.26	338.63	0.25
	105629.4	FuturePh2[3]	59465	-18.43	28.96	6.47	29.88	0.000397	7.71	8014.13	338.75	0.25
	105629.4	FuturePh3[4]	59464	-18.43	28.96	6.47	29.88	0.000397	7.71	8014.02	338.75	0.25
	105211	Existing[1]	59499	-16.14	28.65	6.95	29.66	0.000627	8.06	7383.19	333.81	0.3
	105211	PropPh1[2]	59438	-16.14	28.63	6.94	29.64	0.000627	8.06	7376.69	333.55	0.3
	105211	FuturePh2[3]	59465	-16.14	28.64	6.95	29.65	0.000627	8.06	7379.59	333.67	0.3
	105211	FuturePh3[4]	59464	-16.14	28.64	6.95	29.65	0.000627	8.06	7379.48	333.66	0.3
	104608.2	Existing[1]	59499	-18.46	28.64		29.24	0.00039	6.24	9549.53	483.46	0.24
	104608.2	PropPh1[2]	59438	-18.46	28.62		29.22	0.00039	6.24	9539.98	482.89	0.24
	104608.2	FuturePh2[3]	59465	-18.46	28.63		29.23	0.00039	6.24	9544.23	483.14	0.24
	104608.2	FuturePh3[4]	59464	-18.46	28.63		29.23	0.00039	6.24	9544.08	483.13	0.24

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	104370.8	Existing[1]	59499	-19.99	27.93	9.5	29	0.000446	9.15	10168.47	491.01	0.27
	104370.8	PropPh1[2]	59438	-19.99	27.91	9.48	28.98	0.000446	9.14	10158.95	490.94	0.27
	104370.8	FuturePh2[3]	59465	-19.99	27.92	9.49	28.99	0.000446	9.15	10163.19	490.97	0.27
	104370.8	FuturePh3[4]	59464	-19.99	27.92	9.49	28.99	0.000446	9.15	10163.04	490.97	0.27
	104350		Bridge									
	104329.2	Existing[1]	59499	-20.2	26.81	9.29	27.97	0.000496	9.48	9723.92	487.5	0.28
	104329.2	PropPh1[2]	59438	-20.2	26.79	9.27	27.96	0.000496	9.47	9715.02	487.43	0.28
	104329.2	FuturePh2[3]	59465	-20.2	26.8	9.28	27.96	0.000496	9.48	9718.99	487.46	0.28
	104329.2	FuturePh3[4]	59464	-20.2	26.8	9.28	27.96	0.000496	9.48	9718.85	487.46	0.28
	103664	Existing[1]	59499	-23.03	24.18		26.97	0.001364	14.86	6732.44	682.19	0.42
	103664	PropPh1[2]	59438	-23.03	24.16		26.95	0.001365	14.86	6719.26	679.86	0.42
	103664	FuturePh2[3]	59465	-23.03	24.16		26.96	0.001365	14.86	6725.15	680.9	0.42
	103664	FuturePh3[4]	59464	-23.03	24.16		26.96	0.001365	14.86	6724.94	680.87	0.42
	102875.3	Existing[1]	59499	-26.39	23.94	10.35	25.64	0.000815	12.1	7688.27	382.31	0.33
	102875.3	PropPh1[2]	59438	-26.39	23.92	10.33	25.62	0.000815	12.1	7680.85	382.19	0.33
	102875.3	FuturePh2[3]	59465	-26.39	23.93	10.34	25.63	0.000815	12.1	7684.17	382.24	0.33
	102875.3	FuturePh3[4]	59464	-26.39	23.93	10.34	25.63	0.000815	12.1	7684.05	382.24	0.33
	102847.5		Bridge									
	102819.7	Existing[1]	59499	-26.43	22.69	10.28	24.61	0.000943	12.76	7230.29	375.03	0.35
	102819.7	PropPh1[2]	59438	-26.43	22.68	10.26	24.6	0.000943	12.76	7223.77	374.94	0.35
	102819.7	FuturePh2[3]	59465	-26.43	22.68	10.27	24.61	0.000943	12.76	7226.69	374.98	0.35
	102819.7	FuturePh3[4]	59464	-26.43	22.68	10.27	24.6	0.000943	12.76	7226.59	374.98	0.35
	102309	Existing[1]	59499	-23.48	22.86		23.88	0.000367	8.1	7374.99	223.14	0.24
	102309	PropPh1[2]	59438	-23.48	22.84		23.86	0.000367	8.1	7371.19	223.1	0.24
	102309	FuturePh2[3]	59465	-23.48	22.85		23.87	0.000367	8.1	7372.9	223.12	0.24
	102309	FuturePh3[4]	59464	-23.48	22.85		23.87	0.000367	8.1	7372.84	223.12	0.24
	101828	Existing[1]	59499	-20.7	22.38	3.45	23.61	0.000508	8.91	6973.04	298.05	0.28
	101828	PropPh1[2]	59438	-20.7	22.36	3.44	23.59	0.000507	8.91	6968.01	297.84	0.28
	101828	FuturePh2[3]	59465	-20.7	22.37	3.44	23.6	0.000507	8.91	6970.27	297.93	0.28
	101828	FuturePh3[4]	59464	-20.7	22.37	3.44	23.6	0.000507	8.91	6970.19	297.93	0.28
	101790.1		Bridge									
	101752.2	Existing[1]	59499	-20.69	22.17	3.45	23.41	0.00052	8.98	6906.28	295.24	0.29
	101752.2	PropPh1[2]	59438	-20.69	22.15	3.44	23.4	0.00052	8.98	6901.32	295.03	0.29
	101752.2	FuturePh2[3]	59465	-20.69	22.16	3.44	23.4	0.00052	8.98	6903.55	295.12	0.29
	101752.2	FuturePh3[4]	59464	-20.69	22.16	3.44	23.4	0.00052	8.98	6903.47	295.12	0.29
	101007.3	Existing[1]	59499	-16.93	21.95		22.91	0.000457	7.87	7559.99	277.42	0.27
	101007.3	PropPh1[2]	59438	-16.93	21.93		22.89	0.000457	7.87	7555.3	277.37	0.27
	101007.3	FuturePh2[3]	59465	-16.93	21.94		22.9	0.000457	7.87	7557.41	277.39	0.27
	101007.3	FuturePh3[4]	59464	-16.93	21.94		22.9	0.000457	7.87	7557.33	277.39	0.27
	99992.6	Existing[1]	60210	-18.9	21.29		22.39	0.000548	8.39	7173.94	266.17	0.28
	99992.6	PropPh1[2]	60150	-18.9	21.28		22.37	0.000548	8.39	7169.49	266.12	0.28
	99992.6	FuturePh2[3]	60177	-18.9	21.28		22.38	0.000548	8.39	7171.48	266.15	0.28
	99992.6	FuturePh3[4]	60176	-18.9	21.28		22.38	0.000548	8.39	7171.41	266.15	0.28
	98399.4	Existing[1]	60210	-20.26	20.48		21.51	0.000526	8.15	7391.2	277.51	0.28
	98399.4	PropPh1[2]	60150	-20.26	20.47		21.5	0.000525	8.14	7386.6	277.44	0.28
	98399.4	FuturePh2[3]	60177	-20.26	20.47		21.5	0.000525	8.14	7388.66	277.47	0.28
	98399.4	FuturePh3[4]	60176	-20.26	20.47		21.5	0.000525	8.14	7388.59	277.47	0.28
	97517.4	Existing[1]	60210	-19.35	20.46		21.09	0.000244	6.33	9588.44	319.88	0.2
	97517.4	PropPh1[2]	60150	-19.35	20.45		21.07	0.000244	6.32	9583.12	319.86	0.2
	97517.4	FuturePh2[3]	60177	-19.35	20.45		21.08	0.000244	6.32	9585.5	319.87	0.2
	97517.4	FuturePh3[4]	60176	-19.35	20.45		21.08	0.000244	6.32	9585.42	319.87	0.2

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	96028.6	Existing[1]	60210	-17.81	19.54	1.31	20.5	0.000436	7.91	7809.9	311.2	0.26
	96028.6	PropPh1[2]	60150	-17.81	19.52	1.3	20.49	0.000436	7.91	7804.83	311.15	0.26
	96028.6	FuturePh2[3]	60177	-17.81	19.53	1.31	20.49	0.000436	7.91	7807.11	311.17	0.26
	96028.6	FuturePh3[4]	60176	-17.81	19.53	1.31	20.49	0.000436	7.91	7807.03	311.17	0.26
	95985.1		Bridge									
	95941.6	Existing[1]	60210	-17.87	19.37	1.24	20.35	0.000441	7.94	7776.85	310.87	0.26
	95941.6	PropPh1[2]	60150	-17.87	19.35	1.23	20.33	0.000441	7.94	7771.8	310.82	0.26
	95941.6	FuturePh2[3]	60177	-17.87	19.36	1.24	20.34	0.000441	7.94	7774.06	310.85	0.26
	95941.6	FuturePh3[4]	60176	-17.87	19.36	1.24	20.34	0.000441	7.94	7773.98	310.84	0.26
	95362.9	Existing[1]	60210	-15.97	19.21		20.01	0.000415	7.14	8432.15	344.5	0.25
	95362.9	PropPh1[2]	60150	-15.97	19.2		19.99	0.000415	7.14	8426.51	344.43	0.25
	95362.9	FuturePh2[3]	60177	-15.97	19.2		20	0.000415	7.14	8429.04	344.46	0.25
	95362.9	FuturePh3[4]	60176	-15.97	19.2		20	0.000415	7.14	8428.95	344.46	0.25
	94280.7	Existing[1]	60545	-19.82	17.82		19.33	0.000793	9.86	6314.94	281.56	0.34
	94280.7	PropPh1[2]	60485	-19.82	17.81		19.31	0.000792	9.86	6310.54	281.45	0.34
	94280.7	FuturePh2[3]	60512	-19.82	17.81		19.32	0.000793	9.86	6312.51	281.5	0.34
	94280.7	FuturePh3[4]	60511	-19.82	17.81		19.32	0.000793	9.86	6312.44	281.5	0.34
	93495.6	Existing[1]	60545	-20.43	17.73		18.63	0.000554	7.62	7946.5	363.89	0.29
	93495.6	PropPh1[2]	60485	-20.43	17.71		18.61	0.000554	7.62	7940.63	363.7	0.29
	93495.6	FuturePh2[3]	60512	-20.43	17.72		18.62	0.000554	7.62	7943.26	363.79	0.29
	93495.6	FuturePh3[4]	60511	-20.43	17.72		18.62	0.000554	7.62	7943.17	363.79	0.29
	92795.6	Existing[1]	60674	-20.98	17.24	-1.36	18.22	0.000537	7.95	7632.67	317.73	0.29
	92795.6	PropPh1[2]	60614	-20.98	17.23	-1.37	18.21	0.000537	7.95	7627.62	317.6	0.29
	92795.6	FuturePh2[3]	60641	-20.98	17.23	-1.37	18.22	0.000537	7.95	7629.88	317.66	0.29
	92795.6	FuturePh3[4]	60640	-20.98	17.23	-1.37	18.22	0.000537	7.95	7629.8	317.66	0.29
	92741.1		Bridge									
	92686.6	Existing[1]	60674	-21.08	16.99	-1.46	17.98	0.000548	8	7583.07	316.49	0.29
	92686.6	PropPh1[2]	60614	-21.08	16.97	-1.47	17.96	0.000547	8	7578.06	316.4	0.29
	92686.6	FuturePh2[3]	60641	-21.08	16.98	-1.47	17.97	0.000548	8	7580.31	316.44	0.29
	92686.6	FuturePh3[4]	60640	-21.08	16.98	-1.47	17.97	0.000548	8	7580.23	316.44	0.29
	90936.7	Existing[1]	60674	-18.64	16.15		16.95	0.000517	7.17	8482.63	417.52	0.28
	90936.7	PropPh1[2]	60614	-18.64	16.14		16.94	0.000517	7.17	8475.91	417.44	0.28
	90936.7	FuturePh2[3]	60641	-18.64	16.14		16.94	0.000517	7.17	8478.91	417.48	0.28
	90936.7	FuturePh3[4]	60640	-18.64	16.14		16.94	0.000517	7.17	8478.81	417.48	0.28
	89918.4	Existing[1]	60900	-17.23	15.13		16.3	0.000728	8.69	7697.78	631.8	0.33
	89918.4	PropPh1[2]	60840	-17.23	15.12		16.28	0.000728	8.69	7687.38	630.66	0.33
	89918.4	FuturePh2[3]	60867	-17.23	15.13		16.29	0.000728	8.69	7692.03	631.17	0.33
	89918.4	FuturePh3[4]	60866	-17.23	15.13		16.29	0.000728	8.69	7691.87	631.15	0.33
	88579	Existing[1]	60900	-20.97	14.2		15.3	0.000727	8.42	7230.29	353.11	0.33
	88579	PropPh1[2]	60840	-20.97	14.19		15.29	0.000727	8.42	7224.38	352.93	0.33
	88579	FuturePh2[3]	60867	-20.97	14.19		15.29	0.000727	8.42	7227.02	353.01	0.33
	88579	FuturePh3[4]	60866	-20.97	14.19		15.29	0.000727	8.42	7226.93	353.01	0.33
	87591.9	Existing[1]	60900	-23.72	13.69		14.66	0.000521	7.89	7714.31	311.49	0.28
	87591.9	PropPh1[2]	60840	-23.72	13.68		14.64	0.000521	7.89	7709.13	311.46	0.28
	87591.9	FuturePh2[3]	60867	-23.72	13.68		14.65	0.000521	7.89	7711.44	311.47	0.28
	87591.9	FuturePh3[4]	60866	-23.72	13.68		14.65	0.000521	7.89	7711.37	311.47	0.28
	86660.2	Existing[1]	60900	-23.42	13.36	-6.42	14.19	0.000364	7.29	8414.51	311.38	0.24
	86660.2	PropPh1[2]	60840	-23.42	13.35	-6.43	14.17	0.000364	7.29	8409.35	311.31	0.24
	86660.2	FuturePh2[3]	60867	-23.42	13.35	-6.43	14.18	0.000364	7.29	8411.65	311.34	0.24
	86660.2	FuturePh3[4]	60866	-23.42	13.35	-6.43	14.18	0.000364	7.29	8411.58	311.34	0.24
	86641.7		Bridge									

Profile	River Sta	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1PCT_100yr	86623.2	Existing[1]	60900	-23.61	12.93	-6.62	13.77	0.000374	7.35	8339.64	310.41	0.24
	86623.2	PropPh1[2]	60840	-23.61	12.91	-6.63	13.75	0.000374	7.35	8334.49	310.34	0.24
	86623.2	FuturePh2[3]	60867	-23.61	12.92	-6.62	13.76	0.000374	7.35	8336.81	310.37	0.24
	86623.2	FuturePh3[4]	60866	-23.61	12.92	-6.62	13.76	0.000374	7.35	8336.73	310.37	0.24
	85855.2	Existing[1]	60900	-26.84	11.2		13.03	0.000971	10.87	5602.89	227.13	0.38
	85855.2	PropPh1[2]	60840	-26.84	11.18		13.02	0.000971	10.87	5599.36	226.62	0.38
	85855.2	FuturePh2[3]	60867	-26.84	11.19		13.03	0.000971	10.87	5600.95	226.85	0.38
	85855.2	FuturePh3[4]	60866	-26.84	11.19		13.02	0.000971	10.87	5600.89	226.84	0.38
	85238.7	Existing[1]	60900	-29.43	10.92		12.42	0.000733	9.88	6628.34	352.21	0.33
	85238.7	PropPh1[2]	60840	-29.43	10.9		12.4	0.000733	9.87	6622.81	352	0.33
	85238.7	FuturePh2[3]	60867	-29.43	10.91		12.41	0.000733	9.87	6625.3	352.1	0.33
	85238.7	FuturePh3[4]	60866	-29.43	10.91		12.41	0.000733	9.87	6625.21	352.09	0.33
	84561.7	Existing[1]	60900	-32.27	10.61	-8.81	11.87	0.000546	9.03	7361.45	423.03	0.29
	84561.7	PropPh1[2]	60840	-32.27	10.6	-8.82	11.85	0.000546	9.03	7354.81	422.62	0.29
	84561.7	FuturePh2[3]	60867	-32.27	10.6	-8.81	11.86	0.000546	9.03	7357.81	422.81	0.29
	84561.7	FuturePh3[4]	60866	-32.27	10.6	-8.81	11.86	0.000546	9.03	7357.69	422.8	0.29
	84531.4		Bridge									
	84501.1	Existing[1]	60900	-28.97	9.98	-5.52	11.69	0.000875	10.48	5924.49	305.55	0.36
	84501.1	PropPh1[2]	60840	-28.97	9.97	-5.53	11.67	0.000875	10.48	5919.83	305.22	0.36
	84501.1	FuturePh2[3]	60867	-28.97	9.98	-5.52	11.68	0.000875	10.48	5921.93	305.37	0.36
	84501.1	FuturePh3[4]	60866	-28.97	9.98	-5.52	11.68	0.000875	10.48	5921.85	305.36	0.36
	84252.6	Existing[1]	60900	-26.9	9.93	-5.58	11.35	0.000709	9.55	6555.97	446.68	0.33
	84252.6	PropPh1[2]	60840	-26.9	9.92	-5.59	11.33	0.000709	9.54	6549.11	444.74	0.33
	84252.6	FuturePh2[3]	60867	-26.9	9.93	-5.59	11.34	0.000709	9.54	6552.2	445.61	0.33
	84252.6	FuturePh3[4]	60866	-26.9	9.93	-5.59	11.34	0.000709	9.54	6552.08	445.58	0.33
	84222.3		Bridge									
	84192	Existing[1]	60900	-24.1	9.26	-2.79	11.15	0.001124	11.02	5524.23	242.02	0.41
	84192	PropPh1[2]	60840	-24.1	9.25	-2.8	11.13	0.001124	11.02	5520.56	241.97	0.41
	84192	FuturePh2[3]	60867	-24.1	9.25	-2.8	11.14	0.001124	11.02	5522.21	241.99	0.41
	84192	FuturePh3[4]	60866	-24.1	9.25	-2.8	11.14	0.001124	11.02	5522.15	241.99	0.41
	83635.7	Existing[1]	61411	-21.72	9.13		10.22	0.000822	8.4	7312.48	394.24	0.34
	83635.7	PropPh1[2]	61351	-21.72	9.11		10.21	0.000822	8.4	7306.28	394.1	0.34
	83635.7	FuturePh2[3]	61378	-21.72	9.12		10.21	0.000822	8.4	7309.08	394.17	0.34
	83635.7	FuturePh3[4]	61377	-21.72	9.12		10.21	0.000822	8.4	7308.97	394.16	0.34
	81786.1	Existing[1]	61411	-31.97	7.86		8.87	0.000634	8.05	7626.16	358.33	0.31
	81786.1	PropPh1[2]	61351	-31.97	7.84		8.85	0.000634	8.05	7620.41	358.26	0.31
	81786.1	FuturePh2[3]	61378	-31.97	7.85		8.86	0.000634	8.05	7623	358.29	0.31
	81786.1	FuturePh3[4]	61377	-31.97	7.85		8.86	0.000634	8.05	7622.91	358.29	0.31
	80903.1	Existing[1]	61636	-27.77	7.48	-8.98	8.27	0.00049	7.12	8669.46	408.89	0.27
	80903.1	PropPh1[2]	61576	-27.77	7.46	-8.99	8.25	0.00049	7.12	8662.81	408.81	0.27
	80903.1	FuturePh2[3]	61603	-27.77	7.47	-8.99	8.26	0.00049	7.12	8665.81	408.84	0.27
	80903.1	FuturePh3[4]	61602	-27.77	7.47	-8.99	8.26	0.00049	7.12	8665.7	408.84	0.27
	80883.1		Bridge									
	80863.1	Existing[1]	61636	-28.1	6.93	-9.32	7.73	0.000506	7.2	8580.03	407.83	0.27
	80863.1	PropPh1[2]	61576	-28.1	6.91	-9.33	7.72	0.000506	7.2	8573.43	407.75	0.27
	80863.1	FuturePh2[3]	61603	-28.1	6.92	-9.32	7.72	0.000506	7.2	8576.4	407.79	0.27
	80863.1	FuturePh3[4]	61602	-28.1	6.92	-9.32	7.72	0.000506	7.2	8576.29	407.79	0.27
	80538	Existing[1]	61636	-33.12	7.09	-17.01	7.41	0.00015	4.58	13471.92	521.38	0.16
	80538	PropPh1[2]	61576	-33.12	7.07	-17.02	7.4	0.00015	4.57	13463.45	520.77	0.16
	80538	FuturePh2[3]	61603	-33.12	7.08	-17.02	7.4	0.00015	4.58	13467.26	521.04	0.16
	80538	FuturePh3[4]	61602	-33.12	7.08	-17.02	7.4	0.00015	4.58	13467.12	521.03	0.16

Profile	River Sta	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
	Existing Conditions[1]: Model includes FEMA Effective geometry data with the Existing Conditions HMS model flows.											
	PropPh1[2]: Model includes FEMA Effective geometry data with the Proposed Phase 1 (Pond-Only) HMS model flows.											
	FuturePh2[3]: Model includes FEMA Effective geometry data with the Future Phase 2 (Channel Impvs) HMS model flows.											
	FuturePh3[4]: Model includes FEMA Effective geometry data with the Future Phase 3 (Storm Sew Impvs) HMS model flows.											

DETENTION BASIN STORAGE SUMMARY				
CONTOUR ELEVATION	AREA (SF)	VOLUME (CF)	VOLUME (AC-FT)	DESCRIPTION
65.03	0	0	0.0	Outfall Elevation
65.50	5,457	1,100	0.0	
66.00	28,425	9,571	0.2	
66.50	121,208	46,979	1.1	
67.00	183,706	123,208	2.8	
67.50	187,809	216,086	5.0	
68.00	191,252	310,852	7.1	
68.50	194,718	407,344	9.4	
69.00	198,226	505,580	11.6	
69.50	201,756	605,575	13.9	
70.00	205,313	707,343	16.2	
70.50	208,920	810,901	18.6	
70.63	209,865	838,297	19.2	Prop 10-Year WSEL
71.00	212,556	916,270	21.0	
71.50	216,208	1,023,461	23.5	
72.00	219,908	1,132,490	26.0	
72.50	225,387	1,243,813	28.6	
73.00	233,812	1,358,613	31.2	
73.50	237,767	1,476,507	33.9	
74.00	241,774	1,596,393	36.6	
74.50	245,805	1,718,287	39.4	
75.00	249,881	1,842,209	42.3	
75.36	252,849	1,932,908	44.4	Prop 100-Year WSEL
75.50	254,004	1,968,180	45.2	
76.00	258,172	2,096,224	48.1	
76.50	262,386	2,226,363	51.1	Top of Bank

Step 1: Commitment for future Witte construction

1A: Reconstruction on Witte will add additional impervious area, so detention must be provided.

1B: From the PER plans for Witte Road, the proposed design includes 2.63 Ac of existing impervious area (A_{ie}) and 2.90 Ac of proposed impervious area (A_{ip}).

1C: Per revised City of Houston standards, detention must be provided at a rate of $V = 43560*0.5(A_{ip} - A_{ie}) + 1815*(A_{ie})$

Results		
Exist Area:	2.6	Ac
Prop Area:	2.9	Ac
Volume:	0.2	Ac-ft

Step 2: Commitment for future Gessner construction

2A: To address the excessive ponding issue on Gessner, the roadway profile will be raised, but the WSEL along Gessner will remain largely the same.

2B: Use Infoworks to quantify the existing 100-year inundation depths for Gessner Road between IH-10 and Long Point Road.

2C: Use GIS to sum the existing inundation volume (inundation depth times mesh element area)

2D: Asssume that the roadway profile uniformly increases by 6" while the water surface elevations do not increase/decrease.

2E: Use GIS to total the proposed inundation volume (inundation depth minus 6" times the mesh element area)

2F: Tabulate the results

Results		
Exist Vol:	5.7	Ac-ft
Prop Vol:	3.2	Ac-ft
Difference:	2.4	Ac-ft

2G: Reconstruction on Witte will add additional impervious area, so detention must be provided.

2H: From the PER plans for Witte Road, the proposed design includes 2.63 Ac of existing impervious area (A_{ie}) and 2.90 Ac of proposed

2I: Per revised City of Houston standards, detention must be provided at a rate of $V = 43560*0.5(A_{ip} - A_{ie}) + 1815*(A_{ie})$

Results		
Exist Area:	7.1	Ac
Prop Area:	7.7	Ac
Volume:	0.6	Ac-ft

Step 3: Commitment for future redevelopment at the Prop Basin site

3A: Development south of the pond will add additional impervious area.

3B: Delineate the existing impervious area using aerial imagery within basin site

3C: Delineate the prop impervious area, assuming full development

3D: Subtract the existing impervious area from the proposed to get the additional impervious area.

3E: Assume each acre of extra impervious will require 0.55 acre-feet of detention.

Results		
Exist Area:	4.3	Ac
Prop Area:	6.8	Ac
Volume:	1.4	Ac-ft

Step 4: Summarize

#	Description	Allocation Volume (Ac-ft)
1	Witte Rd	0.2
2	N Gessner Dr	3.0
3	Basin Site	1.4

GEOTECHNICAL INVESTIGATION
MEMORIAL CITY REDEVELOPMENT AUTHORITY
W140 DETENTION POND
HOUSTON, TEXAS

REPORT NO. 1140182101

Reported to:

LOCKWOOD, ANDREWS AND NEWNAM, INC.

Houston, Texas

Submitted by

GEOTEST ENGINEERING, INC.

Houston, Texas

Key Map Nos. 450 X & 490 B

GEOTEST ENGINEERING, INC.
Geotechnical Engineers & Materials Testing
5600 Bintliff Drive Houston, Texas 77036 Telephone: (713) 266-0588
Fax: (713) 266-2977

Report No. 1140182101
August 19, 2011

Mr. Robert J. Fiederlein, P.E.
MCRDA
c/o Lockwood, Andrews and Newnam, Inc.
2925 Briarpark Drive, Suite 400
Houston, Texas 77042

Reference: **Geotechnical Investigation**
Memorial City Redevelopment Authority
W140 Detention Pond
Houston, Texas

Dear Mr. Fiederlein:

Presented herein is the geotechnical investigation final report for the above-referenced project. A draft report was submitted to you on July 29, 2011. This final report will supercede all previously submitted reports, transmittals, e-mails, etc. for the referenced project. This study was authorized by Notice to Proceed Letter for Task Order No. 864/2 Rev.1 dated June 13, 2011 by accepting our proposal No. 1140294999, dated June 9, 2011.

We appreciate this opportunity to be of service to you. If you have any questions regarding the report, or if we can be of further service to you, please call us.

Sincerely,
GEOTEST ENGINEERING, INC.
TBPE Registration No. F-410

Naresh Kolli
Assistant Project Manager

Mohan C. Ballagere, P.E.
Vice President

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Copies Submitted: (2 + 1 pdf)
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EXECUTIVE SUMMARY

A geotechnical investigation was conducted by Geotest Engineering, Inc. for the design and construction of the proposed W140 Detention Pond for Memorial City Redevelopment Authority in Houston, Texas.

The purpose of this investigation was to explore the subsurface conditions and to develop geotechnical recommendations pertaining to the design and construction of the W140 detention pond. This investigation included drilling and sampling six (6) soil borings to depths ranging from 20 to 30 feet, performing appropriate laboratory tests on selected recovered soil samples, performing engineering analyses and preparing a geotechnical report.

The principal findings and conclusions developed from this investigation are summarized below:

- The location of the project site (per Houston Sheet, Texas Geologic Atlas of Texas) lies within the boundary of Beaumont Formation, which is characterized by clays and sands and minor amounts of cemented material. The type of soils is Addicks-Urban land complex and Gessner-Urban land complex. (Based on United Status Department of Agricultural (USDA), Natural Resources Conservation Service (NRCS) database.

- Based on available information, the nearest known faults are Piney Point Fault and Long Point Fault. The Piney Point Fault is located 600 feet south of the project site and Long Point Fault is 800 feet north of the project site.

- The subsurface soils as revealed by boring logs GB-1 through GB-6 consists of predominantly cohesive soils to the termination depths of 20 to 30 feet (El. 56.51 ft. to El. 47.42 ft.), except in borings GB-1, GB-5 and GB-6. In boring GB-1, cohesive with intermittent cohesionless soils were encountered to the explored depth of 30 feet. In borings GB-5 and GB-6, the cohesive soils, encountered to

depths of 12 to 21 feet (El. 65.42 ft. to El. 63.76 ft.) below existing grade, were underlain by cohesionless soils to a termination depth of 30 feet. The cohesive soils consist of stiff to hard dark gray, gray, yellowish brown and reddish brown lean clay with sand (CL), sandy lean clay (CL) and fat clay (CH). The cohesionless soils consist of medium dense to very dense gray, brown and yellowish brown silty sand (SM), fine sand with silt (SP-SM), and sandy silt (ML). In all the borings, except GB-3, fill material consisting of stiff to hard sandy lean clay and lean clay with grass roots was encountered within the upper 2 to 5 feet depth (El. 75.42 ft. to El. 81.76 ft.). In boring GB-4, the 2 feet of fill appeared to be random fill consisting of concrete, asphalt, shell and gravel. The cross section of fill material is shown on Figures 3.1 through 3.6 of this report. No fill materials were encountered in boring GB-3. A summary of the on-site fill materials revealed by the borings is also given below:

Boring No.	Depth (Elevation), Feet	Thickness, Feet	Fill Material
GB-1	0-2 (El. 80-El. 76)	4	Lean clay w/grass roots, sand, calcareous nodules and ferrous stains
GB-2	0-5 (El. 80-El. 75)	5	Sandy lean clay w/roots and calcareous nodules
GB-4	0-2 (El. 77-El. 75)	2	Sandy lean clay w/concrete, asphalt, shell, gravel, sand seams and grass roots (possible random fill)
GB-5	0-3 (El., 85-El. 82)	3	Lean clay w/sand, grass roots and calcareous nodules
GB-6	0-2 (El. 77-El. 75)	2	Lean clay w/sand, grass roots and calcareous nodules

- Groundwater was encountered during drilling at depths ranging between 15.3 feet and 24 feet (El. 64.85 ft. and El. 58.61 ft.) in all the borings except in borings GB-3 and GB-4. In borings GB-3 and GB-4, no groundwater was encountered during drilling. The groundwater level measured 24 hours or more, after drilling was completed, ranges from 16.3 to 24.75 feet (El. 60.61 ft. to El. 54.91 ft.). The

groundwater level measured on July 14, 2011 in piezometers GB-1P and GB-5P is at 20.9 and 24.75 feet (El. 59.25 ft. and El. 60.06 ft.), respectively.

- All excavation operations should be in accordance with OSHA standards.

- Recommended Stable Slope: Based on the results of slope stability analysis and Harris County Flood Control District requirements, the side slope of detention pond should be no steeper than 3(H):1(V) entire North and West Bank and 4(H):1(V) along entire East and South Bank of detention pond.

- Slope Protection and Erosion Control: Due to the presence of the granular/cohesionless soils at and/or near the bottom of the detention pond, it is recommended that at the toe and bottom of the eastern and southern banks of detention pond be covered with low permeability clay liner or Geotextile fabric to prevent erosion. However, additional borings may be required to better determine the horizontal limits of the granular/cohesionless soils. The details of onsite fat clay can be used as clay liner.

- Ground Water Control: For excavations in granular or cohesionless soils, as encountered in soil borings GB-5 and GB-6 between El. 65.4 to El. 47 feet and other areas where water bearing granular or cohesionless soils are encountered during the construction, dewatering may be required to lower and maintain the ground water level at least 5 feet below the level of excavation prior to and during the excavations or other appropriate ground water control method may be used to prevent any sloughing of excavation face and the excavation bottom blow up. The details of groundwater control during excavation are provided in Section 7.0 "Construction Considerations" of this report.

1.0 INTRODUCTION

1.1 Authorization

The Memorial City Redevelopment Authority, the owner, selected Lockwood, Andrews & Newnam, Inc. (LAN) to provide engineering services for the proposed W140 Detention Pond in Houston, Texas. LAN retained the services of Geotest Engineering, Inc. to provide geotechnical support for the design and construction of the detention pond. This study was authorized by Notice to Proceed Letter for Task Order No. 864/2 Rev. 1 dated June 13, 2011 by accepting our Proposal No. 1140294999 dated June 9, 2011.

1.2 Project Description

The project consists of a W140 detention pond (10 to 11 feet deep) approximately 5.4 acres in surface area and storage volume of 43.1 acre-foot proposed for Memorial City Redevelopment Authority at HCAD property number 0430080000507 in Houston, Texas. The total area of the proposed right of way is approximately 8.2 acres. Based on the provided information, the proposed side slopes calculated as from 3(H):1(V) to 4(H):1(V). The bottom elevation of the detention pond will be at 65 feet and the top of the bank elevation will be at 76 feet. The 100-year flood elevation is at 76.40 feet. A project location map is shown on Figure 1.

1.3 Purpose and Scope of Work

The purposes of this investigation were to evaluate subsurface soil and groundwater conditions at the proposed detention pond site and to develop geotechnical engineering recommendations for the design and construction of the proposed detention pond.

The scope of work for this study included the following:

- drilling and sampling six (6) soil borings to depths ranging from 20 to 30 feet and to determine site soil stratigraphy and soil properties, groundwater levels during and after 24-hour of drilling;
- convert two (2) borings into piezometers for long term groundwater measurements;
- performing appropriate laboratory tests on selected representative soil samples to evaluate the engineering properties of soils and to select design soil parameters for slope stability analyses;
- performing engineering analyses to develop geotechnical recommendations for the design and construction of the detention pond; and
- preparing a geotechnical engineering report summarizing our findings and recommendations.

2.0 SITE EXPLORATION

2.1 Physical Description of Area

The subject of this study is located north of Interstate 10 near its intersection with Bunker Hill Road in Houston, Texas. The project site is approximately 5.4 acre tract, with HCAD property No. 0430080000507 in Houston, Texas.

The proposed detention pond site is generally covered by sparsely located trees within the site. Fill was presented within the project site in north central and south western area. Some of the fill appeared to be random fill consisting of concrete, asphalt, shell and gravel.

2.2 Geology

The geology of Harris County is characterized by two formations. The Beaumont Formation and the Lissie Formation. The Beaumont Formation is located in the southeastern portion of the county and the Lissie Formation is located in the northwest portion of the county.

Both the Beaumont and Lissie formations are part of the fluvial and marine coastal complex resulting from the glacial cycles within the Pleistocene (10,000 years to 2 million years ago)/Holocene (2,500 years to 10,000 years ago) epoch. Seaward the lithologies are primarily dominated by clays, often interspersed with coarser sediments, primarily silts and sands. The clays of the Beaumont formation are overconsolidated and slickensided as a result of exposure to weathering during glacial retrenchment and cyclic wetting and drying. Northern portions of Harris County are under the influence of the drainage systems established by rivers such as the Brazos and the San Jacinto. The lithologic pattern generally includes silt, sand and clay with minor amounts of calcareous nodules and iron oxide. Various mineral impregnations are associated with the lithologies. Primary among these are the ferruginous-iron-based and calcareous minerals, which include calcium carbonate. These minerals impart an acidic or alkaline characteristic to soils.

Based on the Houston sheet, Geologic Atlas of Texas (Bureau of Economic Geology, the University of Texas at Austin, Austin, Texas, 1982), the project site (project area) is located in the Beaumont Formation. The clays and sands of this formation are overconsolidated as a result of desiccation or frequent raising and lowering of the sea level and subsequently the groundwater table. Consequently, clays of this formation have moderate to high shear strength and relatively low compressibility. Sands of the Beaumont Formation are typically very fine and often silty. Further, there is occasional evidence in the Houston area of the occurrence of cemented material (sandstone and siltstone) deposits within the Beaumont Formation. The types of soils are Addicks-Urban Land Complex and Gessner-Urban Land Complex (based on USDA NRCS database).

2.3 Faults

A review of information in the Geotest Library relating to known surface and subsurface geologic faults in the general area of the project sites (project area) were undertaken. The available information consisted of U. S. Geological Survey and NASA maps, open file reports and information contained in our files relating to geologic faults in this area.

Based on available information, the nearest known faults are Piney Point Fault and Long Point Fault. The Piney Point Fault is located approximately 600 feet south of the project site and Long Point Fault is approximately 800 feet north of the project site. However, the approximate fault location with respect to the project site was interpreted based on the desktop information and a Phase I fault study was not within the scope of this study. To further determine the impact of these faults on the proposed detention pond, a Phase I fault study may be required.

3.0 FIELD EXPLORATION

3.1 General

The subsurface conditions were explored by drilling a total of six (6) soil borings, designated as GB-1 through GB-6. The borings were marked in the field by LAN. The borings GB-1, GB-2, GB-5 and GB-6 were drilled to a depth of 30 feet and borings GB-3 and GB-4 were drilled to a depth of 20 feet. All borings were drilled using a marsh buggy mounted drill rig. The approximate boring locations are shown on Figure 2, Plan of Borings. The survey information of the completed borings was provided to us by LAN.

3.2 Drilling and Sampling Methods

Samples were obtained continuously to a depth of 20-foot depth and 5 foot intervals thereafter. In general, samples of cohesive soils were obtained with a 3-inch diameter thin-walled tube sampler in general accordance with ASTM D 1587. Cohesionless soils were obtained using the Standard Penetration Test (SPT) with a 2-inch split-spoon barrel in general accordance with ASTM D 1586. Each soil sample was removed from the sampler in the field, carefully examined and then logged by an experienced soils technician. Portions of each sample were sealed and packaged for transportation to Geotest's laboratory for further testing. The shear strength of cohesive soil samples was estimated by use of a calibrated pocket penetrometer in the field. Driving resistances for the split-barrel samples were, recorded as "Blows per Foot," on the boring logs. Water level measurements were made in the open boreholes at the time of drilling.

Detailed descriptions of the soils encountered in the borings drilled for this project are presented on the boring logs (GINT format) on Figures A-1 through A-6 in Appendix A. The depth at which ground water was encountered during drilling and 24-hours water level is also noted on the boring logs. The terms used on borings logs and classification of soils for engineering purposes are presented following the logs of borings on Figures A-7 and A-8, respectively, in Appendix A.

3.3 Piezometer Installation

During the field investigation, two (2) piezometers were installed for this study. The locations of the piezometers, designated as GB-1P, and GB-5P are shown on Plan of Borings, Figure 2. Piezometer installation details showing the construction of piezometer, including the water level readings at different dates, are provided on Figures A-9 and A-10 in Appendix A.

3.4 Ground Water Observation

Borings GB-1, GB-2, GB-5 and GB-6 were dry augered to free water depth or to where the borehole could not be maintained open then continued with the wet rotary method to boring termination depths. Borings GB-3 and GB-4 were dry augered to boring termination depth. Water level measurements were made in all open boreholes at the time of drilling, 24 hours and 30 day (Piezometers) after the completion of drilling. The groundwater level measured 24 hours or more, after drilling was completed, ranges from 16.3 to 24.75 feet. The groundwater level measured on July 14, 2011 in piezometers GB-1P and GB-5P is at 20.9 and 24.75 feet, respectively.

3.5 Borehole Completion

After taking final measurements of the depths to ground water at the boring locations, all boreholes were backfilled with cement bentonite grout. After taking the 30 day water level readings, the piezometers were abandoned in place.

4.0 LABORATORY TESTING PROGRAM

The laboratory-testing program was designed to evaluate the pertinent physical properties and shear strength and compressibility characteristics of the subsurface soils. Laboratory tests were performed in general accordance with the appropriate ASTM standards. The results of the index and physical property tests are presented on the boring logs given on Figures A-1 through A-6 in Appendix A.

4.1 Classification Tests

The index and physical properties tests aid in classifying the soils and are used to correlate the results of other tests performed on samples taken from different borings and/or different depths. The following index and physical property tests were performed on select soil samples obtained from the sampled soil borings:

- particle-size analysis
- water content
- liquid and plastic limits

Particle-Size Analysis of Soils (ASTM D422). The quantitative evaluation of the distribution of particle sizes in the sampled soils was measured via sieve analyses on selected samples. The distribution of particle sizes larger than 75 μm (retained on the No. 200 sieve) is measured by sieving. Grain size distribution curves are shown on Figure B-1 in Appendix B. Results from the sieve analyses are summarized on boring logs. Percent passing the No. 200 sieve were also performed to measure the gradation characteristics of granular soils and to aid in classification of both cohesive and cohesionless soils.

Water Content Tests (ASTM D2216). The measured water content values are included on the individual boring logs in Appendix A on Figures A-1 through A-6.

Atterberg Limits (ASTM D4318). This group of tests aids in the classification of fine-grained soils. Plastic limit (PL) and Liquid limit (LL) tests were conducted on selected soil specimens obtained from the borings at the project site. The results of these classification tests are presented on the borings logs on Figures A-1 through A-6.

4.2 Strength Tests

The undrained shear strength of select undisturbed samples of cohesive soils was measured by performing unconfined compression tests (**ASTM D2166**) and unconsolidated undrained triaxial (UU) compression tests (**ASTM D2850**). Natural moisture contents and dry unit weight were measured as routine portions of each compression test and UU triaxial compression tests. The results of unconfined compression tests and UU triaxial tests are plotted on the boring logs as solid triangles. The shear strengths of cohesive samples were initially measured in the field and later in the laboratory, with a calibrated pocket penetrometer. Torvane was used in the laboratory to also measure the shear strengths of cohesive samples. The shear strength values obtained from the penetrometer and torvane are plotted on the boring logs as solid squares and diamonds, respectively.

Multi-stage consolidated undrained (CU) triaxial compression tests (**ASTM D4767**) were conducted on two soil samples. Three stages of consolidation (with pore pressure measurements) were carried out on the samples following saturation of the samples and consolidation to approximately 100%, 200% and 300% of estimated in situ overburden pressures. The results are presented on Figures B-2 and B-3 in Appendix B.

4.3 Other Tests

Two Pinhole tests (**ASTM D4647**) and two Crumb tests (**ASTM D6572**) were performed to measure the potential for dispersion of soils in distilled water. Both Pinhole and Crumb dispersion test results provide a qualitative evaluation of the potential for soil dispersion in the presence of distilled water. The results are presented below and also given on Figure B-4 in Appendix B. The results of the Pinhole and Crumb tests were also provided on the boring logs presented on Figure A-1 through A-6 in Appendix A.

	PINHOLE TESTS (ASTM D4647)		CRUMB TESTS (ASTM D6572)	
Boring No.	GB-1	GB-6	GB-2	GB-5
Sample No.	S-6	S-4	S-5	S-5
Depth (ft)	10-12	6-8	8-10	6-8
Visual Classification	Lean Clay (CL) w/sand	Lean Clay (CL) w/sand	Lean Clay (CL) w/sand	Fat Clay (CH)
	Stiff to very stiff	Stiff to very stiff	Very stiff to hard	Very stiff to hard
Classification	ND 1 - Nondispersive	ND 1 - Nondispersive	ND 1 - Nondispersive	ND 1 – Nondispersive

5.0 SUBSURFACE SOIL STRATIGRAPHY AND GROUND WATER

5.1 Soil Stratigraphy

Based on the subsurface soils encountered in the discrete boreholes drilled, five (5) boring log profiles were developed and are presented on Figures 3.1 through 3.6. To the left of each boring shown on the profile is an indication of the consistency or density of each stratum. More than one consistency for an individual stratum indicates that the consistency is different at different depths within the stratum. For cohesive soils, consistency is related to the undrained shear strength of the soil. For granular and cohesionless soils, the consistency is related to the relative density of soil. To the right of each boring shown on the profile is the overall classification of the soil contained within each stratum. The soil classification is based on ASTM Standard D2487.

As revealed on the boring logs and as indicated on the boring log profiles, the subsurface soils at the proposed detention pond are summarized below:

The subsurface soils as revealed by boring logs GB-1 through GB-6 consists of predominantly cohesive soils to the termination depths of 20 to 30 feet (El. 56.51 ft. to El. 47.42 ft.), except in borings GB-1, GB-5 and GB-6. In boring GB-1, cohesive with intermittent cohesionless soils were encountered to the explored depth of 30 feet. In borings GB-5 and GB-6, the cohesive soils, encountered to depths of 12 to 21 feet (El. 65.42 ft. to El. 63.76 ft.) below existing grade, were underlain by cohesionless soils to a termination depth of 30 feet. The cohesive soils consist of stiff to hard dark gray, gray, yellowish brown and reddish brown lean clay with sand (CL), sandy lean clay (CL) and fat clay (CH). The cohesionless soils consist of medium dense to very dense gray, brown and yellowish brown silty sand (SM), fine sand with silt (SP-SM), and sandy silt (ML). In all the borings, except GB-3, fill material consisting of stiff to hard sandy lean clay and lean clay with grass roots was encountered within the upper 2 to 5 feet depth (El. 75.42 ft. to El. 81.76 ft.). In boring GB-4, the 2 feet of fill appeared to be random fill consisting of concrete, asphalt, shell and gravel. The cross section of fill material is

shown on Figures 3.1 through 3.6 of this report. No fill materials were encountered in boring GB-3. A summary of the on-site fill materials revealed by the borings is also given below:

Boring No.	Depth (Elevation), Feet	Thickness, Feet	Fill Material
GB-1	0-2 (El. 80-El. 76)	4	Lean clay w/grass roots, sand, calcareous nodules and ferrous stains
GB-2	0-5 (El. 80-El. 75)	5	Sandy lean clay w/roots and calcareous nodules
GB-4	0-2 (El. 77-El. 75)	2	Sandy lean clay w/concrete, asphalt, shell, gravel, sand seams and grass roots (possible random fill)
GB-5	0-3 (El., 85-El. 82)	3	Lean clay w/sand, grass roots and calcareous nodules
GB-6	0-2 (El. 77-El. 75)	2	Lean clay w/sand, grass roots and calcareous nodules

The sandy lean clay (CL) and lean clay with sand (CL) are of low to high plasticity with liquid limits ranging from 23 to 45 and plasticity indices ranging from 9 to 25. The fines content (percent passing no. 200 sieve) of the sandy lean clay and lean clay with sand ranged from 61 to 81 percent.

The fat clay (CH) and fat clay with sand (CH) is of high plasticity with liquid limits ranging from 52 to 61, and plasticity indices ranging from 31 to 37. The fines content of the fat clay and fat clay with sand ranged from 82 to 98 percent.

The fines content of silty sand (SM) and fine sand with silt (SP-SM) ranged from 8 to 17 percent and the fines content of silt is about 72 percent.

The results of pinhole tests indicate that the shallow cohesive soils are non-dispersive. Pinhole test results are given on Figure B-4 in Appendix B.

5.2 Ground Water

Groundwater was encountered during drilling at depths ranging between 15.3 feet and 24 feet in all the borings except in borings GB-3 and GB-4. In borings GB-3 and GB-4, no groundwater was encountered during drilling. The groundwater level measured 24 hours or more, after drilling was completed, ranges from 16.3 to 24.75 feet. The groundwater level measured on July 14, 2011 in piezometers GB-1P and GB-5P is at 20.9 and 24.75 feet, respectively. However, it should be noted that various environmental and man-made factors, such as amount of precipitation and nearby subsurface construction activities, and changes in adjacent creek level can substantially influence the groundwater level.

6.0 ENGINEERING ALAYSES AND RECOMMENDATIONS

The project consists of a W140 detention pond (10 to 11 feet deep) approximately 5.4 acres in surface area and storage volume of 43.1 acre-foot proposed for Memorial City Redevelopment Authority at HCAD property number 0430080000507 in Houston, Texas. The total area of the proposed right of way is approximately 8.2 acres. Based on the provided information, the proposed side slopes calculated as 3(H):1(V) to 4(H):1(V). The bottom elevation of the detention pond will be at 65 feet and the top of the bank elevation will be at 76 feet. The 100-year flood elevation is at 76.40 feet.

6.1 Slope Stability Analyses

Slope stability analyses were performed for the proposed detention pond. The analyses were performed using a computer program "GSTABLE7" (Reference 1) and the Modified Bishop Method of Analyses. Analyses conditions consisted of End of Construction, Rapid Drawdown and Long Term cases. The required factors of safety per HCFCD criteria for end of construction, rapid drawdown and long term condition are 1.3, 1.25 and 1.5, respectively.

6.1.1 Method of Analyses - Experience indicates that the failure of a slope occurs by slippage along a surface of nearly circular cross section. Sufficiently accurate estimates of the stability of such slopes can be made if the surface of sliding is assumed to be circular. Several methods of slope stability analysis are available. The most commonly used method is known as the Bishop Method. For this study, the slope stability analyses were conducted using a computer program. The calculation of the factor of safety against instability was performed using the Modified Bishop Method. Slope stability analyses were performed on critical sections of the proposed detention pond by the computer program "GSTABLE7" with the built-in critical section search algorithm.

6.1.2 Soil Parameters and Water Level - To evaluate the potential stability of a slope, or to assess the effectiveness of a slope, requires the physical properties of the geological material involved to be measured. Shear strength characteristics of corresponding type of soil are

discussed below for each case. Slope stability analyses were performed for the End of Construction, Rapid Drawdown and Long Term design cases for the proposed detention pond with a 3(H):1(V) (critical slope) grass lined slope and 4(H):1(V) grassed lined slope, where 3(H):1(V) slope is not feasible.

- End of Construction: When a slope is excavated, altered stress conditions created pore pressure changes within the slope. In cohesive soils, undrained strength of the bank soil is mobilized since no sufficient time to allow the excess pore pressure to dissipate (drain) immediately or within a short period of time after the completion of the slope excavation. Thus, the end of construction case models the initial undrained condition of the (cohesive) soil. In granular/cohesionless soils, drained strength parameters will be utilized for the analyses for the end of construction case because of the higher permeability nature of the granular or cohesionless soils. For this analysis, 100-year flood level (El. 76.4 feet) was considered to be at or near the top of the pond and water level within the pond was assumed at the bottom of pond elevation of 65 feet. For cohesive soils, laboratory shear strength unconsolidated undrained parameters were used for the analyses. For granular/cohesionless soils (as encountered in borings GB-5 and GB-6), the angle of internal friction was used for the analyses. The angle of internal friction of granular, cohesionless soils was estimated based on field SPT data.

- Rapid Drawdown: The rapid drawdown case models the condition where high floodwater saturates and piezometerically "loads" the slope and then quickly recedes leaving a large unbalanced piezometric head in the bank slope. This unbalanced force increases the shear stresses in the soils behind the slope. For this analysis, 100-year flood level (El. 76.4 feet) within the pond was considered to be at or near the top of the pond. The water level within the pond was assumed to instantaneously drop from the 100-year flood level (El. 76.4 feet) to the bottom of pond (El. 65 feet). For granular/cohesionless soils, angle of internal friction was used for the analyses. For cohesive soils, laboratory consolidated undrained soil parameters were used in this analysis. For earthen slopes, a most critical rapid drawdown case occurs when

shrinkage cracks develop all through the slope soils due to the drying of the soil, the shrinkage cracks are filled with water as the water level rises in the basin and the slopes become "saturated" and then the water level in the basin drops rapidly. This case is most common in medium to high plasticity clay as encountered at all depths in borings GB-1 through GB-4, and above 21 feet in boring GB-5 and above 12 feet in boring GB-6. As shrinkage cracks develop in the medium to high plasticity clay after long periods of exposure to environmental conditions (wetting-drying, swelling-shrinking, etc.), the medium to high plasticity clay shear strength degrades to weathered effective stress shear strength. Experience with shallow slope failure associated with matric suction loss and strength degradation suggests that realistic crack depths will vary between 3 and 8 feet with an average of about 6 feet (Reference 2). Thus, based on the depth of assumed seasonal moisture variation zone, a crack depth of 7 feet was used for developing the weathered soil parameters. In order to incorporate the effects of weathering on the high plasticity clay shear strength, we used a weathered effective stress angle of internal friction (ϕ'_w) and a weathered effective stress cohesion (C'_w) for the rapid drawdown condition analyses. The ϕ'_w was assumed to be the residual secant friction angle of the soil (Reference 3) and the C'_w was assumed to be the mobilized cohesion intercept of the soil (Reference 4). Effective stress cohesion (C') and effective stress angle of internal friction (ϕ') were used below 7-foot from the top of basin.

- Long Term: The long term design case represented steady state piezometric and stress conditions. When a slope is excavated, altered stress conditions create pore pressure changes within the slope and the undrained strength of the bank soils is mobilized. With time, the soil pore pressures adjust to the imposed stress and piezometric conditions and the bank soils rely on their available strength for long term stability. In this analysis, the static water level within the embankment soils was assumed to be the groundwater level measured in the borings 24 hours after the completion of drilling that will be elevation ranging from 58.5 to 65.02 feet for different cases of boring locations. Weathered effective stress sheer strength parameters consisting of a weathered effective stress angle of internal friction (ϕ'_w)

and weathered effective stress cohesion (c'_w) were used to analyze the long term conditions in order to account for the degradation of the slope soil strength due to weathering. Effective stress cohesion (c') and effective stress angle of internal friction (ϕ') were also used below 7-foot from the top of the basin.

6.1.3 Loading Conditions - A surcharge load (construction or maintenance equipment) of 250 psf (per HCFCD geotechnical guidelines) was assumed at the top of the bank and was considered for the short term (end of construction), rapid drawdown and long term conditions. This loading is based on Harris County Flood Control District Geotechnical Guidelines.

Based on the borings drilled, soil parameters were used in the analyses and are presented below.

TABLE 1: SUMMARY OF SOIL PARAMETERS USED FOR SLOPE STABILITY ANALYSES FOR DETENTION POND
Case 1 - (Based on Boring GB-1)

Elevation (ft)	Layer (depth, ft)	Material Description	Wet Density (pcf)	Shear Strength								
				End of Construction		Rapid Drawdown				Long Term			
				Cohesion (psf) = c_{uu}	Friction Angle (deg) = ϕ_{uu}	Effective		Weathered Effective		Effective		Weathered Effective	
						c'	ϕ'	c'_w	ϕ'_w	c'	ϕ'	c'_w	ϕ'_w
76.2-65.2	1 (0 – 11)	Lean Clay w/sand	130	1,500	--	270	25	255	20	270	25	270	20
65.2-62.2	2 (11 – 14)	Fat Clay (CH)	120	1,600	--	230	23	175	19	230	23	175	19
62.2-60.2	3 (14 – 16)	Silt (ML)	100	--	30	--	30	--	--	--	30	--	--
60.2-58.2	4 (16 – 18)	Fat Clay (CH)	120	1,000	--	230	23	175	19	230	23	175	19
58.2-50.2	5 (18-26)	Lean Clay w/sand (CL)	130	1,500	--	270	25	255	20	270	25	255	20

Where c_{uu}: Unconsolidated-Undrained Cohesion
ϕ_{uu}: Unconsolidated-Undrained Friction Angle
c': Effective Stress Cohesion
ϕ': Effective Stress Friction Angle
c'_w: Weathered Effective Stress Cohesion
ϕ'_w: Weathered Effective Stress Friction Angle

Note: For rapid drawdown and long term conditions , weathered effective stress parameters were used within 7' zone below top of bank, slope surface, and bottom of basin wherever is applicable within each layer.

TABLE 2: SUMMARY OF SOIL PARAMETERS USED FOR SLOPE STABILITY ANALYSES FOR DETENTION POND
Case 2 - (Based on Borings GB-2 thru GB-4)

Elevation (ft)	Layer (depth, ft)	Material Description	Wet Density (pcf)	Shear Strength								
				End of Construction		Rapid Drawdown				Long Term			
				Cohesion (psf) = c_{uu}	Friction Angle (deg) = ϕ_{uu}	Effective		Weathered Effective		Effective		Weathered Effective	
						c'	ϕ'	c'_w	ϕ'_w	c'	ϕ'	c'_w	ϕ'_w
75-62	1 (0 – 13)	Lean Clay w/Sand (CL)	130	1,500	--	270	25	255	20	270	25	255	20
62-57	2 (13 – 18)	Fat Clay (CH)	123	2,000	--	230	23	175	19	230	23	175	19
57-50	3 (18 – 25)	Sandy Lean Clay (CL)	130	1,500	--	270	25	255	20	270	25	255	25

Where c_{uu}: Unconsolidated-Undrained Cohesion
ϕ_{uu}: Unconsolidated-Undrained Friction Angle
c': Effective Stress Cohesion
ϕ': Effective Stress Friction Angle
c'_w: Weathered Effective Stress Cohesion
ϕ'_w: Weathered Effective Stress Friction Angle

Note: For rapid drawdown and long term conditions , weathered effective stress parameters were used within 7' zone below top of bank, slope surface, and bottom of basin wherever is applicable within each layer.

TABLE 3: SUMMARY OF SOIL PARAMETERS USED FOR SLOPE STABILITY ANALYSES FOR DETENTION POND
Case 3 - (Based on Borings GB-5 and GB-6)

Elevation (ft)	Layer (depth, ft)	Material Description	Wet Density (pcf)	Shear Strength								
				End of Construction		Rapid Drawdown				Long Term			
				Cohesion (psf) = c_{uu}	Friction Angle (deg) = ϕ_{uu}	Effective		Weathered Effective		Effective		Weathered Effective	
						c'	ϕ'	c'_w	ϕ'_w	c'	ϕ'	c'_w	ϕ'_w
75.4-65.4	1 (0 – 10)	Lean Clay w/sand to Sandy Lean Clay (CL)	130	1,500	--	270	25	255	20	270	25	255	20
65.4-59.4	2 (10 – 16)	Fine Sand w/silt (SP-SM) to Silty Sand (SM)	99	--	--	--	30	--	--	--	30	--	--
59.4-47.4	3 (16 – 28)	Silty Sand (SM) to Fine Sand w/silt (SP-SM)	106	--	30	--	30	--	--	--	30	--	--

Where c_{uu}: Unconsolidated-Undrained Cohesion
ϕ_{uu}: Unconsolidated-Undrained Friction Angle
c': Effective Stress Cohesion
ϕ': Effective Stress Friction Angle
c'_w: Weathered Effective Stress Cohesion
ϕ'_w: Weathered Effective Stress Friction Angle

Note: For rapid drawdown and long term conditions , weathered effective stress parameters were used within 7' zone below top of bank, slope surface, and bottom of basin wherever is applicable within each layer

6.1.4 Factors of Safety - Based on the soil parameters and water level conditions discussed previously, slope stability analyses were performed for 3(H):1(V) earthen bank slope. The results of these analyses are presented on Figures 4.1 through 4.9. The computed factors of safety for these soil conditions are also summarized below.

Case No.	Boring No.	Slope	Factor of Safety			Figure No.
			EOC	RD	LT	
1	GB-1	3(H):1(V)	4.40	1.61	2.18	4.1, 4.2, 4.3
2	GB-2 thru GB-4	3(H):1(V)	5.45	1.99	2.76	4.4, 4.5, 4.6
3	GB-5 and GB-6	3(H):1(V)	2.20	1.23	2.21	4.7, 4.8, 4.9

A minimum factor of safety of 1.3, 1.25 and 1.5 is considered adequate for end of construction, rapid drawdown and long term conditions, respectively per HCFCD criteria. **As can be seen from the above results, the factors of safety will not meet the HCFCD minimum required factors of safety for RD condition for Case 3.** Hence, a 4(H):1(V) slope was analyzed for the Case 3 and the results are presented on Figures 4.10 through 4.12. The computed factor of safety for this case is also summarized below:

Case No.	Boring No.	Slope	Factor of Safety			Figure No.
			EOC	RD	LT	
3a	GB-5 and GB-6	4(H):1(V)	2.32	1.45	2.61	4.10, 4.11, 4.12

6.1.5 Conclusions and Recommendations - A minimum factor of safety of 1.3 is considered acceptable for end of construction, minimum factor of safety of 1.25 is considered acceptable for rapid drawdown conditions, while a minimum factor of safety of 1.5 is considered acceptable for long term condition. **Based on the above analyses, additional soil borings will be required to better determine the horizontal limits of the granular/cohesionless soils between borings GB-2 and GB-6, GB-4 and GB-5 as well as in the vicinity of the center of the pond. However, for a conservative approach, we recommend the side slope be no**

steeper than 3(H):1(V) along western and northern banks and 4(H):1(V) along entire eastern and southern banks of the detention pond.

6.2 Borrow Material Analysis

Based on the HCFCD "Standard Specification Book-2005" Section 02314 "Fill Material", Part 2 Subsection 2.2 "Fill Material Excavation from On-Site", on-site excavated soils that are used as fill material should consist of lean clay with sand and sandy lean clay including onsite fill soils after removal of roots and shell fragments.

Based on the HCFCD specification criteria, the onsite soils that can be used as fill material are:

Boring No.	(Elevation) Range of Depth, feet	Soil Type
GB-1	0-4 (El. 80 – El. 76) 4-15 (El. 76 – El. 65)	Lean Clay Lean Clay with Sand
GB-2	0-5 (El. 80 – El. 75) 5-18 (El. 75 – El. 62)	Sandy Lean Clay Lean Clay with Sand
GB-3	0-10 (El. 75 – El. 65)	Lean Clay with Sand
GB-4	2-12 (El. 75 – El. 65)	Sandy Lean Clay
GB-5	0-3 (El. 85 – El. 82) 8-20 (El. 82 – El. 65)	Lean Clay with Sand Sandy Lean Clay
GB-6	0-2 (El. 77 – El. 75) 2-12 (El. 75 – El. 65)	Lean Clay Lean Clay with Sand

6.3 Excavation Dewatering

Groundwater was encountered at depths ranging from 16.3 feet to 24.75 feet in about 24 hours or more after drilling completion. The excavations along the proposed profile of the

detention pond may encounter groundwater seepage depending upon ground water conditions at the time of construction and the location and depth of excavation.

For cohesive soils as predominantly encountered for the excavation depths of 10 to 11 feet, groundwater may be managed by collection in trench bottom sumps for pumped disposal. For excavations in granular or cohesionless soils, as encountered in soil borings GB-5 and GB-6 between El. 65.4 to El. 47 feet and other areas where water bearing granular or cohesionless soils are encountered during the construction, dewatering will be required to lower and maintain the ground water level at least 5 feet below the level of excavation prior to and during the excavations or other appropriate ground water control method may be used to prevent any sloughing of excavation face and the excavation bottom blow up. It is the responsibility of the contractor to verify the groundwater level at the time of construction and should provide an adequate dewatering system, where required.

Adequate drainage shall be maintained at all times during construction and any drainage ditch or structure disturbed during construction shall be restored to the satisfaction of the HCFCD requirements.

6.4 Slope Protection and Erosion Control

In views of granular/cohesionless soils encountered in borings GB-5 and GB-6 at and/or near the bottom of the detention pond, it is recommended that at toe and bottom of the entire eastern and southern banks of detention pond be covered with low permeability clay liner or Geotextile fabric to prevent erosion. However, additional borings may be required to better determine the horizontal limits of the granular/cohesionless soils. The on-site fat clay can be used as clay liner. Attention should be given for the erosion protection of the detention ponds to prevent over-bank runoff. Excessive erosion can cause substantial ground loss and progressive movement of soil that may cause slope failure. A properly installed and maintained grass cover can serve as a protection for the detention slope by reducing soil erosion. Furthermore, routine maintenance of the slope surface including removal of undesirable vegetation growth on or

around the cover, repair minor cracks or spalling, regrade and repair eroded areas should also be performed on a regular basis to enhance the integrity of the slope protective system.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Borrow Material

The soils that are to be excavated from the detention pond site consist of lean clay with sand (CL) and sandy lean clay (CL). The lean clay with sand (CL) and sandy lean clay (CL) can be utilized as fill, provided these soils should meet HCFCD requirements as provided in HCFCD "Standard Specifications book Section 02314 entitled "Fill Material" and after all foreign materials (i.e. roots, organic material, shell fragments) are removed.

Based on the HCFCD specification criteria, the onsite soils that can be used as fill material are:

Boring No.	(Elevation) Range of Depth, feet	Soil Type
GB-1	0-4 (El. 80 – El. 76) 4-15 (El. 76 – El. 65)	Lean Clay Lean Clay with Sand
GB-2	0-5 (El. 80 – El. 75) 5-18 (El. 75 – El. 62)	Sandy Lean Clay Lean Clay with Sand
GB-3	0-10 (El. 75 – El. 65)	Lean Clay with Sand
GB-4	2-12 (El. 75 – El. 65)	Sandy Lean Clay
GB-5	0-3 (El. 85 – El. 82) 8-20 (El. 82 – El. 65)	Lean Clay with Sand Sandy Lean Clay
GB-6	0-2 (El. 77 – El. 75) 2-12 (El. 75 – El. 65)	Lean Clay Lean Clay with Sand

7.2 Ground Water Control

It should be noted that control of groundwater will be the contractor's responsibility. The comments and suggestions provided in this report regarding groundwater control are for information purposes only and as a general guidance for the control of groundwater.

It is our opinion that for excavations in cohesive soils, ground water may be collected in excavation bottom sumps for pumped disposal. For excavations in granular or cohesionless soils, as encountered in soil borings GB-5 and GB-6 between El. 65.4 to El. 47 feet and other areas where water bearing granular or cohesionless soils are encountered during the construction, dewatering may be required to lower and maintain the ground water level at least 5 feet below the level of excavation prior to and during the excavations or other appropriate ground water control method may be used to prevent any sloughing of excavation face and the excavation bottom blow up. In general, for excavations shallower than 15 feet, dewatering, if used, is performed by the installation and operation of vacuum well points.

The contractor should verify the ground water level at the site at the time of construction and should provide an adequate ground water control method or dewatering system, where required.

8.0 REFERENCES

1. Garry H. Gregory and Harold W. Van Aller (1999) GSTABL 7 with Stedwin Slope Stability Analysis System Software.

2. Charles Aubeny and Robert Lytton (February 2003) "Estimating Strength Versus Location and Time in High-Plasticity Clays," Report No. FHWA/TX-03/2100-P1, Texas Transportation Institute, The Texas A & M University System, College Station, Texas.

3. A. A. Saleh and Stephen G. Wright (October 1997) "Shear Strength Correlations and Remedial Measure Guidelines for Long-Term Stability of Slopes Constructed of Highly Plastic Clay Soils," Research Report 1435-2F, Center for Transportation Research, Bureau of Engineering Research, The University of Texas at Austin, Figure 3.2.

4. G. Mesri and M. E. M. Abdel-Ghaffar (August 1993) "Cohesion Intercept in Effective Stress-Stability Analysis," Journal of Geotechnical Engineering, Volume 119, No.8, Figure 13.

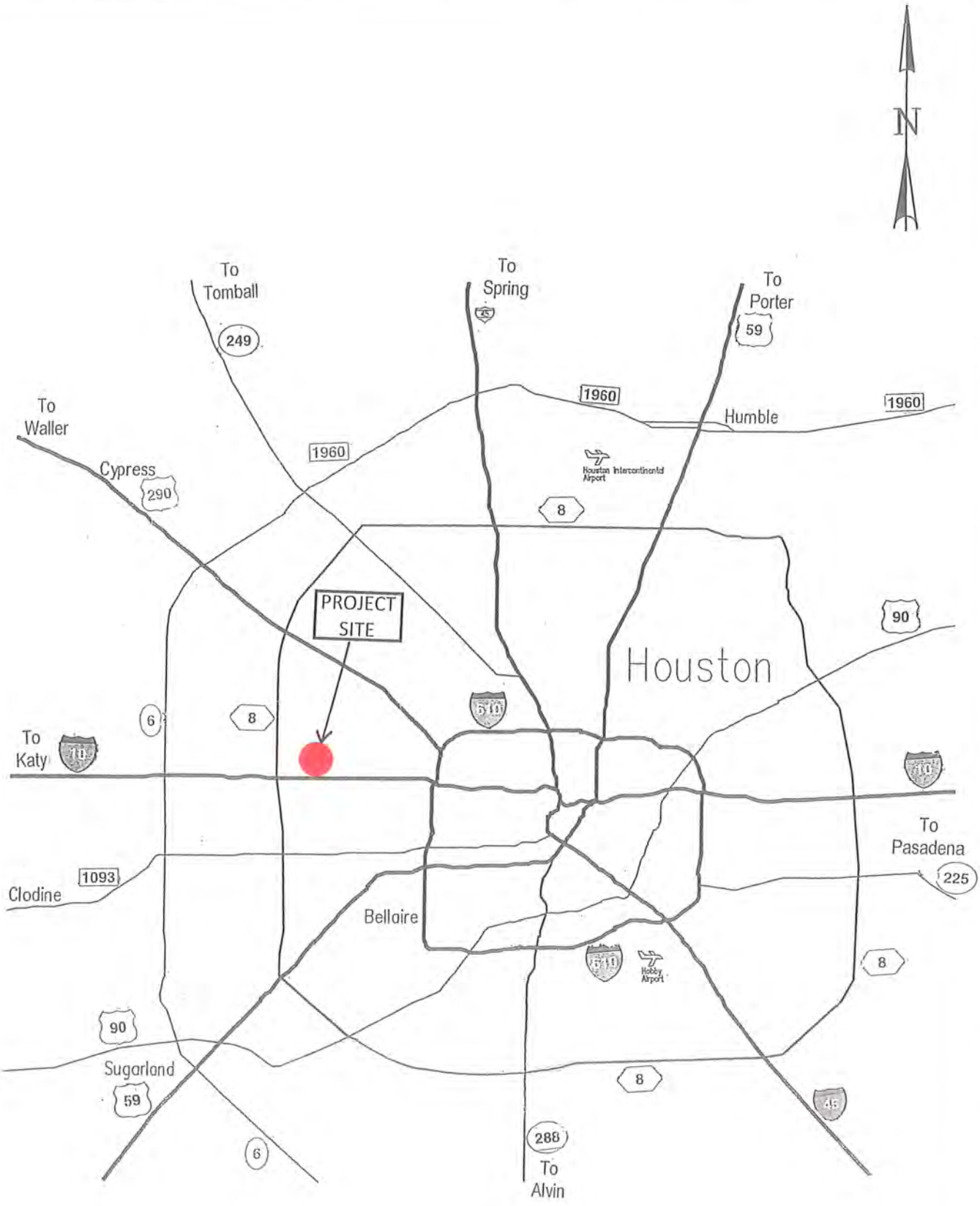
9.0 PROVISIONS

The description of subsurface conditions and the design information contained in this report are based on the soil borings made at the time of drilling at specific locations. Some variation in soil conditions may occur between soil borings. Should subsurface conditions be encountered which differ from those described on our boring logs, Geotest should immediately be notified so that further investigation and supplemental recommendations can be provided. The depth of the ground water level may vary with changes in environmental conditions such as frequency and magnitude of rainfall. The stratification lines on the boring logs represent approximate boundaries between soil types. The transition between soil types, however, may be more gradual than depicted.

This report has been prepared for the exclusive use of Lockwood, Andrews and Newnam, Inc. for design and construction of Memorial City Redevelopment Authority W140 Detention Pond in Houston, Texas.

ILLUSTRATIONS

Job No. 1140182101



PROJECT LOCATION MAP

(NOT TO SCALE)

Key Map No. 450 X and 490 B

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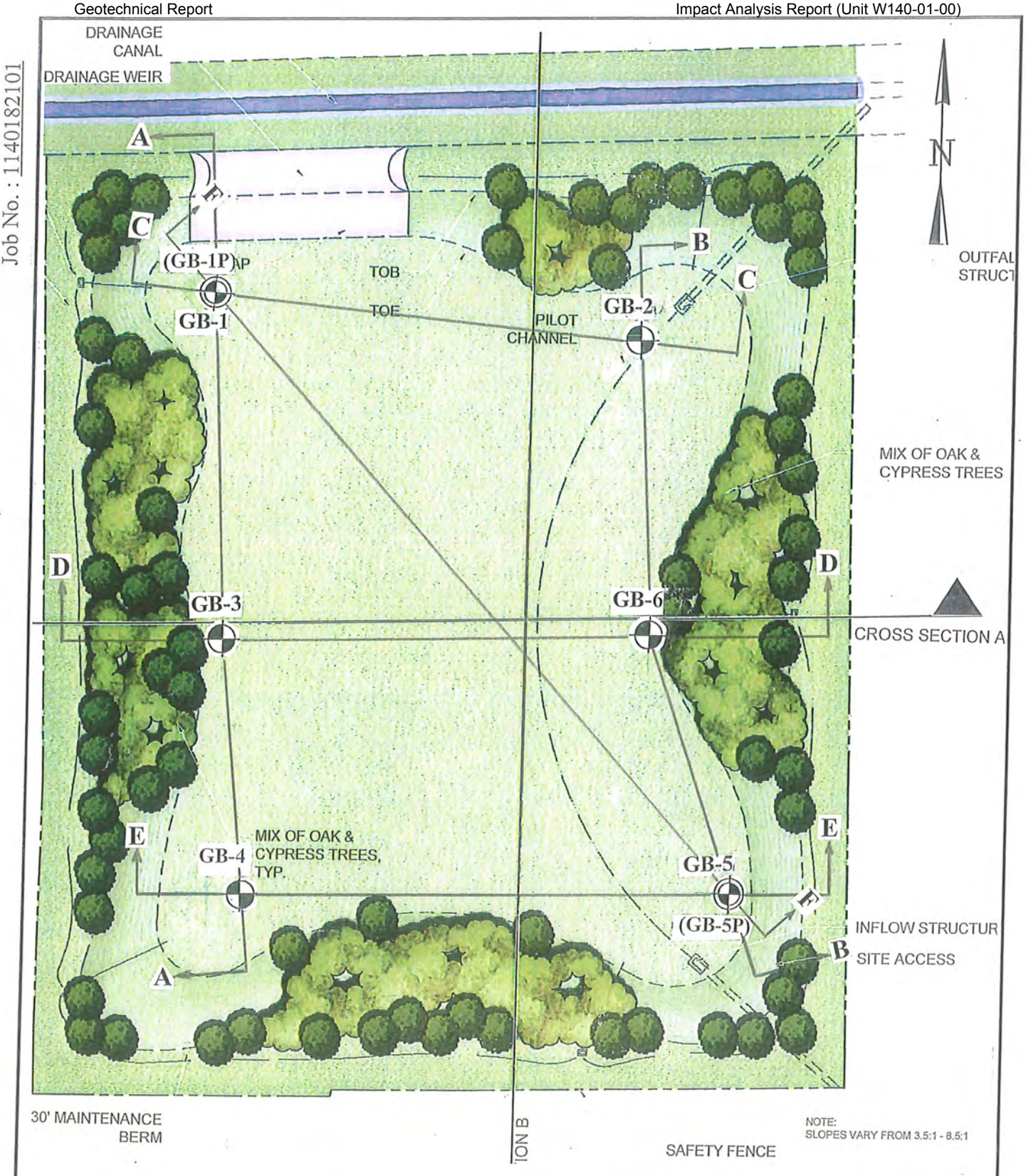
FIGURE 1



MEMORIAL CITY REDEVELOPMENT AUTHORITY
TASK ORDER NO. 86612.W140 - DETENTION POND
HOUSTON, TEXAS

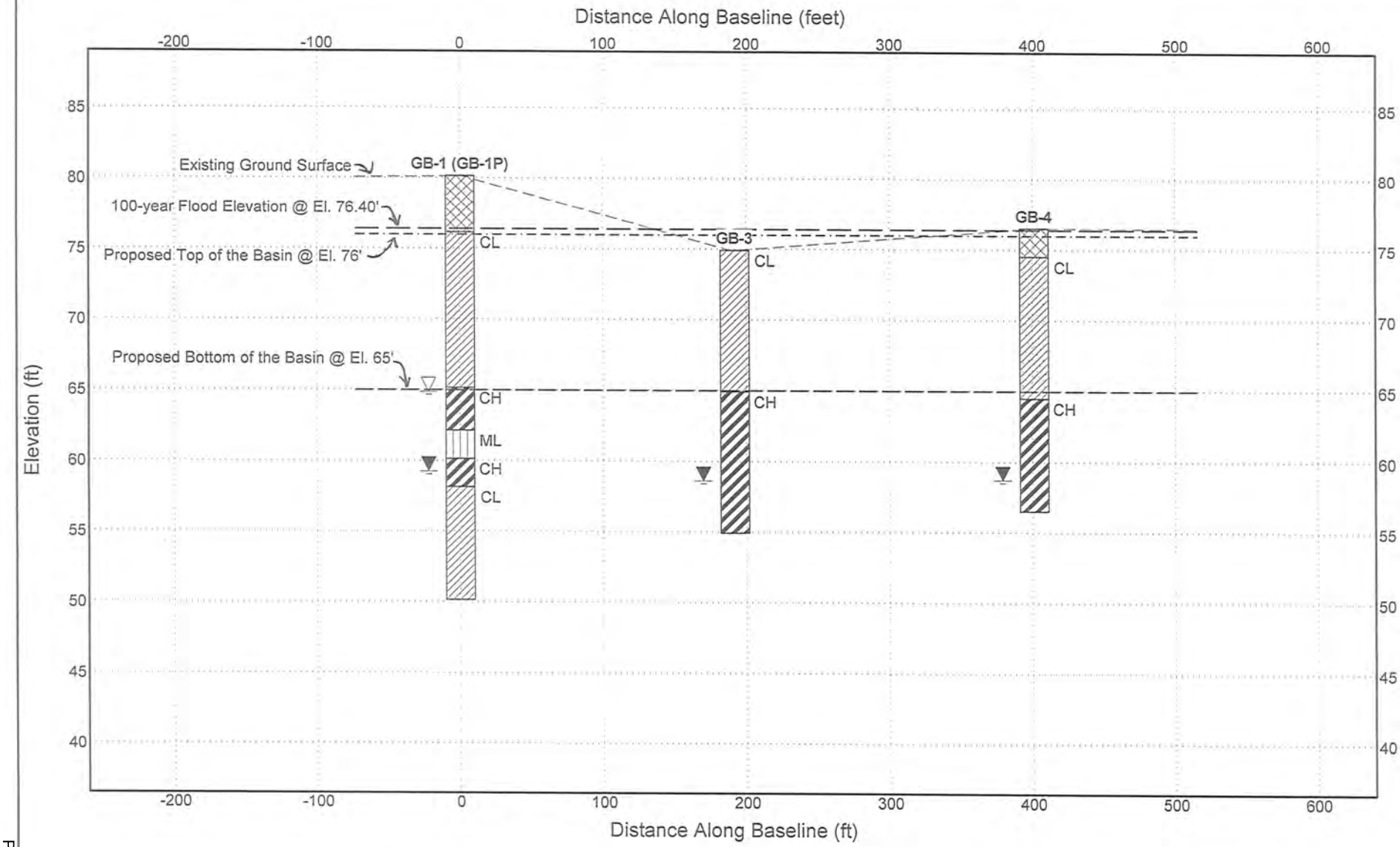
PLAN OF BORINGS

NOT TO SCALE

Geotest Engineering, Inc.

FIGURE 2

Project Number: 1140182101



GEOTEST ENGINEERING, INC.

Houston, Texas

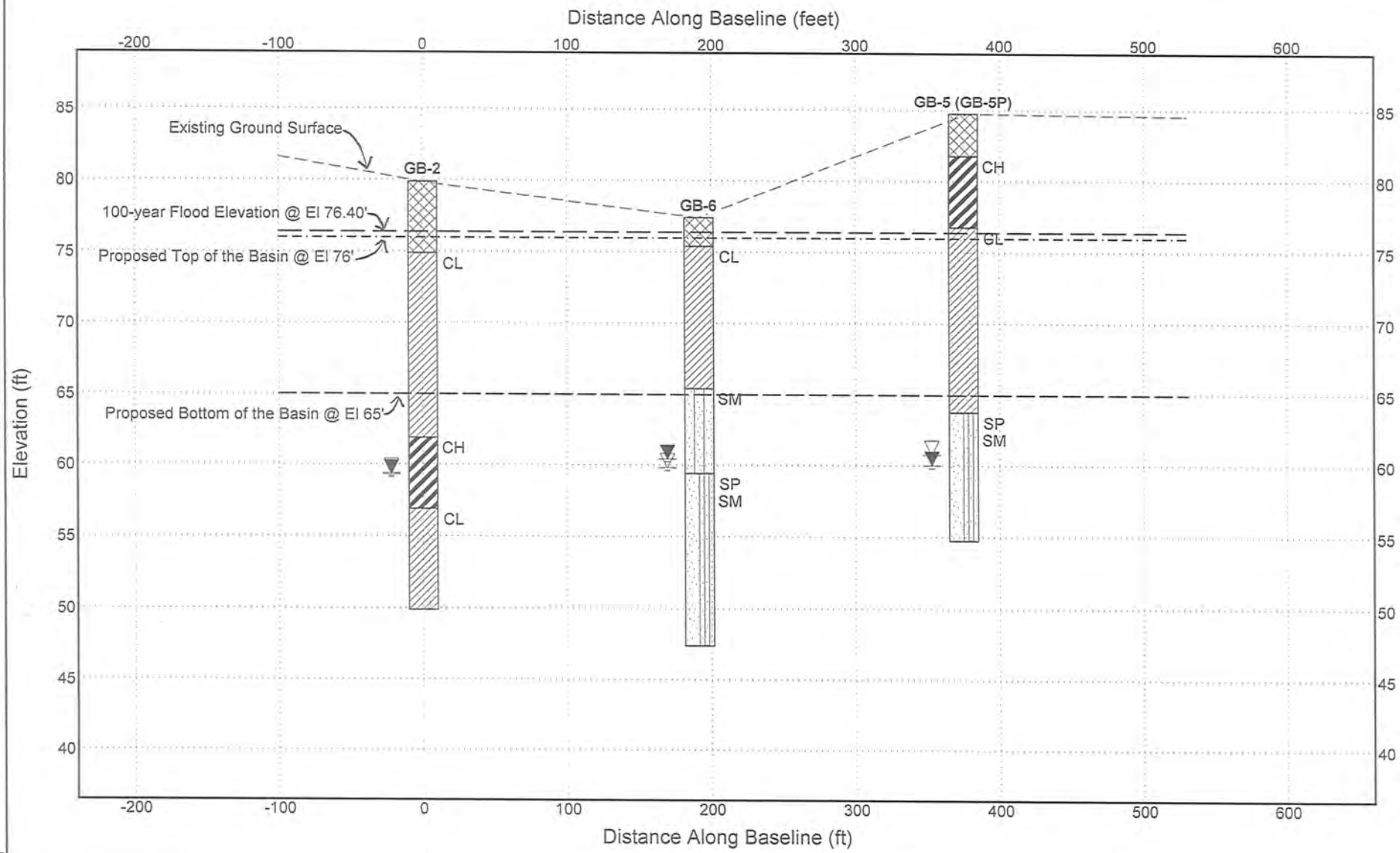
LEGEND

- Fill
- Lean Clay w/sand (CL)
- Fat Clay (CH)
- Silt w/sand (ML)
- Sandy Lean Clay (CL)
- Water Level Encountered During Drilling
- Water Level Measured 24 Hours or More After Drilling

Memorial City Redevelopment Authority
W140 Detention Pond

Section A - A

Project Number: 1140182101



GEOTEST ENGINEERING, INC.
Houston, Texas

LEGEND

- Fill
- Lean Clay (CL)
- Fat Clay (CH)
- Sandy Lean Clay (CL)
- Fine Sand with Silt (SP-SM)
- Silty Sand (SM)
- Water Level Encountered During Drilling
- Water Level Measured 24 Hours or More After Drilling

Memorial City Redevelopment Authority
W140 Detention Pond

Section B - B

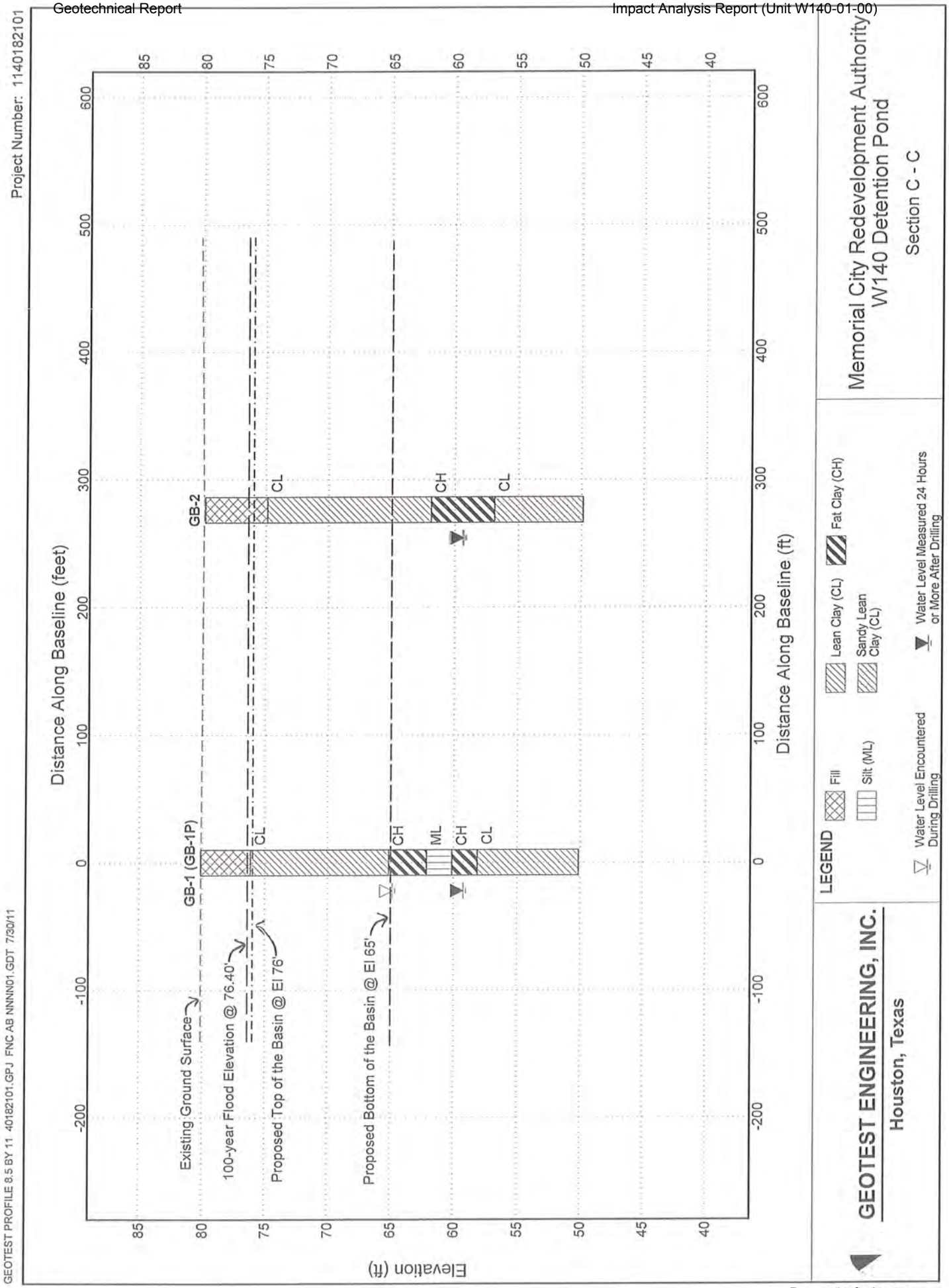
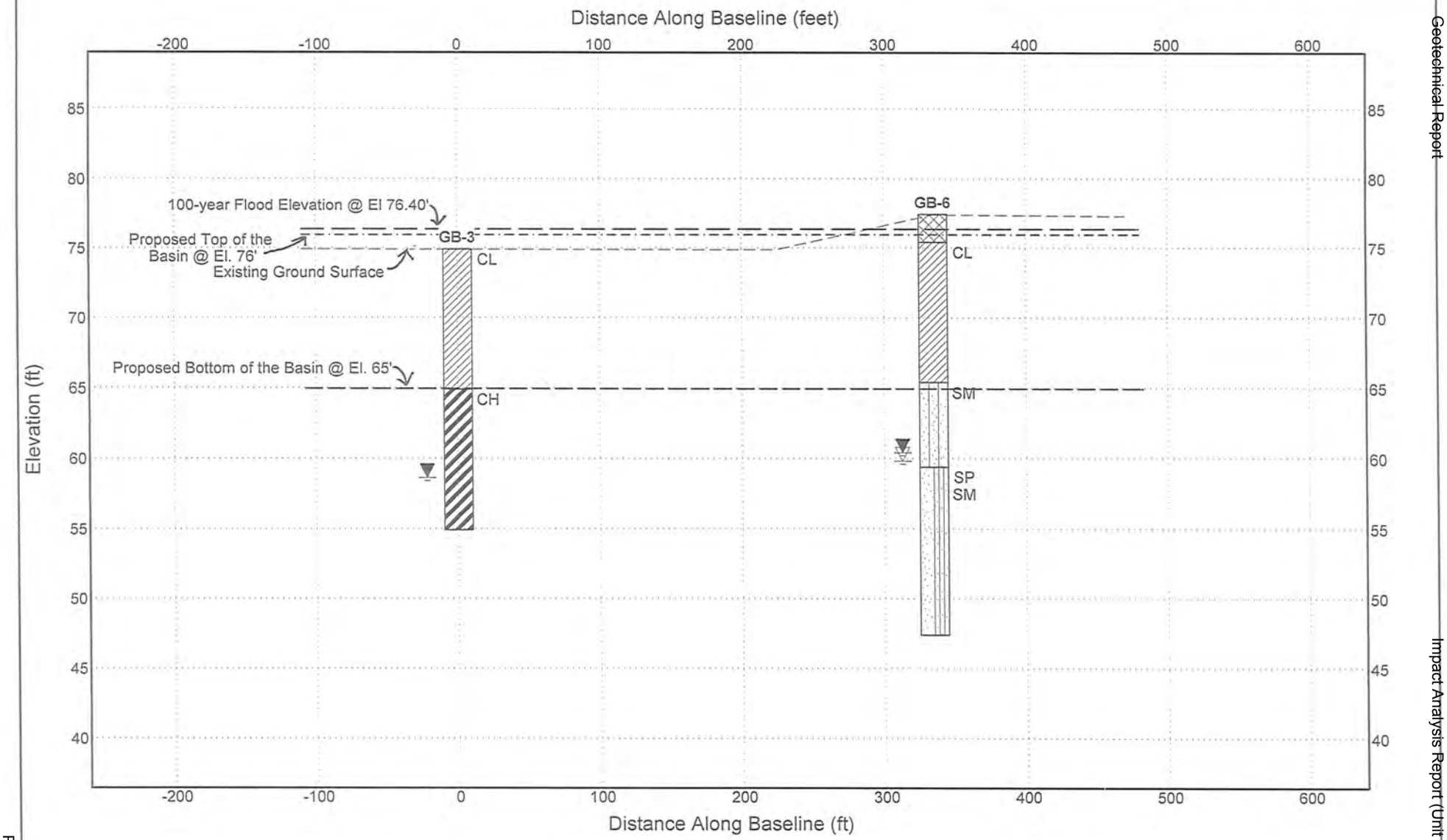

Project Number: 1140182101
GEOTEST PROFILE 8.5 BY 11 40182101.GPJ FNC AB NNNN01.GDT 7/30/11
Distance Along Baseline (feet)
Distance Along Baseline (ft)
Elevation (ft)
GB-1 (GB-1P)
GB-2
CL
CH
ML
Existing Ground Surface
100-year Flood Elevation @ 76.40'
Proposed Top of the Basin @ El 76'
Proposed Bottom of the Basin @ El 65'
LEGEND
Fill
Silt (ML)
Lean Clay (CL)
Sandy Lean Clay (CL)
Fat Clay (CH)
Water Level Encountered During Drilling
Water Level Measured 24 Hours or More After Drilling
GEOTEST ENGINEERING, INC.
Houston, Texas
Memorial City Redevelopment Authority
W140 Detention Pond
Section C - C

FIGURE 3.3

Project Number: 1140182101



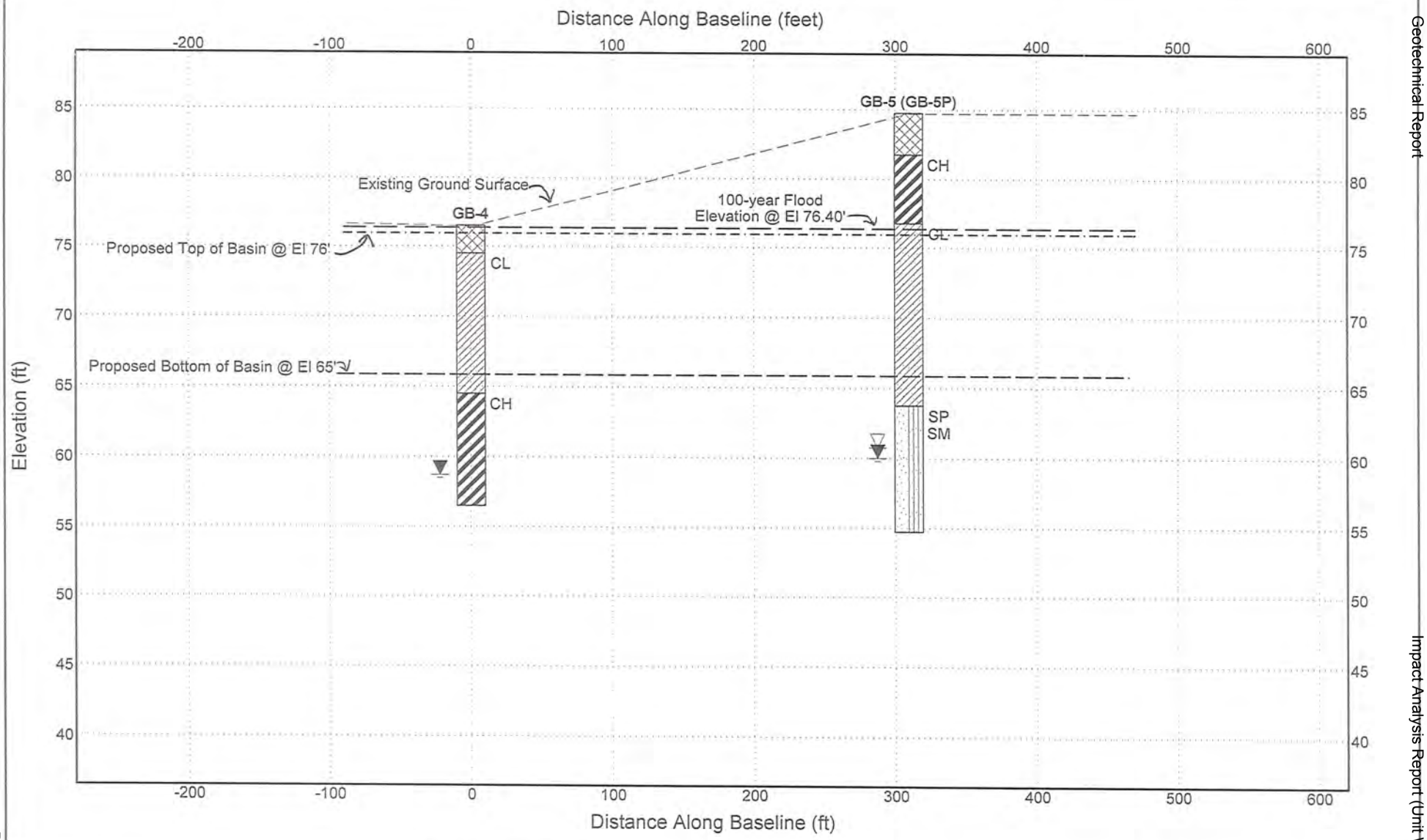
GEOTEST ENGINEERING, INC.
Houston, Texas

LEGEND
- Lean Clay (CL) w/sand
- Fat Clay (CH)
- Fill
- Silty Sand (SM)
- Fine Sand with Silt (SP-SM)
- Water Level Encountered During Drilling
- Water Level Measured 24 Hours or More After Drilling

Memorial City Redevelopment Authority
W140 Detention Pond

Section D - D

Project Number: 1140182101

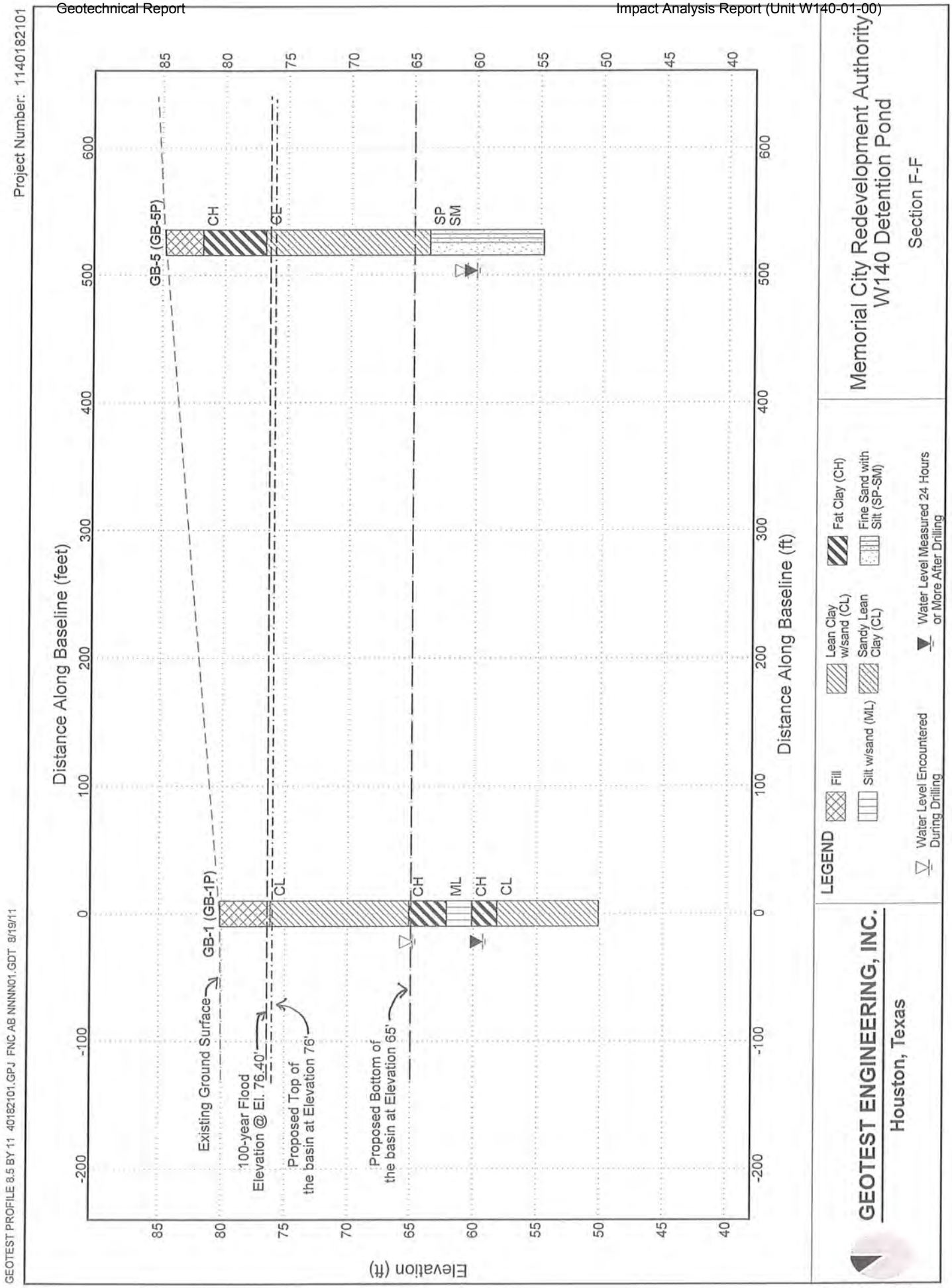


GEOTEST ENGINEERING, INC.
Houston, Texas

LEGEND
- Fill
- Lean Clay (CL)
- Fat Clay (CH)
- Fine Sand with Silt (SP-SM)
- Water Level Encountered During Drilling
- Water Level Measured 24 Hours or More After Drilling

Memorial City Redevelopment Authority
W140 Detention Pond

Section E - E


Project Number: 1140182101
GEOTEST PROFILE 8.5 BY 11 40182101.GPJ FNC AB NNNN01.GDT 8/19/11
Distance Along Baseline (feet)
Distance Along Baseline (ft)
Elevation (ft)
GB-5 (GB-5P)
GB-1 (GB-1P)
CH
CL
SP
SM
ML
Existing Ground Surface
100-year Flood Elevation @ El. 76.40'
Proposed Top of the basin at Elevation 76'
Proposed Bottom of the basin at Elevation 65'
LEGEND
Fill
Silt w/sand (ML)
Lean Clay w/sand (CL)
Sandy Lean Clay (CL)
Fat Clay (CH)
Fine Sand with Silt (SP-SM)
Water Level Encountered During Drilling
Water Level Measured 24 Hours or More After Drilling
GEOTEST ENGINEERING, INC.
Houston, Texas
Memorial City Redevelopment Authority
W140 Detention Pond
Section F-F

Job No. 1140182101

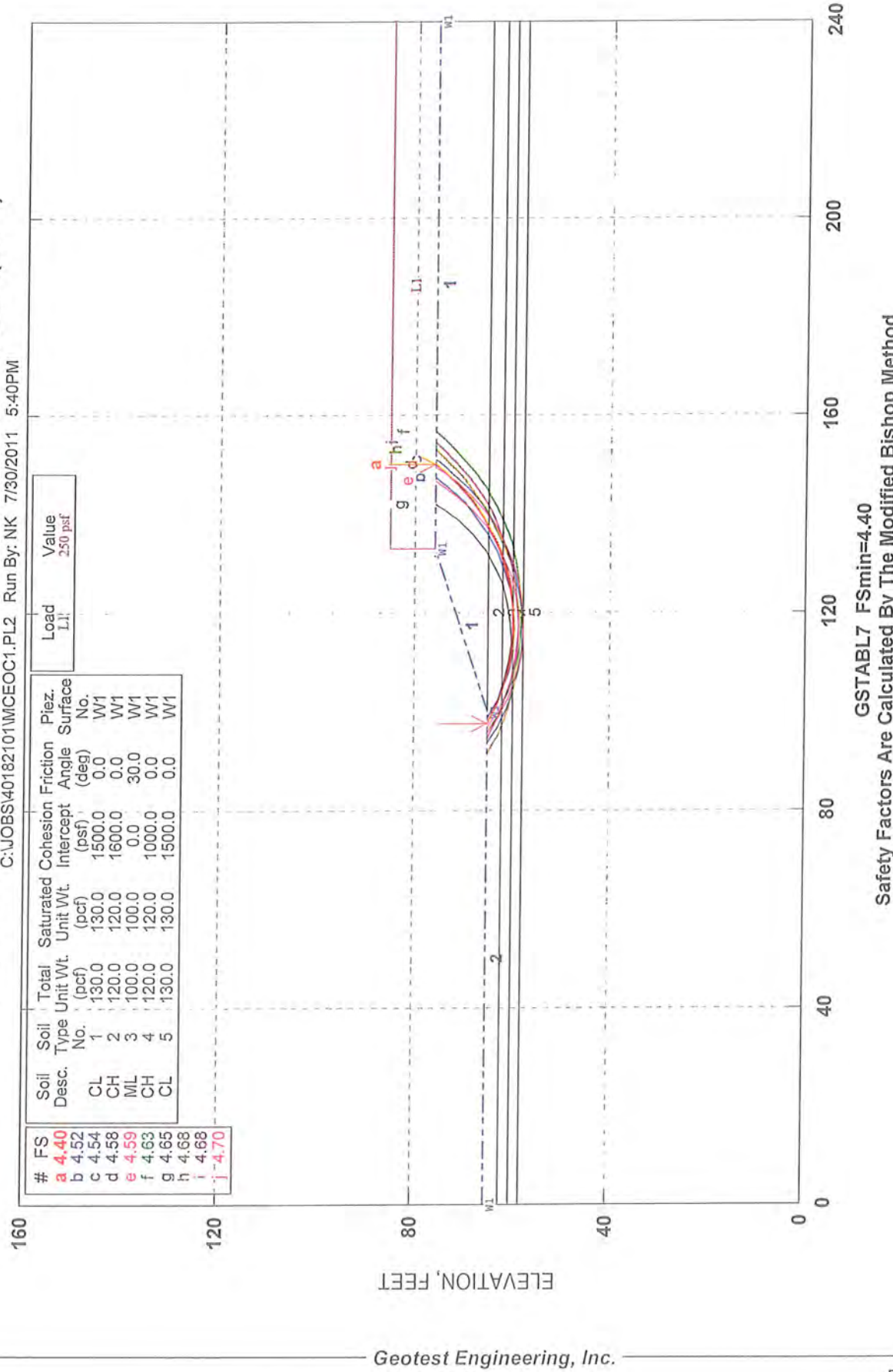


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Figure 4.1

Job No. 1140182101

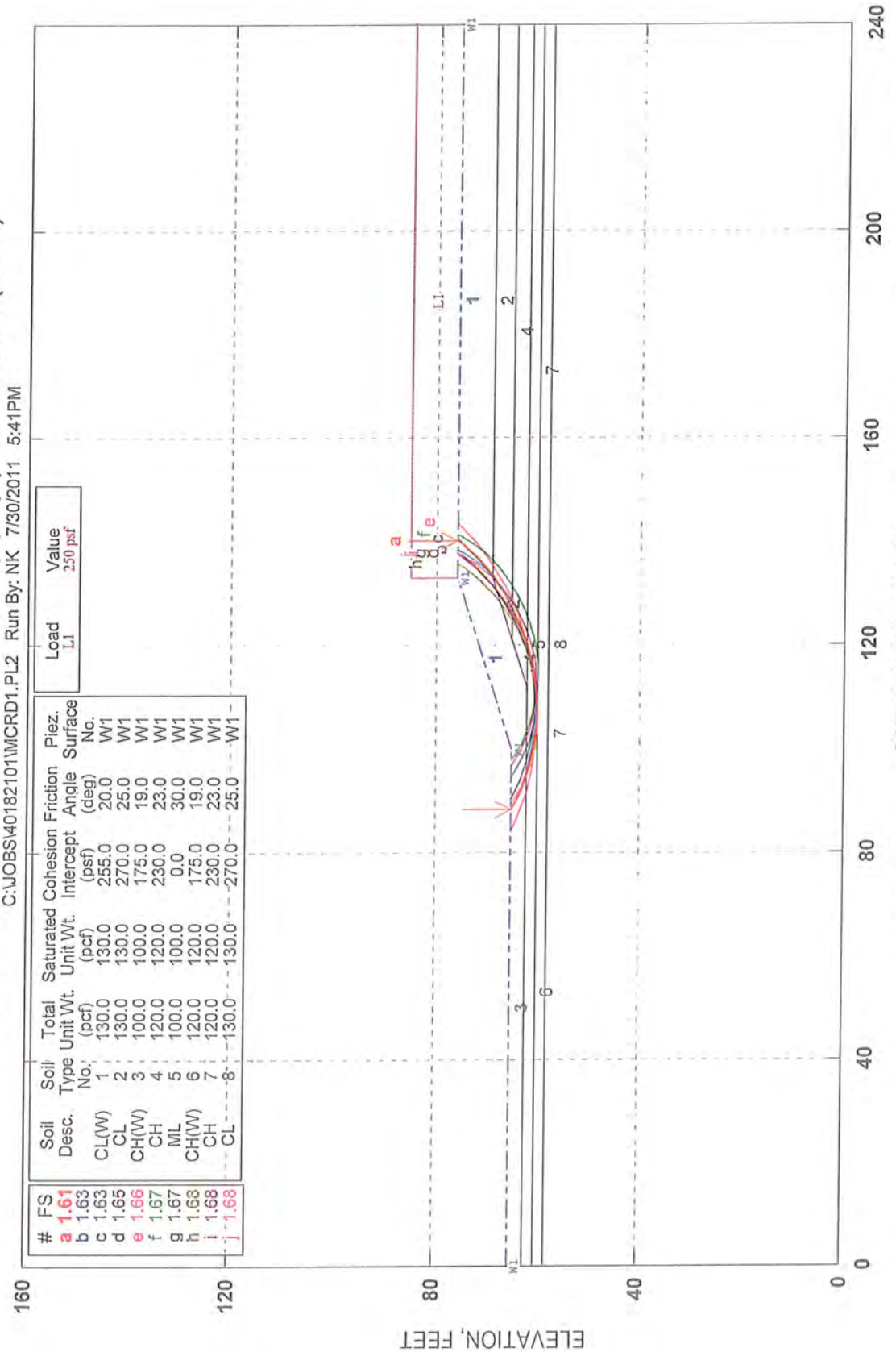

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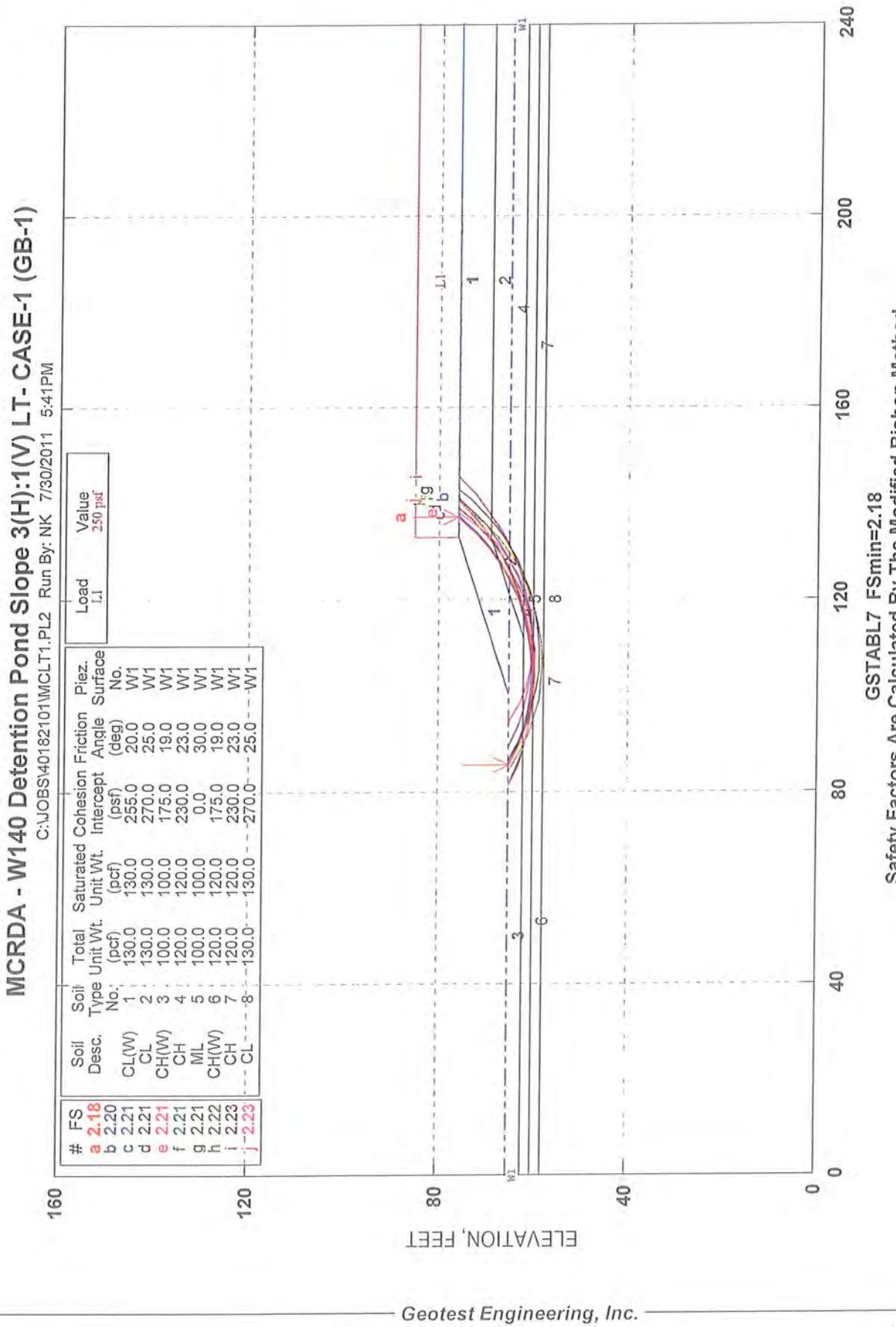
Figure 4.2

Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.3

Job No. 1140182101

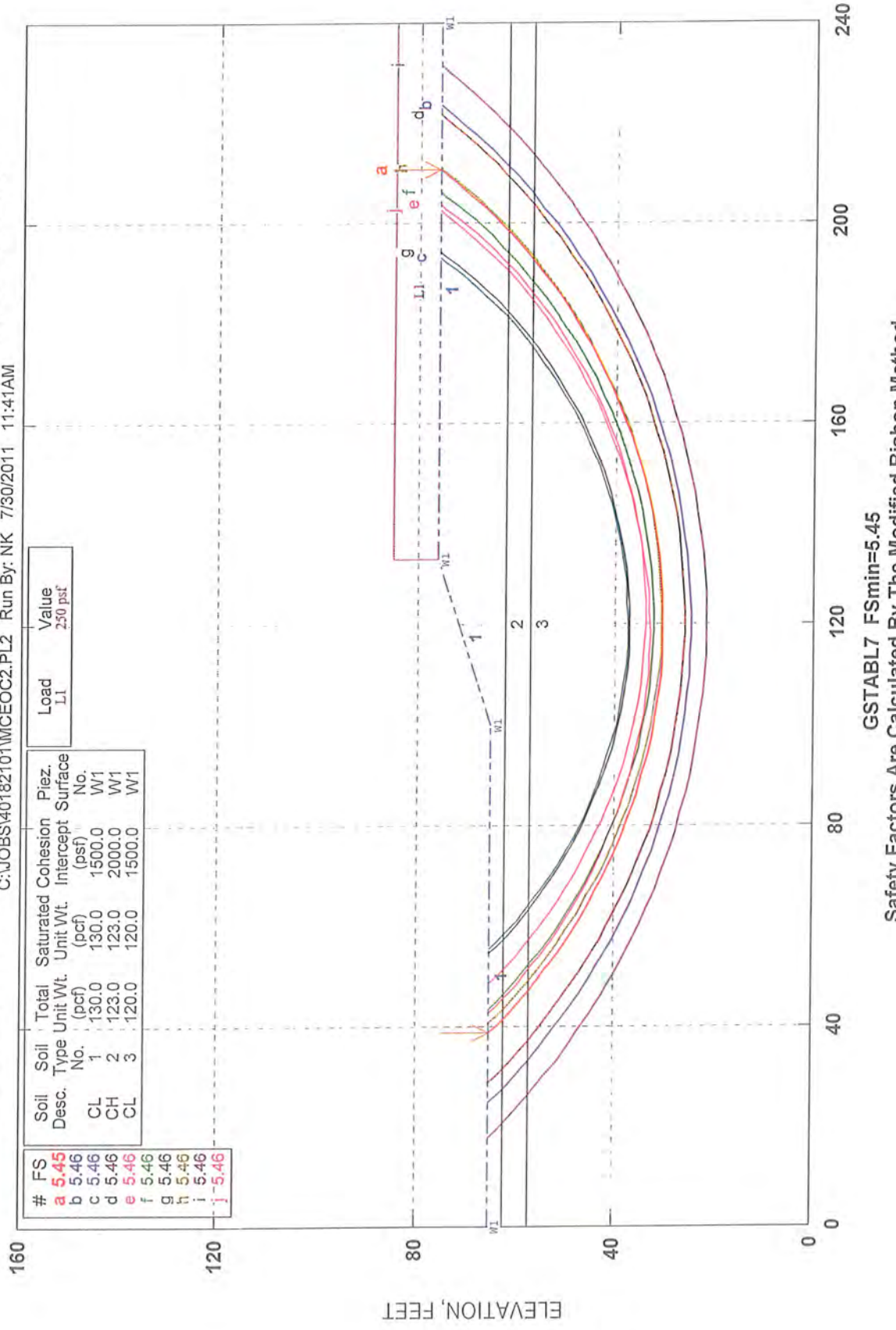


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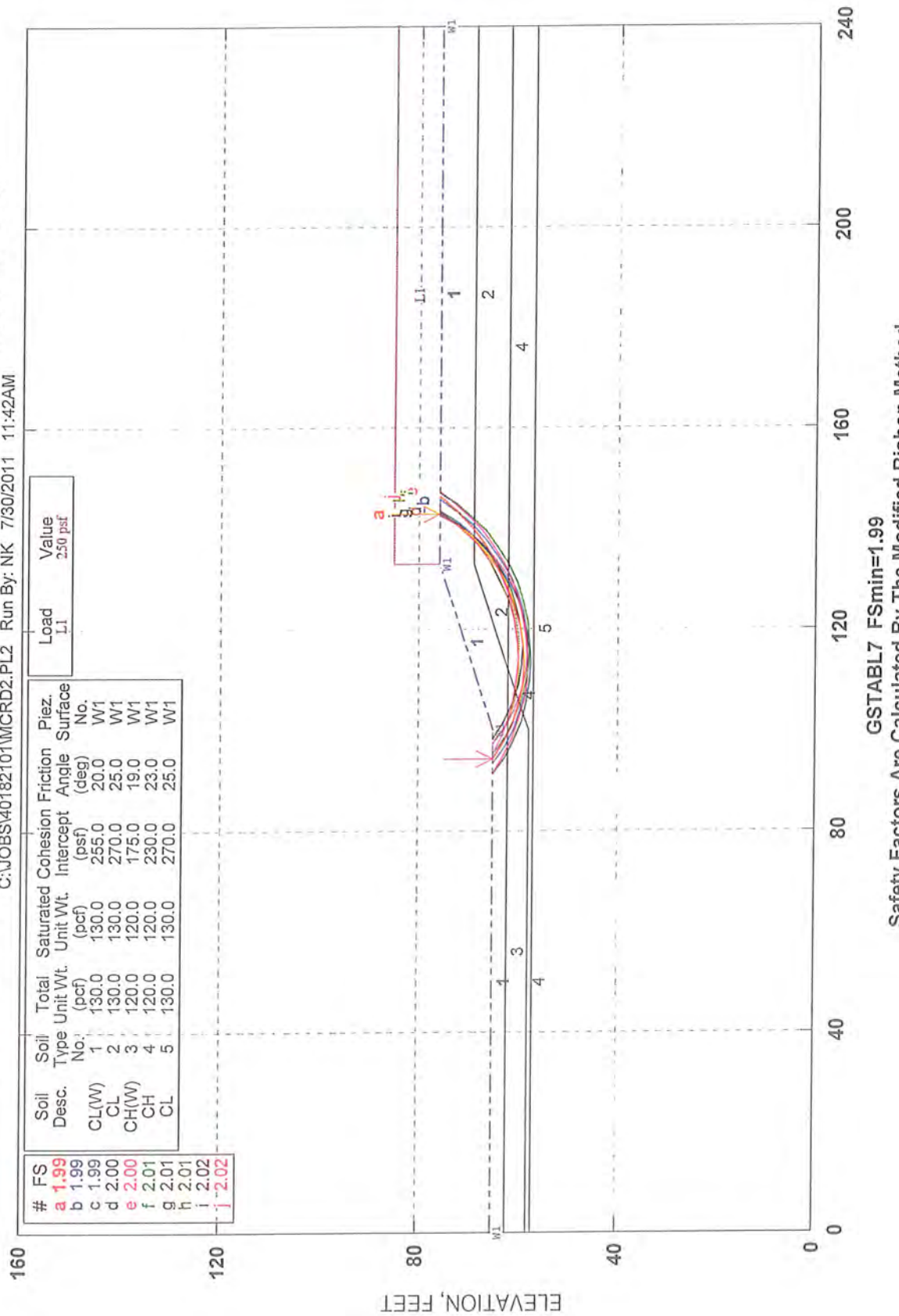
Figure 4.4

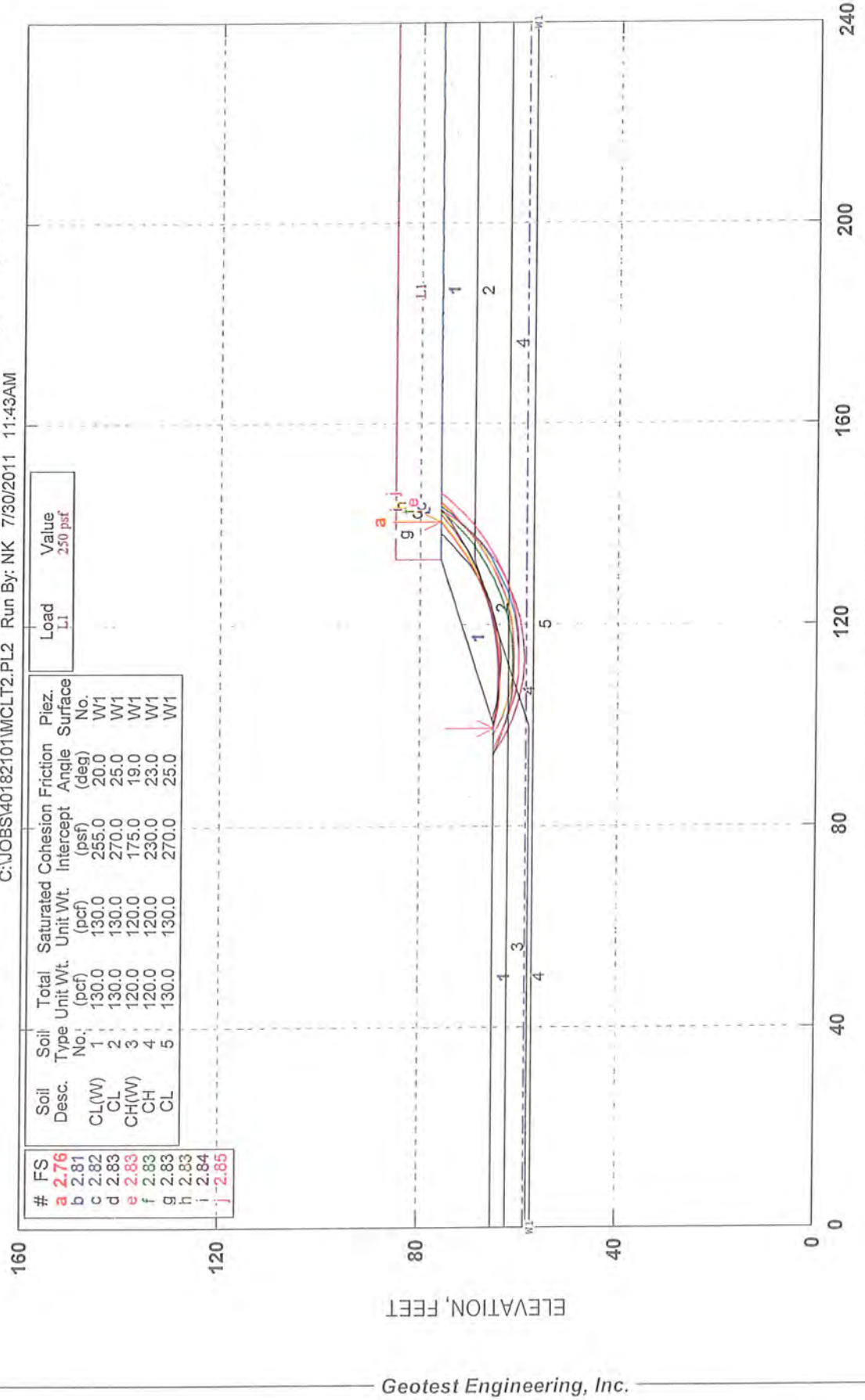
Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.5

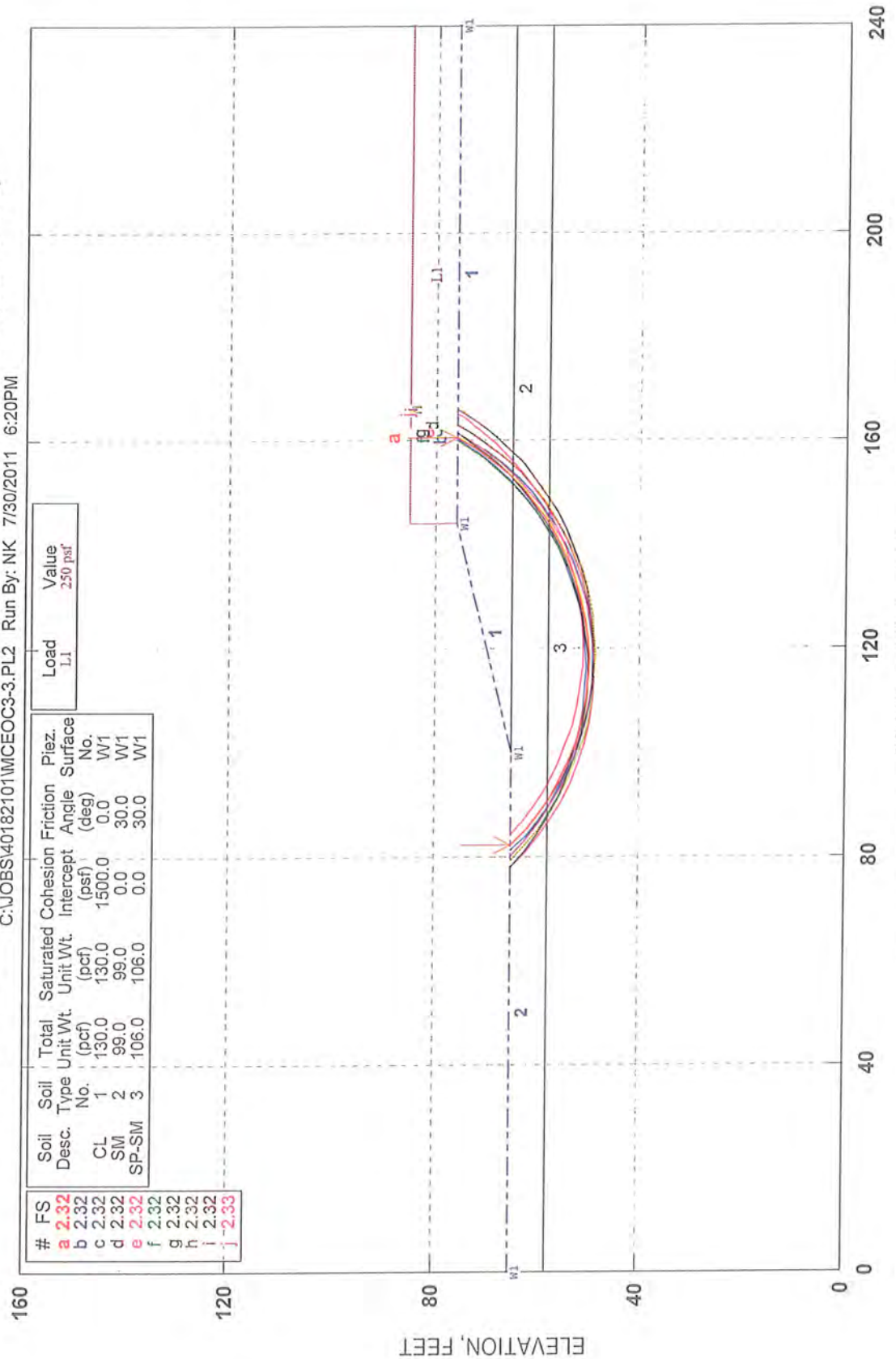
Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.6

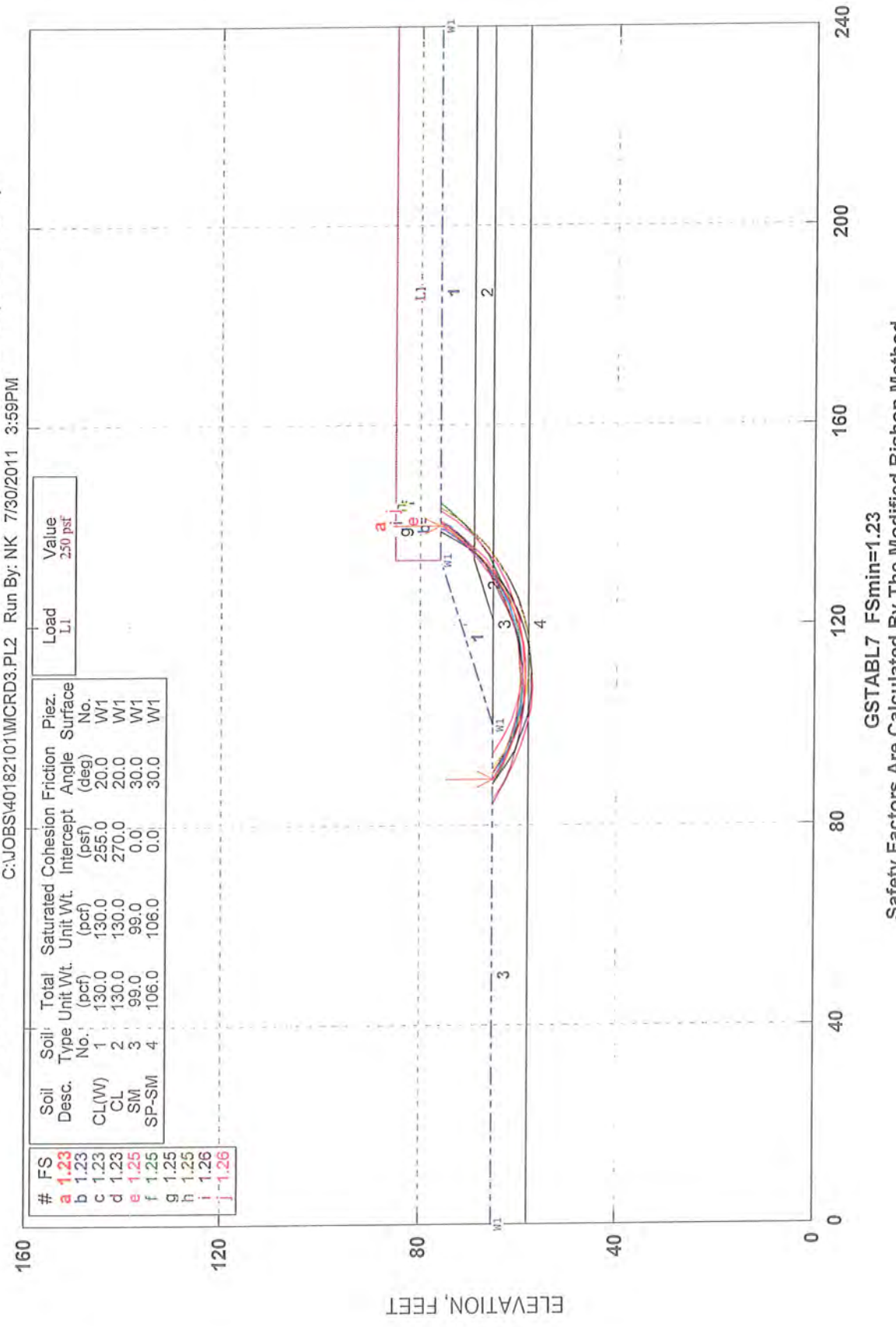
Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.7

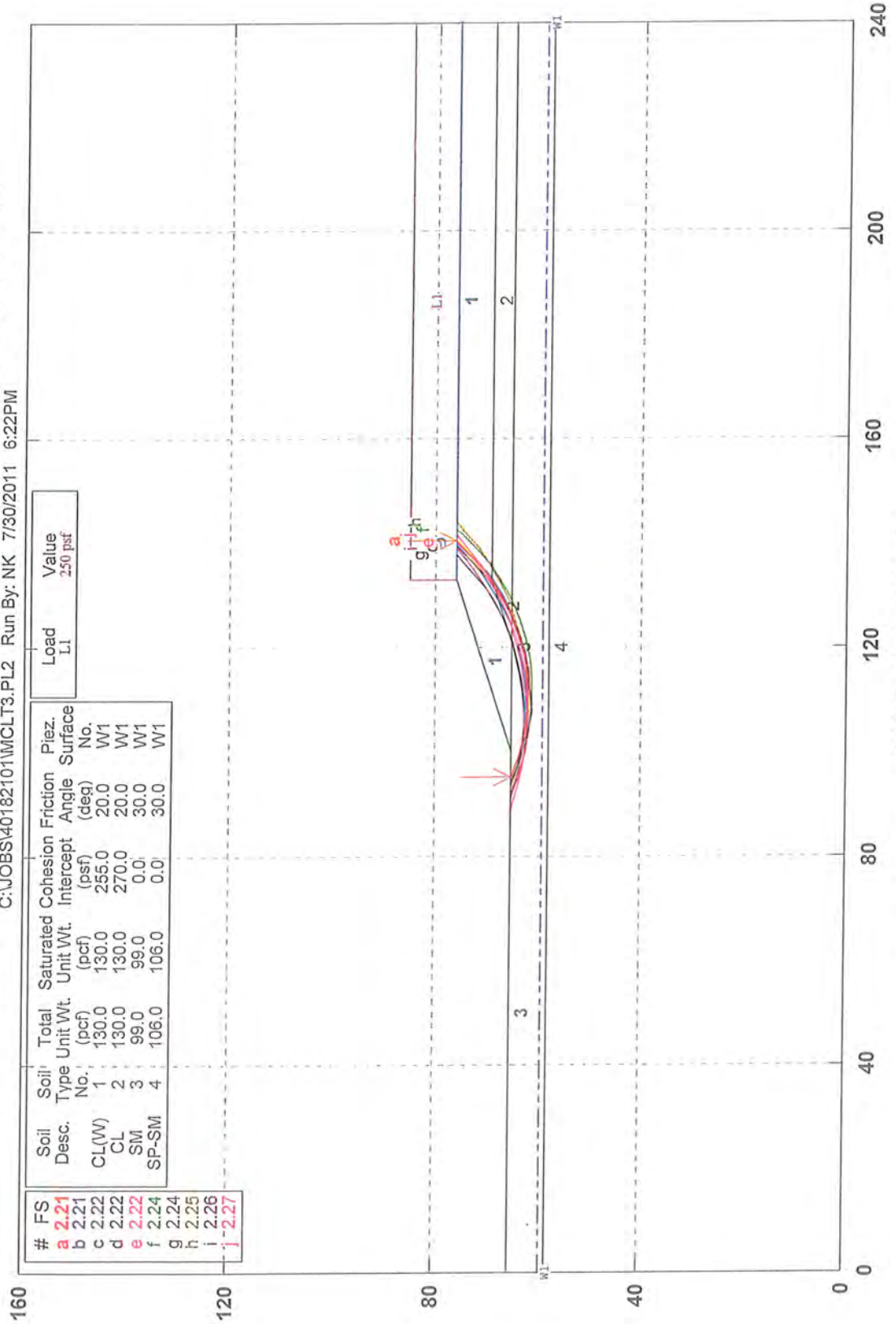
Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.8

Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.9

Job No. 1140182101

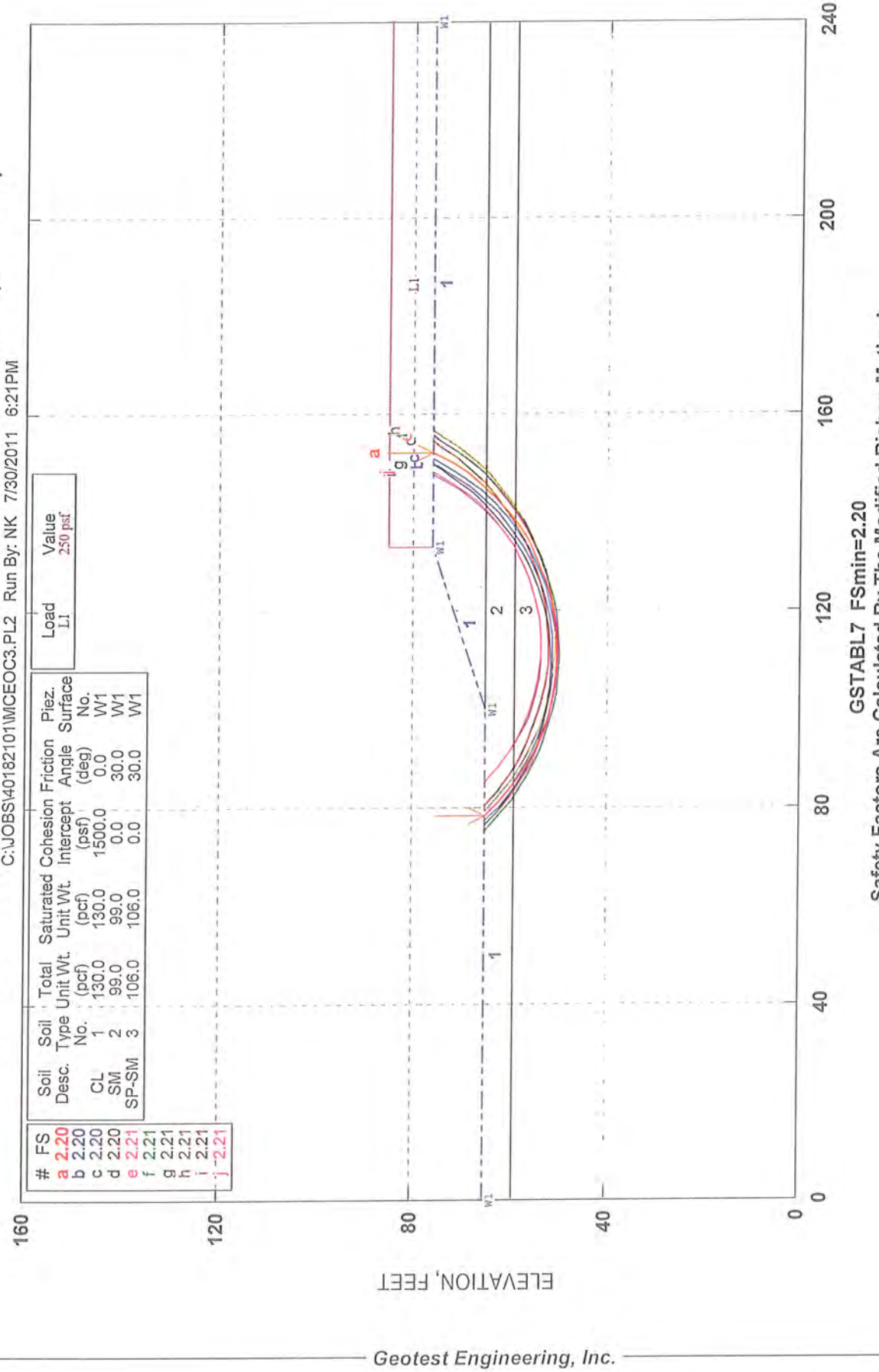
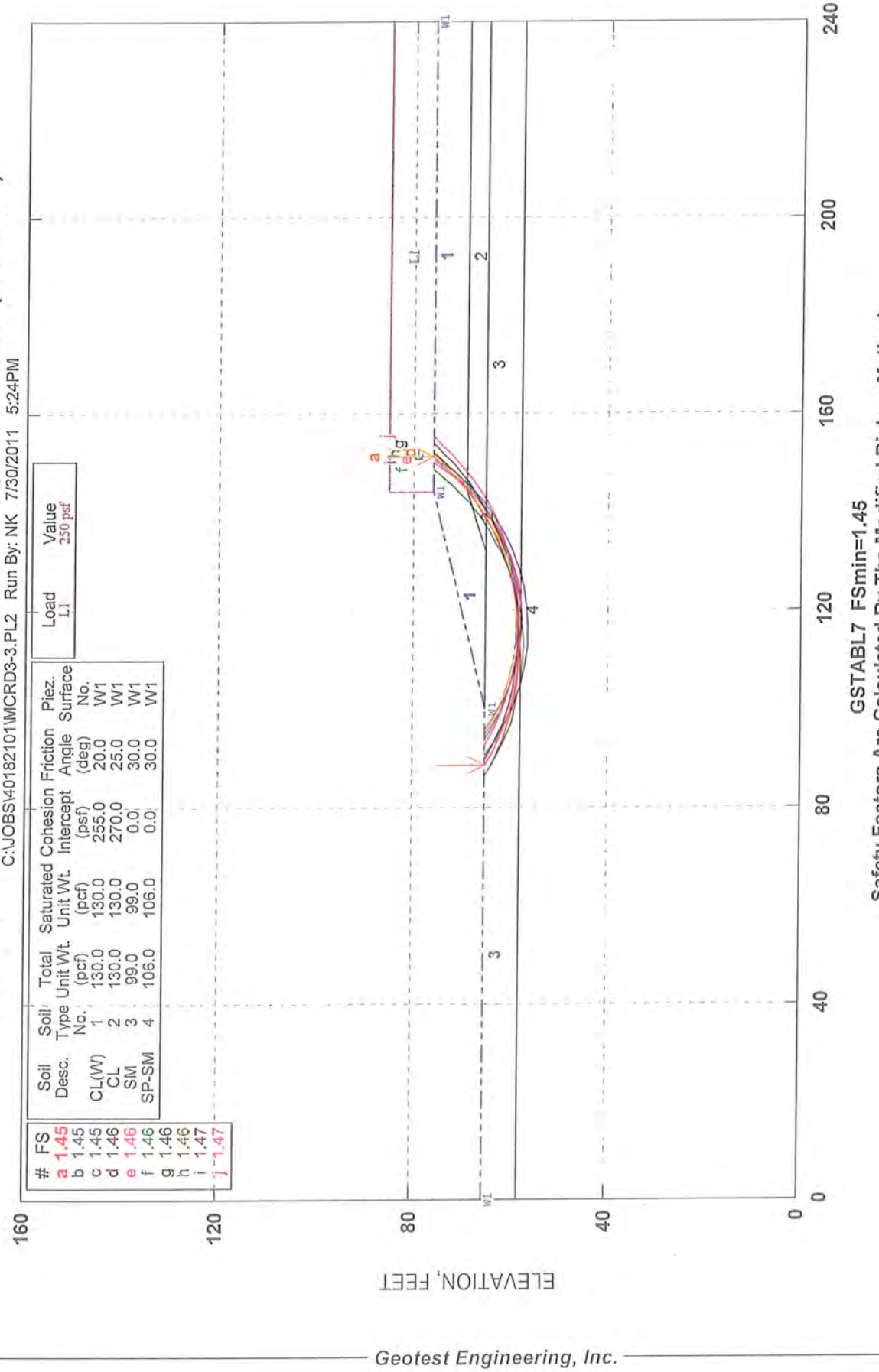


Figure 4.10

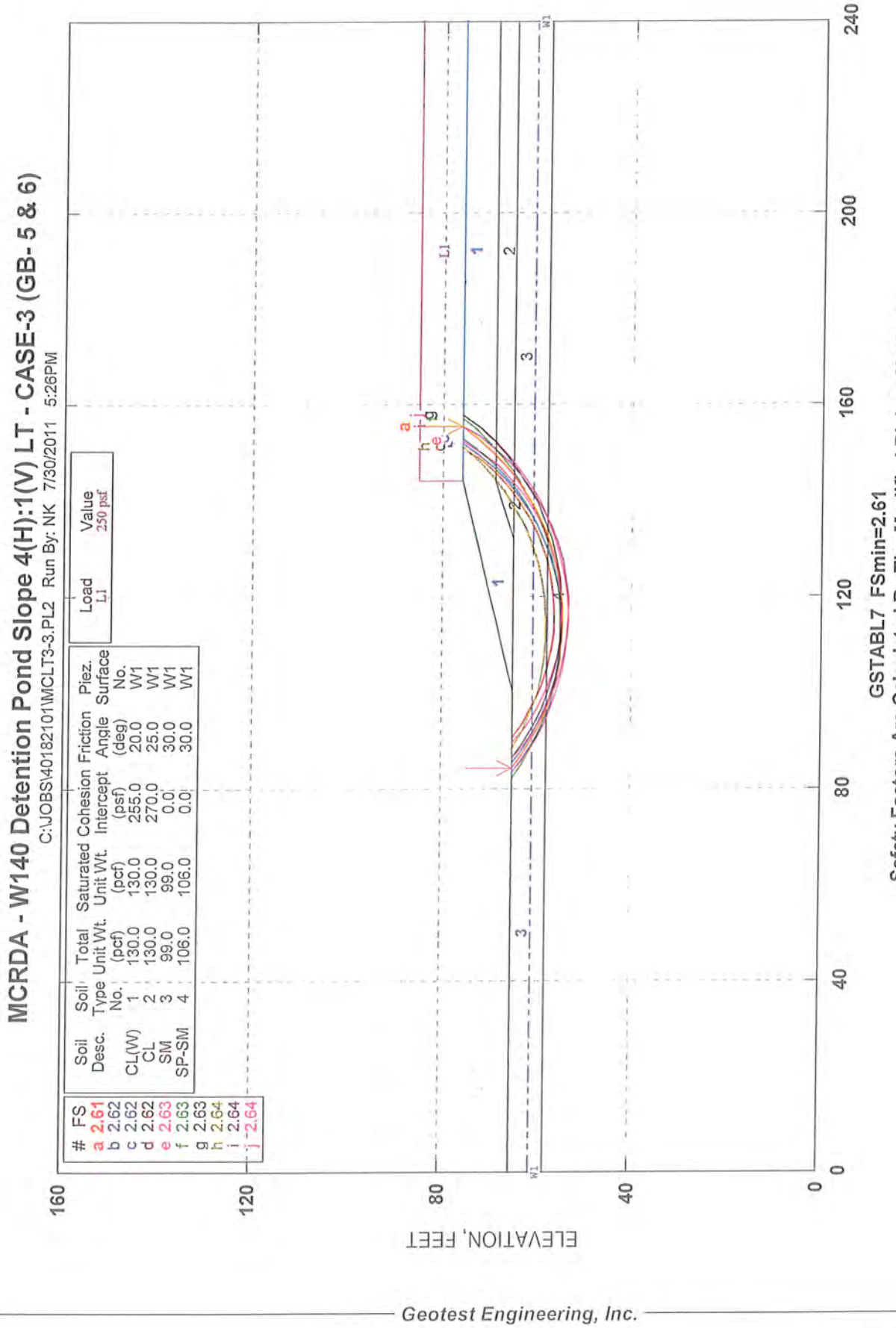
Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.11

Job No. 1140182101



Geotest Engineering, Inc.

Figure 4.12

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

PHASE I ENVIRONMENTAL SITE ASSESSMENT

W140 DETENTION BASIN FEASIBILITY STUDY

Houston, Texas

August 2011

REPORT NO. 082011-A

Prepared for:

Memorial City Redevelopment Authority
on behalf of
Tax Increment Reinvestment Zone No. 17 (TIRZ 17)

Prepared by:

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Firm No. 2614
2925 Briarpark
Houston, Texas 77042

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APPENDICES:

I. EXECUTIVE SUMMARY

A summary of the findings for the Phase I Environmental Site Assessment (ESA) for the W140 Detention Basin Feasibility Study is provided below. Details are neither included nor fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of this summary.

- The project area includes a property approximately 8.3 acres located north of Interstate Highway 10 between Bunker Hill Road and Blalock Road.
- The proposed work includes design of a detention pond with 40-45 acre-feet of capacity on the subject property that will provide detention for storm events in the W140 watershed in Houston, TX.
- The regulatory database search identified nine (9) Leaking Underground Storage Tank sites and four (4) Voluntary Cleanup Program (VCP) sites within the specified search radius.

The facilities identified in the regulatory agency database review that appear to constitute a Recognized Environmental Condition (REC), based on facility characteristics and environmental settings at the time of this assessment study, are listed below. Based on the Phase I ESA for the W140 Detention Basin Feasibility Study, there are three (3) potential RECs present.

- Hurricane Steel Industries. 9600 Old Katy Rd. **TXVCP**. Phase: Completed. Metal contaminants were found in soils and groundwater. A certificate of completion was granted on February 4, 2003. A groundwater sample was collected from the existing monitoring well on the subject property, and Barium, Chromium, Mercury, and Lead were below Maximum Contaminant Levels. Based on the available information, and since the soil has been affected **further investigation is recommended.**
- Daniel Measurement and Control. 9720 Old Katy Road. **TXVCP**. Phase: Conditional. VOC's, SVOCs, metals, and chlorinated solvents contaminants were found in soils and groundwater. Currently there is a pump and treat system to assist with on-site remediation. Because the site is outside ½ mile radius, no impact is anticipated. **No further investigation is recommended.**
- Goodson Yugo. 9702 Old Katy Rd. **LPST**. Status code: Final concurrence issued, case closed. Groundwater is affected. Because the site is outside ½ mile radius, no impact is anticipated. **No further investigation is recommended.**

Although groundwater sampling results were below maximum contaminant levels, the possibility of soil contamination still exists. For the purpose of the detention basin construction, Phase II soil sampling on the subject property is recommended to determine soil handling and disposal requirements.

II. INTRODUCTION

A. Purpose

The purpose of the Phase I ESA is to investigate the subject property through a combination of historical research and site reconnaissance in order to determine the likelihood of any environmental risks or liabilities. These results are to assist the City of Houston (City) in developing information to identify Recognized Environmental Conditions (RECs). A REC is the presence or likely presence of hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products.

B. Detailed Scope of Work

This Phase I ESA was performed in accordance with ASTM E 1527-00 and the City of Houston Department of Public Works and Engineering ECRE Standard Practices for ESAs. The scope of work includes the following tasks:

- Review of Federal and State regulatory agency database records to assess any documented RECs near the subject property. The database prepared by Environmental Data Resources, Inc. (EDR), dated June 24, 2011, contains information on:
    - Federal National Priority List (NPL) sites within 1.0 mile:
    - Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites within 500 feet;
    - CERCLIS sites designated No Further Remedial Action Planned (NFRAP) on or adjoining the subject property;
    - Resource Conservation and Recovery Act (RCRA) Corrective Action Activity (CORRACTS) within 500 feet;
    - Federal RCRA Treatment, Storage, and Disposal Facilities (TSDF) within 0.5 mile;
    - RCRA generators on or adjoining the subject property;
    - Emergency Response Notification System (ERNS) listings on the subject property;
    - Texas Hazardous Waste Sites including state NPL, CERCLIS, and Texas Voluntary Cleanup (VCP) sites within 0.5 mile;
    - Leaking Petroleum Storage Tanks (LPSTs) within 500 feet; and
    - Registered Underground Storage Tanks (USTs) on or adjoining the subject property.
- Compare selected historical and current aerial photographs to identify changes in land uses near the subject property over time and to determine potential environmental concerns related to the use of the subject alignment or adjacent properties. Sources of aerial photography are the Agricultural Stabilization and Conservation Service (ASCS) (1953), the United States Geological Survey (USGS)

(1968), Texas Department of Transportation (TxDOT) (1979, 1989), United States Geological Survey (1995), United States Department of Agriculture (2004), and the Environmental Data Resources (EDR) (2005, 2008).

- Review Emergency Release Reports, pipeline maps, and flood plain maps.
- Review City directories and interview individuals with knowledge of the subject alignment in order to assess the historical ownership, development, and use of the subject property and adjacent properties.
- Conduct visual site reconnaissance of the subject property and the adjoining properties, and interview available individuals with knowledge of the subject property in order to assess any current RECs.
- Prepare a report that summarizes the results of the investigation and provides recommendations regarding further investigation to fully determine and quantify potential environmental liabilities associated with the subject property.

C. Limitations of Scope and Services

This assessment is limited to the visual observation of surface conditions within the subject property, interviews with public agencies and other persons knowledgeable of the subject property, and a review of reasonably ascertainable data. For the purposes of this ESA, reasonably ascertainable data is defined as interview information that could be obtained from property owners, individuals present during the site visit, and any agency records and historical maps that could be readily obtained through a commercial source. The information obtained was not further verified unless it was known to be incorrect or conflicted with other information previously obtained. Lockwood, Andrews & Newnam, Inc. (LAN) does not guarantee the completeness or accuracy of the regulatory agency files and site listings. Therefore, this report does not contain any information that was not provided or was not known by the individuals that were interviewed at the time this site assessment was performed.

The ESA is intended to reduce, but not eliminate, uncertainty regarding the potential for RECs in connection with the subject property. The following conditions were not included in the scope of work:

- Naturally occurring toxins in subsurface soils, rocks, and water or toxicity of on-site flora;
- Biological hazards;
- Health effects of electromagnetic radiation from high-voltage power lines;
- Drinking water quality including lead in drinking water;
- Asbestos-containing building materials or lead-based paint;
- Radon and other naturally occurring radioactive materials; or
- Surface or subsurface contamination.

There is no guarantee that not finding the indicators of hazardous substances or petroleum products assumes that these materials do not exist within the subject alignment. No subsurface investigations were performed to identify any closed landfills within the subject property. This report is based on the regulations in effect at the time it was prepared.

LAN has completed this Phase I ESA in general accordance with ASTM E 1527-00, unless otherwise specified, for the W140 Detention Basin Feasibility Study. The guidelines and procedures used to perform this ESA are consistent with the City of Houston's ECRE Standard Practice for conducting Phase I ESAs.

D. User Reliance

This Phase I ESA report has been prepared for the exclusive use and reliance of the Tax Increment Reinvestment Zone No. 17 (TIRZ 17) and City of Houston for this project. Use or reliance by any other party is prohibited without written authorization of LAN, TIRZ 17, or the City of Houston. Reliance on this Phase I ESA by the client and all authorized parties will be subject to the terms, conditions, and limitations stated in the ESA report.

III. SITE DESCRIPTION

This subject property is located north of Interstate Highway 10 between Bunker Hill Road and Blalock Road in Houston, Harris County, Texas. The project area is approximately 8.3 acres.

A. Location and Legal Description

The proposed work includes design of a storm water detention pond with 40-45 acre-feet of capacity on the subject property that will provide storage for storm events in the W140 watershed in Houston, TX. Vicinity maps and project location maps are included in Appendix A.

B. Current Land Use

Land use in the subject property is considered to be general commercial vacant land. The site is bordered by Lowe's and Costco to the west, Briar Branch Ditch (Harris County Flood Control District Ditch Number W140-01-05) to the north, office buildings and warehouses to the east, and Interstate Highway 10 to the south.

C. Site and Vicinity General Characteristics

1. Geology and Soils

The subject property is located in Harris County, which lies in the Quaternary Gulf Coastal Plain of Texas. According to Soil Survey of Harris County, Texas the surface soil mapping units on the proposed Detention Basin consists mostly of Addicks-Urban land complex (**Ak**) and partially of Gessner-Urban land complex (**Gu**).

The Addicks-Urban land complex (Ak) is a nearly level complex in urban areas and in the surrounding rural areas where the population is increasing. Encroachment of trees has occurred in some areas. The older urban areas are generally wooded, as a result of tree planting to provide shade.

The Addicks soil has a surface layer of friable, neutral, black loam about 11 inches thick. The layer below that is friable, neutral, dark gray loam about 12 inches thick. The next layer is about 26 inches thick and consists of friable, moderately alkaline, light gray loam that is about 20 percent, by volume, visible calcium carbonate. The layer at a depth of about 49 inches is firm, moderately alkaline, light gray loam that has distinct yellow and yellowish brown mottles and is about 5 percent visible calcium carbonate.

Urban land in the Addicks-Urban land complex consists of small areas of Addicks loam that has been altered by cutting, filling, and grading. Fill material has altered the soil in places. In some areas the entire profile is covered with 6 to 24 inches of fill material. Soils in the older areas that are drained by road ditches show less evidence of alteration. The area is characterized with poor drainage and chlorosis is common in areas where cuts have been made. Most of the acreage was formerly in cropland or native pasture.

The Gessner-Urban land complex contains slopes that are 0 to 1 percent. This component is on depressions on coastal plains. The parent material consists of loamy fluviomarine deposits of Early Pleistone age. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is occasionally ponded. A seasonal zone of water saturation is at 0 inches during the entire year. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land and Irrigated land capability classification is 4w. Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both. Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, 4w. The letter w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). This soil meets hydric criteria.

In general, both mapping units also contain Urban Land soil mapping unit. Urban land consists of soils that have been altered or covered by buildings and other urban structures, making classification impractical. Typical structures are single-unit and multiple-unit dwellings, streets, schools, churches, parking lots, office buildings, shopping centers that are less than 40 acres in size, and few industrial sites. The soils in this unit have been altered by cutting, filling, and grading in urban development. Also included are remnants of undisturbed soil and areas where the natural soil is covered by fill material.

2. Topography and Surface Water Drainage

The Hedwig Village, Texas, United States Geological Survey (USGS) topographical quadrangle map, dated 1995, identifies the slope of the natural ground surface of the subject property. Based on the available information, it can be reasonably assumed that surface water flows in a south-southeast, towards Buffalo Bayou. The typical elevation the subject property ranges between 80 and 85 feet above sea level.

3. Hydrogeology

The key water bearing aquifers located underneath the subject property are the Chicot Aquifer and the Evangeline Aquifer. Both the Chicot and Evangeline aquifers are composed of lenticular deposits of sand compressible clay but bear different hydraulic conductivities. The general direction of groundwater flow is assumed to be in the same direction as the slope of the natural historic ground elevation.

The subject property area's Hydrologic Group is classified as Class B/D. The area includes soils having very slow infiltration rates with a seasonal high water table but can be drained.

4. Floodplain Data

Floodplain characteristics for the subject property were found in the Flood Insurance Rate Map (FIRM) Number 48201C0645L revised on June 18, 2007. The FIRMs are maintained and published by the Federal Emergency Management Agency (FEMA). The subject property lies within Zone X, which means the subject property has been determined to be outside the 500-year flood plain. The Flood Insurance Rate Maps are included in Appendix A.

5. Wetlands

The map provided by EDR shows no areas within the vicinity of the subject property that are listed in the National Wetlands Inventory.

IV. HISTORICAL RECORDS REVIEW

A. Aerial Photographs

Historic and recent aerial photographs were obtained through EDR to identify changes in land uses on and around the subject property over time and to determine potential environmental concerns related to the use of the subject property or adjacent properties.

Aerial photographs were obtained for review from the Agricultural Stabilization and Conservation Service (ASCS) (1953), the United States Geological Survey (USGS) (1968), Texas Department of Transportation (TxDOT) (1979, 1989), United States Geological Survey (1995), United States Department of Agriculture (2004), and the Environmental Data Resources (EDR) (2005, 2008). Best available copies for each decade have been provided. Apparent conditions for each aerial photograph are

summarized below, and reproductions of the aerial photographs are included in Appendix B.

- The 1953 ASCS aerial shows that the subject property is undeveloped. Early stages of Interstate Highway 10 (IH-10), Bunker Hill Road, Blalock Road, and Long Point are shown. There is heavy residential development north of Briar Branch Ditch.
- The 1968 USGS aerial photograph shows the subject property remains undeveloped. Trees have grown in the subject property, but there is significant residential and commercial development in the surrounding vicinity. A neighborhood exists north of the subject property and Briar Branch Ditch. IH-10 has been built into a highway. Industrial sites can be found west adjacent to the subject property. Memorial High School is now found south of IH-10.
- The 1979 TxDOT aerial photograph shows commercial development on the southern portion of the subject property, with the construction of three new buildings and accompanying parking lots. Trees on the land have also been cleared. Continued growth in the area is shown with construction of shopping centers and parking lots south of IH-10. Bunker Hill Road has also been expanded.
- The 1989 TxDOT aerial photograph shows trees on the northern portion have been cleared and two buildings have been built on the southwest corner of the subject property. Three areas appear to have fill material. A building on the adjacent western property has been demolished, and warehouse and office buildings have been built on the adjacent eastern properties. Blalock Road has been expanded also.
- The 1995 USGS aerial photograph shows no significant change within the subject property. Bunker Hill Road has been expanded, south of IH-10. The eastern adjoining property appears to have turned into a car junk yard.
- The 2004 USDA aerial photograph shows no significant change in the subject property. A building appears to be demolished south of the subject area. IH-10 expansion construction is also shown.
- The 2005 EDR aerial photograph shows no significant change, except for the demolition of buildings north of Town & Country Village and north of Queensbury Lane.
- The 2008 EDR aerial photograph shows no significant change in the subject property.

B. USGS Topographic Maps

Historic and recent USGS topographic maps were obtained through EDR to identify changes in surface topography on and around the subject area over time. The USGS Topographic Maps are used to visually identify historic and current conditions on or near the subject property. Apparent conditions for each topographic map are summarized below, and reproductions of the maps are included in Appendix C.

- Year: 1918. Quad: Hillendahl, TX. Series: 7.5. Few roads exist, including Long Point Road, Katy Road, Jennetta Road, and portion of Gessner Road from Old Katy Road to Long Point. There is also minor residential presence surrounding the area of interest. Spring Branch creek and Rummel Creek are shown draining into Buffalo Bayou. The elevation along subject property is approximately 80 to 85 feet above sea level.
- Year: 1919. Quad: Addicks, TX. Series: 7.5. The topography of the subject property has not changed. Project area is still undeveloped.
- Year: 1955. Quad: Addicks, TX. Series: 15. Significant development appears in the vicinity, including the villages of Bunker Hill, Piney Point, Hunters Creek, Spring Valley, and Hedwig Village. Drainage improvements have been made in the vicinity, such as Briar Branch Ditch, which is located north of the subject property. Beltway 8 extends up to Katy Highway.
- Year: 1970. Quad: Hedwig Village, TX. Series: 7.5. Residential development continues to grow in the area. Railroad tracks are shown on the western adjoining property. Memorial City Shopping Center, a golf course, and some other commercial development appear along IH-10, which has been expanded into a 6-lane freeway. Buildings appear in the western adjoining property. The Town and Country Shopping Center appears along Beltway 8, which have expanded to northbound and southbound lanes.
- Year: 1982. Quad: Hedwig Village, TX. Series: 7.5. The subject property remains mostly unchanged, with the exception of new buildings along the IH-10 corridor. Bunker Hill Road has also expanded. There is continued growth for the Memorial City Shopping Center.
- Year: 1995. Quad: Hedwig Village, TX. Series: 7.5. The subject property remains mostly unchanged. The golf course is replaced with a building.

C. City Directories

Morrison & Fourmy's City Directory, Polk's City Directory, Southwestern Bell Yellow Pages, and Cole's Criss Cross Directory for the City of Houston were reviewed for this study and made available through EDR. Business directories including city, cross reference and telephone directories were reviewed, when available, at approximately 5 year intervals for the years spanning 1962 to 2004. Data obtained indicates when particular addresses came into existence, whether or not the property was (or is) vacant, and the names of occupying facilities. A review of the city directories, using select addresses along the subject property, did not reveal any significant information regarding past or present use. Copies of the city directory search results are included in Appendix D.

D. Sanborn Maps

The Sanborn Company began preparing maps of central business districts in the late nineteenth century for use by fire insurance companies. The Sanborn maps were updated periodically and expanded geographically through the twentieth century. These maps often indicate construction materials of specific building structures and the location of gasoline storage tanks. Based upon review of the statewide Sanborn Map index, no Sanborn Maps were found for the area of interest. The EDR's Sanborn map report can be found in Appendix D.

V. REGULATORY AGENCY RECORDS REVIEW

EDR was contracted to conduct a regulatory database review for the subject property. The database report, prepared by EDR and dated June 24, 2011, includes information on:

- Federal National Priority List (NPL) sites within 1.0 mile:
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites within 500 feet;
- CERCLIS sites designated No Further Remedial Action Planned (NFRAP) on or adjoining the subject property;
- Resource Conservation and Recovery Act (RCRA) Corrective Action Activity (CORRACTS) within 500 feet;
- Federal RCRA Treatment, Storage, and Disposal Facilities (TSDF) within 1.0 mile;
- RCRA generators on or adjoining the subject property;
- Emergency Response Notification System (ERNS) listings on the subject property;
- Texas Hazardous Waste Sites including state NPL, CERCLIS and Texas Voluntary Cleanup (VCP) sites within 0.5 mile;
- Leaking Petroleum Storage Tanks (LPSTs) within 500 feet; and
- Registered Underground Storage Tanks (USTs) on or adjoining the subject property.

The executive summary of the EDR database search is in Appendix E. The report in its entirety totals 481 pages. Reports on each of the RECs have been extracted from the full body of the EDR reports and follow the executive summaries. Some of the facilities have more than one report because the title or address was recorded slightly differently.

A. National Priority List (NPL)

The database research performed by EDR revealed no NPL sites within the 1-mile search radius.

B. Comprehensive Environmental Response and Compensation Liabilities Information System (CERCLIS)

The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) contains data on potentially hazardous waste sites, which are either proposed to or on the National Priorities List (NPL), and sites that are in the screening and assessment phase for inclusion on the NPL. The database research performed by EDR identified no CERCLIS sites within 500 feet of the subject property.

C. No Further Remedial Action Planned (NFRAP)

NFRAP sites are those where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund Action or NPL consideration. No NFRAP sites were located within 500 feet of the subject property.

D. Corrective Action Activity (CORRACTS)

CORRACTS is a list of handlers with RCRA Corrective Action Activity and shows which nationally-defined corrective action core events have occurred for every handler that has had corrective action activity. No CORRACTS sites are within 500 feet of the subject property.

E. Federal Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal Facilities (TSDF)

The Resource Conservation and Recovery Act (RCRA) oversee sites that generate, store, treat, or dispose of hazardous waste. Activities at these Treatment, Storage, and Disposal Facilities (TSDF) are tracked. No sites exist within 1.0 mile of the subject property.

F. RCRA Generators

The Resource Conservation and Recovery Act (RCRA) oversees sites that generate, store, treat, or dispose of hazardous waste. Generators are categorized by the amount of waste they generate: conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg. of acutely hazardous waste per month; small quantity generators (SQGs) generate between 100 kg. and 1,000 kg. of hazardous waste per month; and large quantity generators generate (LQG) over 1,000 kg. of hazardous waste or over 1 kg. of acutely hazardous waste per month. The database research performed by EDR identified zero (0) RCRA generator located on or adjoining the subject property.

G. Leaking Underground Storage Tanks (LTANKS)

The Leaking Underground Storage Tank incident reports contain an inventory of reported leaking underground storage tank incidents from the Texas Commission on Environmental Quality database. The database search performed by EDR revealed nine (9) LTANKS sites, which include:

- Goodson Yugo. 9702 Old Katy Rd. Status code: Final concurrence issued, case closed. Groundwater is affected.
- Phillips 66 Co 018424. 9669 Katy Rd. Status code: Final concurrence issued, case closed. Groundwater is affected.
- Bunker Hill Texaco. 995 Bunker Hill Rd. Status code: Final concurrence issued, case closed. Groundwater is affected.
- Pick N Pay 2 Shell. 1315 Blalock Rd. Status Code: Final concurrence issued, case closed. Groundwater is affected and a domestic water supply well is located within 0.25 and 0.5 miles of underground storage tank.
- Former Shell. 1314 Blalock Rd. Status code: Final concurrence issued, case closed. Assessment incomplete, no apparent threats or impacts to receptors.
- Lucky Gas Phillips 66. 9226 Katy Fwy. Status code: Final concurrence pending documentation of well plugging. Groundwater is affected and a domestic water supply well is located within 0.25 and 0.5 miles of underground storage tank.
- Buy the Way. 9342 Westview Dr. Status code: Final concurrence issued, case closed. Groundwater is affected and a domestic water supply well is located within 0.25 and 0.5 miles of underground storage tank.
- Target Store 17. 9429 Katy Fwy. Status code: Final concurrence pending documentation of well plugging. Groundwater is affected.
- Chevron 60108044. 9303 IH 10. Status code: Final concurrence issued, case closed. Groundwater is affected and a domestic water supply well is located within 0.25 miles of underground storage tank.

H. Underground Storage Tanks (UST)

The Underground Storage Tank (UST) Database contains registered USTs, which are regulated under Subtitle I of RCRA. The data comes from the Texas Commission on Environmental Quality database. The database search performed by EDR revealed zero (0) UST sites within 0.25 of subject property.

I. Emergency Response Notification System (ERNS)

The Emergency Response Notification System is a national computer database system that is used to store information reported releases of oil and hazardous substances into the environment. The database research performed by EDR did not find any ERNS sites listed on the subject property.

J. Texas Voluntary Cleanup Program Sites (TX VCP)

In 1995, the Texas legislature amended the Texas Solid Waste Disposal Act and created the Voluntary Cleanup Program. The voluntary cleanup program has focused on "brownfields," abandoned industrial or commercial sites in urban areas that have remained undeveloped because of contamination and fear of liability. The Texas Voluntary Cleanup Program operates in partnership with the EPA's Brownfields Initiative. EDR performed a search for TX VCP sites near the subject property in which four (4) were found.

- Daniel Measurement and Control. 9720 Old Katy Road. Phase: Conditional. VOC's, SVOCs, metals, chlorinated solvents, and TP contaminants were found in soils and groundwater. Currently there is a pump and treat system to assist with on-site remediation.
- Dilley's Dry Cleaner. 1304 Blalock Road, Suite F. Phase: Investigation. VOCs and chlorinated solvents have affected approximately 4.0 acres of soils and groundwater. A natural attenuation has been proposed to remedy the contamination.
- Hurricane Steel Industries. 9600 Old Katy Rd. Phase: Completed. Metal contaminants were found in soils and groundwater. A certificate of completion was granted on February 4, 2003.
- Echo Lane Shopping Center. 9309 - 9363 Katy Freeway. Phase: Completed. Chlorinated solvents affected the soils and groundwater. The site was excavated to remove contaminants. A certificate of completion was granted on April 7, 2000.

K. Solid Waste Municipal Landfill

The database research performed by EDR revealed no Solid Waste Municipal Landfill sites with 500 feet of the subject property.

L. Aboveground Storage Tanks (AST)

The database research performed by EDR found no aboveground storage tank sites within the search radius.

VI. SITE RECONNAISSANCE

A partial walk-through site reconnaissance was completed on July 1, 2011. The weather was hot and humid. A photographic overview can be found in Appendix F.

A. Methodology and Limiting Conditions

Site reconnaissance was completed in the form of a walk-through survey. One limiting condition included obtaining access of fenced in areas in the subject property.

B. Observations Made During Site Reconnaissance

All sites listed with potential concern in the regulatory agency review were verified. Visual inspection of the sites to identify any past activities or new development that may pose an environmental threat to the subject property was limited due to restricted areas.

The following table provides a summary of the items observed during the Site Reconnaissance. No problematic evidence was noted.

Category	Item or Feature	Item or Feature Observed
Aboveground Chemical or Waste Storage	Evidence of aboveground storage tanks	
	Drums, barrels and containers greater than 5 gallons	
Underground Chemical or Waste Storage, Drainage or Collection Systems	Evidence of underground storage tanks or ancillary UST equipment	
	Sumps, cisterns, catch basins and/or drywalls	
	Septic tanks and/or leach fields	
	Pipeline markers	
Electrical Transformers/PCB's	Pad or pole mounted transformers	
Evidence of Releases or Potential Releases	Stressed vegetation	
	Stained soil	
	Stained pavement or similar service	
	Trash, debris and/or other waste materials	X
	Dumping or disposal areas	X
	Construction/demolition debris and/or dumped fill dirt	X
	Surface water discoloration, odor, sheen and/or floating free product	
	Strong, pungent or noxious odors	
Other Notable Site Features	Surface water bodies	
	Quarries or pits	
	Monitoring wells	X

During the site visit, a Costco Gasoline Station was identified adjacent to the subject property. Two monitoring wells were located close to the underground gasoline storage tank. The capacity of the underground storage tank is unknown. No impact is anticipated from this site.

A photographic overview of the site reconnaissance is included in Appendix F.

VIII. INTERVIEWS

A. Interviews with Government Officials

A written inquiry was made to Nekiea (Nikki) Corpening of the City of Houston Fire Department regarding documented hazardous material incidents on or adjacent to the subject alignment. The Hazmat Chemical Release database list provided showed nine possible sites with hazardous material incidents since November 2003. All sites were outside a ½ mile radius of the subject property or were a "turn-around" incident. Ms. Phillips of the City of Houston Department of Health and Human Services was also contacted. Written correspondence returned no incidents found. Correspondence with these government officials can be found in Appendix G.

B. Interviews with Owners/Operators

Ms. Tammie Porch with Texas Commission on Environmental Quality (TCEQ) was contacted to request records information on the following sites:

- Hurricane Steel Industries. 9600 Old Katy Road. TXVCP
- Daniel Measurement and Control. 9720 Old Katy Road. TXVCP
- Goodson Yugo. 9702 Old Katy Rd. LPST.

No pertinent records were found.

The property owner made the following report available for review: Phase I ESA Update for Business Park and & Vacant Land 9446, 9444, and 9440 Old Katy Road by Fugro Environmental, dated 1996. The report summarized previous environmental investigations that were completed on the subject property, and additional sampling was performed.

- A Limited Subsurface Investigation (Report No. 50-280-91) dated March 1991 included two (2) soil borings and one (1) monitoring well taken along the western boundary of the subject property. No VOCs were detected in the soil samples. Barium, Chromium, & Mercury were detected in the soil at MW-1 and SB-1, but were below reporting limits. Chromium was found in the groundwater in MW-1 at a concentration of 0.09 mg/L, which was above the MCL of 0.05 mg/L. Barium was found in the groundwater at a concentration of 0.53 mg/L, which was below the MCL of 2.0 mg/L.

- An ESA Update dated June 1993 (Report No. 505193-372) indicated that heavy metals were below detection limits in the groundwater, with the exception of Barium, which was found at a concentration of 0.501 mg/L (below the MCL of 2.0 mg/L).

- The Fugro Phase I ESA Update performed groundwater sampling at MW-1 on March 28, 1996. Barium and lead concentrations were 0.07 and 0.006 mg/L, respectively, both of which were below MCLs. Concentrations of Arsenic, Cadmium, Chromium, Mercury, Selenium, and Silver were not found.

For a comparison of sampling results, refer to Table 1: Summary of Groundwater Sampling from Existing Monitoring Well at Proposed W140 Detention Basin Property (see Section IX. Groundwater Sampling).

Notes and relevant documentation are included in Appendix G.

IX. GROUNDWATER SAMPLING

LAN contracted Geotest Engineering, Inc. to perform groundwater sampling for Barium, Chromium, Lead, and Mercury. Groundwater samples were collected from the existing monitoring well at the subject property on July 18, 2011.

The constituents tested were below the MCLs published by the Environmental Protection Agency's National Primary Drinking Water Regulations and TCEQ's Drinking Water Standards (30 TAC 290.104). Although they were below MCLs, concentrations of Barium, Lead, and Chromium were detected in the groundwater samples.

The table below provides a summary of samples and concentrations collected from the existing monitoring well.

Table 1. Summary of Groundwater Sampling from Existing Monitoring Well at Proposed W140 Detention Basin Property

		Sample Date: 3/1991		Sample Date: 6/1993		Sample Date: 3/28/1996		Sample Date: 7/18/2011	
Contaminant	**2011 MCL (mg/L)**	**Sample (mg/L)**	**Note**	**Sample (mg/L)**	**Note**	**Sample (mg/L)**	**Note**	**Sample (mg/L)**	**Note**
Barium	2.00	0.53	Below 1991 MCL	0.201	Below 1996 MCL (2.0 mg/L)	0.07	Below 1996 MCL	0.319	Below 2011 MCL
Chromium	0.10	0.09	Above 1991 MCL (0.05 mg/L)	-	-	-	Not Found	0.0101	Below 2011 MCL
Lead	0.015	-	-	-	-	0.006	Below 1996 MCL	0.00857	Below 2011 MCL
Mercury	0.002	-	-	-	-	-	Not Found	-	Below Reporting Limit

The lab results collected by Geotest Engineering, Inc. from the existing monitoring well on July 18, 2011 are included in Appendix G.

X. FINDINGS AND CONCLUSIONS

LAN has performed a Phase I ESA of the subject property in conformance with the scope and limitations of ASTM Practice E 1527-00 and the City of Houston Department of Public Works and Engineering ECRE Standard Practices for ESAs. Any exceptions to or deletions from this practice are described in Section II C of this report. This assessment revealed three (3) RECs in connection with the subject project.

A summary below provides recommendations regarding further investigations of the findings/potential RECs:

- Hurricane Steel Industries. 9600 Old Katy Rd. **TXVCP**. Phase: Completed. Metal contaminants were found in soils and groundwater. A certificate of completion was granted on February 4, 2003. A groundwater sample was collected from the existing monitoring well on the subject property, and Barium, Chromium, Mercury, and Lead were below Maximum Contaminant Levels. Based on the available information, and since the soil has been affected **further investigation is recommended.**
- Daniel Measurement and Control. 9720 Old Katy Road. **TXVCP**. Phase: Conditional. VOC's, SVOCs, metals, and chlorinated solvents contaminants were found in soils and groundwater. Currently there is a pump and treat system to assist with on-site remediation. Because the site is outside ½ mile radius, no impact is anticipated. **No further investigation is recommended.**
- Goodson Yugo. 9702 Old Katy Rd. **LPST**. Status code: Final concurrence issued, case closed. Groundwater is affected. Because the site is outside ½ mile radius, no impact is anticipated. **No further investigation is recommended.**

Although groundwater sampling results were below maximum contaminant levels, the possibility of soil contamination still exists. For the purpose of the detention basin construction, Phase II soil sampling on the subject property is recommended to determine soil handling and disposal requirements.

IX. REFERENCES

Aerial Photograph, ASCS 1953.

Aerial Photograph, USGS 1968.

Aerial Photograph, TxDOT 1979.

Aerial Photograph, TxDOT 1989.

Aerial Photograph, USGS 1995.

Aerial Photograph, USDA 2004.

Aerial Photograph, EDR 2005.

Aerial Photograph, EDR 2008.

EDR, Inc. June 24, 2011. W140 Detention Pond Report prepared for Lockwood, Andrews & Newnam, Inc.

Federal Emergency Management Agency (FEMA), June 18, 2007. Flood Insurance Rate Map Number 48201C0645L, Harris County, Texas and Incorporated Areas.

U.S. Department of the Interior, Geological Survey. USGS, Denver CO.

- Year: 1918. Quad: Hillendahl, TX. Series: 7.5.
- Year: 1919. Quad: Addicks, TX. Series: 15.
- Year: 1955. Quad: Addicks, TX. Series 15.
- Year: 1970. Quad: Hedwig Village, TX Series: 7.5.
- Year: 1982. Quad: Hedwig Village, TX. Series: 7.5.
- Year: 1995. Quad: Hedwig Village, TX. Series: 7.5.

National Resources Conservation Service, United States Department of Agriculture, July 6, 2011. Custom Soil Resource Report for Harris County, Texas.

X. LIST OF PREPARERS

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PHASE II ENVIRONMENTAL SITE ASSESSMENT
MEMORIAL CITY REDEVELOPMENT AUTHORITY
W140 DETENTION BASIN
LAN PROJECT NO. 130-10384-011-112
HOUSTON, TEXAS

DRAFT

Reported to:

LOCKWOOD, ANDREWS & NEWNAM, INC.

Houston, Texas

Submitted by:

GEOTEST ENGINEERING, INC.

Houston, Texas

REPORT NO. 1130015101, dated October 21, 2011

Key Map Nos. 450 C & 490 B

GEOTEST ENGINEERING, INC.
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Report No. 1130015101
DRAFT
October 21, 2011

Mr. Muhammad M. Ali, P.E.
Lockwood, Andrews & Newnam, Inc.
2929 Briarpark Drive, Suite 400
Houston, Texas 77042

Reference: **Phase II Environmental Site Assessment (ESA)**
Memorial City Redevelopment Authority
W140 Detention Pond
LAN Project No. 130-10384-011-112
Houston, Texas

Dear Mr. Ali:

We are pleased to submit the Phase II Environmental Site Assessment draft report for the referenced project. This study was authorized by Notice to Proceed Letter dated September 19, 2011 and Task Order No. 899/2 by accepting our proposal No. 1130022999 dated August 16, 2011.

We appreciate the opportunity to be of service to you. If we can be of further assistance, please call us.

Sincerely,
GEOTEST ENGINEERING, INC.
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Naresh Kolli, E.I.T.
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THIS PRELIMINARY DOCUMENT IS FOR INTERIM REVIEW AND NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

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1.0 EXECUTIVE SUMMARY

A Phase II Environmental Site Assessment (the study) was conducted for Lockwood, Andrews & Newnam, Inc. for the W140 Detention Basin in Houston, Texas. This study is in reference to the existing monitoring well located on the proposed W140 detention basin site.

This study was based on the ASTM guidelines for Phase II Environmental Site Assessment, designation ASTM 1903-97 (2002) and modified by City of Houston Department of Public Works and Engineering Design Manual, Chapter 11 – Geotechnical and Environmental Requirements Subsection, Phase II Environmental Requirements, dated July 1, 2011. The purpose of this study is to evaluate the presence of heavy metals contamination in soil and groundwater around the existing monitoring well at the proposed W140 detention basin site.

This study included drilling and continuous sampling three (3) environmental borings to depths ranging from 13 to 17 feet, screen each soil sample in the field for the presence of volatile compounds using a photoionization detector (PID), performing analytical tests on soil and water samples (if encountered) recovered from the borings, performing laboratory testing on collected samples and preparation of a report documenting the field investigation and analytical test results

The principal findings and conclusions developed from this study are summarized below:

- The field screening indicated no organic vapors for the soil samples.
- No groundwater was encountered in all the borings performed during this study.
- Three selected soil samples were tested for RCRA metals including, Mercury, Arsenic, Barium, Cadmium, Chromium, Lead, Selenium and Silver.
- Based on the results of analytical testing, the metals Arsenic, Barium, Cadmium, Chromium and Lead were detected in laboratory tests in borings EB-1 through EB-3. The contaminants Arsenic in borings EB-1 and EB-3 and Lead in borings EB-1 through

EB-3 exceeded the TCEQ TRRP TIER 1 PCLs for residential guidelines (based on Tier 1 Residential Soil PCLs on 0.5-acre source area and $^{GW}soil_{ing}$ exposure pathway).

2.0 INTRODUCTION

2.1 General

A Phase II Environmental Site Assessment (the study) was conducted for Lockwood, Andrews & Newnam, Inc. for the W140 Detention Basin in Houston, Texas. This study is in reference to the existing monitoring well located on the proposed W140 detention basin site.

The project location map is shown on Figure 1.

This study was authorized by Notice to Proceed Letter dated September 19, 2011 and Task Order No. 899/2 by accepting our proposal No. 1130022999 dated August 16, 2011.

2.2 Objectives

The objectives of this study are to evaluate the presence of heavy metals contamination in soil and groundwater (if encountered) around the existing monitoring well at the proposed W140 detention basin site. This study was performed in general accordance with ASTM guidelines for Phase II Environmental Site Assessment, designation ASTM 1903-97 (2002) and modified by City of Houston Department of Public Works and Engineering Design Manual, Chapter 11 – Geotechnical and Environmental Requirements Subsection, Phase II Environmental Requirements, dated July 1, 2011.

2.3 Scope of the Study

The scope will consist of the following:

- Drilling and continuously sampling three (3) environmental borings utilizing Geoprobe, with two (2) borings to a depth of 17 feet and one (1) boring to a depth of 13 feet;
- Screening each soil sample for the presence of organic vapor using a photoionization detector (PID);
- develop 1-inch temporary monitoring wells for groundwater (if encountered) sampling

and then plug and abandon;

- Conducting analytical tests on selected one (1) soil sample from each boring and one (1) ground water sample (if encountered) from each location;
- Preparing a Phase II environmental site assessment report documenting the field investigation and analytical test results.

2.4 Special Terms and Conditions

There were no special terms or conditions.

2.5 Limitations and Exceptions of Assessment

The scope of this Phase II ESA is limited to matters expressly described herein. In preparing this report, Geotest has relied upon the information derived from secondary sources. All findings and conclusions stated in this report are based upon the facts and circumstances as they existed at the time this report was prepared (e.g., Federal, State and Local Laws, Rules, Regulations and other matters that Geotest deemed relevant). A change in any facts or circumstances upon which this report was based may affect the findings expressed herein.

The subsurface conditions described in this report and the results of analytical tests are based on three (3) completed borings drilled at specific locations. However, variation in soil conditions and level of contamination, if any, may occur between the completed borings. The depth of the groundwater level may vary with changes in environmental conditions such as frequency and magnitude of rainfall.

2.6 Limiting Conditions and Methodology Used

This Phase II ESA is limited to the data derived from the soil borings and the laboratory tests performed on the samples recovered from the project site. Following this section of the report, Section 3 provides a subsurface investigation; Section 4 describes the laboratory analytical program, Section 5 describes the data evaluation and Section 6 contains references.

3.0 SUBSURFACE INVESTIGATION

3.1 Field Investigation Methodologies

The field investigation methodology takes into consideration the potential distributions of contaminants with respect to the properties, behaviors and fate and transport characteristics of the contaminant in a setting such as that being assessed. The sampling plan was designed to provide for the collection of potentially contaminated environmental media, if they occur, at locations and depths where the highest concentrations are likely to occur.

These investigation methodologies were developed in general accordance with ASTM Standard D 5730: Guide to Site Characteristics for Environmental Purposes with Emphasis on Soil, Rock, The Vadose Zone and Groundwater (Reference 1).

Personal health and safety precautions were followed in accordance with applicable federal and state laws or local equivalents and any requirements imposed by the owner, occupant or field personnel.

No test pits were excavated as part of this Phase II ESA study.

The field investigation includes drill and continuously sample three (3) environmental borings (designated as EB-1 through EB-3). All the boring locations are shown on Figure 2, Plan of Borings.

In each boring, geoprobe tubes were pushed to collect samples. At the start of the each boring, all sampling tools were decontaminated with a phosphate-free Liquid-Nox detergent, followed by a Freon rinse and a final deionized water rinse to reduce possible sample cross-contamination. The sampling tools, however, were decontaminated after every sample recovery. After extrusion, the soil samples were placed in EPA-approved laboratory-provided glass jars. All the samples were then placed in a small cooler with ice.

Geotest's representative visually field-classified the recovered soil samples. Notations of soil type, color and odor, if present, were recorded on the soil boring logs. Soil classifications presented

on the log of borings are based on visual field classification and have not been verified by geotechnical laboratory soil testing. All the borings were grouted with cement-bentonite grout at the end of drilling.

The environmental boring logs are presented on Figures A-1 through A-3 in Appendix A. A key to symbols and terms used on the boring logs is presented on Figure A-4 in Appendix A.

During the field investigation, field screening for organic vapor concentrations was performed on all soil samples recovered from the borings. The measurements were made in the field with a benzene-calibrated, HNU DL-101 Photo-Ionization Detector (PID) equipped with a 10.2 eV lamp. Results of the field PID screening are summarized as "Field Screening – Organic Vapor" on the boring logs presented on Figures A-1 through A-3 in Appendix A.

Since no groundwater was encountered during drilling, temporary monitoring wells were not installed in the borings for this study.

4.0 LABORATORY ANALYTICAL PROGRAM

4.1 Chemical Testing Plan

All soil samples were screened in the field for organic vapors with a Photo-Ionization Detector (PID). Three (3) soil samples were selected for the analytical testing. The analytical testing included RCRA metals including Mercury, Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, and Silver. The results are presented in Appendix B.

4.2 Sampling and Chemical Analyses and Methods

4.2.1 Soil. Soil samples were obtained by pushing a geoprobe tube. After extrusion, the soil samples were collected and placed in EPA-approved laboratory-provided glass jars and then placed in a portable ice cooler with ice. One soil sample from each boring (based on excavation depth of detention basin) was selected for analytical testing. The samples selected for analytical testing are given below.

Boring No.	Sample No	Depth, ft
EB-1	S-8	14-16
EB-2	S-7	12-14
EB-3	S-6	10-12

The analytical tests and corresponding test methods are listed below.

Mercury	SW-846 7471 A
Metals	SW846 6010B Sub: T104704295-TX

The samples were transported along with the chain-of-custody documentation to XENCO Laboratories in Houston, Texas for analytical testing.

4.2.2 Groundwater. No groundwater was encountered in the borings performed for this study and hence no testing was performed.

5.0 DATA EVALUATION

5.1 Subsurface Conditions

5.1.1 Geologic Setting. Based on the Geologic Atlas of Texas - Houston Sheet, the project area is in the Beaumont Formation. The clays and sands of this formation are overconsolidated as a result of desiccation or frequent raising and lowering of the sea level and subsequently the groundwater table. Consequently, clays of this formation have moderate to high shear strength and relatively low compressibility. Sands of the Beaumont Formation are typically very fine and often silty. Further there is evidence in the Houston area of the occurrence of cemented material (sandstone and siltstone) deposits within the Beaumont Formation.

5.1.2 Hydrogeologic Conditions. There are three major water-producing components in the region; Chicot (shallowest), Evangeline and Jasper (deepest) aquifers. The Chicot and Evangeline aquifers have base altitudes as deep as 600 and 1,500 feet below mean sea level, respectively. Most of the groundwater usage in the region is supplied by the Chicot and Evangeline aquifers. The permeability of the subsurface soils ranges from low permeable sandy lean clay and lean clay to very low permeable fat clay. The general groundwater flow in the area is typically from northwest to southeast.

5.1.3 Verification of Conceptual Site Model. The conceptual site model and sampling plan developed for the site were verified during the Phase II ESA assessment activities. The Quality Assurance (QA)/Quality Control (QC) procedures described in the chemical testing plan were adequate to verify the data acceptability.

5.2 Analytical Data

5.2.1 Soil. Based on the results of analytical testing, the metals Arsenic, Barium, Cadmium, Chromium and Lead were detected in laboratory tests in borings EB-1 through EB-3. The contaminants Arsenic in borings EB-1 and EB-3 and Lead in borings EB-1 through EB-3 exceeded the TCEQ TRRP TIER 1 PCLs for residential guidelines (based on Tier 1 Residential Soil PCLs on

0.5-acre source area and $^{GW}soil_{ing}$ exposure pathway).

A summary of analytical test results and the TIER 1 PCLs are presented in Table 1. Soil contamination levels were based on TCEQ RG-366/TRRP-23, revised on March 25, 2009 regulatory guidance document that includes TIER 1 PCLs for residential guidelines (using 0.5-acre source area and $^{GW}soil_{ing}$ exposure pathway) (Reference 2). Details of analytical test results are presented in Appendix B.

5.2.2 Groundwater. No groundwater was encountered in the borings performed for this study and hence no testing was performed.

6.0 REFERENCES

1. ASTM Standard D 5730 Guide to Site Characteristics for Environmental Purposes with Emphasis on Soil, Rock, the Vadose Zone and Groundwater.

2. TCEQ (TNRCC) Regulatory Guidance-Remediation Division-RG-366/TRRP- Tier 1 PCL Tables March 25, 2009.

TABLES

TABLE 1

SUMMARY OF ANALYTICAL TEST RESULTS FOR METALS (Soil)

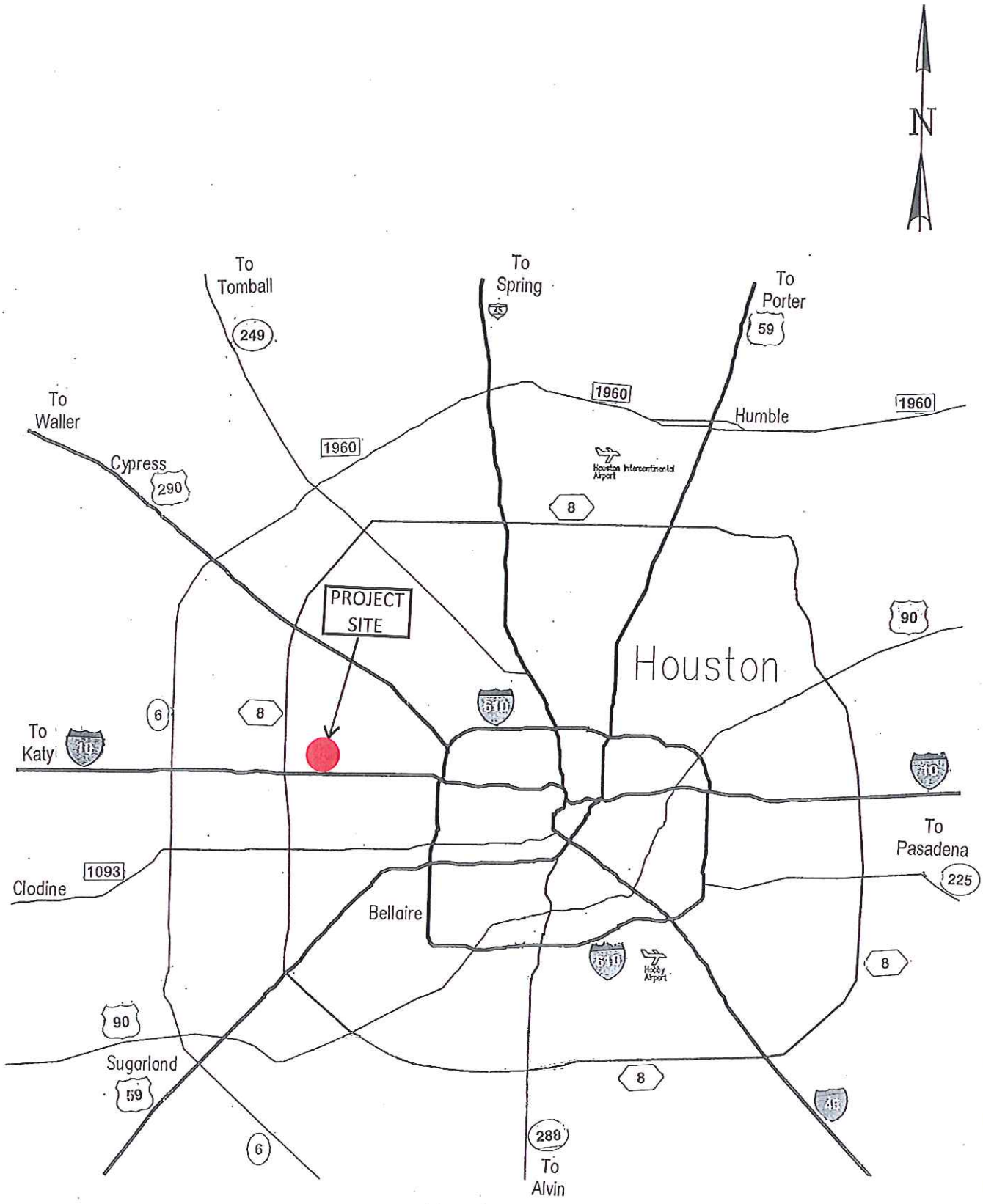
LOCATION (See Figure 2)		TCEQ TRRP TIER 1 Soil PCLs (mg/kg)	Mercury (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
Boring No.	**Sample Depth, ft**	**Residential** [1]	*0.07*	*5.9*	*300*	*1.5*	*240*	*3.0*	*2.3*	*0.48*
EB-1	14-16		<0.06	**12.2**	62.6	<0.28	6.77	**11.7**	<0.564	<0.226
EB-2	12-14		<0.06	3.69	91.2	0.335	5.32	**6.85**	<0.540	<0.216
EB-3	10-12		<0.06	**14.2**	110	<0.26	9.30	**23.4**	<0.517	<0.201

Note: Value in **BOLD** shows exceeds the TCEQ TRRP TIER 1 PCLs
Details of these tests are provided in Appendix B.

(1) TCEQ TRRP TIER 1 PCLS For 0.5 acre source area and $^{GW}soil_{ing}$ exposure pathway

ILLUSTRATIONS

Job No. 1130015101

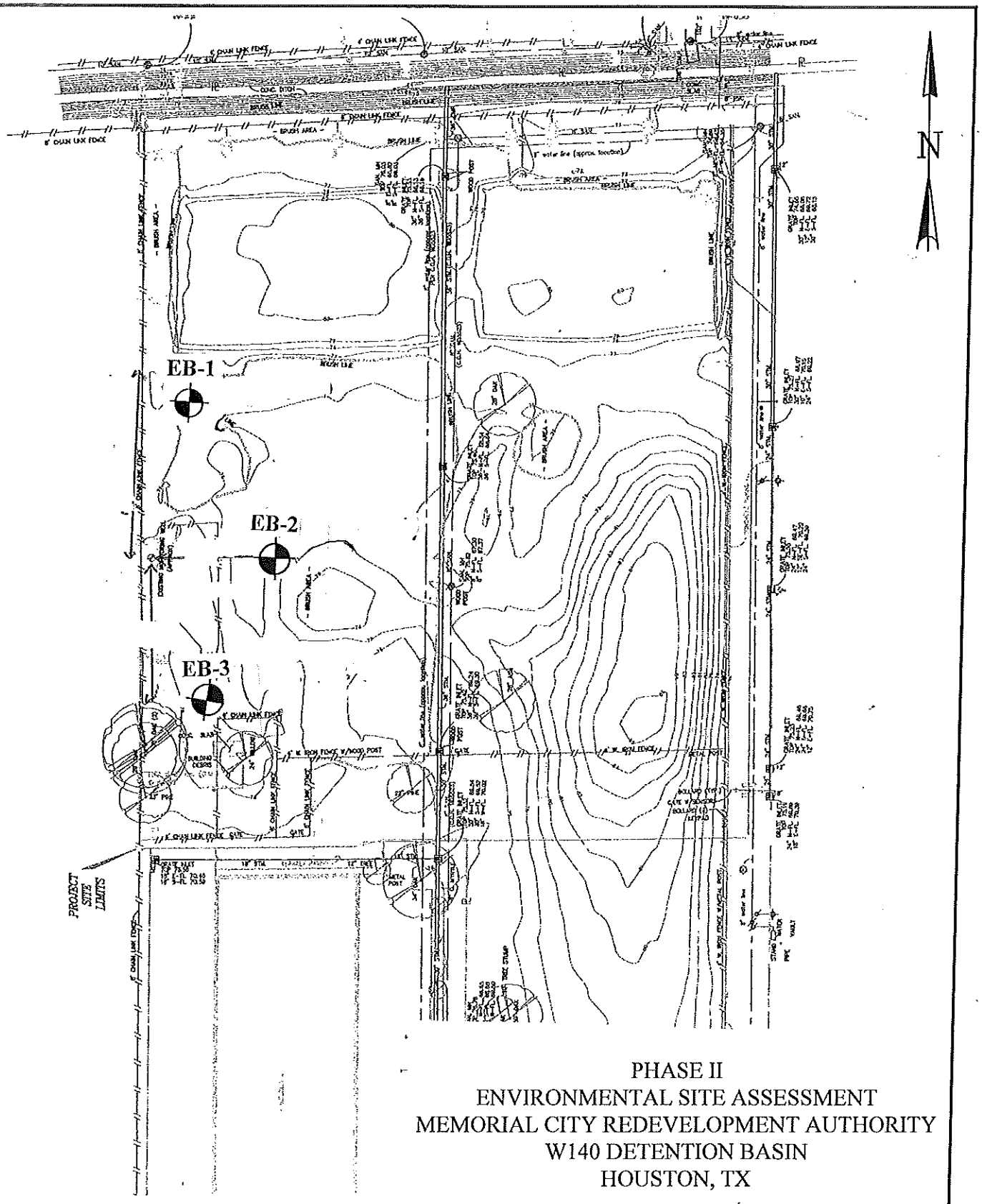


PROJECT LOCATION MAP

(NOT TO SCALE)

Key Map No. 450 X and 490 B

Job No. 1130015101



PHASE II
ENVIRONMENTAL SITE ASSESSMENT
MEMORIAL CITY REDEVELOPMENT AUTHORITY
W140 DETENTION BASIN
HOUSTON, TX

PLAN OF BORINGS

LEGEND

Boring

0 30 60 90 120

SCALE IN FEET

Geotest Engineering, Inc.

FIGURE 2

PHASE II ENVIRONMENTAL SITE ASSESSMENT
MEMORIAL CITY REDEVELOPMENT AUTHORITY
W140 DETENTION BASIN
LAN PROJECT NO. 130-10384-011-112
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DRAFT

Reported to:

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Key Map Nos. 450 C & 490 B

GEOTEST ENGINEERING, INC.
Geotechnical Engineers & Materials Testing
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Report No. 1130015101
DRAFT
October 21, 2011

Mr. Muhammad M. Ali, P.E.
Lockwood, Andrews & Newnam, Inc.
2929 Briarpark Drive, Suite 400
Houston, Texas 77042

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Memorial City Redevelopment Authority
W140 Detention Pond
LAN Project No. 130-10384-011-112
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2.3 Scope of the Study

The scope will consist of the following:

- Drilling and continuously sampling three (3) environmental borings utilizing Geoprobe, with two (2) borings to a depth of 17 feet and one (1) boring to a depth of 13 feet;
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There were no special terms or conditions.

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The scope of this Phase II ESA is limited to matters expressly described herein. In preparing this report, Geotest has relied upon the information derived from secondary sources. All findings and conclusions stated in this report are based upon the facts and circumstances as they existed at the time this report was prepared (e.g., Federal, State and Local Laws, Rules, Regulations and other matters that Geotest deemed relevant). A change in any facts or circumstances upon which this report was based may affect the findings expressed herein.

The subsurface conditions described in this report and the results of analytical tests are based on three (3) completed borings drilled at specific locations. However, variation in soil conditions and level of contamination, if any, may occur between the completed borings. The depth of the groundwater level may vary with changes in environmental conditions such as frequency and magnitude of rainfall.

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This Phase II ESA is limited to the data derived from the soil borings and the laboratory tests performed on the samples recovered from the project site. Following this section of the report, Section 3 provides a subsurface investigation; Section 4 describes the laboratory analytical program, Section 5 describes the data evaluation and Section 6 contains references.

3.0 SUBSURFACE INVESTIGATION

3.1 Field Investigation Methodologies

The field investigation methodology takes into consideration the potential distributions of contaminants with respect to the properties, behaviors and fate and transport characteristics of the contaminant in a setting such as that being assessed. The sampling plan was designed to provide for the collection of potentially contaminated environmental media, if they occur, at locations and depths where the highest concentrations are likely to occur.

These investigation methodologies were developed in general accordance with ASTM Standard D 5730: Guide to Site Characteristics for Environmental Purposes with Emphasis on Soil, Rock, The Vadose Zone and Groundwater (Reference 1).

Personal health and safety precautions were followed in accordance with applicable federal and state laws or local equivalents and any requirements imposed by the owner, occupant or field personnel.

No test pits were excavated as part of this Phase II ESA study.

The field investigation includes drill and continuously sample three (3) environmental borings (designated as EB-1 through EB-3). All the boring locations are shown on Figure 2, Plan of Borings.

In each boring, geoprobe tubes were pushed to collect samples. At the start of the each boring, all sampling tools were decontaminated with a phosphate-free Liquid-Nox detergent, followed by a Freon rinse and a final deionized water rinse to reduce possible sample cross-contamination. The sampling tools, however, were decontaminated after every sample recovery. After extrusion, the soil samples were placed in EPA-approved laboratory-provided glass jars. All the samples were then placed in a small cooler with ice.

Geotest's representative visually field-classified the recovered soil samples. Notations of soil type, color and odor, if present, were recorded on the soil boring logs. Soil classifications presented

on the log of borings are based on visual field classification and have not been verified by geotechnical laboratory soil testing. All the borings were grouted with cement-bentonite grout at the end of drilling.

The environmental boring logs are presented on Figures A-1 through A-3 in Appendix A. A key to symbols and terms used on the boring logs is presented on Figure A-4 in Appendix A.

During the field investigation, field screening for organic vapor concentrations was performed on all soil samples recovered from the borings. The measurements were made in the field with a benzene-calibrated, HNU DL-101 Photo-Ionization Detector (PID) equipped with a 10.2 eV lamp. Results of the field PID screening are summarized as "Field Screening – Organic Vapor" on the boring logs presented on Figures A-1 through A-3 in Appendix A.

Since no groundwater was encountered during drilling, temporary monitoring wells were not installed in the borings for this study.

4.0 LABORATORY ANALYTICAL PROGRAM

4.1 Chemical Testing Plan

All soil samples were screened in the field for organic vapors with a Photo-Ionization Detector (PID). Three (3) soil samples were selected for the analytical testing. The analytical testing included RCRA metals including Mercury, Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, and Silver. The results are presented in Appendix B.

4.2 Sampling and Chemical Analyses and Methods

4.2.1 Soil. Soil samples were obtained by pushing a geoprobe tube. After extrusion, the soil samples were collected and placed in EPA-approved laboratory-provided glass jars and then placed in a portable ice cooler with ice. One soil sample from each boring (based on excavation depth of detention basin) was selected for analytical testing. The samples selected for analytical testing are given below.

Boring No.	Sample No	Depth, ft
EB-1	S-8	14-16
EB-2	S-7	12-14
EB-3	S-6	10-12

The analytical tests and corresponding test methods are listed below.

Mercury	SW-846 7471 A
Metals	SW846 6010B Sub: T104704295-TX

The samples were transported along with the chain-of-custody documentation to XENCO Laboratories in Houston, Texas for analytical testing.

4.2.2 Groundwater. No groundwater was encountered in the borings performed for this study and hence no testing was performed.

5.0 DATA EVALUATION

5.1 Subsurface Conditions

5.1.1 Geologic Setting. Based on the Geologic Atlas of Texas - Houston Sheet, the project area is in the Beaumont Formation. The clays and sands of this formation are overconsolidated as a result of desiccation or frequent raising and lowering of the sea level and subsequently the groundwater table. Consequently, clays of this formation have moderate to high shear strength and relatively low compressibility. Sands of the Beaumont Formation are typically very fine and often silty. Further there is evidence in the Houston area of the occurrence of cemented material (sandstone and siltstone) deposits within the Beaumont Formation.

5.1.2 Hydrogeologic Conditions. There are three major water-producing components in the region; Chicot (shallowest), Evangeline and Jasper (deepest) aquifers. The Chicot and Evangeline aquifers have base altitudes as deep as 600 and 1,500 feet below mean sea level, respectively. Most of the groundwater usage in the region is supplied by the Chicot and Evangeline aquifers. The permeability of the subsurface soils ranges from low permeable sandy lean clay and lean clay to very low permeable fat clay. The general groundwater flow in the area is typically from northwest to southeast.

5.1.3 Verification of Conceptual Site Model. The conceptual site model and sampling plan developed for the site were verified during the Phase II ESA assessment activities. The Quality Assurance (QA)/Quality Control (QC) procedures described in the chemical testing plan were adequate to verify the data acceptability.

5.2 Analytical Data

5.2.1 Soil. Based on the results of analytical testing, the metals Arsenic, Barium, Cadmium, Chromium and Lead were detected in laboratory tests in borings EB-1 through EB-3. The contaminants Arsenic in borings EB-1 and EB-3 and Lead in borings EB-1 through EB-3 exceeded the TCEQ TRRP TIER 1 PCLs for residential guidelines (based on Tier 1 Residential Soil PCLs on

0.5-acre source area and $^{GW}soil_{ing}$ exposure pathway).

A summary of analytical test results and the TIER 1 PCLs are presented in Table 1. Soil contamination levels were based on TCEQ RG-366/TRRP-23, revised on March 25, 2009 regulatory guidance document that includes TIER 1 PCLs for residential guidelines (using 0.5-acre source area and $^{GW}soil_{ing}$ exposure pathway) (Reference 2). Details of analytical test results are presented in Appendix B.

5.2.2 Groundwater. No groundwater was encountered in the borings performed for this study and hence no testing was performed.

6.0 REFERENCES

1. ASTM Standard D 5730 Guide to Site Characteristics for Environmental Purposes with Emphasis on Soil, Rock, the Vadose Zone and Groundwater.

2. TCEQ (TNRCC) Regulatory Guidance-Remediation Division-RG-366/TRRP- Tier 1 PCL Tables March 25, 2009.

TABLES

TABLE 1

SUMMARY OF ANALYTICAL TEST RESULTS FOR METALS (Soil)

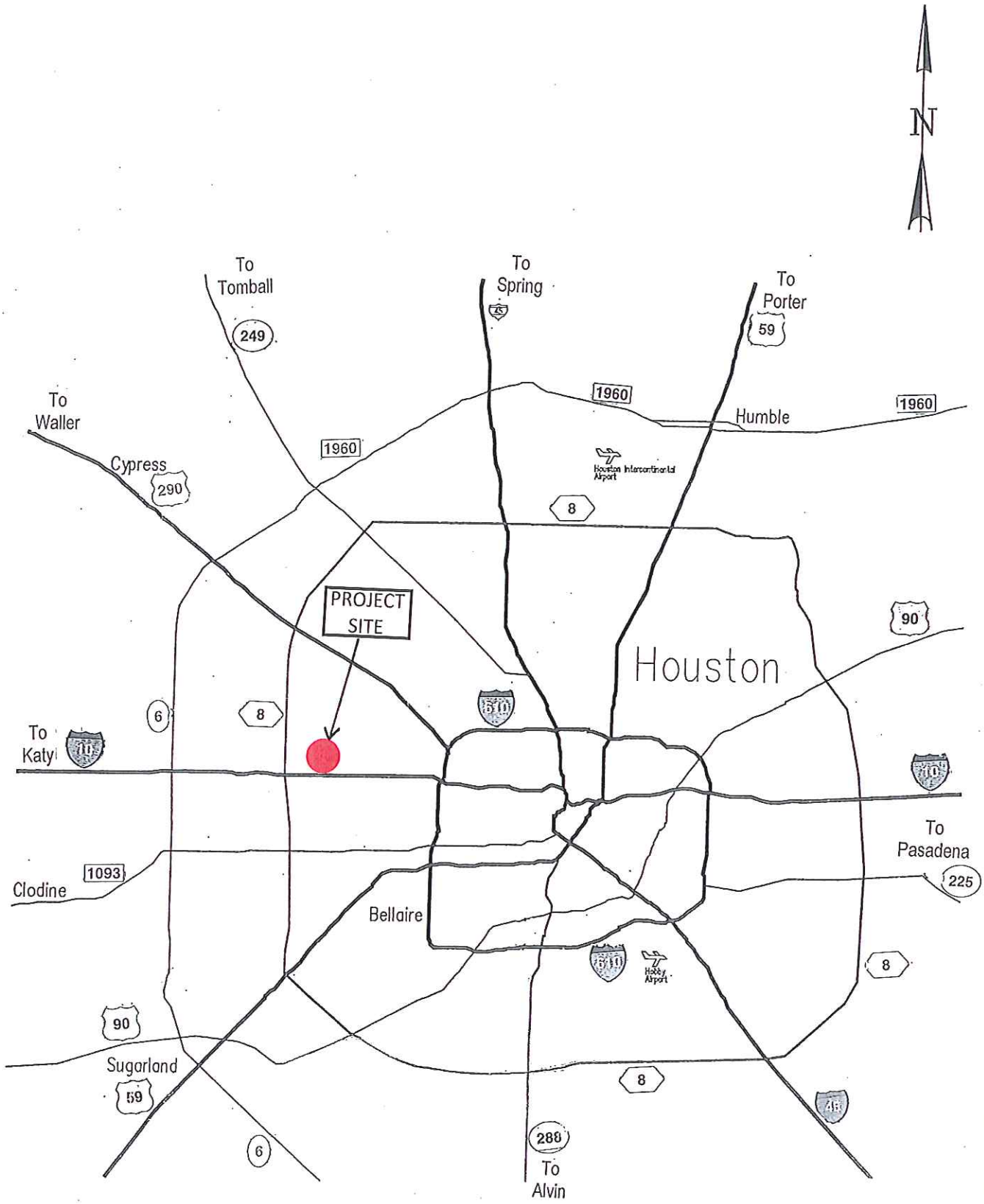
LOCATION (See Figure 2)		TCEQ TRRP TIER 1 Soil PCLs (mg/kg)	Mercury (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
Boring No.	**Sample Depth, ft**	**Residential** [1]	*0.07*	*5.9*	*300*	*1.5*	*240*	*3.0*	*2.3*	*0.48*
EB-1	14-16		<0.06	**12.2**	62.6	<0.28	6.77	**11.7**	<0.564	<0.226
EB-2	12-14		<0.06	3.69	91.2	0.335	5.32	**6.85**	<0.540	<0.216
EB-3	10-12		<0.06	**14.2**	110	<0.26	9.30	**23.4**	<0.517	<0.201

Note: Value in **BOLD** shows exceeds the TCEQ TRRP TIER 1 PCLs
Details of these tests are provided in Appendix B.

(1) TCEQ TRRP TIER 1 PCLS For 0.5 acre source area and $^{GW}soil_{ing}$ exposure pathway

ILLUSTRATIONS

Job No. 1130015101

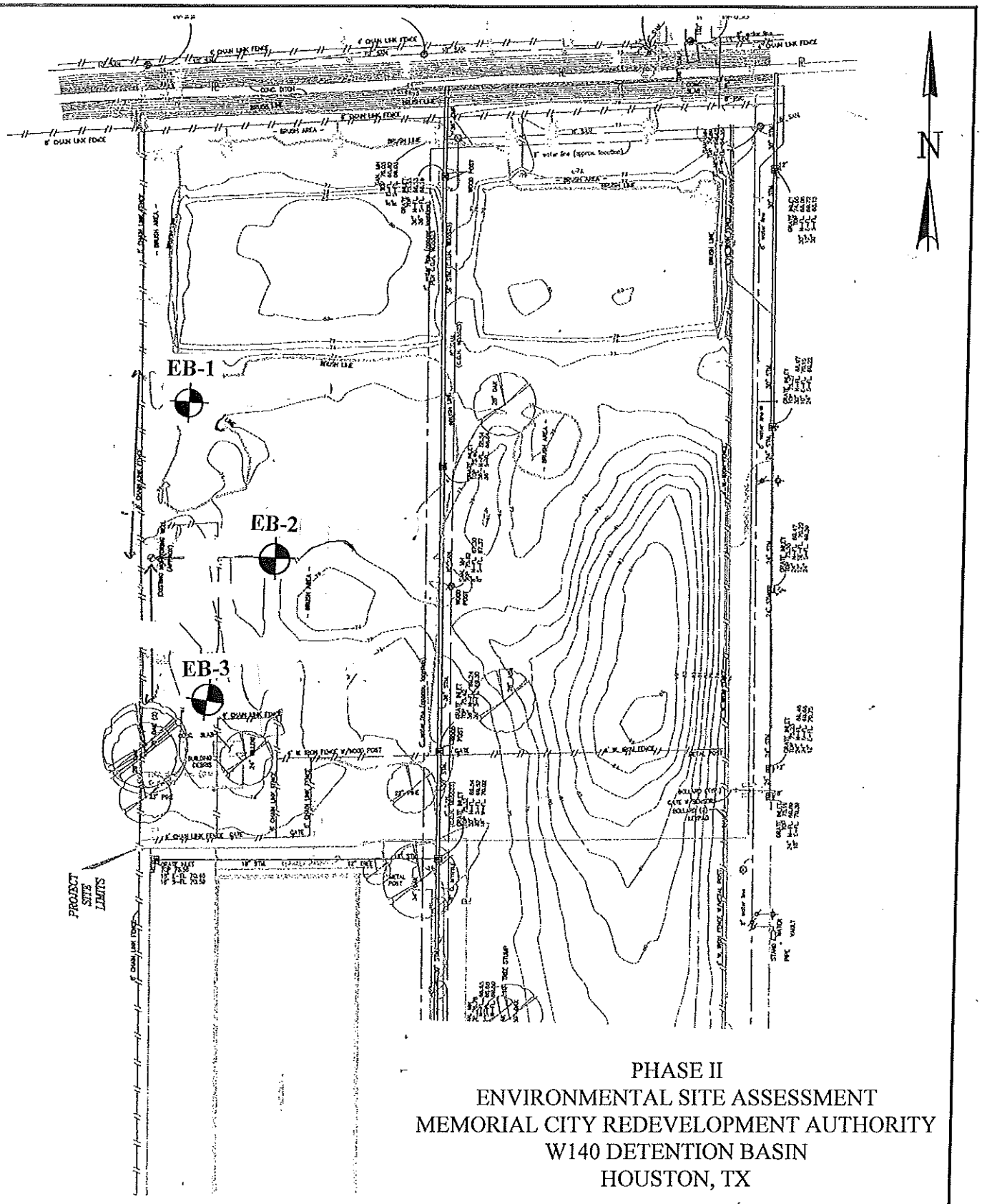


PROJECT LOCATION MAP

(NOT TO SCALE)

Key Map No. 450 X and 490 B

Job No. 1130015101



PHASE II
ENVIRONMENTAL SITE ASSESSMENT
MEMORIAL CITY REDEVELOPMENT AUTHORITY
W140 DETENTION BASIN
HOUSTON, TX

PLAN OF BORINGS

LEGEND

Boring

0 30 60 90 120

SCALE IN FEET

Geotest Engineering, Inc.

FIGURE 2

MAR 06 2013

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON TEXAS 77553-1229

February 20, 2013

Compliance Section

SUBJECT: SWG 2012-00174; TIRZ 17 Redevelopment Authority, Jurisdictional Determination, Proposed Drainage Improvement Project, Located Along a Drainage Ditch South of the Intersection of Bunker Hill Road and Long Branch Lane, City of Houston, Harris County, Texas

Muhammad Ali, P.E.
TIRZ 17 Redevelopment Authority
2925 Briarpark Drive, Suite 400
Houston, Texas 77042-3720

Dear Mr. Ali:

This letter is in response to your request for a jurisdictional determination received February 12, 2012, for the proposed drainage improvement project on behalf of TIRZ 17 Redevelopment Authority. The project is located along a drainage ditch south of the intersection of Bunker Hill Road and Long Branch Lane, City of Houston, Harris County, Texas.

Based on our desk review and the June 4, 2012 site visit, we determined that the project site (see attached map) does not contain waters of the United States. Therefore, any work, structures, or the discharge of fill material on the project site is not subject to Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act (CWA) and does not require a Department of the Army permit.

This determination has been conducted to identify the limits of the Corps' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

This letter contains an approved jurisdictional determination for your subject site, which is valid for 5 years from the date of this letter unless new information warrants a revision prior to the expiration date. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeals Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination, you must submit a completed RFA form to the Southwest Division Office at the following address:

Mr. Elliott Carman
Regulatory Appeals Officer
Southwest Division USACE (CESWD-PD-O)
1100 Commerce Street, Suite 831
Dallas, Texas 75242-1731
Telephone: 469-487-7061; FAX: 469-487-7199

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete; that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within **60 days** of the date of the NAP. It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.

If you have questions concerning this matter, please reference file number **SWG 2012-00174** and contact Ms. Diana Stevens at the letterhead address, by telephone at 409-766-6380 or email at diana.d.stevens@usace.army.mil. To assist us in improving our service to you, please complete the survey found at http://per2.nwp.usace.army.mil/survey.html. If you would prefer a hard copy of the survey form, please let us know, and one will be mailed to you.

Sincerely,

Kenny Jaynes
Chief, Compliance Section

Enclosure

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

8

Applicant: **TIRZ 17 REDEVELOPMENT AUTHORITY**	File Number: **SWG-2012-00174**	Date: **02/20/2013**

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of Permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of Permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I – The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/inet/functions/cw/cecwo/reg/ or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved jurisdictional determination (JD) or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Ms Diana Sevens Regulatory Specials, Compliance Section CESWG-PE-RC U.S. Army Corps of Engineers P.O. Box 1229 Galveston, Texas 77553-1229 409-766-6380 FAX: 409-766-3931	Mr. Elliott Carman Appeal Review Officer, (CESWD-PD-O) U.S. Army Corps of Engineers 1100 Commerce Street, Suite 831 Dallas, Texas 75242-1731 Telephone: 469-487-7061; FAX: 469-487-7199

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15-day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
Signature of appellant or authorized agent.		

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

PREPARED: CPF
APPROVED: DST

EXHIBIT 2
PROPOSED PROJECT ZONES WITH 2010 AERIAL PHOTOGRAPH

REV	DESCRIPTION	DATE	APPR

TIRZ 27 REDEVELOPMENT AUTHORITY

DATE: JAN 2012
SCALE: 1" = 1000'

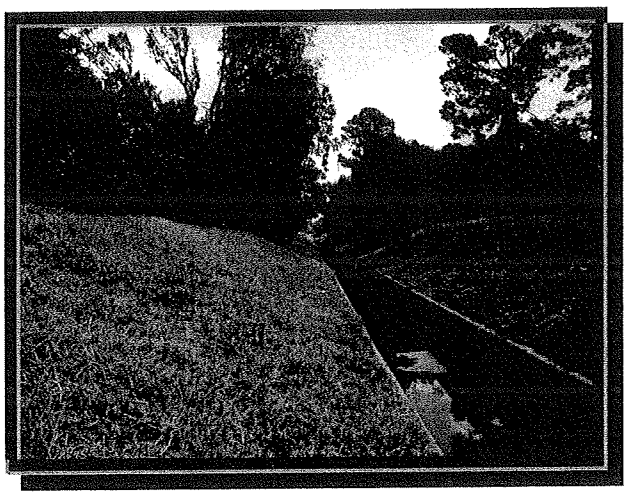
EXHIBIT NUMBER 2 OF 5

Map Document: L:\1130-10384-01\1-0-Project_Correspondence\1-02-Correspondence_Out\USACE_Determination\02_Project_Zones.mxd 2/2/2012 10:22:06 AM cpfrerich

Appendix B: Geotechnical Report

GEOTECHNICAL STUDY
IMPROVEMENTS OF HCFCD W140-01-00 CHANNEL
NORTH OF I-10 & SOUTH OF WESTVIEW DRIVE FROM
GESSNER ROAD TO EAST OF BUNKER HILL ROAD
TIRZ CIP NO. T-1734
LAN PROJECT NO. 130-10384-017
HARRIS COUNTY, TEXAS

PROJECT NO. 12-568E



TO

LOCKWOOD, ANDREWS & NEWNAM, INC.
HOUSTON, TEXAS

BY

GEOTECH ENGINEERING AND TESTING

SERVICING

TEXAS, LOUISIANA, NEW MEXICO, OKLAHOMA

www.geotecheng.com

MAY 2013

TEXAS BOARD OF PROFESSIONAL ENGINEERS
REGISTRATION NUMBER F-001183

GEOTECH ENGINEERING and TESTING

ACCREDITED

Geotechnical, Environmental, Construction Materials, and Forensic Engineering

Lockwood, Andrews & Newnam, Inc.
2925 Briarpark Drive, Suite 400
Houston, Texas 77042

Project No. 12-568E
Report No. 1
Report Type: 10/29/E
May 06, 2013

Attention: Mr. Brian R. Whitney, P.E.

GEOTECHNICAL STUDY
IMPROVEMENTS OF HCFCD W140-01-00 CHANNEL
NORTH OF I-10 & SOUTH OF WESTVIEW DRIVE FROM
GESSNER ROAD TO EAST OF BUNKER HILL ROAD
TIRZ CIP NO. T-1734
LAN PROJECT NO. 130-10384-017
HARRIS COUNTY, TEXAS

Gentlemen:

Submitted here is the report of Geotech Engineering and Testing (GET) geotechnical study for the improvements to HCFCD W140-01-00 Channel at the above referenced location. This study was conducted in general accordance with our proposal No. P12-156, Revision II, dated August 09, 2012. Authorization to proceed with this study was received through a notice to proceed for Task Order 939/2 (LAN Project Number 130-10384-017), signed by Mr. Robert J. Fiederlein, Senior Program Manager with Lockwood, Andrews & Newnam, Inc. on August 14, 2012.

This report presents the results of our field exploration and laboratory testing together with design recommendations for the improvements to HCFCD W140-01-00 Channel in Harris County, Texas. Our recommendations for the channel improvements are in general accordance with Harris County Flood Control District (HCFCD), Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1).

We appreciate the opportunity to be of service. Should you have any questions or need additional assistance, please call.

Very truly yours,

GEOTECH ENGINEERING AND TESTING

Alex Kwon, M.S.C.E.
Project Manager

Moe Tavassoli, Ph.D., P.E.
Engineering Manager

AK/MT/DAE/ak

Copies Submitted: (1) Hard Copy – Lockwood, Andrews & Newnam, Inc. – Mr. Brian R. Whitney, P.E.
(1) PDF Copy Email – Mr. Brian R. Whitney, P.E.

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ILLUSTRATIONS

APPENDICES

1.0 EXECUTIVE SUMMARY

It is planned to improve HCFCD channel W-140-01-00 located north of I-10 and south of Westview Drive from Gessner Road to East of Bunker Hill Road in Harris County, Texas. A site vicinity map is presented on Plate 1. The improvement may include widening, deepening and straightening of the channel alignment by constructing a gravity block wall. The proposed channel improvement is about 6,000-ft. Furnished information indicates that depth of existing channel is about 12-ft. Our engineering analyses and recommendations provided in this report are in general accordance with Harris County Flood Control District (HCFCD), Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1).

Soil stratigraphy and groundwater conditions for the proposed channel improvements were explored conducting by twelve (12) soil test borings (Borings B-1 through B-12) along the channel alignment to a depth of 25-ft to evaluate soil stratigraphy and to obtain soil samples for laboratory testing. In addition, three (3) piezometers (P-1 through P-3) were installed along the channel alignment to evaluate groundwater conditions. Due to site accessibility problems, a portable rig was used to drill Borings B-1, B-5 and B-8 through B-11. Results of these data and our engineering analyses are summarized below:

1. In general, based on our field exploration and laboratory test data, the soils in the area of the existing channel generally consist of stiff to hard brown, dark brown, light gray and reddish brown sandy lean clay fill or medium dense light gray, brown or dark brown sandy silt to about 4-ft. This is underlain by soft to hard light gray, light brown, reddish brown, dark brown clays to about 12 to 25-ft. However, layers of medium dense to dense light gray, light brown, brown or reddish brown silty sands were encountered between the depths of 12- to 25-ft in Borings B-1 through B-7. All borings were terminated at a depth of 25-ft.

2. Borings B-3, B-8 and B-12 were converted to piezometers P-1, P-2 and P-3, respectively, after completion of the field exploration.

   The water level readings measured in Piezometers P-1 through P-3 indicate that the range of stabilized groundwater level is approximately between El. +69.5 and El. +60.1 which corresponds to a depth of 9 to 20-ft the below existing grade. Therefore, groundwater dewatering may be required. **Dewatering is very important on this project in order to prevent potential bottom blow up in the sands encountered in some of the borings.** In the event that groundwater is encountered during construction, it is our opinion that groundwater should be lowered to a depth of at least three-ft below the deepest excavation grade in order to provide dry working conditions and firm bedding. Any minor water inflow in cohesive soil layers can probably be removed using a sump-pump or a trench sump-pump immediately. Wellpoint system can be used in the area where sands are present.

3. Slope stability analyses were performed for the furnished cross sections of the channel using GSTABL7 with STEDwin computer program for Short-Term (ST), Rapid-Drawdown (RDD) and Long-Term (LT) conditions. A summary of the factors of safety for the analyzed slopes is provided in this report. Based on the results of slope stability analysis, gravity wall slope ratio of 1 horizontal to 10 vertical, 1(h):10(v), will satisfy the required factors of safety for the design of the channel.

4. Dispersive characteristics of the subsoils along the channel alignment were evaluated by Pinhole and Crumb tests. In general, our analyses show that the on-site clay soils are non-dispersive. However, erosion and sloughing of the channel slope can still occur, especially in the areas where inlet pipe or other drainage structures enter the channel. Excessive erosion can lead to a loss of ground and gradual (progressive) sloughing of the slopes. Consequently, progressive slope failures can occur. In view of this, we recommend dressing of the channel basin slopes with surface erosion control systems including, grass cover, riprap or concrete lining.

5. The results of our field investigation and laboratory test results indicate that cohesionless soils (i.e. silty sands) exist within the slope and bottom of the existing channel. These soils are highly permeable and will not retain water. We understand that the channel basin will have a wet bottom. In view of this, a liner system may be needed to prevent water loss through these permeable soils. Furthermore, **Dewatering is very important in construction of the proposed channel in order to prevent potential bottom blow up in the sands.**

2.0 INTRODUCTION

It is planned to improve HCFCD channel W-140-01-00 located north of I-10 and south of Westview Drive from Gessner Road to east of Bunker Hill Road in Harris County, Texas. A site vicinity map is presented on Plate 1. The improvement may include widening, deepening and straightening of the channel by constructing a gravity block wall. Approximate length of channel improvement is about 6,000-ft. The depth of channel is about 12-ft. Furnished information indicates that different channel designs, including 20-ft wide U-shaped concrete channel, 8' x 4' rectangular concrete channel or gravity block wall channel are being considered for the proposed improvements.

The purpose of our work was to conduct a field exploration, laboratory testing and engineering analyses to develop recommendations for the proposed channel improvement and to evaluate the factors of safety of the channel slopes using detailed slope stability analysis.

This report briefly describes the field exploration and laboratory testing followed by our engineering analyses and recommendations in general accordance with Harris County Flood Control District (HCFCD), Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1).

3.0 REVIEW OF EXISTING REPORTS

We reviewed the Geotechnical Investigation Report for the Memorial City Redevelopment Authority W140 Detention Pond in Houston, Texas, dated August 19, 2011, performed by Geotest Engineering, Inc. The report indicates that six (6) soil borings (GB-1 through GB-6) were drilled to depths ranging from 20- to 30-ft below existing ground surface to evaluate the subsurface soils and groundwater conditions.

The subsoils as revealed by Borings GB-1 through GB-6 consist of predominantly cohesive soils to the termination depths of 20-to 30-ft (El. 56.51- to El. 47.42-ft), except in borings GB-1, GB-5 and GB-6. The sandy lean clay (CL) and lean clay with sand (CL) are of low to high plasticity with liquid limits ranging from 23 to 45 and plasticity indices ranging from 9 to 25. The fines content (percent passing No. 200 sieve) of the sandy lean clay and lean clay with sand ranged from 61 to 81 percent. The fat clay (CH) soils are of high plasticity with liquid limits ranging from 52 to 61, and plasticity indices ranging from 31 to 37. The fines content of the fat clay soils ranged from 82 to 98 percent. The fines content of sand (SP) and silty sand (SM) ranged from 8 to 17 percent and the fines content of silt (ML) is about 72 percent.

Groundwater was encountered during drilling at depths ranging between 15.3-ft and 24-ft (El. 64.85-ft and El. 58.61-ft) in all the borings except in borings GB-3 and GB-4. In borings GB-3 and GB-4, no groundwater was encountered during drilling. The groundwater level measured 24 hours or more, after drilling was completed, ranged from 16.3 to 24.75-ft (El. 60.61-ft to El. 54.91-ft).

Using GSTABLE 7 computer program, Geotest Engineering, Inc. performed slope stability for the proposed detention pond with 3(H):1(V) earthen slope. The results of slope stability analysis met the minimum factor of safety. Geotest Engineering, Inc. recommends the side slope to be no steeper than 3(H):1(V) along western and northern banks and 4(H):1(V) along entire eastern and southern banks of the detention pond.

4.0 FIELD EXPLORATION

4.1 Drilling and Sampling

At the request of the client, the soil conditions were explored by conducting twelve (12) soil test borings (B-1 through B-12), located approximately as shown on Plate 2. The soil boring locations were discussed with Mr. Philip L. Taylor, P.E. of Lockwood, Andrews & Newnam, Inc. prior to drilling. Soil samples were obtained continuously at boring locations from the ground surface to 20-ft and at five-ft interval thereafter to the completion depth of the borings at 25-ft. Due to the site access problem, a portable rig was used to drill Borings B-1, B-5 and B-8 through B-11. The cohesive soils were sampled in general accordance with ASTM D 1587.

Cohesionless soils were generally sampled with a split-spoon sampler driven in general accordance with the Standard Penetration Test (SPT), ASTM D 1586. This test is conducted by recording the number of blows required for a 140-pound weight falling 30 inches to drive the sampler 12 inches into the soil. Driving resistance for the SPT, expressed as blows per foot of sampler resistance (N), is tabulated on the boring logs.

Soil samples were examined and classified in the field, and cohesive soil strengths were estimated using a calibrated hand penetrometer. This data, together with a classification of the soils encountered and strata limits, is presented on the soil stratigraphy profiles, Plates 3 through 5. Logs of borings and a key to the log terms and symbols are presented in Appendix A.

Depth to groundwater is important for design and construction of the proposed channel basin. For this reason, borings were initially drilled dry and the depth at which groundwater was first encountered was recorded. A wet rotary boring technique was used thereafter to the completion depth of the borings. Water levels were measured after a 24-hour period in the boreholes. Water level observations made during and 24-hours after drilling are indicated at the bottom portion of the individual logs.

4.2 Piezometer Installation

Borings B-3, B-8 and B-12 were converted to piezometers P-1, P-2 and P-3, respectively, after completion of drilling and sampling. The piezometers consist of a three-inch diameter PVC riser pipe connected to a 10-foot long section of 0.01-inch slotted well screen. The riser pipe extends above the ground surface and is sealed with water tight flush mounted locking cap. After the boring was drilled, the riser pipe and well screen assembly were installed in the borehole and sealed with Bentonite. Several days after the piezometers installation, the piezometers were developed by the use of a water bailer purging several well volumes of static water. The water levels were periodically measured to evaluate stabilized groundwater table. The piezometers installation data are shown on Plates 6 through 8. A summary of the piezometer readings is presented in the "Piezometer Reading Table" on Plate 9.

5.0 LABORATORY TESTS

5.1 General

Soil classifications and shear strengths were further evaluated by laboratory tests on representative samples of the major strata. The laboratory tests were performed in general accordance with ASTM Standards. Specifically, ASTM D 2487 is used for classification of soils for engineering purposes. A summary of the laboratory tests performed is presented on Plates 10 through 15.

5.2 Classification Tests

As an aid to visual soil classifications, physical properties of the soils were evaluated by classification tests. The tests were conducted in general accordance with ASTM Standards. These tests consisted of natural moisture content tests (ASTM D 4643), percent finer than the No. 200 sieve tests (ASTM D 1140), Atterberg limit determinations (ASTM D 4318, Method A) and dry unit weights. Similarity of these properties is indicative of uniform strength and compressibility characteristics for soils of essentially the same geological origin. Results of these tests are tabulated on the boring logs at respective sample depths.

5.3 Strength Tests

Undrained shear strengths of the cohesive soils measured in the field were verified by calibrated hand penetrometer, unconfined compressive strength tests (ASTM D 2166), unconsolidated-undrained tests (ASTM D 2850) and torvane tests. The test results are also presented on the boring logs.

Effective soil strength parameters were also obtained by performing consolidated-undrained (CIU) triaxial compression tests (ASTM D 4767). Results of these tests plotted in accordance with Mohr's criteria for shearing failure are presented in Appendix B. The interpreted effective strength parameters, angle of internal friction and cohesion together with stress-strain curves are all shown in Appendix B. The triaxial tests were conducted by HTS, Inc. The A2LA certificate for this company is also presented in Appendix B.

5.4 Particle Size Analysis Tests

This test was conducted in general accordance with ASTM D 422, the Standard Method for Particle-Size Analysis of Soils. The soil sample was first separated into two portions using the No. 10 (2.0-mm) sieve. A sieve analysis was performed on the soil samples retained on the No. 200 sieve, if any obtained. The portion of soil samples passing the No. 10 sieve then went into the hydrometer tests followed by another sieve analysis to complete the particle size distribution curve. Soil samples had to be soaked in the sodium hexametaphosphate solution (40 g/L), dispersed by stirring the beaker, and kept in the sedimentation cylinder in order to obtain accurate hydrometer readings. This test was performed on selected samples obtained from Borings B-2 through B-4, B-6, B-7 and B-12. The test results are presented in Appendix C.

5.5 Dispersive Soils Characterization Tests

5.5.1 General

The dispersive characteristic of the clay soils at this site was evaluated by performing Pinhole tests and Crumb tests on selected samples obtained from Borings B-1 through B-6 and B-8 through B-10. These tests are described briefly below. The test results are discussed in this report and are presented in Appendix D.

5.5.2 Pinhole Tests

The pinhole tests were conducted in general accordance with ASTM D 4647, Method A. The dispersability of the soil specimen is evaluated from the appearance of the flowing solution emerging from the specimen, the rate of flow, and the final size of the hole through the specimen. The test method uses distilled water flowing horizontally though a 1.0-mm diameter hole punched in the soil specimen, under a hydraulic head of 50 mm at the beginning and increasing gradually to 180-mm, 380-mm and 120-mm as required. The initial 50-mm head provides the principle differentiation between dispersive and non-dispersive clays. Flow from dispersive soils will be distinctly dark and the hole in the specimen will enlarge rapidly with a resultant increase in the flow rate. Flow from slightly to moderate dispersive soils will be slightly dark with a constant hole size and flow rate. Flow from non-dispersive clays will be completely clear with no measurable increase in hole size. The pinhole test results are presented in Appendix D.

5.5.3 Crumb Tests

The crumb tests were performed in accordance with ASTM D 6572 procedures. The dispersibility of the soils is evaluated by the texture of distilled water solution when a 1.5-cm diameter or square soil sample is introduced in this solution. Dispersive soils will lead to the solution becoming cloudy, while non-dispersive soils will lead to the solution remaining clear. The dispersibility of these soils is evaluated by the degree of sample reaction in the water. Grade 1 indicates no reaction, Grade 2 indicates slight reaction, Grade 3 indicates moderate reaction and Grade 4 indicates strong reaction. The crumb test results are also presented in Appendix D.

5.6 Soil Sample Storage

Soil samples tested or not tested in the laboratory will be stored for a period of two weeks subsequent to submittal of the final report. The samples will be discarded after this period, unless we are instructed otherwise.

6.0 GENERAL SOILS AND DESIGN CONDITIONS

6.1 Site Conditions

Currently, the existing channel alignment consists of concrete U-shaped channel or natural earth channel. Grass, brush and trees exist on top of the channel banks. Project site pictures were taken during our site visit and drilling operations. These pictures are presented on the cover page and Appendix E.

6.2 Soil Stratigraphy

Details of subsoil conditions at each boring location are presented on the respective boring logs. In general, the soil stratigraphy for the proposed channel improvements are as follows:

Stratum No.	Range of Depth, ft.	Soil Description
I	0 – 4	FILL: SANDY SILT, medium dense, light gray, brown, dark brown, with root fibers, clay pockets (ML)
II	0 – 4	FILL: SANDY LEAN CLAY, stiff to hard, light gray, gray, dark gray, light brown, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist (CL)
III	2 – 16	SANDY LEAN CLAY, soft to hard, light gray, light brown, brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist (CL)
IV	2 – 25	LEAN CLAY WITH SAND, stiff to hard, light gray, gray, light brown, brown, dark brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist (CL)
V	10 – 25	FAT CLAY, firm to hard, light gray, gray, light brown, reddish brown, with ferrous and calcareous nodules, moist (CH)
VI	12 – 25	SILTY SAND, medium dense to dense, light gray, light brown, brown, reddish brown, with clay pockets, moist to wet (SM)

6.3 Soil Properties

Soil strength and index properties and how they relate to design of the proposed channel are summarized below:

Stratum No.	Soil Type	PI(s)	SPT	Soil Expansivity	Soil Strength, tsf	Remarks
I	Fill: Sandy Silt (ML)	–	21	Non-Expansive	–	Moisture Sensitive
II	Fill: Sandy Lean Clay (CL)	9 – 22	–	Non-Expansive	0.56 – 2.72	–
III	Sandy Lean Clay (CL)	10 – 25	–	Non-to Moderately Expansive	0.23 – 2.99	–
IV	Lean Clay with Sand (CL)	8 – 30	–	Non-to Moderately Expansive	0.56 – 2.80	–
V	Fat Clay (CH)	31 – 53	–	Expansive to Highly Expansive	0.31 – 2.74	–
VI	Silty Sand (SM)	–	16 – 42	Non-Expansive	–	Moisture Sensitive

Legend: PI = Plasticity Index
SPT = Standard Penetration Tests

6.4 Water-Level Measurements

The soil borings were drilled dry to evaluate the presence of perched or free-water conditions. The levels where free water was encountered in the open boreholes during and 24-hours after drilling are shown on the boring logs. Furthermore, Borings B-3, B-8 and B-12 were converted to piezometers P-1, P-2 and P-3, respectively, after completion of the field work. The detailed piezometer readings are presented on Plate 9. Groundwater measurements are summarized below:

		Measured Groundwater Elevation, ft.	
Boring No.	Ground Elevation, ft.	During Drilling	After 24 hours
B-1	80.08	66.08	68.08
B-2	79.19	65.19	67.19
B-3	77.58	62.58	66.58
B-4	80.29	Dry	Dry
B-5	80.71	56.71	58.71
B-6	79.41	61.41	64.41
B-7	80.03	64.03	66.03
B-8	78.80	60.80	62.80
B-9	78.80	Dry	Dry
B-10	77.88	59.88	61.88
B-11	77.67	62.67	64.67
B-12	80.51	60.51	62.51

Fluctuations in groundwater generally occur as a function of seasonal moisture variation, temperature, groundwater withdrawal, water level in the existing channel and future construction activities that may alter the surface drainage and subdrainage characteristics at the proposed project site.

We recommend that the groundwater level be verified just before construction of the proposed channel. We also recommend that GET be immediately notified if a noticeable change in groundwater occurs from that mentioned in our report. We would be pleased to evaluate the effect of any groundwater changes on our design and construction sections of this report.

7.0 CHANNEL IMPROVEMENT RECOMMENDATIONS

7.1 General

It is planned to improve HCFCD channel W-140-01-00 located north of I-10 and south of Westview Drive from Gessner Road to east of Bunker Hill Road in Harris County, Texas. The improvement may include widening, deepening and straightening of the channel alignment. Approximate length of channel improvement is about 6,000-ft. The depth of channel is about 12-ft. Furthermore, we understand that U-shaped concrete channel or gravity wall will be used for channel. Our recommendations for slope-stability and erosion protection for the improvement of channel (W140-01-00) are in general accordance with HCFCD, Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1).

7.2 Soil Stratigraphy

STA. 53+00 to STA. 32+00 (Borings B-1 through B-4)

Based on Borings B-1 through B-4, subsurface soils generally consist of sandy clay (CL) fill soils from El. +80.3 to El. +76.3-ft. and sandy silt (ML) fill soils from El. +80.1 to El. +75.2-ft. Clay (CL) soils were generally encountered from El. +78.1 to El. +65.2-ft. Silty sand (SM) soils were generally encountered from El +68.1-ft to El. +52.6-ft. Clay (CH) soils were generally encountered from El. +60.3-ft to the maximum completion depth at El. +52.6-ft.

STA. 32+00 to STA. 11+00 (Borings B-5 through B-7)

Based on Borings B-5 through B-7, subsurface soils generally consist of sandy clay (CL) fill soils from El. +78.7 to El. +75.4-ft. Clay (CL) soils were generally encountered from El. +78.1 to El. +64.7-ft. Silty sand (SM) soils were generally encountered from El +68.1-ft to El. +55.7-ft. Clay (CH) soils were generally encountered from El. +59.4-ft to the maximum completion depth at El. +54.4-ft.

STA. 11+00 to STA 0+00 (Borings B-8 through B-12)

Based on Borings B-8 through B-12, subsurface soils generally consist of sandy clay (CL) fill soils from El. +80.5 to El. +73.7-ft. Clay (CL) soils were generally encountered from El. +76.8 to the maximum completion depth at El. +52.7-ft.

7.3 Dispersive Soils Characterization Test Results

Dispersive characteristics of the subsoils for the proposed channel improvements were evaluated by Pinhole tests. Based on the results of Pinhole tests, presented in Appendix D, the on-site clay soils are generally non-dispersive in Pinhole tests. However, dispersive silty sands were encountered in some of the borings drilled along the project alignment.

7.4 Slope Stability Analysis

7.4.1 General

Slope stability analysis of the channel using GSTABL7 with STEDwin computer program (Ref. 2) was performed for the furnished cross sections for the three following conditions: (a) Short-term (ST), (b) Rapid-Drawdown (RDD) conditions and (c) Long-term (LT) conditions. The Short-term (ST) parameters represent the end of construction loading conditions. The Rapid draw-down (RDD) represents a flooded condition where the water rises to the top of the slope, then recedes fast enough leaving an unbalanced piezometric head behind the slope. Long-term (LT) design values are applicable to soil gravity loads and continuously applied live loads (maintenance vehicle loads, dozer loads, etc.). The long term represents a steady-state soil parameter condition.

This report presents the slope stability analysis for the proposed channel improvements based on three furnished cross-sections at Sta. 11+00, Sta. 32+00 and Sta. 53+00 as shown in Plate 16.

7.4.2 Design Parameters

Short-terms strengths (Ref. 3) were estimated from undrained test data including hand penetrometer, torvane, unconfined compression, and unconsolidated undrained triaxial tests. Soil strength for the long-term and rapid draw-down conditions (Ref. 4 and Ref. 5) were estimated from correlations between the soil index properties, consolidated undrained triaxial tests, residual and soften secant friction angles (Ref. 5) and previous work experience with similar soils of the same geologic origin. In general, the residual shear strengths parameters are used for the slope stability analyses, instead of the peak shear strengths obtained in the laboratory tests. Furthermore, (CIU) triaxial tests were performed on selected soil samples from borings B-3 (8- to 10-ft), B-4 (6- to 8-ft and 12- to 14-ft), B-6 (8- to 10-ft), B-7 (8- to 10-ft) and B-12 (20- to 22-ft) to obtain long-term and rapid drawn-down soil strength parameters. The triaxial test results are presented in Appendix B. The design soil parameters used in the analysis for the three furnished cross-sections are as follows:

STA. 0+00 to STA. 11+00 (Borings B-8 through B-12)

Soil Conditions					Design Strength Parameters					
					Short Term		Rapid Draw Down		Long Term	
Elevation Range, ft.	Symbol	Description	γ_t, pcf	γ_s, pcf	c_0, psf	ϕ_0	c', psf	ϕ'	c", psf	ϕ''
+77.0 to +76.0	CL	Fill: Sandy Clay	120	125	1,000	–	125	18	125	20
+76.0 to +64.0	CL	Clay with Sand	120	125	2,000	–	275	23	250	25
+64.0 to +30.0	CH	Clay	120	125	2,000	–	275	18	250	20
+77.0 to +66.0	–	Gravity Wall	130	135	–	40	–	40	–	40
+77.0 to +65.0	–	Backfill	130	135	–	35	–	35	–	35

STA. 11+00 to STA. 32+00 (Borings B-5 through B-7)

Soil Conditions					Design Strength Parameters					
					Short Term		Rapid Draw Down		Long Term	
Elevation Range, ft.	Symbol	Description	γ_t, pcf	γ_s, pcf	c_0, psf	ϕ_0	c', psf	ϕ'	c", psf	ϕ"
+80.0 to +76.0	CL	Fill: Sandy Clay	120	125	1,000	–	200	20	180	22
+76.0 to +68.0	CL	Sandy Clay	120	125	2,000	–	300	27	275	30
+68.0 to +30.0	SM	Silty Sand	120	125	–	30	–	30	–	30
+80.0 to +69.0	–	Gravity Wall	130	135	–	40	–	40	–	40
+80.0 to +68.0	–	Backfill	130	135	–	35	–	35	–	35

STA. 32+00 to STA. 53+00 (Borings B-1 through B-4)

Soil Conditions					Design Strength Parameters					
					Short Term		Rapid Draw Down		Long Term	
Elevation Range, ft.	Symbol	Description	γ_t, pcf	γ_s, pcf	c_0, psf	ϕ_0	c', psf	ϕ'	c", psf	ϕ"
+80.0 to +76.0	CL	Fill: Sandy Clay	120	125	1,000	–	200	20	180	22
+76.0 to +66.0	CL	Sandy Clay	120	125	2,000	–	300	27	275	30
+66.0 to +30.0	SM	Silty Sand	120	125	–	30	–	30	–	30
+80.0 to +71.0	–	Gravity Wall	130	135	–	40	–	40	–	40
+80.0 to +70.0	–	Backfill	130	135	–	35	–	35	–	35

Where:

γ_t = Total unit weight of soils, pcf
γ_s = Saturated unit weight of soils, pcf
c_o, c', c" = Undrained, consolidated undrained and consolidated drained, cohesion, psf
ϕ_o, ϕ', ϕ" = Undrained, consolidated undrained and consolidated drained, angle of internal friction, degrees

7.4.3 **Results of Slope Stability Analyses**

Slope stability analyses were performed on the furnished cross sections using the computer program "GSTABL7 with STEDwin". The modified Bishop method of analysis was used for the slope stability analysis. In the Modified Bishop analysis method, slope stability is evaluated along a circular arc. The degree of safety is measured by comparison of the driving forces (soil gravity loading, surcharge, etc.) causing movement with the soil friction and cohesive forces resisting failure. The ratio of resisting forces to driving forces defines the factor of safety. During construction, a dozer or other construction equipment are expected to be operated at the project site area. A live load of 250 psf was used on top of the bank in our short term and long term slope stability analysis to represent the unit surcharge load applied to the ground surface by the dozer, construction equipment or maintenance vehicles.

For the slope analyzed, the stability was evaluated for numerous radii representing trial circles originating from a grid system. Trial circle centers selected to incorporate the failure are illustrated in Appendix G. A summary is provided below for the factors of safety for the analyzed gravity wall with wall slope ratio of 1(H): 7(V) to 10(V):

Sta. No	Slope Ratio	Factor of Safety		
		Short Term	Rapid Draw Down	Long Term
Sta. 0+00 to Sta. 11+00	1(H): 7(V)	5.98	1.37	1.78
Sta. 11+00 to Sta. 32+00	1(H): 7(V)	3.61	1.30	1.72
Sta. 32+00 to Sta. 53+00	1(H): 10(V)	5.65	2.09	2.33

For a stable slope, HCFCD requires minimum safety factors of 1.3 for the Short Term (ST) condition, 1.25 for the Rapid Draw Down (RDD) condition, and 1.5 for the Long Term (LT) condition.

7.5 Recommended Slope Ratios

Based on the results of slope stability analyses discussed above, gravity wall slope ratio of 1 horizontal to 10 vertical, 1(h):10(v), will satisfy the required factors of safety for the design of the channel. However, slope ratio of 1 horizontal to 8 vertical, 1(h):8(v), will perform better for maintenance and safety purposes.

7.6 Slope Erosion Protection

7.6.1 General

Our laboratory testing indicated the on-site clay soils are generally non-dispersive. Erosion problems are usually associated with channel slopes especially where control structures such as outfall and weir structures will be located. Excessive erosion can lead to a loss of ground and gradual (progressive) sloughing of the slopes. Consequently, progressive slope failures can occur. Our recommendations for slopes erosion protection are as follows:

7.6.2 Slope Erosion Protection

Our erosion protection recommendations are generally in accordance with HCFCD, Policy, Criteria, and Procedure Manual, October 2010 (Ref. 1). Dressing of the channel slopes with surface erosion control systems should ensure successful long-term performance. These systems may consist of the following:

7.6.2.1 Grass Cover

Grass cover can provide a suitable erosion protection system provided the root systems can sustain the peak velocities from the rain water. Turf grass shall be established per the guidelines contained in Section 10.3 of HCFCD, Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1). Periodic observation of channel basin slopes should be planned to identify areas that may require a more positive erosion protection system.

7.6.2.2 Riprap

Ripraps are stone or broken concrete rubbles widely used for erosion protection of slopes. Protection of the toe is critical for providing acceptable stability. The design and construction of rip-rap for the channel locations should be in general accordance with Section 10.5 - Riprap and Appendix D- Riprap Detail Sheet of HCFCD, Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1) and Section 02378 - Riprap and Granular Fill of HCFCD Standard Specifications, August 2005 (Ref. 6).

7.6.2.3 Geotextiles

Geotextiles may be placed directly against the slope to serve as a filter layer to prevent migration on site through a crushed stone rip-rap layer. The rip-rap layer should consist of four to eight-inch diameter crushed stone with thicknesses on the order of 12-inches. In the areas of steeper slopes, gabions should be used for support of the geotextile and rip-rap layer. Alternatively, geotextiles are now available that can be used without rip-rap to minimize erosion.

7.6.2.4 Concrete Lining

This type of erosion control system is effective when placed on top of subgrade soils compacted to at least 95% of maximum standard density (ASTM D 698) at a moisture content between optimum and + 3% of optimum. The concrete lining shall be constructed per the guidelines presented in Section 10.4 - Concrete Lining and Appendix D of HCFCD, Policy, Criteria, and Procedure Manual, December 2010 (Ref. 1). The minimum concrete lining thickness on slope and bottom should be five inches in accordance with HCFCD standard, and be reinforced in each direction with reinforcement equal to about 0.51% of the concrete area. In the areas on the sloped surfaces where loose or soft soils are encountered, these areas should be excavated to a minimum depth of at least six (6) inches and be filled with Class A non-structural concrete in accordance with Section 03310 of HCFCD Specifications, August 2005 (Ref. 6). The loose or soft soils should be removed, moisture conditioned and recompacted to at least 95% of maximum density (ASTM D 698). Drainage holes should be placed at fixed intervals at the lower portion of concrete lining not exceeding 15-ft to prevent hydrostatic pressure build up behind the concrete liner.

8.0 GRAVITY WALL RECOMMENDATIONS

8.1 General

We understand that the proposed improvements may utilize gravity wall structures at this site. Excavation and groundwater control for construction of this structure should be in accordance with our recommendations provided in construction consideration section of this report (Section 9).

8.2 Lateral Earth Pressure

Lateral earth pressures for the gravity wall vary with structure type, wall rigidity, soil type and degree of compaction of the backfill soil. Gravity walls must be designed to withstand lateral earth loads and surcharge pressures plus any hydrostatic pressures that may develop due to possible entrapped surface water behind the walls, unless an effective drainage system is provided.

The proposed gravity wall will be subjected to lateral active and passive earth pressures as shown on Plate 17. The lateral active and passive earth pressures may be computed by the use of the following equations.

Active Lateral Earth Pressure:

For Sands/Silts Backfill $P_a = 85(H+h) + 0.5q$
For Clay Backfill $P_a = 102(H+h) + 0.7q$

Where: P_a = active lateral earth pressure, psf
H = height of wall above the dredge line, ft
h = height of the wall below the dredge line, ft.
q = surcharge loading, psf

Allowable Passive Lateral Earth Pressure:

For Sands/Silts $P_p = 100h$
For Clays $P_p = 1000$

Where: P_p = Allowable passive lateral earth pressure, psf

The passive lateral earth pressure given above includes a factor of safety of 2.0. The passive lateral earth pressure is applicable only if the soil in front of the wall will not erode away during the life of the structure. It is recommended that the backfill behind the wall be select cohesionless granular materials for the gravity wall with less than 5 percent passing the No. 200 sieve.

We recommend the exposed subgrade be uniformly proofrolled to at least 95 percent of Standard Proctor (ASTM D 698) maximum dry density at a moisture content between optimum and +3% of optimum. The excavation, trenching, foundation, embedment, and backfilling for the proposed gravity wall shall be in accordance with HCFCD Standard Specifications, August 2005 (Ref. 6), Section 02315 – Excavation and Backfilling.

8.3 Allowable Bearing Pressure

Bearing capacity is the ability of the soil to safely carry the pressure placed on the soil without undergoing a shear failure with accompanying large settlements. Based on the results of the field and laboratory testing and bearing capacity theory, a net allowable bearing capacity in of 1,500 psf (Dead load + sustained live load) can be used for supported of the gravity wall seated in the naturally occurring very stiff clay subsoils. The allowable loading for total load (Dead + live load) will be 50 percent larger. The allowable soil concrete adhesion at the base of the gravity wall is 200 psf for cohesive subgrade.

If the gravity wall is supported in the silty sand/sandy silt subsoils, a net allowable bearing capacity of 1,000 psf can be used for dead load. The allowable loading for total load (Dead + live load) will be 50 percent larger. We recommend that the above-mentioned bearing capacities be reduced by 50 percent if the subgrade soils become saturated or have potential for saturation. For cohesionless subgrade, a coefficient of friction of 0.3 may be used between the foundation bottom and the supporting soils against sliding.

9.0 CHANNEL STRUCTURES RECOMMENDATIONS

9.1 General

We understand that channel improvements may utilize U-shaped concrete channel, 8' x 4' rectangular concrete channel or box culverts at this site. Excavation and groundwater control for construction of these structures should be in accordance with our recommendations provided in construction consideration section of this report (Section 9). The proposed box culverts may be designed in accordance with the parameters presented on Plate 18.

9.2 Allowable Bearing Pressure

We understand that the box culverts, if used, may be supported on a seal slab foundation at about El. +64-ft. The allowable bearing pressures for the seal slab foundation at this elevation are as follows:

Foundation Type	Elevation, ft.	Allowable Net Bearing Pressure, psf	
		Dead Load*	Total Load (Dead + Live)
Seal Slab	+64.0	2,000	2,500

* Dead load + sustained live load

Footings proportioned in accordance with the above bearing capacity values will have a safety factor of 2.5 and 2.0 with respect to shearing failure for dead and total loading, respectively.

9.3 Bedding and Backfilling

The proposed concrete channel structures should be placed on a well prepared, properly compacted working surface. Cast-in-place culverts can be supported on the natural soils provided subgrade is protected from construction disturbances and surface water is not allowed to pond within the excavation. We recommend the exposed subgrade be uniformly proofrolled to at least 95 percent of Standard Proctor (ASTM D 698) maximum dry density at a moisture content between optimum and +3% of optimum. The excavation, trenching, foundation, embedment, and backfilling for the proposed inlet and outlet structures shall be in accordance with HCFCD Standard Specifications, August 2005 (Ref. 6), Section 02315 – Excavation and Backfilling.

Sand used in the cement-stabilized sand backfill sections should be free of clay lumps, organic materials, or other deleterious substances, and should have a PI less than 4 for the cement-stabilized sand, and not more than 15% passing the No. 200 sieve. Cement stabilized sand should conform to the HCFCD Standard Specifications, August 2005 (Ref. 6), section 02321 – Cement Stabilized Sand.

9.4 Buoyancy

The proposed outlet structure may experience uplift loads from the groundwater during flood conditions. The box culverts should perform satisfactorily if a design factor of safety against uplift loads of 2.0 is used. In general, the hydrostatic pressure will be resisted by the dead weight of the structure, weight of the overburden soils above the top of the box culverts and the friction or adhesion between the walls and natural soils or fill. A submerged unit weight of 60 pounds per cubic foot (pcf) and 85 pcf can be used for soils and concrete, respectively, to compute the resistance to uplift loads. An adhesion value of 200 psf can be used between the backfill and the box culverts to resist the uplift loads. A factor of safety of 2.0 is included in the adhesion value.

10.0 CONSTRUCTION CONSIDERATIONS

10.1 Site Drainage

It is recommended that site drainage be well developed. Surface water should be directed away from the top bank of the slope. Drainage weep holes should be placed at fixed intervals not exceeding 15-ft on the concrete lining (if used) to prevent ponding of water behind the concrete liner.

10.2 Groundwater Control

We understand that the maximum channel depth will be about 12-ft (El. +64.0). Water level observations were made during and at 24-hours after drilling. The range of short term groundwater level is approximately between El. +66.5 and El. +62.8 after 24-hours of drilling.

The water level readings measured in Piezometers P-1 through P-3 indicate that the range of stabilized groundwater level is approximately between El. +69.5 and El. +60.1. Therefore, groundwater dewatering may be required. **Dewatering is very important on this project in order to prevent potential bottom blow up in the sands.** In the event that groundwater is encountered during construction, it is our opinion that groundwater should be lowered to a depth of at least three-ft below the deepest excavation grade in order to provide dry working conditions and firm bedding. Any minor water inflow in cohesive soil layers can probably be removed using a sump-pump or a trench sump-pump immediately. Wellpoint system can be used in the area where sands are present.

Design of a wellpoint system should consider the amount of groundwater to be lowered and the permeability of the affected soils. The selection and proper implementation of an effective groundwater control system is the responsibility of the contractor. The design of dewatering system for groundwater and surface water control should be in accordance with the City of Houston Specifications, Section 01578 – Control of Ground Water and Surface Water and Item 3.1 of Section 02241 of HCFCD Standard Specifications, August 2005 (Ref. 6).

10.3 OSHA Soil Classifications

The subsoils can be classified in accordance with Occupational Safety and Health Administration (OSHA) Standards, dated October 31, 1989 of the Federal Register. OSHA classification system categorizes the soil and rock in four types based on shear strength and stability. The description of four (4) types in classification system is summarized in the Appendix G.

Based on our geotechnical exploration and laboratory test results, details of soil classifications at each boring are summarized in the OSHA Soil Classification and Trench Safety Recommendations presented in Appendix H.

10.4 Excavations

Each side of an excavation or trench which is five-ft or deeper must be protected by sheeting/bracing shoring or sloped. Based on soil strength data and OSHA soil classifications, temporary (less than 24 hours) open-trenched, non-surcharged, and unsupported excavations should be made on slopes of about 1.5(h):1(v). Vertical cuts can be constructed, provided shoring and bracing are used for the excavation wall stability. Benched excavation can also be used with average slopes of about 1(h):1(v) and steps should not be higher than five-ft. In all cases, excavations should conform to OSHA guidelines. Flatter slopes may have to be used if large amounts of sand need to be excavated for deep installations. Specifications should require that no water be allowed to pond in the excavations. The surface slopes should be protected from deterioration and weathering if they are to be left open for more than 24 hours.

Excavations should be performed with equipment capable of providing a relatively clean bearing area. Excavation equipment should not disturb the soil beneath the design excavation bottom and should not leave large amounts of loose soil in the excavation.

The bearing surface should be protected against disturbance and deterioration by completing the box culverts installation and backfilling operations as quickly as possible. The excavation bottom should be properly sloped to allow any water to infiltrate into the convenient location along the edge of the excavation. Water should not be allowed to stand on the bearing areas.

Based on our field exploration and laboratory test results, cohesionless soils are most likely to be encountered during excavation. In addition, shallow groundwater table exists at the project sites. Therefore, bottom blow up will be an issue during excavation. The excavation process should be properly monitored by an experienced geotechnical engineer.

10.5 Earthwork

In general, site preparation and earthwork should conform to HCFCD Specifications (Ref. 6). Our recommendations on the earthwork preparation are summarized below:

1. Remove all soft soils, vegetation, root fibers and any organic materials from the face of the slopes.

2. The bearing surface should be protected against disturbance and deterioration by completing the back-filling operations as quickly as possible. The excavation bottom should be properly sloped to allow any water infiltrating into the excavation at the convenient location along the edge of the excavation. Water should not be allowed to stand on the bearing area.

3. Remove all soft and wet soils. The excavation bottom areas should then be proofrolled with a loaded dump truck, or similar pneumatic-tired equipment with loads ranging from 25- to 50-tons. The proofrolling serves to compact surficial soils and to detect any soft or loose zones. The proofrolling should be conducted in accordance with TxDOT Standard Specification Item 216. Any soils deflecting excessively under moving loads should be undercut to firm soils and recompacted. The proofrolling operations should be observed by an experienced geotechnician.

4. Scarify the subgrade, add moisture, or dry if necessary, and recompact to 95% of the maximum dry density as determined by ASTM D 698 (Standard Proctor). The moisture content at the time of compaction of subgrade soils should be within ±2% of the Proctor optimum value. We recommend that the degree of compaction and moisture in the subgrade soils be verified by field density tests at the time of construction.

5. If off-site fills are used to stabilize or construct the slope, they should consist of sandy clay (CL) soils with liquid limit of less than 50 and plasticity index between 15 to 30, non-dispersive in Pinhole test Method A and 60% to 85% passing the No. 200 sieve. In addition, each layer should be placed in lifts not exceeding 8-inches and compacted to 95% of maximum Proctor dry density (ASTM D 698). Off-site fills shall be in accordance with HCFCD Standard Specifications, section 02314 Part Two (Ref. 6).

6. Side slopes should be compacted to 95% of standard Proctor density (ASTM D 698) with moisture content within ± 2% of the Proctor optimum, using a heavy crawler tractor, winching the compactor up and down the slope with cable (Yo-Yo fashion) or a Vibrator tractor compactor.

10.6 Fill Requirement

Fill requirements should be in accordance with Section 02314 of HCFCD Standard Specifications, August 2005 (Ref. 6).

10.7 Construction Surveillance

Construction surveillance and quality control tests should be planned to verify materials and placement in accordance with the specifications. The recommendations presented in this report were based on a discrete number of soil test borings. Soil type and properties may vary across the site. As a part of quality control, if this condition is noted during the construction, we can then evaluate and revise the design and construction to minimize construction delays. We recommend the following quality control procedures be followed by a qualified engineer or technician during the construction of the proposed channel basin:

- Observe all phases of excavations.
- Observe the site stripping, sloping and proofrolling.
- Monitor the dewatering during excavation for potential bottom blow up.
- Verify the compaction of subgrade soils.
- Evaluate the quality of fill and monitor the fill compaction for all lifts.
- Monitor concrete placement, conduct slump tests and make concrete cylinders.

It is the responsibility of the client to notify GET when each phase of the construction is taking place so that proper quality control and procedures are implemented.

11.0 RECOMMENDED ADDITIONAL STUDIES

This report has been on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. We recommend that GET be retained to review the plans and specifications to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted as intended.

12.0 STANDARD OF CARE

The recommendations described herein were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty or guarantee, expressed or implied, is made other than the work was performed in a proper and workmanlike manner.

13.0 REPORT DISTRIBUTION

This report was prepared for the sole and exclusive use by our client, based on specific and limited objectives. All reports, boring logs, field data, laboratory test results, maps and other documents prepared by GET as instruments of service shall remain the property of GET. Reuse of these documents is not permitted without written approval by GET. GET assumes no responsibility or obligation for the unauthorized use of this report by other parties and for purposes beyond the stated project objectives and work limitations.

14.0 REFERENCES

1. "Harris County Flood Control District Policy, Criteria, and Procedure Manual", by Harris County Flood Control District, 2010.

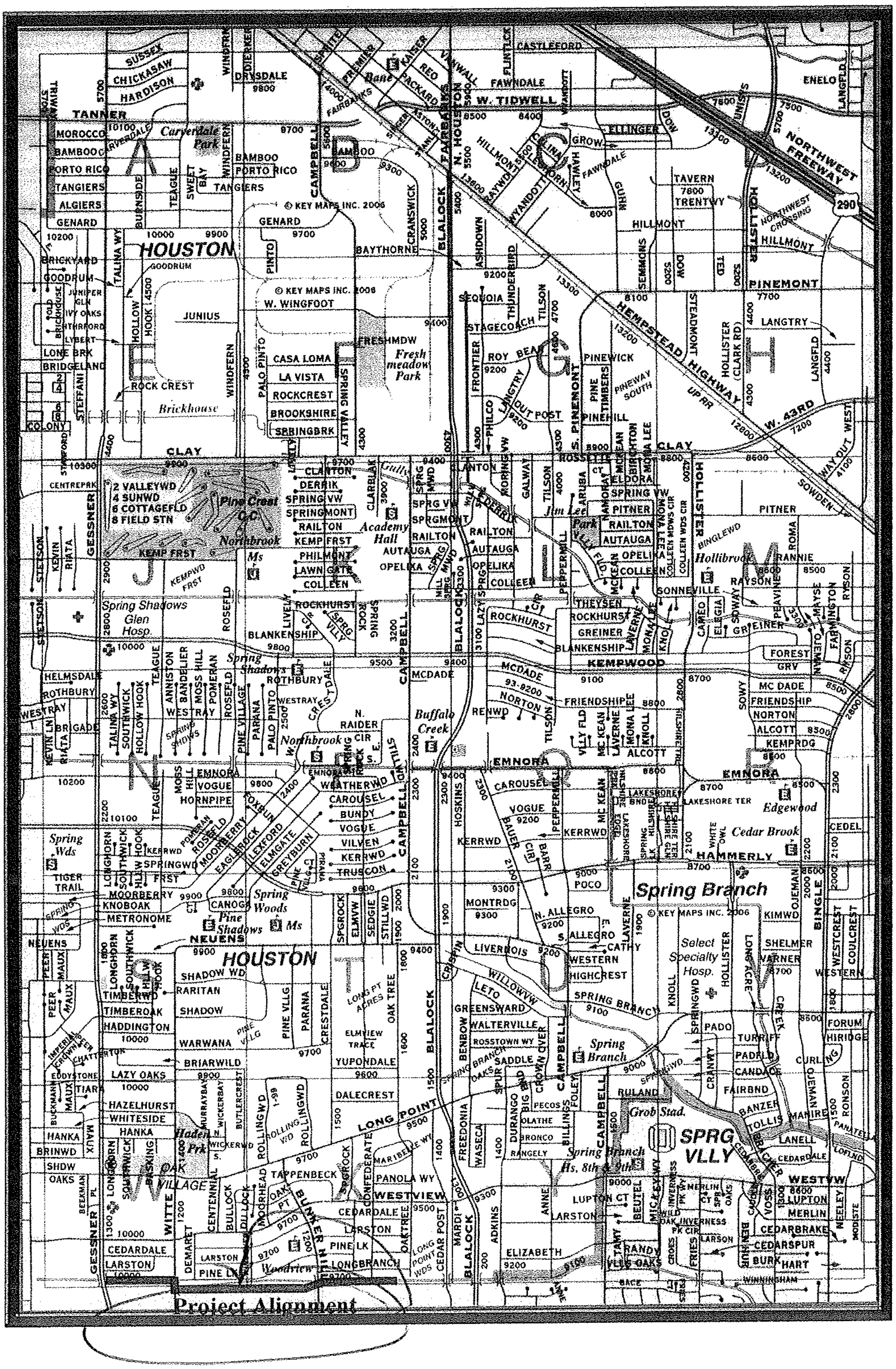
2. "GSTABL7 with STEDwin", by Gregory, P.E. Gregory Geotechnical Software, 2003.

3. "An Engineering Manual for Slope Stability Studies", by J.M. Duncan and A.L. Buchigwani, University of California at Berkley, Department of Engineering, 1975.

4. "Cohesion Intercept in Effective Stress-Stability Analysis", by G. Mesri, and M.E.M. Abdel-Ghaffar, Journal of Geotechnical Engineering, Vol. 119, No. 8, August 1993, pp. 1229-1249.

5. "Shear Strength Correlations and Remedial Measure Guidelines for Long-Term Stability of Slopes Constructed of Highly Plastic Clay Soils", by A. A. Saleh and Stephen G. Wright, Center for Transportation Research Bureau of Engineering Research, The University of Texas at Austin, October, 1997.

6. "Harris County Flood Control District 2005 Standard Specifications Book", by Harris County Flood Control District, August 2005.



SITE VICINITY MAP

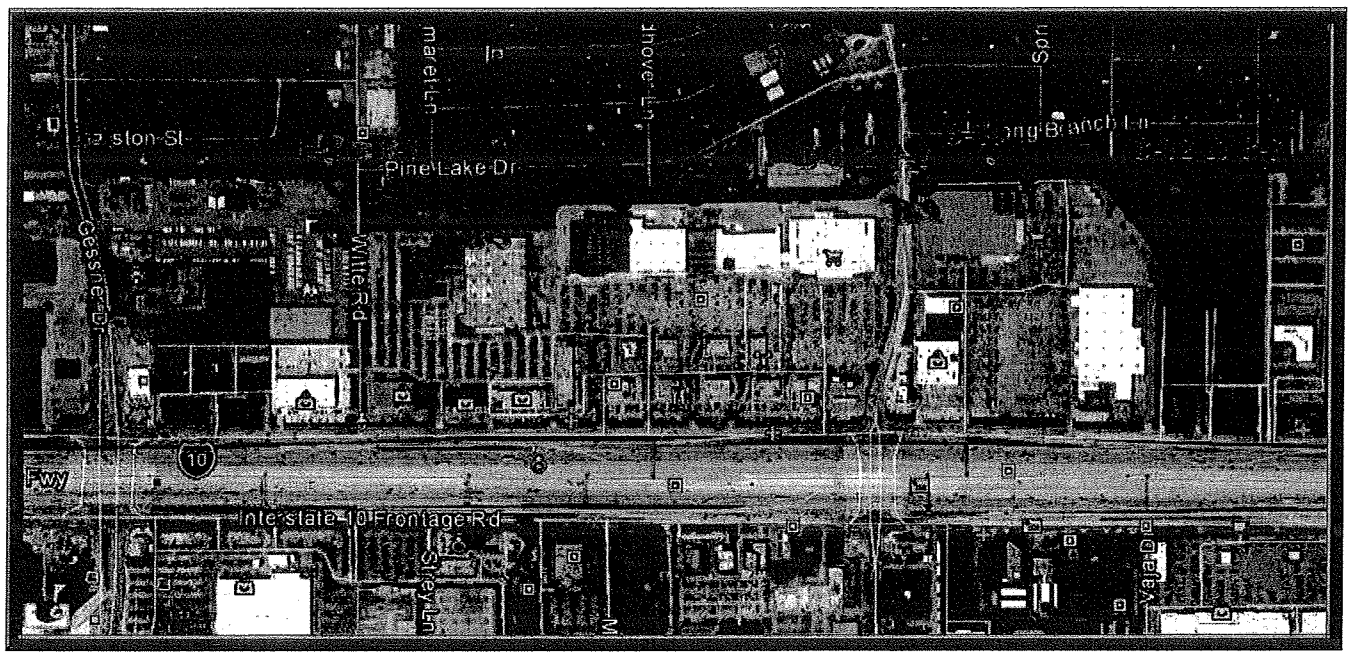
PROJECT: Geotechnical Study for HCFCD 140-01-00 Channel Improvement
Harris County, TX

SCALE: NOT TO SCALE	DATE: MAY 2013	PROJECT NO.: 12-568

NORTH

GEOTECH ENGINEERING AND TESTING

PLATE 1

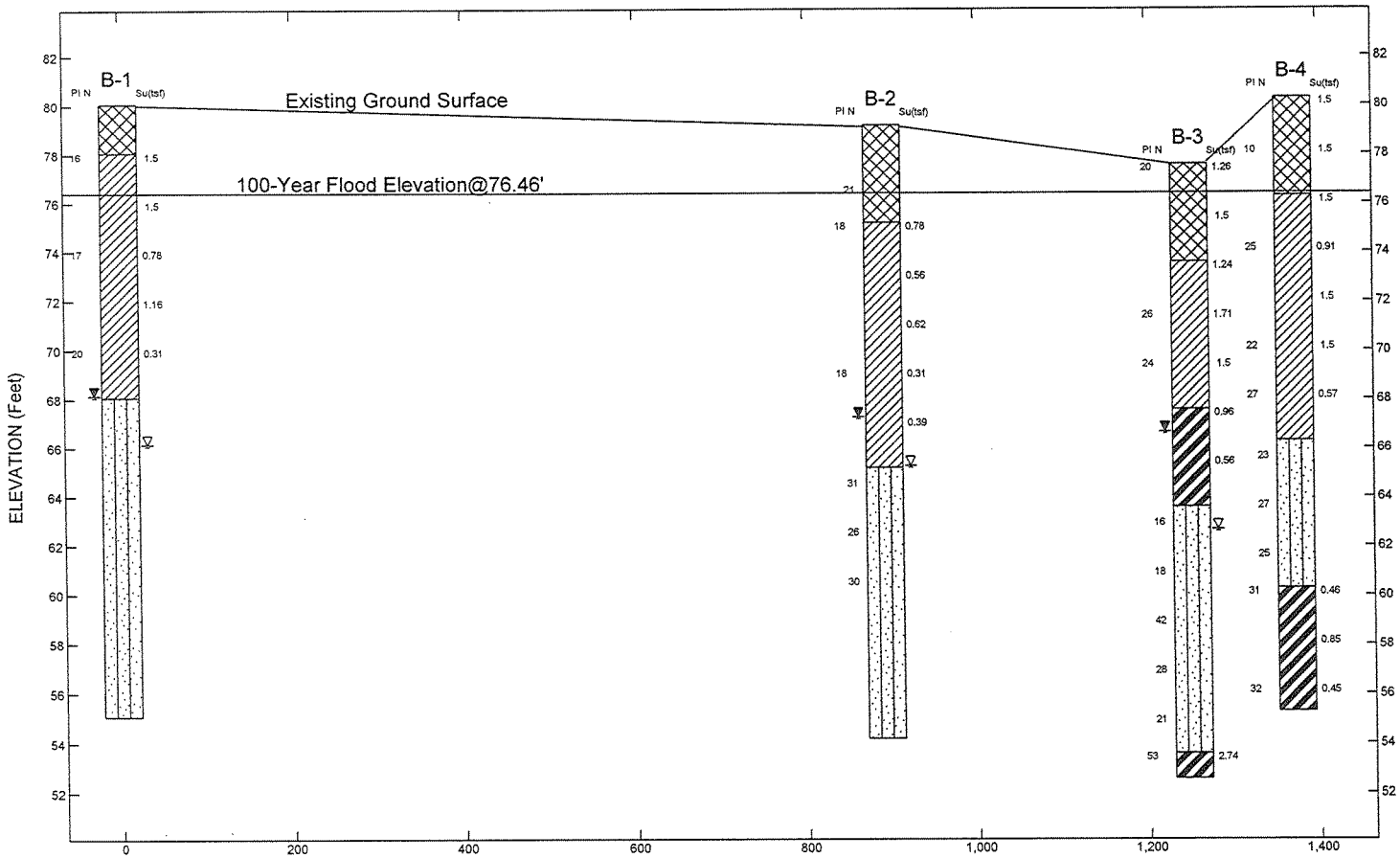


Legend:

- ● : Soil Boring
- ◉ : Piezometer Was Installed in the Boring

Notes: Borings B-2 through B-4, B-6, B-7 and B-12 were drilled using a Truck mounted drilling rig. Borings B-1, B-5 and B-8 through B-11 were drilled using a portable drilling rig.

PLAN OF BORINGS/ PIEZOMETERS			NORTH
PROJECT: Geotechnical Study for HCFCD 140-01-00 Channel Improvement Harris County, TX			
SCALE: NOT TO SCALE	DATE: MAY 2013	PROJECT NO.: 12-568	



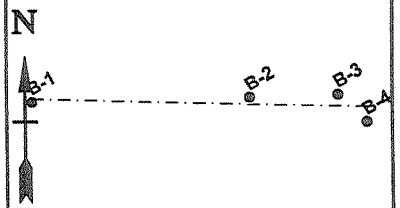
Lithology Graphics

Fill

Lean Clay (CL)

Silty Sand (SM)

Fat Clay (CH)



Site Map Scale 1 inch equals 790 feet

Explanation

B-1 — Borehole Number

Borehole Lithology

Water Level Reading at time of drilling.

Water Level Reading after drilling.

0 215

Horizontal Scale

Vertical Exaggeration: 28.5x

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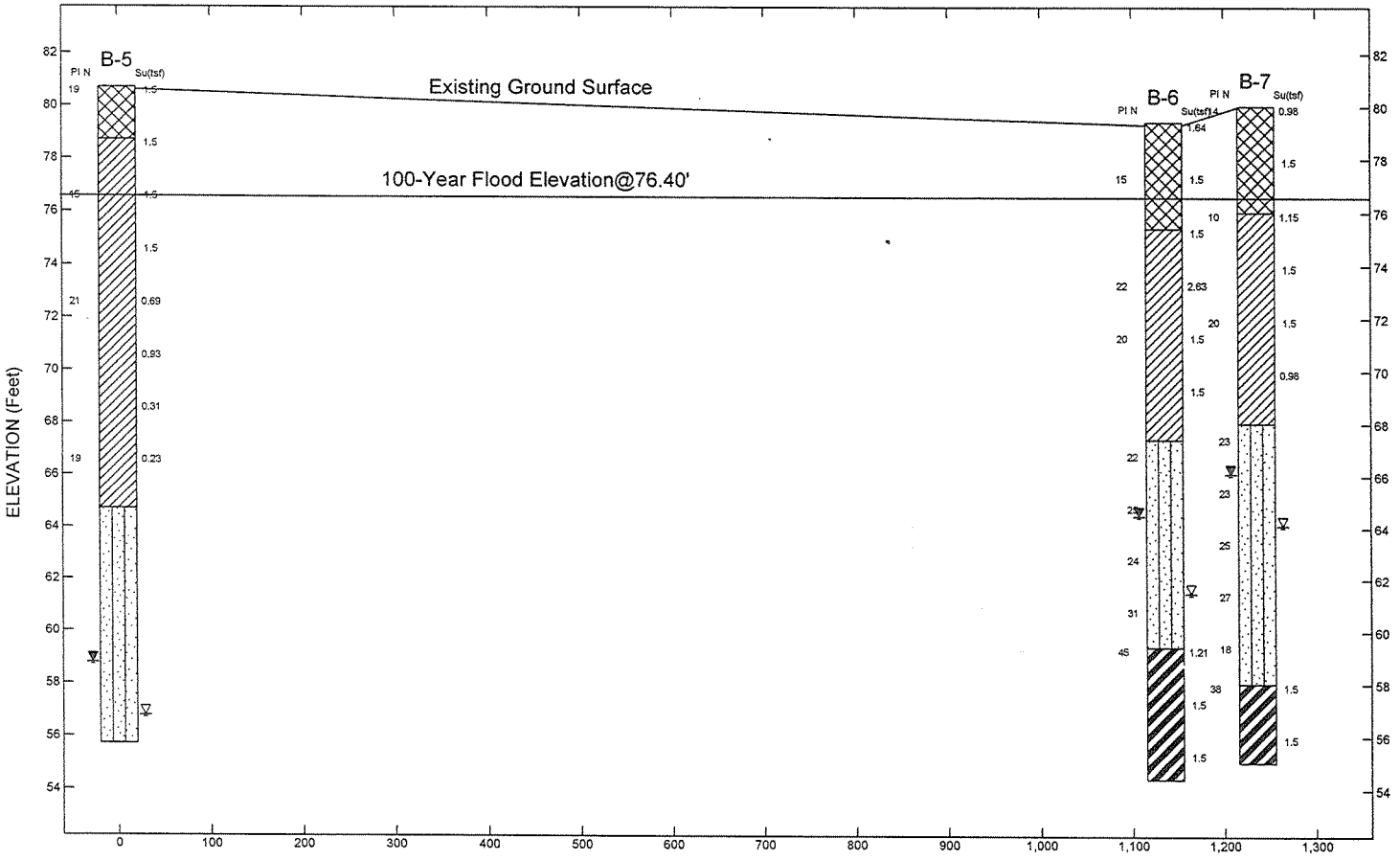
800 Victoria Drive
Houston, Texas 77022

Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734

Harris County, Texas

JOB NUMBER	PLATE NUMBER
12-568E	Plate 3

BERNARD 12-568E.GPJ FANWNL01.GDT 2/13/13



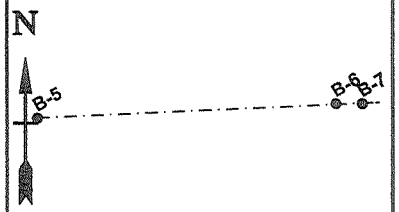
Lithology Graphics

Fill

Lean Clay (CL)

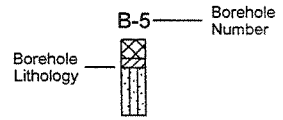
Silty Sand (SM)

Fat Clay (CH)



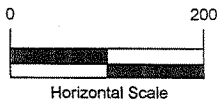
Site Map Scale 1 inch equals 735 feet

Explanation



Water Level Reading at time of drilling.

Water Level Reading after drilling.



Vertical Exaggeration: 28.5x

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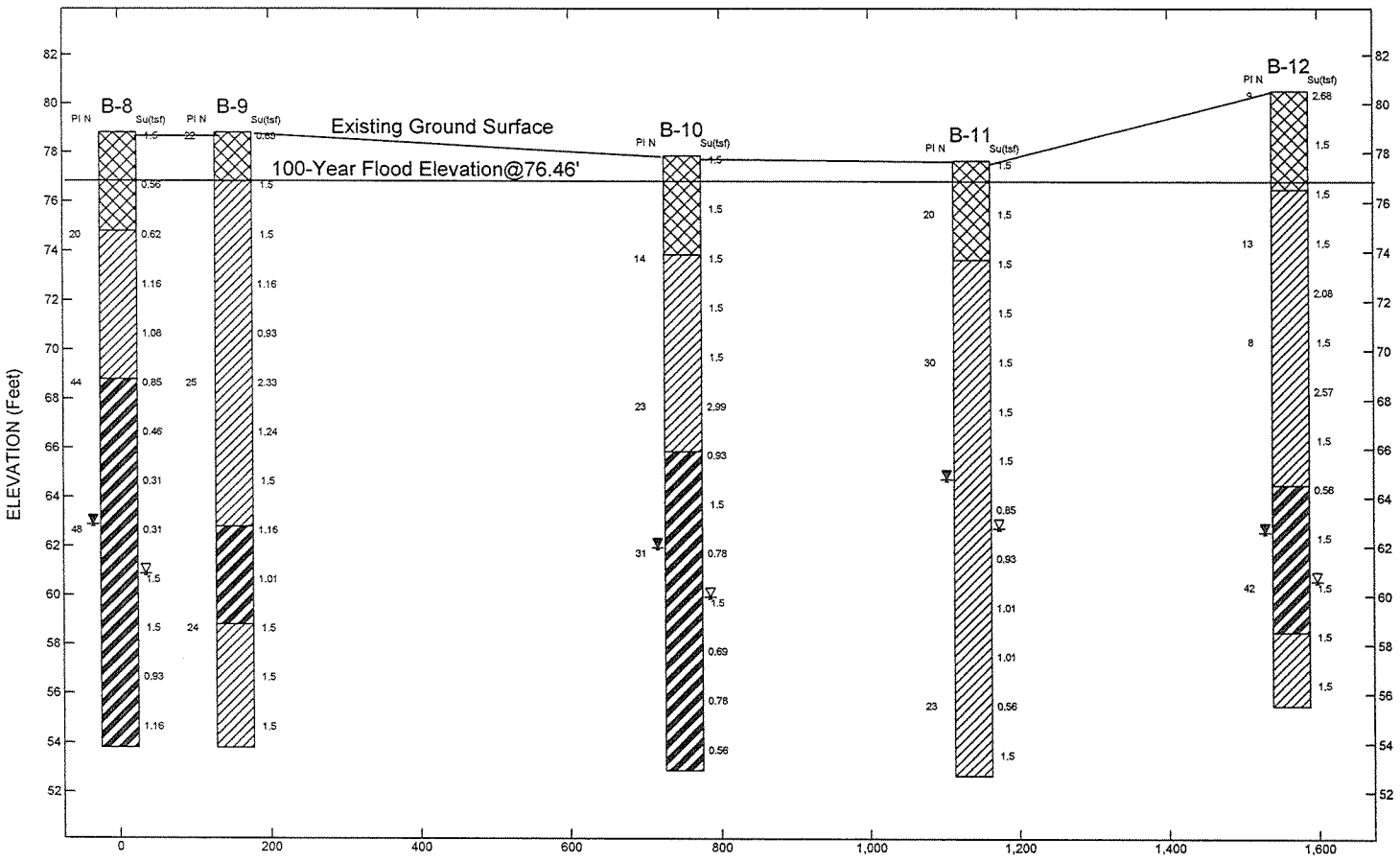
Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734

Harris County, Texas

JOB NUMBER	PLATE NUMBER
12-568E	Plate 4

BERNARD 12-568E.GPJ FANWNL01.GDT 2/13/13

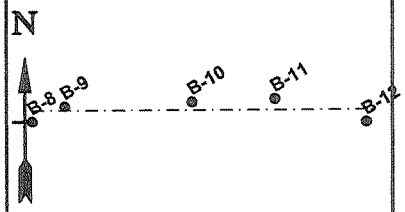


Lithology Graphics

Fill

Lean Clay (CL)

Fat Clay (CH)



Site Map Scale 1 inch equals 905 feet

Explanation

B-10 — Borehole Number

Borehole Lithology

Water Level Reading at time of drilling.

Water Level Reading after drilling.

0 246

Horizontal Scale

Vertical Exaggeration: 33x

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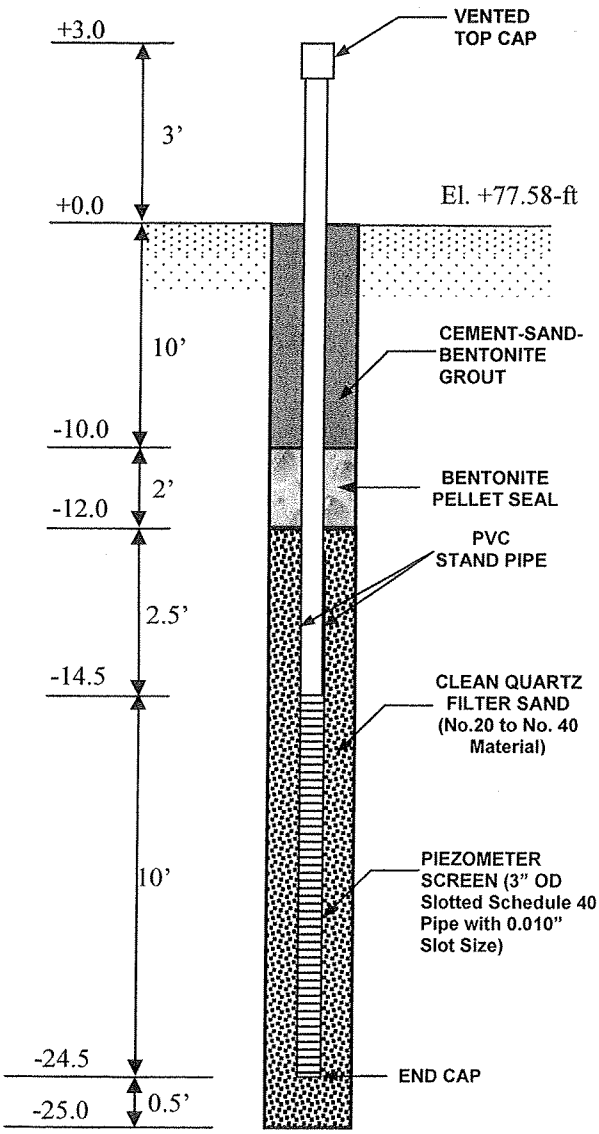
Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734

Harris County, Texas

JOB NUMBER	PLATE NUMBER
12-568E	Plate 5

BERNARD_12-568E.GPJ FANWNL01.GDT 2/13/13

PIEZOMETER INSTALLATION DATA (P-1)



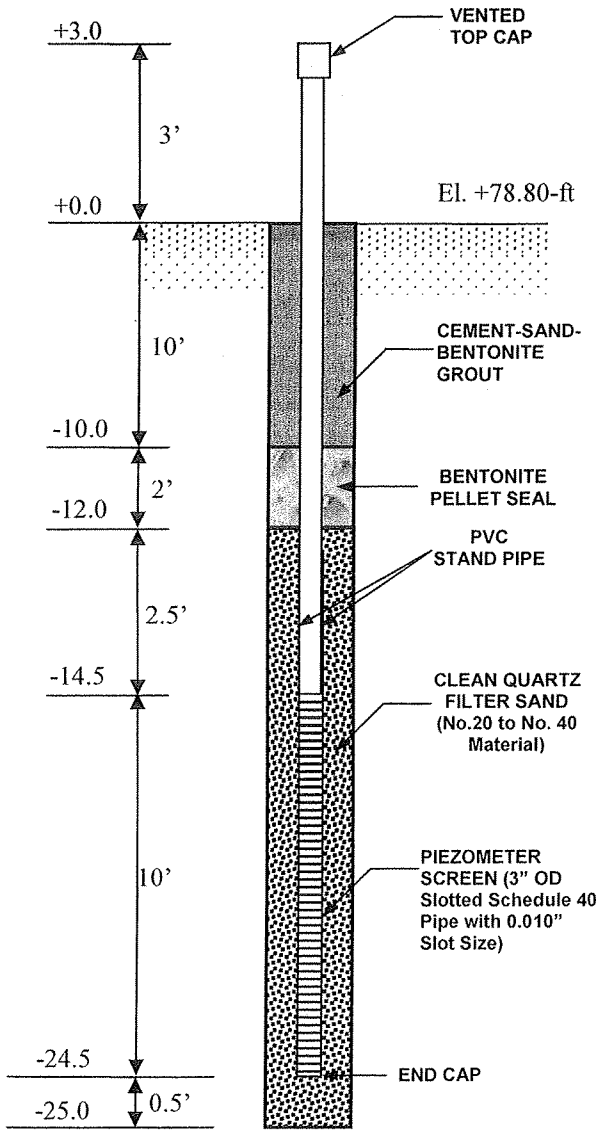
Installation and Development Details

Piezometer No	:	P-1*
Location	:	Boring No. B-3
Installation Date	:	09/06/2012
Drilling Method	:	Dry Auger Wet Rotary
Development Date	:	09/24/2012 10/09/2012
Development Method	:	Plunging

Water Level Data		Depth Below Grade	Elevation, (ft)
During Drilling	:	15.0'	62.48
After Installation	:	11.0'	66.58
Before Development	:	10.1'	67.48
After Development	:	8.3'	69.28
Before Development	:	8.9'	68.68
After Development	:	8.1'	69.48

* Boring B-3 was converted to Piezometer P-1

PIEZOMETER INSTALLATION DATA (P-2)



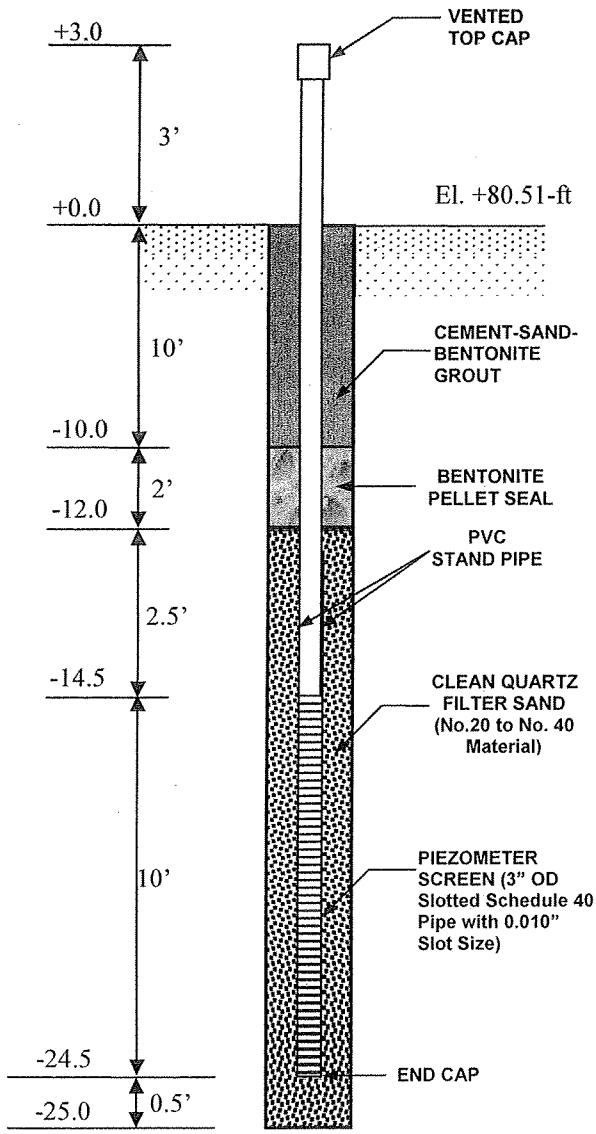
Installation and Development Details

Piezometer No	:	P-2*
Location	:	Boring No. B-8*
Installation Date	:	09/10/2012
Drilling Method	:	Dry Auger Wet Rotary
Development Date	:	09/24/2012 10/09/2012
Development Method	:	Plunging

Water Level Data		Depth Below Grade	Elevation, (ft)
During Drilling	:	18.0'	60.80
After Installation	:	16.0'	62.80
Before Development	:	14.0'	64.80
After Development	:	11.9'	66.90
Before Development	:	13.5'	65.30
After Development	:	11.8'	67.00

* Boring B-8 was converted to Piezometer P-2

PIEZOMETER INSTALLATION DATA (P-3)



Installation and Development Details

Piezometer No	:	P-3*
Location	:	Boring No. B-12*
Installation Date	:	09/06/2012
Drilling Method	:	Dry Auger Wet Rotary
Development Date	:	09/24/2012 10/09/2012
Development Method	:	Plunging

Water Level Data		Depth Below Grade	Elevation, (ft)
During Drilling	:	20.0'	60.51
After Installation	:	18.0'	62.51
Before Development	:	20.7'	59.81
After Development	:	19.5'	61.01
Before Development	:	20.0'	60.51
After Development	:	19.7'	60.81

* Boring B-12 was converted to Piezometer P-3

PIEZOMETER READING TABLE

Piezometer No./Depth	Existing Ground Surface Elevation, ft.	Groundwater Depth During Drilling from Existing Ground Surface, ft.	Piezometric Level with Respect to Existing Ground Surface, ft.					
			September 24, 2012			October 09, 2012		
			Before Bailing	After Bailing		Before Bailing	After Bailing	
				Time (Min.)	Depth		Time, (Min.)	Depth
P-1 (25')	+77.58	15.0	10.1'	1	9' 8"	8.9'	1	8' 6"
				2	9' 6"		2	8' 5"
				5	8' 6"		5	8' 3"
				10	8' 3"		10	8' 1"
				20	8' 3"		20	8' 1"
				30	8' 3"		30	8' 1"
				60	8' 3"		60	8' 1"
P-2 (25')	+78.80	18.0	14.0'	1	12' 9"	13.5'	1	13' 2"
				2	12.5"		2	12' 9"
				5	12' 1"		5	12' 4"
				10	12' 0"		10	12' 1"
				20	12' 0"		20	11 9"
				30	11' 9"		30	11' 8"
				60	11' 9"		60	11' 8"
P-3 (25')	80.51	20.0	20.7'	Time (Min.)	Depth	20.0'	Time, (Min.)	Depth
				1	20' 7"		1	19' 11"
				2	20' 5"		2	19' 11"
				5	20' 2"		5	19' 11"
				10	20' 1"		10	19' 9"
				20	19' 9"		20	19' 7"
				30	19' 7"		30	19' 7"
				60	19' 5"		60	19' 7"

Note: Borings B-3, B-8 and B-12 were converted to Piezometers P-1, P-2 and P-3, respectively.

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

GET Project No.: 12-568E

Location: Harris County, Texas

Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
B-1	0 – 2	Fill: Sandy Silt (ML)	9									
	2 – 4	Sandy Clay (CL)	7		32	16	16	58				
	4 – 6	Sandy Clay (CL)	12									
	6 – 8	Sandy Clay (CL)	17		34	17	17					6'-8' Grade 1 (Non-Dispersive)
	8 – 10	Sandy Clay (CL)	14									
	10 – 12	Sandy Clay (CL)	17		36	16	20	57				
	12 – 14	Silty Sand (SM)	21									
	14 – 16	Silty Sand (SM)	18									
	16 – 18	Silty Sand (SM)	16									
	18 – 20	Silty Sand (SM)	22									
	20 – 22	Silty Sand (SM)	22									
	22 – 24	Silty Sand (SM)	21									
	24 – 25	Silty Sand (SM)	16									
B-2	0 – 2	Fill: Sandy Silt (ML)	11					58				
	2 – 4	Fill: Sandy Silt (ML)	14									
	4 – 6	Sandy Clay (CL)	8		35	17	18					
	6 – 8	Sandy Clay (CL)	17									
	8 – 10	Sandy Clay (CL)	18									
	10 – 12	Sandy Clay (CL)	18		35	17	18					10'-12' Grade 1 (Non-Dispersive)
	12 – 14	Sandy Clay (CL)	19									
	14 – 16	Silty Sand (SM)	23									
	16 – 18	Silty Sand (SM)	22									
	18 – 20	Silty Sand (SM)	24									
	20 – 22	Silty Sand (SM)	23									
	22 – 24	Silty Sand (SM)	21									
	24 – 25	Silty Sand (SM)	22									

PLATE 10

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

GET Project No.: 12-568E

Location: Harris County, Texas

Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
B-3	0 – 2	Fill: Sandy Clay (CL)	16	111	37	17	20	65	1.26	9.08	0	
	2 – 4	Fill: Sandy Clay (CL)	13						0.92	14.5	3	
	4 – 6	Clay (CL)	16									
	6 – 8	Clay (CL)	17	119	45	19	26	76	1.71	10.9	0	
	8 – 10	Clay (CL)	16		42	18	24	76				8'-10' Grade 1
	10 – 12	Clay (CH)	34	90					2.23	14.2	9	CU Test (8'10')
	12 – 14	Clay (CH)	35									C' = 236.8 psf
	14 – 16	Silty Sand (SM)	24					12				ϕ'= 27.9 °
	16 – 18	Silty Sand (SM)	23									
	18 – 20	Silty Sand (SM)	27									
	20 – 22	Silty Sand (SM)	20									
	22 – 24	Silty Sand (SM)	27						1.9	4.7	20	
	24 – 25	Clay (CH)	28	98	75	22	53		2.74	10	0	24' - 25' ND1 Non-Dispersive
B-4	0 – 2	Fill: Sandy Clay (CL)	8									
	2 – 4	Fill: Sandy Clay (CL)	6		24	14	10					
	4 – 6	Sandy Clay (CL)	8						2.54	9.78	4	
	6 – 8	Sandy Clay (CL)	10	117	43	18	25	63	0.91	10.9	0	6'-8' Grade 1
	8 – 10	Sandy Clay (CL)	10									CU Test (6'-8')
	10 – 12	Sandy Clay (CL)	13		40	18	22					C' = 261.4 psf
	12 – 14	Sandy Clay (CL)	24	110	44	17	27	56	0.57	9.83	0	ϕ'= 28.3 °
	14 – 16	Silty Sand (SM)	20									10'-12' ND1 Non-Dispersive
	16 – 18	Silty Sand (SM)	22									CU Test (10'-12')
	18 – 20	Silty Sand (SM)	26					17				C' = 241.7 psf
	20 – 22	Clay (CH)	25		50	19	31					ϕ'= 21.3 °
	22 – 24	Clay (CH)	21						0.49	10.9	19	
	24 – 25	Clay (CH)	22	100	50	18	32	88	0.45	10	0	

PLATE 11

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

GET Project No.: 12-568E

Location: Harris County, Texas

Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
B-5	0 – 2	Fill: Sandy Clay (CL)	7		36	17	19					
	2 – 4	Sandy Clay (CL)	12									
	4 – 6	Sandy Clay (CL)	12		32	17	15					
	6 – 8	Sandy Clay (CL)	14									
	8 – 10	Sandy Clay (CL)	14		38	17	21	61				
	10 – 12	Sandy Clay (CL)	14									
	12 – 14	Sandy Clay (CL)	18									
	14 – 16	Sandy Clay (CL)	18		35	16	19	68				14'-16' Grade 1
	16 – 18	Silty Sand (SM)	20									
	18 – 20	Silty Sand (SM)	19									
	20 – 22	Silty Sand (SM)	14					25				
	22 – 24	Silty Sand (SM)	19									
	24 – 25	Silty Sand (SM)	16									
B-6	0 – 2	Fill: Sandy Clay (CL)	7	110					1.64	8.6	0	
	2 – 4	Fill: Sandy Clay (CL)	7		29	14	15	56	2.41	8.4	3	
	4 – 6	Sandy Clay (CL)	10									
	6 – 8	Sandy Clay (CL)	11	118	39	17	22	64	2.63	9.56	0	6'-8' Non-Dispersive
	8 – 10	Sandy Clay (CL)	9		37	17	20	61	1.97	14.2	6	CU Test (8'-10')
	10 – 12	Sandy Clay (CL)	18									C' = 263.5 psf
	12 – 14	Silty Sand (SM)	22					39				ϕ'= 30.8 °
	14 – 16	Silty Sand (SM)	24									10'-12' Grade 1
	16 – 18	Silty Sand (SM)	22									
	18 – 20	Silty Sand (SM)	22									
	20 – 22	Clay (CH)	28	104	65	20	45	87	1.21	9.5	0	
	22 – 24	Clay (CH)	18									
	24 – 25	Silty Sand (SM)	22						2.49	8	19	

PLATE 12

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

GET Project No.: 12-568E

Location: Harris County, Texas

Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%) LL	PL	PI	-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
B-7	0 - 2	Fill: Sandy Clay (CL)	6	113	29	15	14	57	0.98	9.4	0	
	2 - 4	Fill: Sandy Clay (CL)	8									
	4 - 6	Sandy Clay (CL)	7	108	24	14	10		1.15	9.4	0	
	6 - 8	Sandy Clay (CL)	10						2.64	10.5	6	
	8 - 10	Sandy Clay (CL)	7		36	16	20	64				CU Test (8'-10')
	10 - 12	Sandy Clay (CL)	17	106					0.98	9.4	0	C' = 277.2 psf
	12 - 14	Silty Sand (SM)	23									ϕ'= 38.1 °
	14 - 16	Silty Sand (SM)	26					36				
	16 - 18	Silty Sand (SM)	24									
	18 - 20	Silty Sand (SM)	20									
	20 - 22	Silty Sand (SM)	19									
	22 - 24	Clay (CH)	20		58	20	38	96				
	24 - 25	Clay (CH)	22						1.77	9.12	19	
B-8	0 - 2	Fill: Sandy Clay (CL)	13									
	2 - 4	Fill: Sandy Clay (CL)	18									
	4 - 6	Clay (CL)	15		36	16	20	78				
	6 - 8	Clay (CL)	16									
	8 - 10	Clay (CL)	16									
	10 - 12	Clay (CH)	22		67	23	44					10'-12' Grade 1
	12 - 14	Clay (CH)	21									
	14 - 16	Clay (CH)	22									
	16 - 18	Clay (CH)	21		69	21	48	95				
	18 - 20	Clay (CH)	27									
	20 - 22	Clay (CH)	23									
	22 - 24	Clay (CH)	17									
	24 - 25	Clay (CH)	26									

PLATE 13

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

GET Project No.: 12-568E

Location: Harris County, Texas

Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
B-9	0 - 2	Fill: Sandy Clay (CL)	18		40	18	22					
	2 - 4	Clay (CL)	12									
	4 - 6	Clay (CL)	13									
	6 - 8	Clay (CL)	16									
	8 - 10	Clay (CL)	16									
	10 - 12	Clay (CL)	14	116	43	18	25	87	2.33	12.9	0	
	12 - 14	Clay (CL)	17									
	14 - 16	Clay (CL)	18									
	16 - 18	Clay (CH)	20									
	18 - 20	Clay (CH)	20									
	20 - 22	Clay (CL)	15		43	19	24	79				20'-22' Grade 1
	22 - 24	Clay (CL)	13									
	24 - 25	Clay (CL)	17									
B-10	0 - 2	Fill: Sandy Clay (CL)	15									
	2 - 4	Fill: Sandy Clay (CL)	15									
	4 - 6	Sandy Clay (CL)	12		29	15	14	68				4'-6' Grade 1
	6 - 8	Sandy Clay (CL)	14									
	8 - 10	Sandy Clay (CL)	13									
	10 - 12	Sandy Clay (CL)	12	123	40	17	23		2.99	11.3	0	
	12 - 14	Clay (CH)	28									
	14 - 16	Clay (CH)	18									
	16 - 18	Clay (CH)	16		50	19	31	87				
	18 - 20	Clay (CH)	19									
	20 - 22	Clay (CH)	18									
	22 - 24	Clay (CH)	18									
	24 - 25	Clay (CH)	19									

PLATE 14

Summary of Laboratory Tests

Project: Improvements to HCFCD Channel W140-01-00

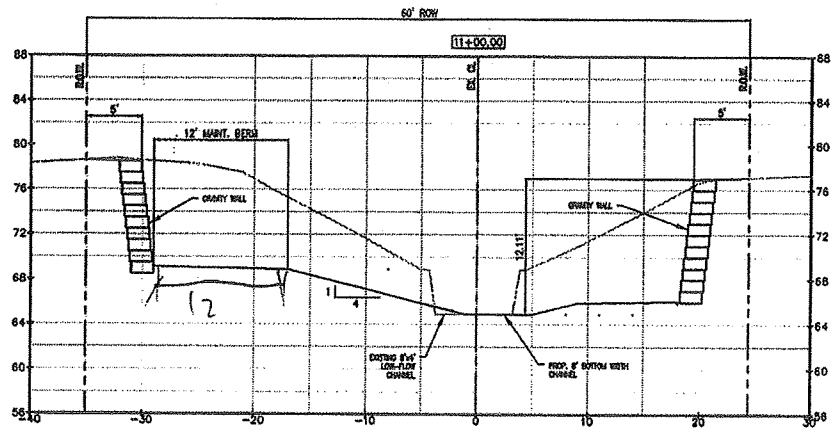
GET Project No.: 12-568E

Location: Harris County, Texas

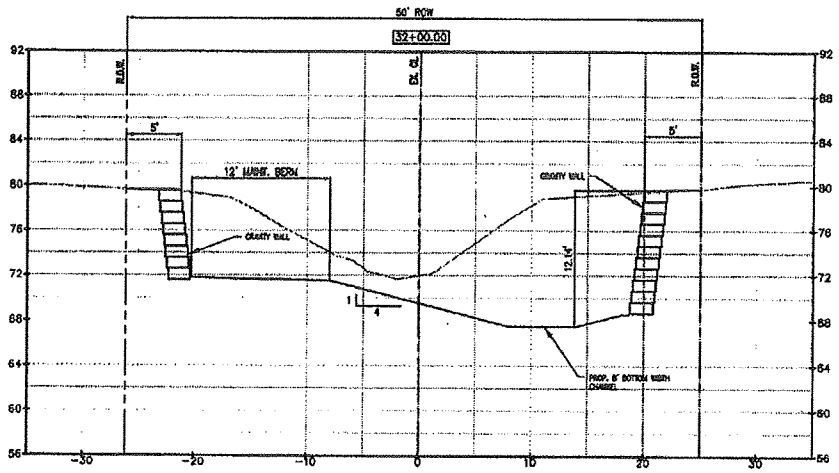
Client: LAN
Harris County Flood Control District

Boring No.	Sample Depth (feet)	Soil Classification	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Undrained Shear Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
B-11	0 - 2	Fill: Sandy Clay (CL)	7									
	2 - 4	Fill: Sandy Clay (CL)	12		36	16	20	67				
	4 - 6	Clay (CL)	10									
	6 - 8	Clay (CL)	14									
	8 - 10	Clay (CL)	16		48	18	30					
	10 - 12	Clay (CL)	15									
	12 - 14	Clay (CL)	18									
	14 - 16	Clay (CL)	18									
	16 - 18	Clay (CL)	16									
	18 - 20	Clay (CL)	14									
	20 - 22	Clay (CL)	17									
	22 - 24	Clay (CL)	16		40	17	23	76				
	24 - 25	Clay (CL)	13									
B-12	0 - 2	Fill: Sandy Clay (CL)	6	119	23	14	9	62	2.68	5.4	0	
	2 - 4	Fill: Sandy Clay (CL)	7						2.72	4.71	2	
	4 - 6	Clay (CL)	12									
	6 - 8	Clay (CL)	10		28	15	13	81	2.8	3.28	6	
	8 - 10	Clay (CL)	16	118					2.08	9.5	0	
	10 - 12	Clay (CL)	8		23	15	8	77				
	12 - 14	Clay (CL)	14	121					2.57	8.7	0	12'-14' ND1 Non-Dispersive
	14 - 16	Clay (CL)	21						1.25	7.65	12	
	16 - 18	Clay (CH)	31									
	18 - 20	Clay (CH)	33									
	20 - 22	Clay (CH)	22		62	20	42					CU Test (20'-22')
	22 - 24	Clay (CL)	8						1.78	14.3	18	C' = 206.6 psf
	24 - 25	Clay (CL)	12									ϕ'= 24.5 °

PLATE 15



Sta. 11+00.00



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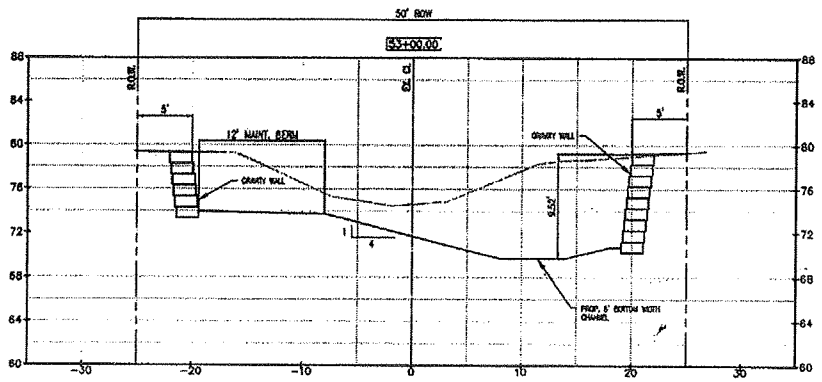
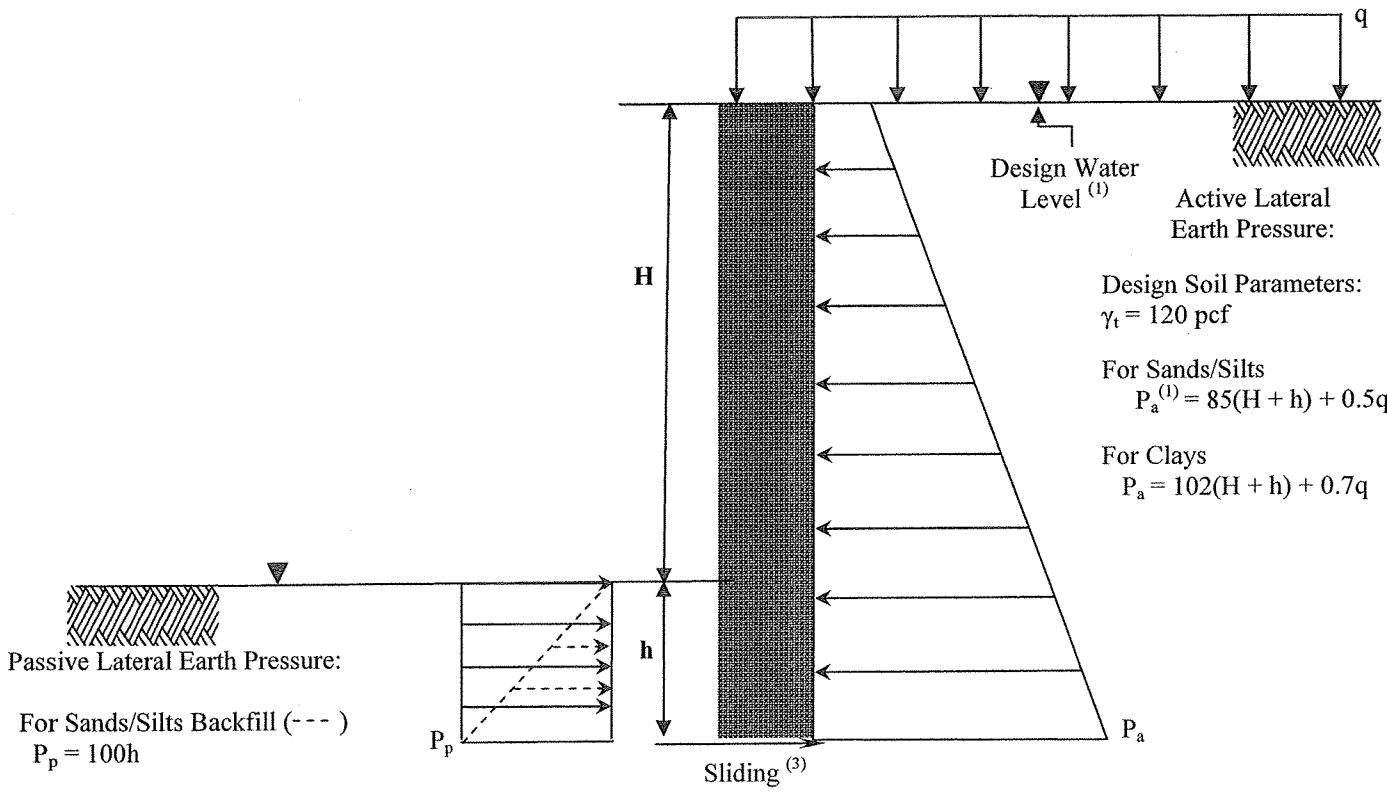


Sta. 53+00.00

CROSS SECTIONS FOR SLOPE STABILITY ANALYSIS (NOT TO SCALE)			NORTH
PROJECT: Geotechnical Study for HCFCD 140-01-00 Channel Improvement Harris County, Texas			
SCALE: NOT TO SCALE	DATE: MAY 2013	PROJECT NO.: 12-568E	

LATERAL EARTH PRESSURE DIAGRAM OF GRAVITY WALL



Notes: (1) Hydrostatic pressure load of 62.4 pcf per foot of wall height assuming groundwater at grade, have been added to the lateral loads, unless positive measures are taken to relieve hydrostatic pressures.

(2) We assumed a horizontal backfill behind the wall.

(3) Allowable adhesion against sliding: 200 psf (Clay)

(4) Allowable Friction coefficient against sliding: 0.3 (Sands)

(5) Assumed that compacted clay with shear strength of 1,000 psf in front of the wall in calculating the passive pressures.

(5) Where: P_a = Active earth pressure, psf per foot of wall.
P_p = Allowable passive earth pressure, psf per foot of wall. This includes a factor of safety of 2.0.
H = Height of the retaining wall above the design grade line, ft .
h = Height of the retaining wall below the design grade line, ft .
q = Surcharge load in psf, due to construction equipment loading or soil supported loads on top of the retaining wall. A surcharge load of 250 psf can be assumed for the weight of construction equipment/traffic.
γ_t = Total unit weight of soil.

LATERAL EARTH PRESSURE DIAGRAM

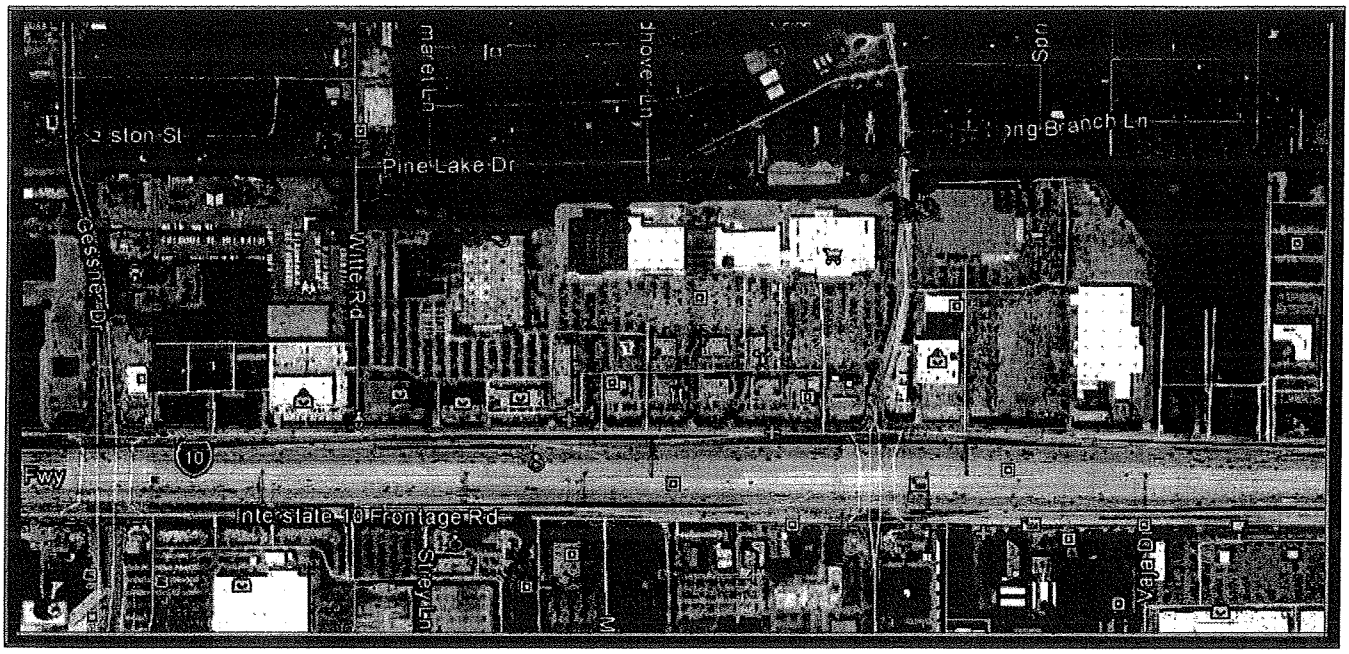
PROJECT: Geotechnical Study for HCFCD 140-01-00 Channel Improvement
Harris County, TX

SCALE: NOT TO SCALE	DATE: MAY 2013	PROJECT NO.: 12-568E

BOX CULVERT DESIGN PARAMETERS

APPENDIX A

Boring Logs and Key to Log Terms and Symbols



Legend:

● : Soil Boring

◉ : Piezometer Was Installed in the Boring

Notes: Borings B-2 through B-4, B-6, B-7 and B-12 were drilled using a Truck mounted drilling rig. Borings B-1, B-5 and B-8 through B-11 were drilled using a portable drilling rig.

PLAN OF BORINGS/ PIEZOMETERS			NORTH
PROJECT: Geotechnical Study for HCFCD 140-01-00 Channel Improvement Harris County, TX			
SCALE: NOT TO SCALE	DATE: MAY 2013	PROJECT NO.: 12-568	

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-1

PAGE 1 OF 1

DATE: 9/7/2012

SURFACE ELEVATION: 80.1

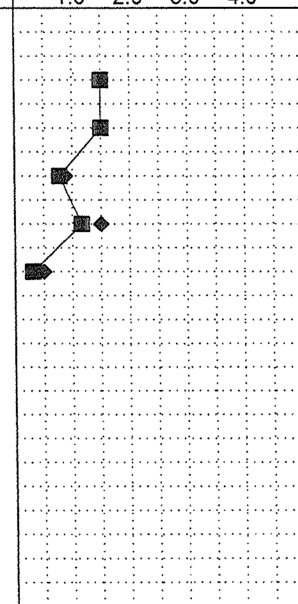
PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

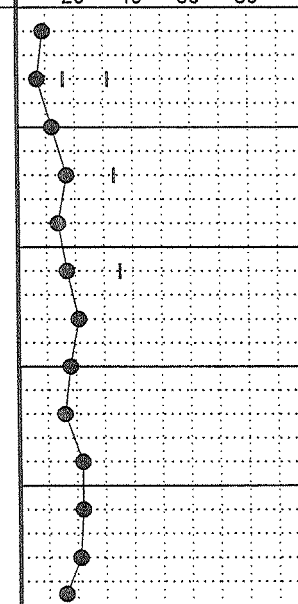
BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

LOCATION
Northing: 13851967.38
Easting: 3064802.52

DEPTH (ft.)	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	MOISTURE CONTENT (%)	LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL		FILL: SANDY SILT (ML), non plastic, dark brown, with root fibers, clay pockets, moist		9					
	CL		SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist	P=3	7	32	16	16	58	
5				P=3	12					
			- stiff 6' to 8'	P=1.56	17	34	17	17		6'-8' Grade 1 Non-Dispersive
				P=2.32	14					
10			- firm 10' to 12'	P=0.62	17	36	16	20	57	
	SM	▼ ▽	SILTY SAND (SM), non plastic, light brown, wet		21					
15					18					
					16					
					22					
20					22					
					21					
25					16					



DRY DENSITY (pcf) | UU SHEAR STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)



Water Level During: ▽ After 24 Hrs: ▼ Perched: ▼
: WATER ENCOUNTERED AT 14.0 ft. DURING DRILLING.
: WATER DEPTH AT 12.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ▱ Shelby Tube ▤ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:
Driller: GET (P)
Logger: Sam
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-2

HCFCD 12-568E.GPJ D.GDT 1/30/13

GET GEOTECH ENGINEERING & TESTING
Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-2

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/7/2012

SURFACE ELEVATION: 79.2

LOCATION

Northing: 13851985.52

Easting: 3065695.104

MATERIAL DESCRIPTION

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	BLOW COUNT / C_u (tsf) / SS (tsf) / Torvane (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL	FILL: SANDY SILT (ML), non plastic, light gray, brown, with root fibers, clay pockets, moist - medium dense 2' to 4'	N=21							11				58	
5	CL	SANDY LEAN CLAY (CL), stiff, medium plastic, light gray, light brown, brown, with root fibers to 6', ferrous nodules, sands, moist	P=1.56 P=1.12 P=1.24							14 8 17 18	35	17	18		
10		- firm 10' to 14'	P=0.62 P=0.78							18 19	35	17	18		10'-12' Grade 1 (Non-Dispersive)
15	SM	SILTY SAND (SM), dense, non plastic, light gray, brown, wet - medium dense 16' to 20'	N=31 N=26							23 22					
20			N=30							24 23					
25										21 22					

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 14.0 ft. DURING DRILLING.
: WATER DEPTH AT 12.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ▤ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: GET (T)
Logger: Sam

PLATE A-3

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-3

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T1-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 15-ft.
Wash Boring: 15 to 25-ft.

DATE: 9/6/2012

SURFACE ELEVATION: 77.6

LOCATION

Northing: 13851995.07

Easting: 3066054.732

DEPTH (ft.)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL	FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, gray, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=3	111	1.26		0	16	37	17	20	65	
	CL	- stiff 2' to 4'	P=3		0.92		3	13					
5		LEAN CLAY WITH SAND (CL), very stiff, high plastic, gray, dark brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist	P=2.48					16					
			P=2.32	119	1.71		0	17	45	19	26	76	
			P=3					16	42	18	24	76	8'-10' Grade 1 (Non-Dispersive) CU Test (8'10') c' = 236.8 psf ø' = 27.9°
10	CH	- light brown 6' to 10'	P=2.16	90	2.23		9	34					
		FAT CLAY (CH), hard, high plastic, gray, light brown, with ferrous and calcareous nodules	P=1.12					35					
	SM	- stiff 12' to 14'	N=16					24				12	
15		SILTY SAND (SM), medium dense, non plastic, light brown, wet	N=18					23					
		- dense, light brown 18' to 20'	N=42					27					
20			N=28					20					
			N=21		1.9		20	27					
	CH		P=3	98	2.74		0	28	75	22	53		24' - 25' ND1 Non-Dispersive
25		FAT CLAY (CH), hard, very high plastic, reddish brown, with ferrous and calcareous nodules, moist											

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

Water Level During: ▽ After 24 Hrs: ▽ Perched: ▽
: WATER ENCOUNTERED AT 15.0 ft. DURING DRILLING.
: WATER DEPTH AT 11.0 ft. AFTER 24 HOUR

Sample Key: SPT, Shelby Tube, Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
N - SPT Data (Blows/Ft)
T - Torvane (tsf)
C_u - Undrained Cohesion (tsf)
SS - Shear Strength (P/2, tsf)

Notes:

Driller: Mathers
Logger: George
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-4

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-4

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/7/2012

SURFACE ELEVATION: 80.3

LOCATION

Northing: 13851883.06

Easting: 3066173.587

DEPTH (ft.)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0		FILL		FILL: SANDY LEAN CLAY (CL), very stiff, slight plastic, light brown, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=3					8					
		CL			P=3					6	24	14	10		
5				SANDY LEAN CLAY (CL), hard, high plastic, light brown, dark brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist - stiff 6' to 8' - very stiff 8' to 12'	P=3		2.54		4	8					
					P=3	117	0.91		0	10	43	18	25	63	6'-8' Grade 1 CU Test (6'-8') c' = 261.4 psf ø' = 28.3°
					P=3					10					
10					P=3					13	40	18	22		10'-12' ND1 Non-Dispersive CU Test (10'-12') c' = 241.7 psf ø' = 21.3°
				- stiff 12' to 14'	P=0.92	110	0.57		0	24	44	17	27	56	
		SM		SILTY SAND (SM), medium dense, non plastic, light brown, reddish brown, wet	N=23					20					
15					N=27					22					
					N=25					26				17	
20		CH		FAT CLAY (CH), firm, high plastic, reddish brown, with ferrous and calcareous nodules, moist - stiff 22' to 24'	P=0.92					25	50	19	31		
					P=1.7		0.49		19	21					
25					P=1.86	100	0.45		0	22	50	18	32	88	

Natural Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (20 40 60 80)

BLOW COUNT (20 40 60 80); C_u (tsf) (1.0 2.0 3.0 4.0); SS (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▼
NO FREE WATER ENCOUNTERED DURING DRILLING

Sample Key: ☒ SPT ☐ Shelby Tube ▤ Disturbed

Key to Abbreviations:
- P - Pocket Penetrometer Reading (tsf)
- N - SPT Data (Blows/Ft)
- T - Torvane (tsf)
- C_u - Undrained Cohesion (tsf)
- SS - Shear Strength (P/2, tsf)

Notes:

Driller: Orion
Logger: Ricky
Bottom of Boring at 25-ft.

PLATE A-5

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-5

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/7/2012

SURFACE ELEVATION: 80.7

LOCATION

Northing: 13851892.39

Easting: 3066425.083

DEPTH (ft.)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL	FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, dark brown, with root fibers, ferrous nodules, sands, moist	P=3					7	36	17	19		
	CL	SANDY LEAN CLAY (CL), very stiff, medium plastic, brown, dark brown, with root fibers to 6', ferrous nodules, sands, moist	P=3					12					
5		- stiff 8' to 12'	P=3					12	32	17	15		
			P=3					14					
10			P=1.38					14	38	17	21	61	
		- firm, light brown 12' to 14'	P=1.86					14					
		- soft 14' to 16'	P=0.62					18					
15	SM	SILTY SAND (SM), non plastic, light brown, with clay pockets, moist	P=0.46					18	35	16	19	68	14'-16' Grade 1 (Non-Dispersive)
								20					
20		- wet 22' to 25'						19					
								14				25	
25								19					
								16					

BLOW COUNT (20 40 60 80)
C_u (tsf) (1.0 2.0 3.0 4.0)
SS (tsf) (1.0 2.0 3.0 4.0)
Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
20 40 60 80

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 24.0 ft. DURING DRILLING.
: WATER DEPTH AT 22.0 ft. AFTER 24 HOUR

Sample Key: SPT, Shelby Tube, Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
N - SPT Data (Blows/Ft)
T - Torvane (tsf)
C_u - Undrained Cohesion (tsf)
SS - Shear Strength (P/2, tsf)

Notes:

Driller: GET (P)
Logger: Sam
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-6

HCFCD 12-568E.GPJ .GDT 1/30/13

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-6

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 18-ft.
Wash Boring: 18 to 25-ft.

DATE: 9/10/2013

SURFACE ELEVATION: 79.4

LOCATION

Northing: 13851949.08

Easting: 3067559.111

DEPTH (ft.)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	BLOW COUNT / C_u (tsf) / SS (tsf) / Torvane (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0		FILL		FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=3		110	1.64		0		7					
		CL		- hard 2' to 4'	P=3			2.41		3		7	29	14	15	56	
5				SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, dark brown, with root fibers to 6', ferrous and calcareous nodules, sands, mosit	P=3							10					
					P=3		118	2.63		0		11	39	17	22	64	6'-8' Non-Dispersive CU Test (8'-10') c' = 263.5 psf ø' = 30.8° 10'-12' Grade 1
				- hard 6' to 8'	P=3			1.97		6		9	37	17	20	61	
10		SM		SILTY SAND (SM), medium dense, non plastic, light brown, wet	P=3							18					
					N=22							22				39	
15					N=25							24					
					N=24							22					
				- dense 18' to 20'	N=31							22					
20		CH		FAT CLAY (CH), very stiff, high plastic, reddish brown, with ferrous and calcareuos nodules, moist	P=3		104	1.21		0		28	65	20	45	87	
					P=3							18					
25				- hard 24' to 25'	P=3			2.49		19		22					

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING.
: WATER DEPTH AT 15.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ▤ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: Orion
Logger: Ricky
Bottom of Boring at 25-ft.

PLATE A-7

HCFCD 12-568E.GPJ .GDT 1/30/13

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-7

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 16-ft.
Wash Boring: 16 to 25-ft.

DATE: 9/10/2013

SURFACE ELEVATION: 80.0

LOCATION

Northing: 13851949.17

Easting: 3067659.586

DEPTH (ft.)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	BLOW COUNT / C_u (tsf) / SS (tsf) / Torvane (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0		FILL		FILL: SANDY LEAN CLAY (CL), stiff, medium plastic, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=3		113	0.98		0		6	29	15	14	57	
				- light brown 2' to 4'	P=3							8					
5		CL		SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, with root fibers to 6', ferrous nodules, sands, moist	P=3		108	1.15		0		7	24	14	10		
				- hard 6' to 8'	P=3			2.64		6		10					
10				- stiff 10' to 12'	P=3							7	36	16	20	64	CU Test (8'-10') c' = 277.2 psf ø' = 38.1°
		SM		SILTY SAND (SM), medium dense, non plastic, light brown, wet	P=1.7		106	0.98		0		17					
15				- reddish brown 14' to 22'	N=23							23					
					N=23							26				36	
					N=25							24					
20					N=27							20					
		CH			N=18							19					
				FAT CLAY (CH), very stiff, high plastic, reddish brown, with ferrous and calcareous nodules, moist	P=3							20	58	20	38	96	
25					P=3			1.77		19		22					

Water Level During: ▽ After 24 Hrs: ▽ Perched: ▽
: WATER ENCOUNTERED AT 16.0 ft. DURING DRILLING.
: WATER DEPTH AT 14.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: Orion
Logger: Ricky
Bottom of Boring at 25-ft.

PLATE A-8

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-8

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 18-ft.
Wash Boring: 18 to 25-ft.

DATE: 9/10/2012

SURFACE ELEVATION: 78.8

LOCATION

Northing: 13852043.94

Easting: 3068813.691

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL	FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, gray, dark brown, with root fibers, ferrous nodules, sands, moist	P=3					13					
	CL	- stiff, dark gray 2' to 4'	P=1.12					18					
5		LEAN CLAY WITH SAND (CL), stiff, medium plastic, light gray, brown, with root fibers to 10', ferrous nodules, sands, moist	P=1.24					15	36	16	20	78	
		- very stiff, light brown 6' to 10'	P=2.32					16					
10	CH	FAT CLAY (CH), stiff, very high plastic, light gray, reddish brown, with ferrous and calcareous nodules, moist	P=2.16					16					
		- firm 12' to 18'	P=1.7					22	67	23	44		10'-12' Grade 1 (Non-Dispersive)
15			P=0.92					21					
			P=0.62					22					
		- very stiff, gray 18' to 22'	P=0.62					21	69	21	48	95	
20			P=3					27					
			P=3					23					
			P=1.86					17					
25		- very stiff 24' to 25'	P=2.32					26					

Natural Moisture Content and Atterberg Limits: Plastic Limit | Moisture Content | Liquid Limit (20 40 60 80)

Water Level During: ▽ After 24 Hrs: ▽ Perched: ▽
: WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING.
: WATER DEPTH AT 16.0 ft. AFTER 24 HOUR

Sample Key: SPT | Shelby Tube | Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
N - SPT Data (Blows/Ft)
T - Torvane (tsf)
C_u - Undrained Cohesion (tsf)
SS - Shear Strength (P/2, tsf)

Notes:

Driller: Mathers
Logger: George
Bottom of Boring at 25-ft.

PLATE A-9

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-9

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/10/2013

SURFACE ELEVATION: 78.8

LOCATION

Northing: 13852118.02

Easting: 3068966.181

DEPTH (ft.)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0		FILL		FILL: SANDY LEAN CLAY (CL), stiff, high plastic, light gray, light brown, brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=1.38					18	40	18	22		
		CL			P=3					12					
5				LEAN CLAY WITH SAND (CL), very stiff, high plastic, light gray, brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist - light brown 6' to 16' - stiff 8' to 10' - hard 10' to 12'	P=3					13					
					P=2.32					16					
					P=1.86					16					
10					P=3	116	2.33		0	14	43	18	25	87	
					P=2.48					17					
15					P=3					18					
		CH		FAT CLAY (CH), very stiff, high plastic, light gray, with ferrous and calcareous nodules, moist	P=2.32					20					
20		CL		LEAN CLAY WITH SAND (CL), very stiff, high plastic, light gray, light brown, brown, with ferrous and calcareous nodules, sands, moist - reddish brown 22' to 25'	P=2.02					20					
					P=3					15	43	19	24	79	20'-22' Grade 1 (Non-Dispersive)
					P=3					13					
25					P=3					17					

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▼
NO FREE WATER ENCOUNTERED DURING DRILLING

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: GET (P)
Logger: Sam
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-10

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-10

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/10/2013

SURFACE ELEVATION: 77.9

LOCATION

Northing: 13852141.648

Easting: 3069563.72

DEPTH (ft)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0	FILL	FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, with root fibers, ferrous and calcareous nodules, sands, moist	P=3					15					
	CL		P=3					15					
5		SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, with root fibers to 6', ferrous and calcareous nodules, sands, moist	P=3					12	29	15	14	68	4'-6' Grade 1 (Non-Dispersive)
			P=3					14					
			P=3					13					
10		- hard 10' to 12'	P=3	123	2.99		0	12	40	17	23		
	CH	FAT CLAY (CH), stiff, high plpastic, light brown, with ferrous and calcareous nodules, moist	P=1.86					28					
15		- very stiff 14' to 16'	P=3					18					
			P=1.56					16	50	19	31	87	
		- very stiff 18' to 20'	P=3					19					
20			P=1.38					18					
			P=1.56					18					
25			P=1.12					19					

Natural Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit (20 40 60 80)

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING.
: WATER DEPTH AT 16.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: GET (P)
Logger: Sam
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-11

GET GEOTECH ENGINEERING & TESTING
Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-11

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 25-ft.
Wash Boring: to -ft.

DATE: 9/10/2013

SURFACE ELEVATION: 77.7

LOCATION

Northing: 13852158.922

Easting: 3069951.259

MATERIAL DESCRIPTION

DEPTH (ft.)	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA, P (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	PASSING #200 SIEVE (%)
0	FILL	FILL: SANDY LEAN CLAY (CL), very stiff, medium plastic, light brown, dark brown, with root fibers, ferrous and calcareuos nodules, sands, moist	P=3	7				
	CL	LEAN CLAY WITH SAND (CL), very stiff, medium plastic, light brown, dark brown, with root fibers to 6', ferrous and calcareuos nodules, sands, moist	P=3	12	36	16	20	67
5			P=3	10				
			P=3	14				
10			P=3	16	48	18	30	
			P=3	15				
			P=3	18				
15		- stiff 14' to 18'	P=1.7	18				
			P=1.86	16				
			P=2.02	14				
20			P=2.02	17				
		- stiff 22' to 24'	P=1.12	16	40	17	23	76
25			P=3	13				

FIELD STRENGTH DATA, P (tsf): BLOW COUNT (20 40 60 80); C_u (tsf) (1.0 2.0 3.0 4.0); SS (tsf) (1.0 2.0 3.0 4.0); Torvane (tsf) (1.0 2.0 3.0 4.0)

DRY DENSITY (pcf) | UU SHEAR STRENGTH (tsf) | FAILURE STRAIN (%) | CONFINING PRESSURE (psi)

Natural Moisture Content and Atterberg Limits (Plastic Limit | Moisture Content | Liquid Limit; 20 40 60 80)

ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 15.0 ft. DURING DRILLING.
: WATER DEPTH AT 13.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: GET (P)
Logger: Sam
Bottom of Boring at 25-ft. Due to access problem, a portable rig was used.

PLATE A-12

Geotech Engineering and Testing
800 Victoria
Houston, Texas

LOG OF BORING B-12

PROJECT: Improvements to HCFCD Channel W140-01-00, TIRZ CIP No. T-1734
Harris County, Texas

PROJECT NO.: 12-568E

BORING TYPE: Dry Auger: 0 to 20-ft.
Wash Boring: 20 to 25-ft.

DATE: 9/6/2012

SURFACE ELEVATION: 80.5

LOCATION

Northing: 13852051.896

Easting: 3070376.704

DEPTH (ft.)	USC	MATERIAL DESCRIPTION
0	FILL	FILL: SANDY LEAN CLAY (CL), hard, medium plastic, light brown, dark brown, with root fibers, ferrous and calcareous nodules, sands, moist
5	CL	LEAN CLAY WITH SAND (CL), very stiff, medium plastic, dark brown, with root fibers to 6', moist - hard 6' to 10' - light brown 10' to 16' - hard 12' to 14'
15	CH	FAT CLAY (CH), stiff, very high plastic, light brown, with ferrous and calcareous nodules, moist - very stiff, reddish brown 18' to 22'
20	CL	LEAN CLAY WITH SAND (CL), very stiff, medium plastic, light brown, with ferrous and calcareous nodules, sands, moist
25		

SAMPLES | WATER LEVEL

FIELD STRENGTH DATA, P (tsf)	DRY DENSITY (pcf)	UU SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
P=3	119	2.68		0	6	23	14	9	62	
P=3		2.72		2	7					
P=3					12					
P=3		2.8		6	10	28	15	13	81	
P=3	118	2.08		0	16					
P=3					8	23	15	8	77	
P=3	121	2.57		0	14					12'-14' ND1 Non-Dispersive
P=3		1.25		12	21					
P=1.12					31					
P=3					33					
P=3					22	62	20	42		CU Test (20'-22') c' = 206.6 psf ø' = 24.5°
P=3		1.78		18	8					
P=3					12					

BLOW COUNT (20 40 60 80)
C_u (tsf) (1.0 2.0 3.0 4.0)
SS (tsf) (1.0 2.0 3.0 4.0)
Torvane (tsf) (1.0 2.0 3.0 4.0)

Natural Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
20 40 60 80

Water Level During: ▽ After 24 Hrs: ▼ Perched: ▽
: WATER ENCOUNTERED AT 20.0 ft. DURING DRILLING.
: WATER DEPTH AT 18.0 ft. AFTER 24 HOUR

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
P - Pocket Penetrometer Reading (tsf)
● N - SPT Data (Blows/Ft)
◆ T - Torvane (tsf)
▲ C_u - Undrained Cohesion (tsf)
■ SS - Shear Strength (P/2, tsf)

Notes:

Driller: Mathers
Logger: George
Bottom of Boring at 25-ft.

PLATE A-13

KEY TO LOG TERMS AND SYMBOLS

UNIFIED SOIL CLASSIFICATIONS

Symbol		Material Descriptions
GW		WELL GRADED-GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM		SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES
GC		CLAY GRAVELS, GRAVEL-SAND CLAY MIXTURES
SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP		POORLY GRADED SANDS, OR GRAVELLY SANDS, LITTLE OR NO FINES
SM		SILTY SANDS, SAND-SILT MIXTURES a
SC		CLAYEY SANDS, SAND-SILT MIXTURES b
ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS
OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
PT		PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT
		FILL SOILS

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	-	Having incline planes of weakness that are slick and glossy in appearance.
Fissured	-	Containing shrinkage cracks frequently filled with fine sand or silt: usually vertical.
Laminated	-	Composed of thin layers of varying colors and soil sample texture.
Interbedded	-	Composed of alternate layers of different soil types.
Calcareous	-	Containing appreciable quantities of calcium carbonate.
Well Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes.
Poorly Graded	-	Predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.
Pocket	-	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	-	Inclusion less than ⅛-inch thick extending through the sample.
Seam	-	Inclusion ⅛- to 3-inch thick extending through the sample.
Layer	-	Inclusion greater than 3-inch thick extending through the sample.
Interlayered	-	Soils sample composed of alternating layers of different soil types.
Intermixed	-	Soil samples composed of pockets of different soil type and layered or laminated structure is not evident.

COARSE GRAINED SOILS (major portion retained on No. 200 Sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Conditions rated according to standard penetration test (SPT)* as performed in the field.

Descriptive Terms	Blows Per Foot*
Very Loose	0 – 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	over 50

* 140 pound weight having a free fall of 30-inch

FINE GRAINED SOILS (major portion passing No. 200 Sieve): Include (1) inorganic or organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength as indicated by hand penetrometer readings or by unconfined compression tests.

Descriptive Term	Undrained Shear Strength Ton/Sq. Ft.
Very Soft	Less than 0.13
Soft	0.13 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very Stiff	1.00 to 2.00
Hard	2.00 or higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above because of weakness or cracks in the soil. The consistency ratings of such soils are based on hand penetrometer readings.

SOIL SAMPLERS

- SHELBY TUBE SAMPLER
- STANDARD PENETRATION TEST
- AUGER SAMPLING

TERMS CHARACTERIZING ROCK PROPERTIES

VERY SOFT OR PLASTIC	Can be remolded in hand: corresponds in consistency up to very stiff in soils.
SOFT	Can be scratched with fingernail.
MODERATELY HARD	Can be scratched easily with knife; cannot be scratched with fingernail. Difficult to scratch with knife.
VERY HARD	Cannot be scratched with knife.
POORLY CEMENTED OR FRIABLE	Easily crumbled.
CEMENTED	Bounded Together by chemically precipitated materials.
UNWEATHERED	Rock in its natural state before being exposed to atmospheric agents.
SLIGHTLY WEATHERED	Noted predominantly by color change with no disintegrated zones.
WEATHERED	Complete color change with zones of slightly decomposed rock.
EXTREMELY WEATHERED	Complete color change with consistency, texture, and general appearance or soil.

APPENDIX B

Consolidated Undrained Triaxial Test Results

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

HTS, INC. CONSULTANTS

Houston, TX

for technical competence in the field of

Geotechnical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 2nd day of November 2010.

President & CEO
For the Accreditation Council
Certificate Number 0029.02
Valid to October 31, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Geotechnical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

HTS, INC. CONSULTANTS
416 Pickering
Houston, TX 77206
Terry J. Jackson, P.E. Phone: 713 692 8373

GEOTECHNICAL

Valid To: October 31, 2012 Certificate Number: 0029.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests under the ASTM recommended practice D3740 and Geosynthetic Institute (GSI):

Soils:

ASTM:	D421 D422 D698 D854 D1140 D1143* D1557 D1883 D2166 D2216 D2217 D2419 D2434 D2435 D2487* D2488* D2850 D2922* D2974 D3017* D3080 D3282 D3668 D3689* D3877 D3966* D4186 D4221 D4318 D4546 D4643 D4647 (Undisturbed Samples Only) D4750* D4767 D4829 D4832 D4959 D5084 D5102 D6572
TXDOT:	103-E 104-E 105-E 106-E 107-E 108-E 111-E 113-E (2004) 114-E (Part 1 Only) 118-E 120-E 121-E 600-J (Part 1 and pH)

Soil-Cement:

ASTM:	D1632 D1633

Geosynthetics:

ASTM:	D374 D412 (Using Die B) D413 D570 (Water Absorption) D638 D751 D790 D792 D882 D903 D1004 D1204 (Dimensional Stability) D1238 D1505 D1593 D1621 D2122 D2240 (Procedures A and D Only) D2412 D2663 D3015 D3083 (89) D3776 (Ambient Lab Conditions Only) D3786 (89) D4218 D4354 D4437 (Destructive Testing Only) D4491 D4533 D4545 D4595 D4632 D4716 D4751 D4833 D4884 D4885 D5034 D5035 D5199 D5261 D5321 D5596 D5887 D5890 D5891 D5993
FTMS:	101/2065

* This laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing Laboratories* for these tests.

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

HTS, INC. Consultants
416 Pickering Street
Houston, Texas 77091

5. Project # 12-568

1. REPORT TO:
Company: GET
Address: 800 Victoria Dr
Houston, TX 77022
Contact: Alex or Moe.
Phone: 713-699-4000
Fax: 713-699-9200

2. INVOICE TO:
Company: GET
Address:
Contact:
Phone:
3. PO/SO #:

4. Turnaround Time
Standard
Rush
Super Rush ✓

FOR LAB USE ONLY
Sampling Fee: ____ Hrs.
Equipment Rental Fee: ____

6. Project Name / Location
Channel Improvement of W140-01-00

7. Special Detection Limits

8. Sampler's Name & Company: Alex Kwon, GET
Sampler's Signature:

Preservative Codes (for Item 15)
C = Cool
H = Hydrochloric Acid
M = Monochloroacetic Acid
N = Nitric Acid
OH = Sodium Hydroxide
S = Sulfuric Acid
T = Sodium Thiosulfate
X = Other____

LAB USE ONLY LAB SAMPLE NO.	Item	9. Sample ID or No.	10. Sample Name	11. Collection Date	11. Collection Time	12. Comp.	12. Grab	13. Matrix*	14. No. of Containers	15. Preservatives	16. Containers**	17. Analyses Requested: Triaxial CU, 3samples	18. REMARKS
✓	1	B-3	8'-10'	9/6/12								✓	CU (7, 10, 15psi)
✓	2	B-4	6'-8'	9/11/12								✓	CU (7, 10, 15 psi)
✓	3	B-4	12'-14'	9/11/12								✓	CU (7, 10, 15 psi)
✓	4	B-6	8'-10'	9/11/12								✓	CU (7, 10, 15 psi)
✓	5	B-7	8'-10'	9/11/12								✓	CU (5, 8, 10 psi)
✓	6	B-12	20'-22'	9/6/12								✓	CU (10, 15, 20 psi)
	7												
	8												
	9												
	10												

	20. RELINQUISHED BY	DATE	TIME	21. RECEIVED BY	DATE	TIME
1	Paz.	9/14		M. Coronado	9-14-12	
2						
3						
4						

19. KNOWN HAZARDS / COMMENTS

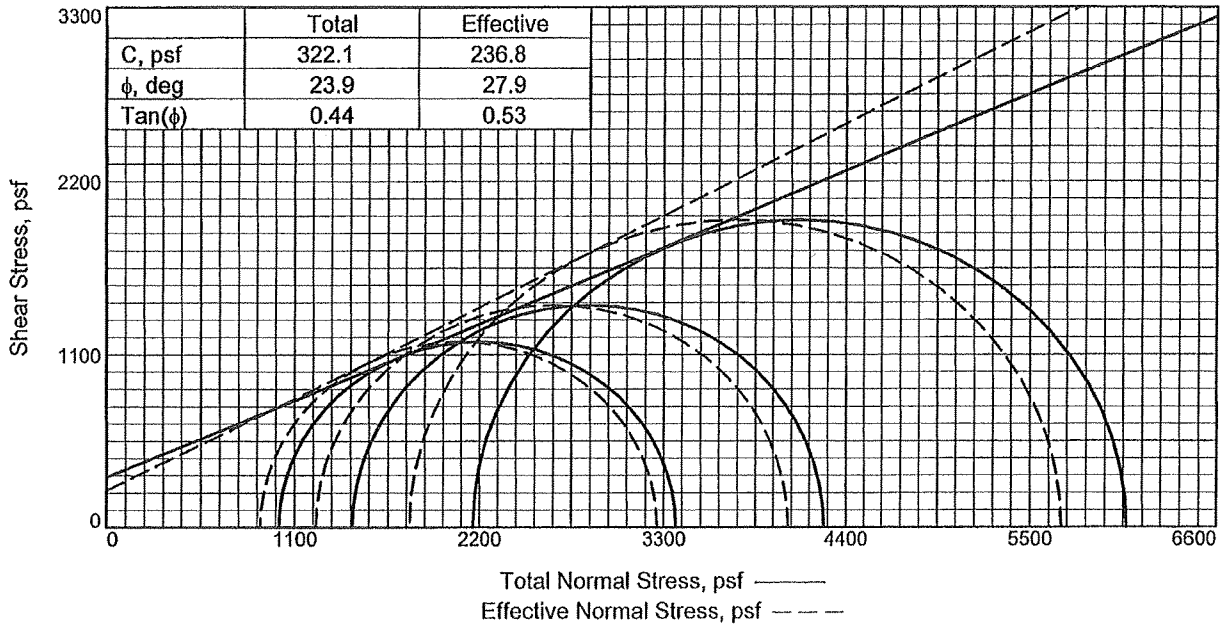
22. METHOD OF SHIPMENT

23. BILL OF LADING / TRACKING #

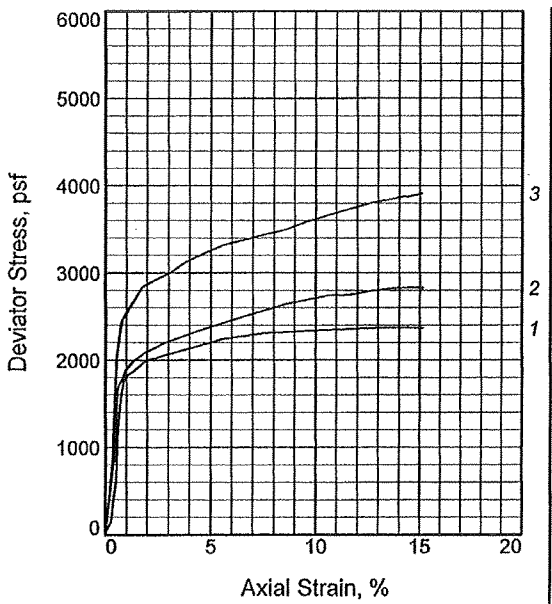
*Matrix WW-Wastewater W-Water S-Soil SD-Solid L-Liquid A-Air Bag C-Charcoal Tube SL-Sludge O-Oil OH-Other____
**Container VOA-40 ml vial A/G-Amber or Glass1 Liter 4 oz-8 oz glass wide mouth P/O-Plastic or other____

Phone: 713-692-8373
Fax: 713-692-8502

LAB USE ONLY



	Total	Effective
C, psf	322.1	236.8
ϕ, deg	23.9	27.9
Tan(ϕ)	0.44	0.53



Sample No.		1	2	3
Initial	Water Content, %	20.7	19.1	14.3
	Dry Density, pcf	101.8	109.8	120.0
	Saturation, %	87.8	100.0	100.0
	Void Ratio	0.6253	0.5064	0.3784
	Diameter, in.	2.79	2.79	2.81
	Height, in.	5.64	5.53	5.73
At Test	Water Content, %	31.6	23.0	18.9
	Dry Density, pcf	90.1	102.9	110.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8366	0.6082	0.5016
	Diameter, in.	2.98	2.90	2.95
	Height, in.	5.59	5.47	5.66
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		45.000	48.000	53.000
Fail. Stress, psf		2365.2	2827.8	3909.0
Total Pore Pr., psf		5584.6	5688.0	5853.6
Ult. Stress, psf		2365.2	2827.8	3909.0
Total Pore Pr., psf		5584.6	5688.0	5853.6
$\bar{\sigma}_1$ Failure, psf		3260.6	4051.8	5687.4
$\bar{\sigma}_3$ Failure, psf		895.4	1224.0	1778.4

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve=76%
"B" Coefficient = 0.95 (1), 0.97 (2), 0.95 (3)
LL= 45 **PL=** 19 **PI=** 26
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 10/24/12
Checked by: BFM Date: 10/27/12

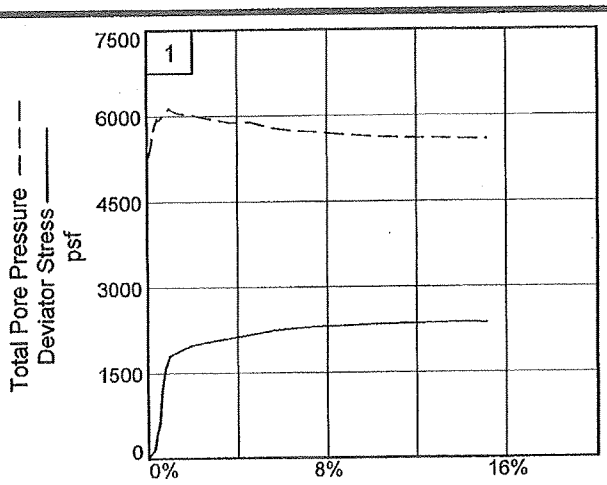
Client: GET

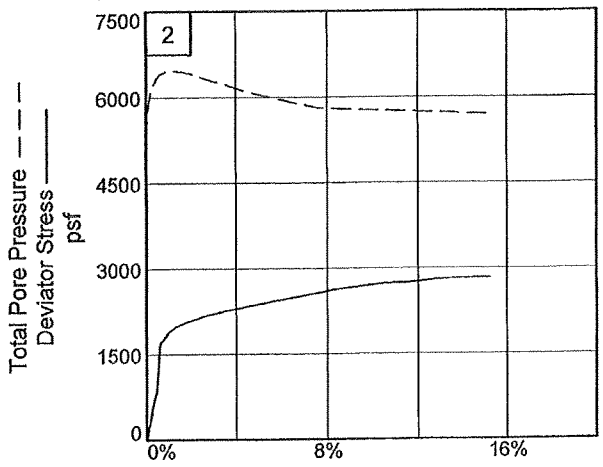
Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-3 **Depth:** 8'-10'

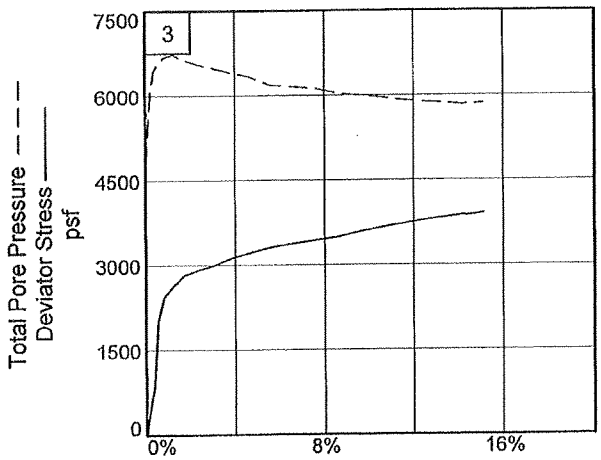
Proj. No.: 12-S-331 **Date Sampled:** 10/24/12

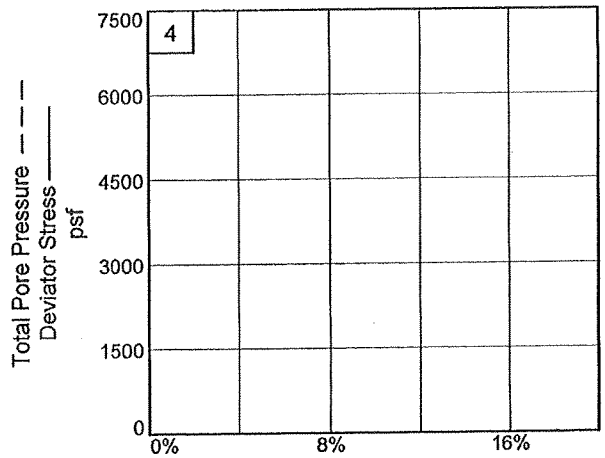
HTS, INC Consultants

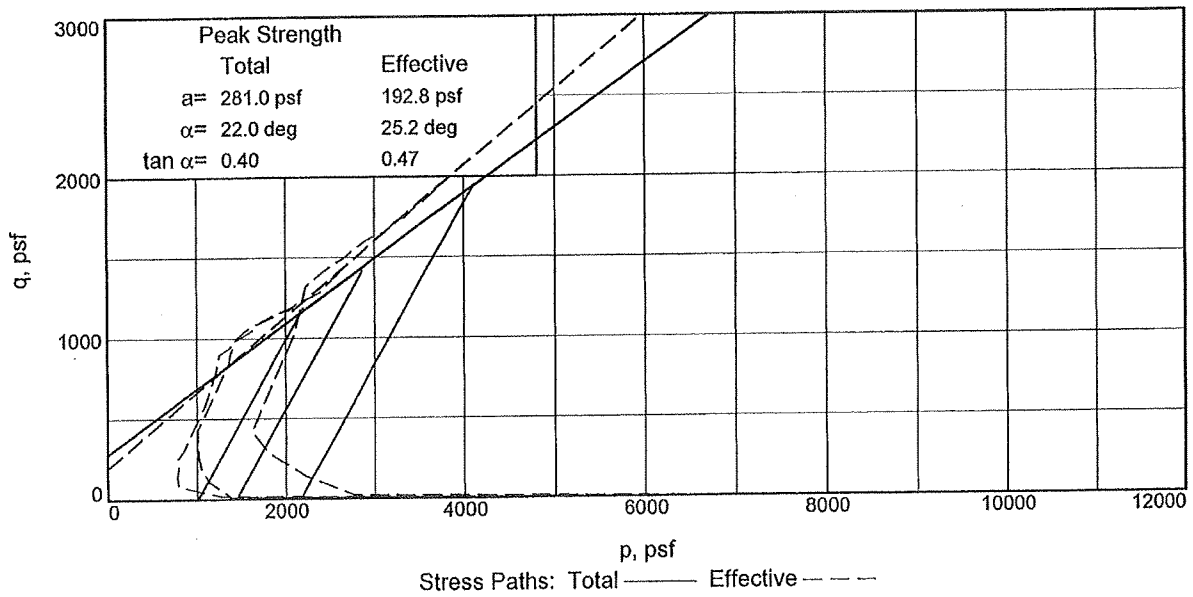
Figure 1







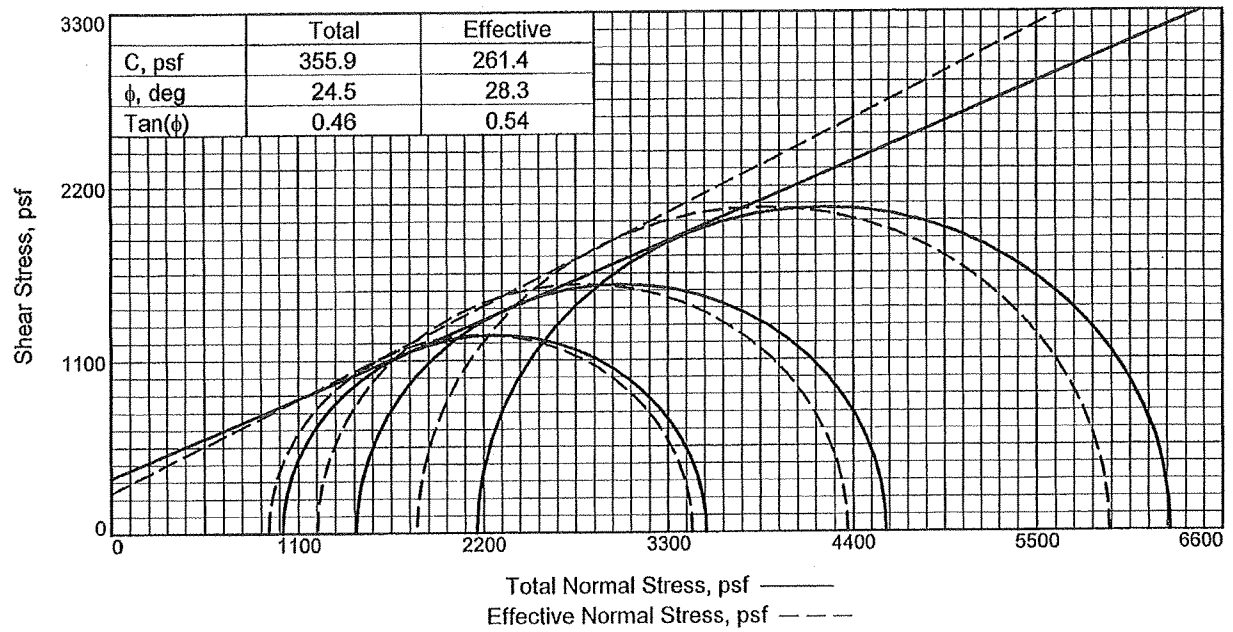


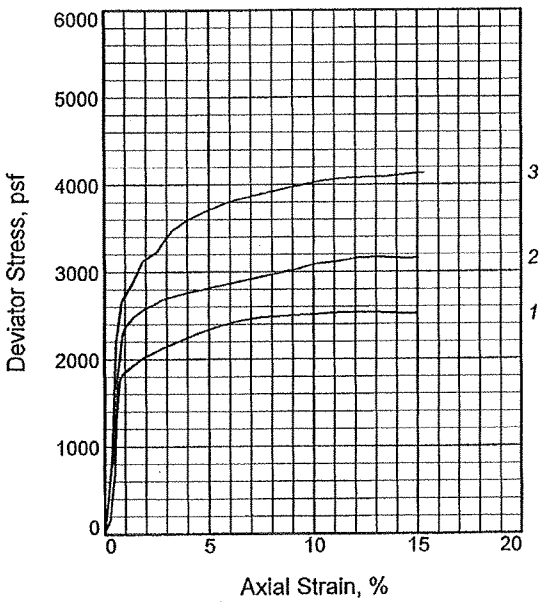


Client: GET
Project: Channel Improvement of W140-01-00
Depth: 8'-10' **Sample Number:** B-3
Project No.: 12-S-331

Figure _____

HTS, Inc.





Sample No.		1	2	3
Initial	Water Content, %	14.4	13.3	11.6
	Dry Density, pcf	119.7	122.2	123.9
	Saturation, %	100.0	99.7	91.3
	Void Ratio	0.3818	0.3540	0.3355
	Diameter, in.	2.76	2.72	2.73
	Height, in.	5.70	5.28	5.35
At Test	Water Content, %	16.6	15.5	15.9
	Dry Density, pcf	115.0	117.2	116.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4392	0.4112	0.4210
	Diameter, in.	2.83	2.79	2.83
	Height, in.	5.65	5.22	5.28
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		45.000	48.000	53.000
Fail. Stress, psf		2520.5	3158.4	4127.7
Total Pore Pr., psf		5555.8	5702.4	5832.0
Ult. Stress, psf		2520.5	3158.4	4127.7
Total Pore Pr., psf		5555.8	5702.4	5832.0
$\bar{\sigma}_1$ Failure, psf		3444.7	4368.0	5927.7
$\bar{\sigma}_3$ Failure, psf		924.2	1209.6	1800.0

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve=63%
"B" Coefficient = 0.96 (1), 0.96 (2), 0.99 (3)
LL= 43 **PL=** 18 **PI=** 25
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 11/04/12
Checked by: BFM Date: 11/027/12

Client: GET

Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-4 **Depth:** 6'-8'

Proj. No.: 12-S-331 **Date Sampled:** 10/24/12

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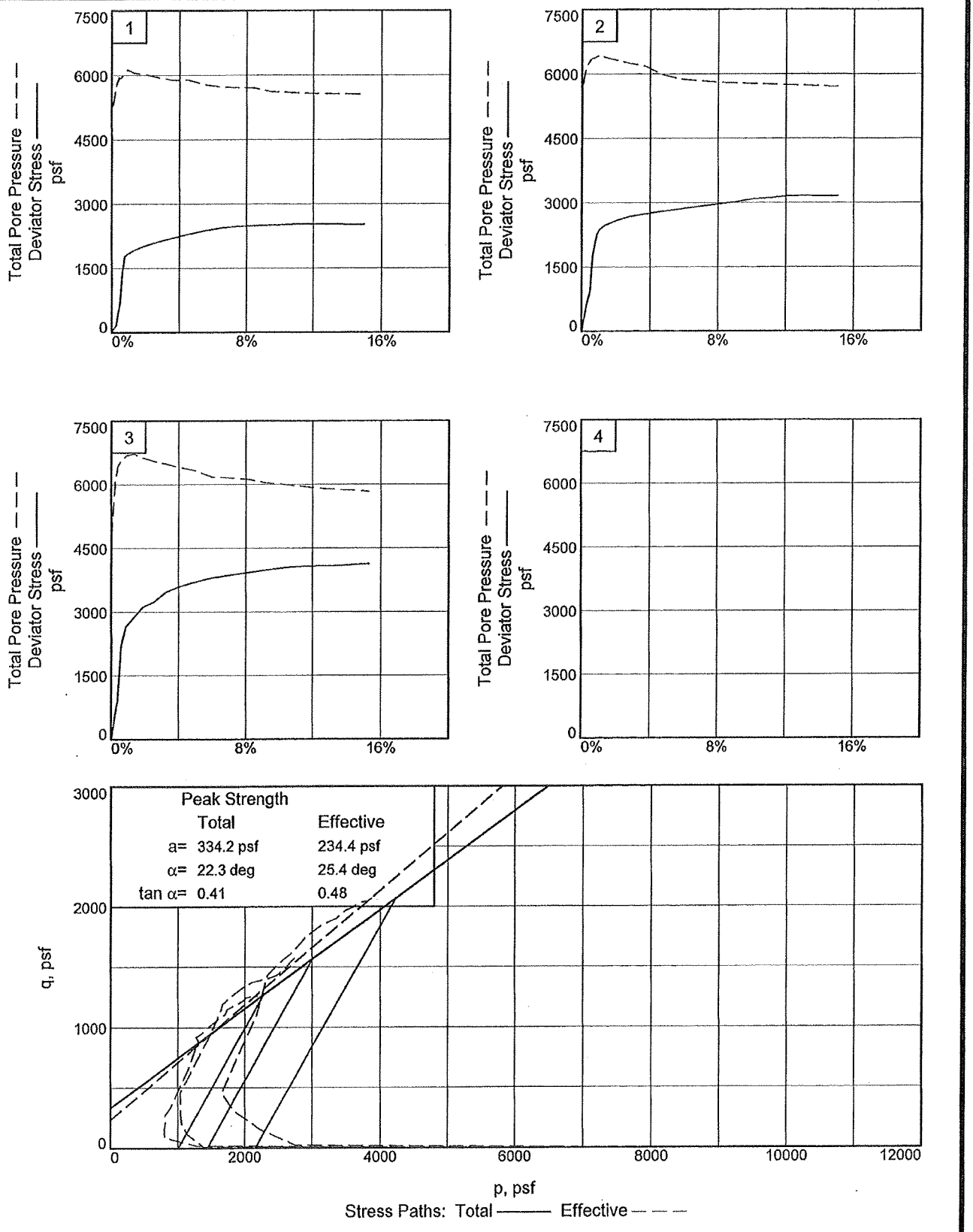
Figure 2



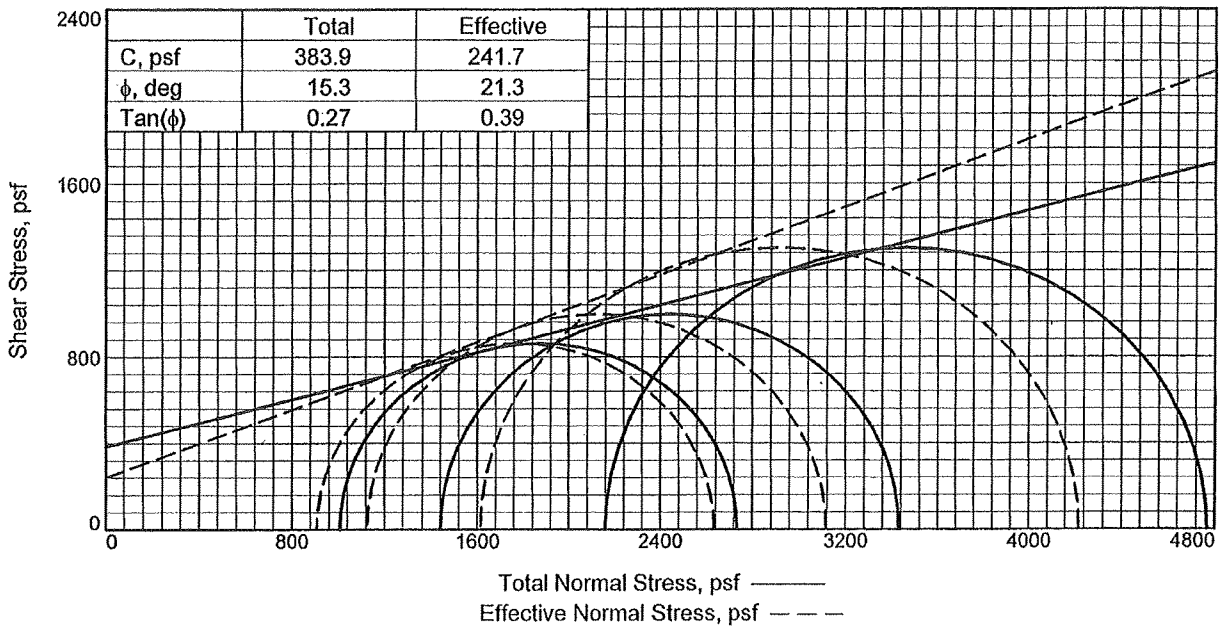
Client: GET

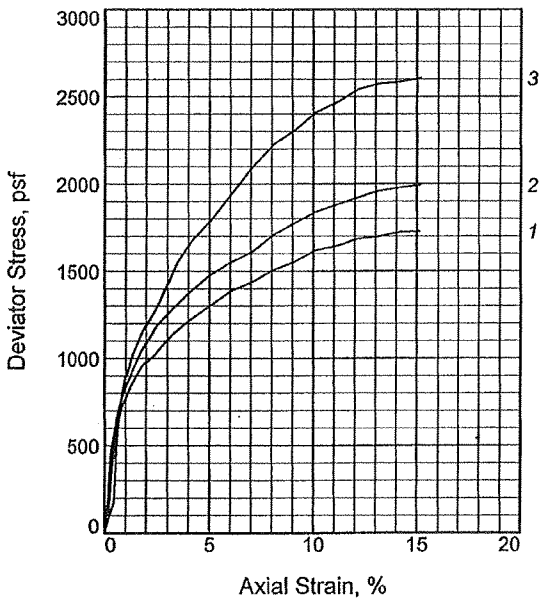
Project: Channel Improvement of W140-01-00

Depth: 6'-8' **Sample Number:** B-4

Project No.: 12-S-331 **Figure** _____

HTS, Inc.





Sample No.		1	2	3
Initial	Water Content, %	17.5	20.6	19.4
	Dry Density, pcf	113.0	106.9	109.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4644	0.5470	0.5142
	Diameter, in.	2.74	2.74	2.73
	Height, in.	5.74	5.70	5.68
At Test	Water Content, %	20.0	22.5	21.5
	Dry Density, pcf	108.2	103.6	105.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5293	0.5961	0.5697
	Diameter, in.	2.81	2.80	2.79
	Height, in.	5.69	5.64	5.61
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		45.000	48.000	53.000
Fail. Stress, psf		1726.3	1992.8	2605.7
Total Pore Pr., psf		5572.8	5788.4	6019.2
Ult. Stress, psf		1726.3	1992.8	2605.7
Total Pore Pr., psf		5572.8	5788.4	6019.2
$\bar{\sigma}_1$ Failure, psf		2633.5	3116.5	4218.5
$\bar{\sigma}_3$ Failure, psf		907.2	1123.6	1612.8

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve=56%
"B" Coefficient = 0.95 (1), 0.99 (2), 0.95 (3)
LL= 44 **PL=** 17 **PI=** 27
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 11/4/12
Checked by: BFM Date: 11/7/12

Client: GET

Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-4 **Depth:** 12'-14'

Proj. No.: 12-S-331 **Date Sampled:** 11/4/12

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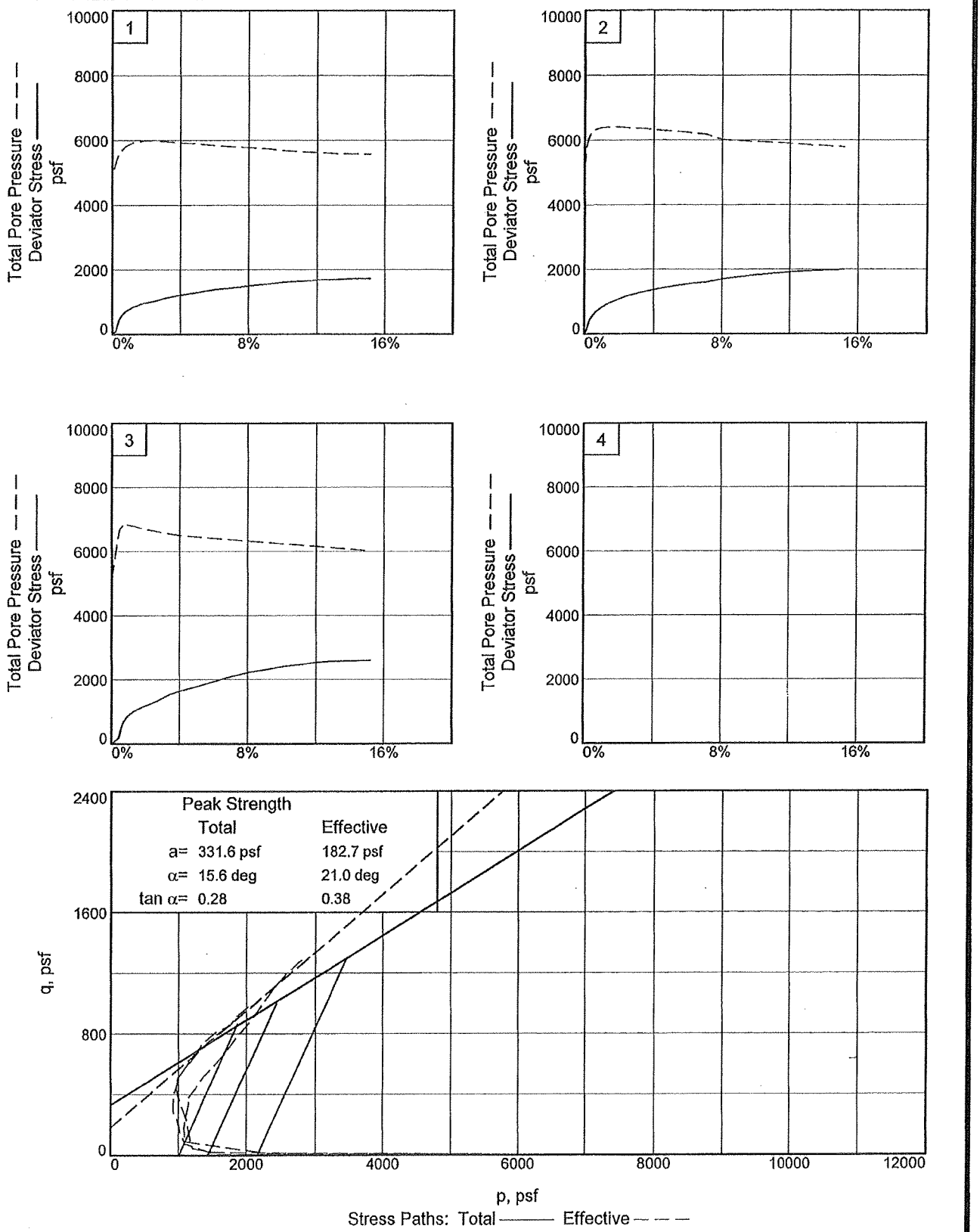
Figure 3



Client: GET

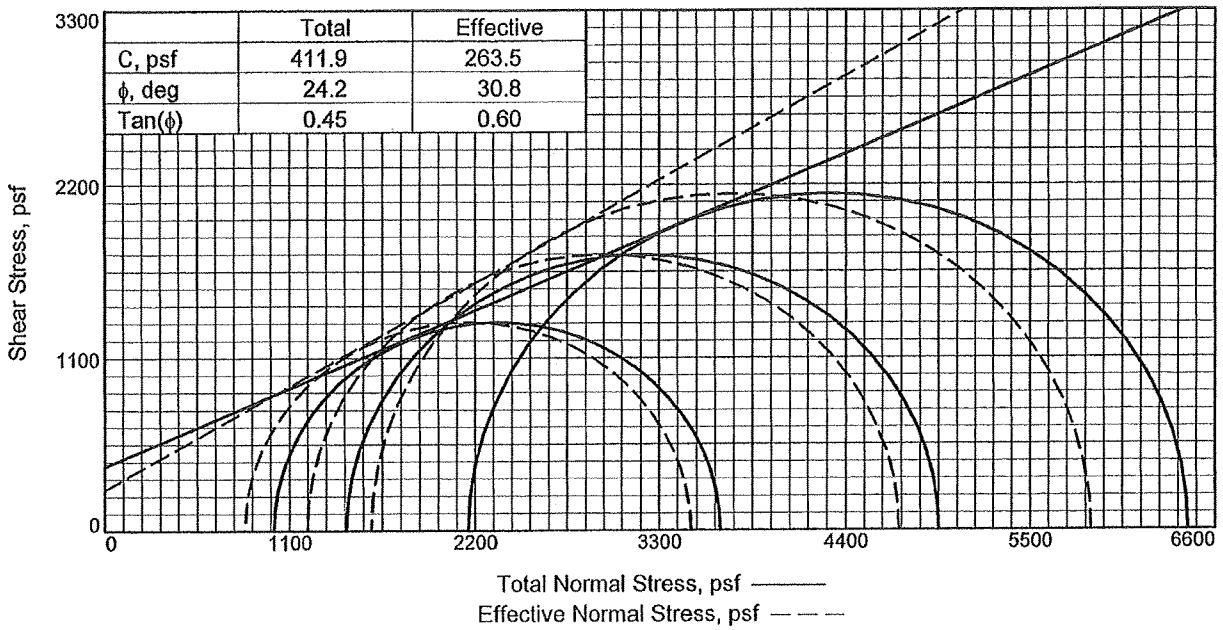
Project: Channel Improvement of W140-01-00

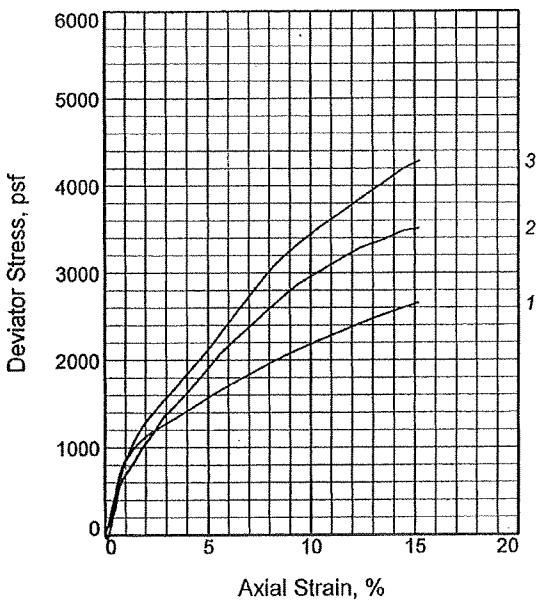
Depth: 12'-14' **Sample Number:** B-4

Project No.: 12-S-331

Figure _____

HTS, Inc.





Sample No.		1	2	3
Initial	Water Content, %	11.1	11.6	13.6
	Dry Density, pcf	116.1	112.6	111.4
	Saturation, %	69.0	65.5	74.1
	Void Ratio	0.4248	0.4692	0.4855
	Diameter, in.	2.73	2.72	2.69
	Height, in.	5.49	5.46	5.42
At Test	Water Content, %	17.2	18.2	19.6
	Dry Density, pcf	113.7	111.7	108.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4550	0.4813	0.5190
	Diameter, in.	2.77	2.74	2.74
	Height, in.	5.44	5.40	5.35
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		45.000	48.000	53.000
Fail. Stress, psf		2651.9	3510.4	4281.5
Total Pore Pr., psf		5644.8	5706.7	6048.7
Ult. Stress, psf		2651.9	3510.4	4281.5
Total Pore Pr., psf		5644.8	5706.7	6048.7
$\bar{\sigma}_1$ Failure, psf		3487.1	4715.7	5864.8
$\bar{\sigma}_3$ Failure, psf		835.2	1205.3	1583.3

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve=61%
"B" Coefficient = 0.96 (1), 1.00 (2), 1.05 (3)
LL= 37 **PL=** 17 **PI=** 20
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 11/12/12
Checked by: BFM Date: 11/15/12

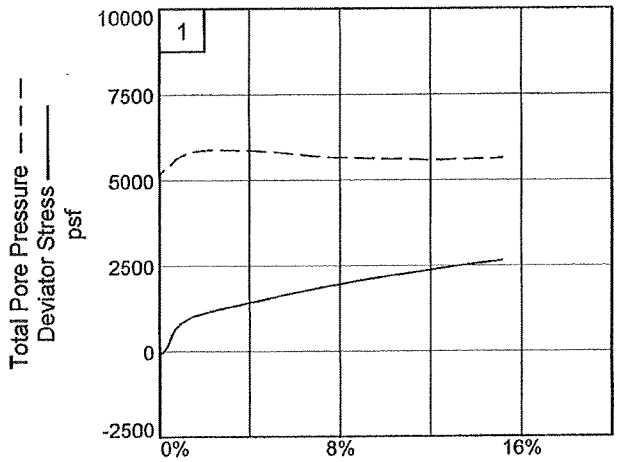
Client: GET

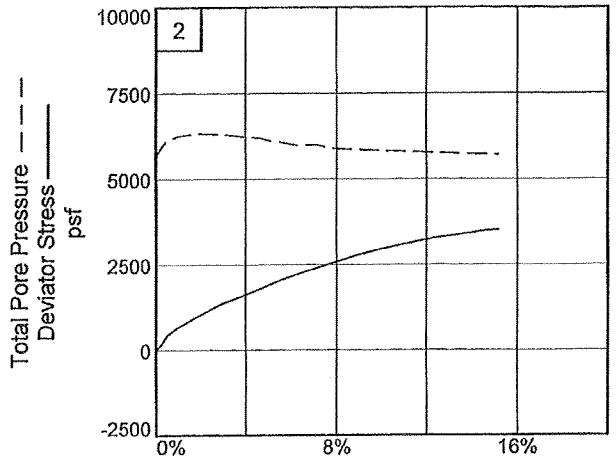
Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-6 **Depth:** 8'-10'

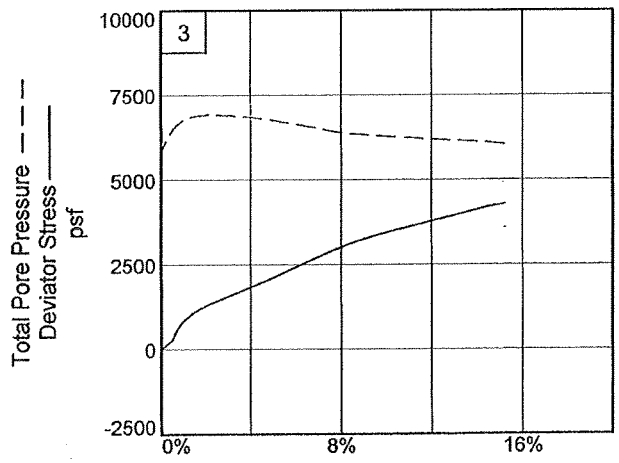
Proj. No.: 12-S-331 **Date Sampled:** 11/12/12

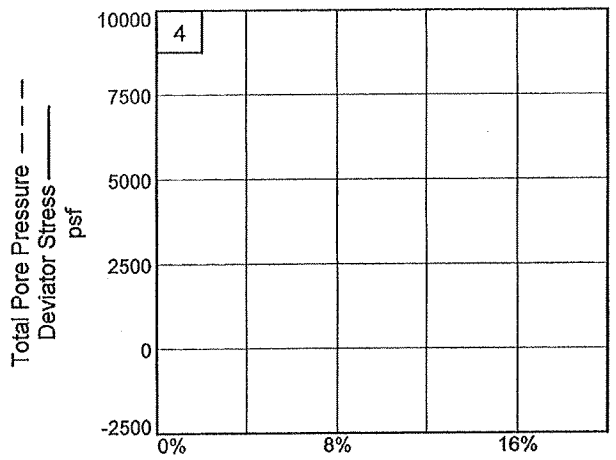
HTS, INC. Consultants

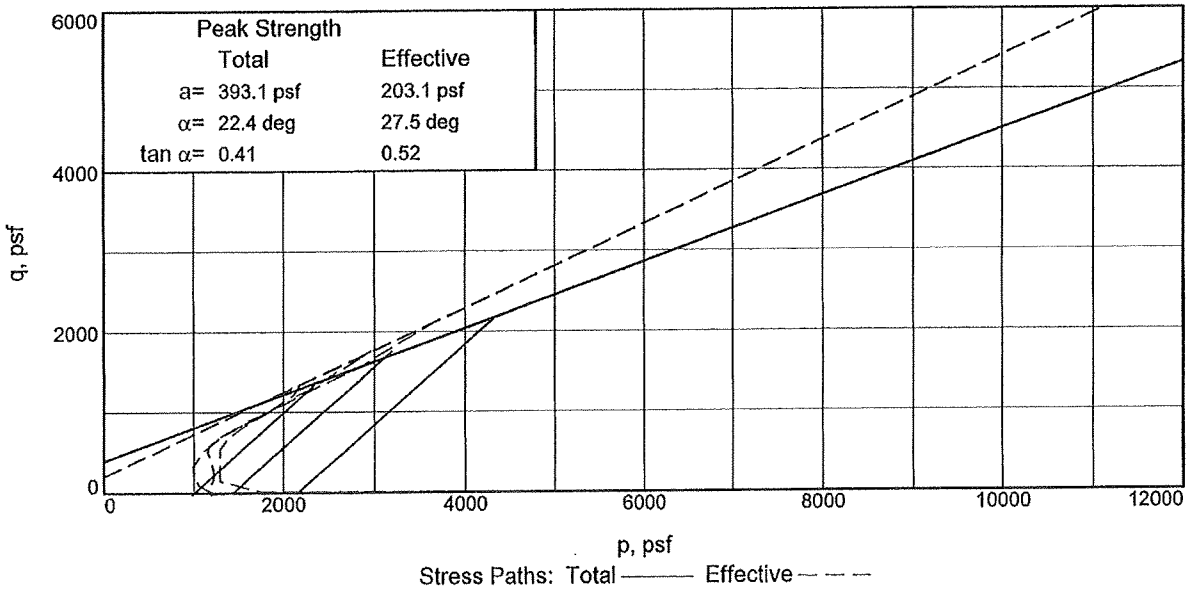
Figure 4





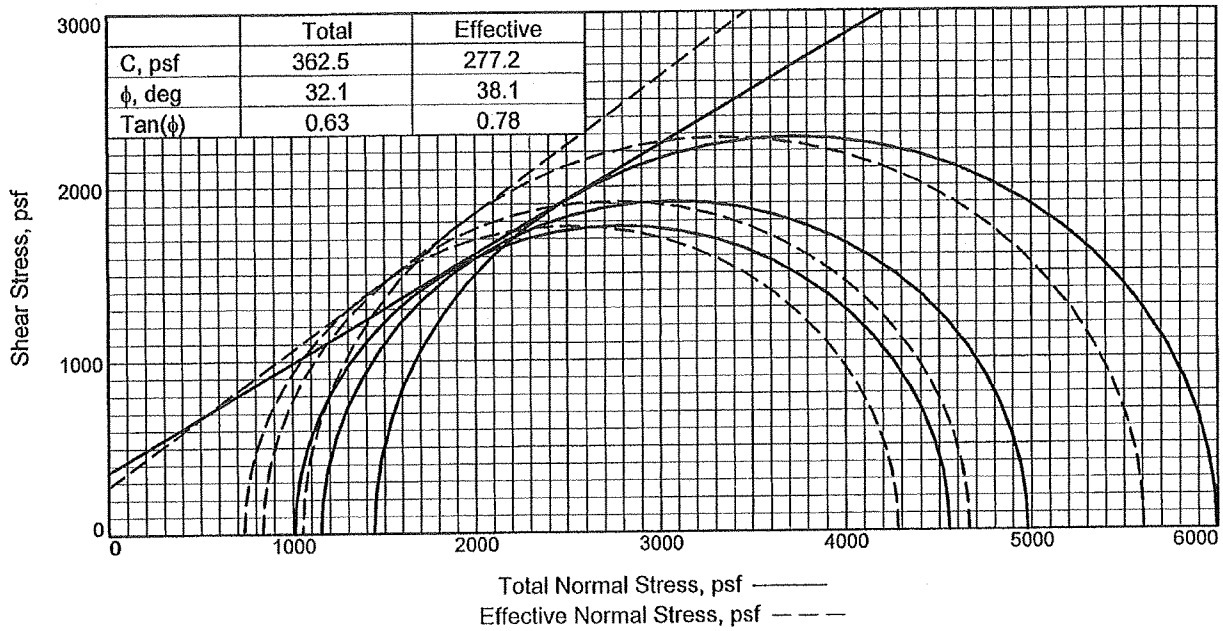




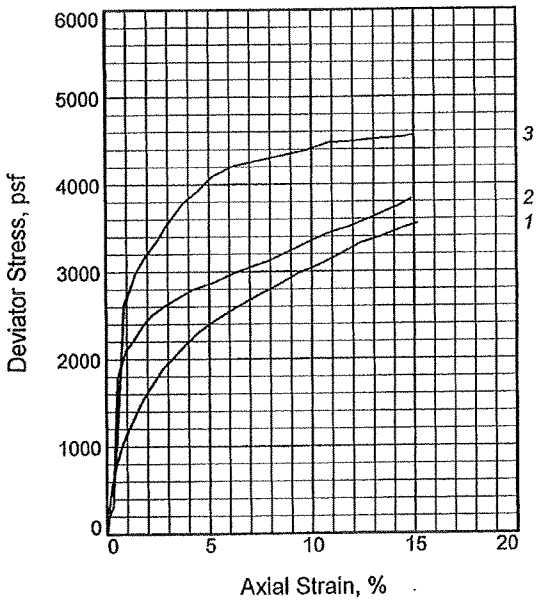


Client: GET
Project: Channel Improvement of W140-01-00
Depth: 8'-10' **Sample Number:** B-6
Project No.: 12-S-331 **Figure** _____

HTS, Inc.



	Total	Effective
C, psf	362.5	277.2
ϕ, deg	32.1	38.1
Tan(ϕ)	0.63	0.78



Sample No.		1	2	3
Initial	Water Content, %	12.3	13.2	12.3
	Dry Density, pcf	114.5	117.2	118.8
	Saturation, %	73.3	85.0	83.1
	Void Ratio	0.4451	0.4111	0.3925
	Diameter, in.	2.78	2.75	2.75
	Height, in.	5.50	5.54	5.43
At Test	Water Content, %	18.1	15.6	15.5
	Dry Density, pcf	111.8	117.1	117.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4802	0.4129	0.4107
	Diameter, in.	2.82	2.77	2.97
	Height, in.	5.45	5.48	4.73
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		45.000	46.000	48.000
Fail. Stress, psf		3544.3	3825.2	4556.0
Total Pore Pr., psf		5745.6	5788.8	5860.8
Ult. Stress, psf		3544.3	3825.2	4556.0
Total Pore Pr., psf		5745.6	5788.8	5860.8
$\bar{\sigma}_1$ Failure, psf		4278.7	4660.4	5607.2
$\bar{\sigma}_3$ Failure, psf		734.4	835.2	1051.2

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve= 64%
"B" Coefficient = 0.95(1), 1.05(2), 1.03(3)
LL= 36 **PL=** 16 **PI=** 20
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 11/14/12
Checked by: BFM Date: 11/17/12

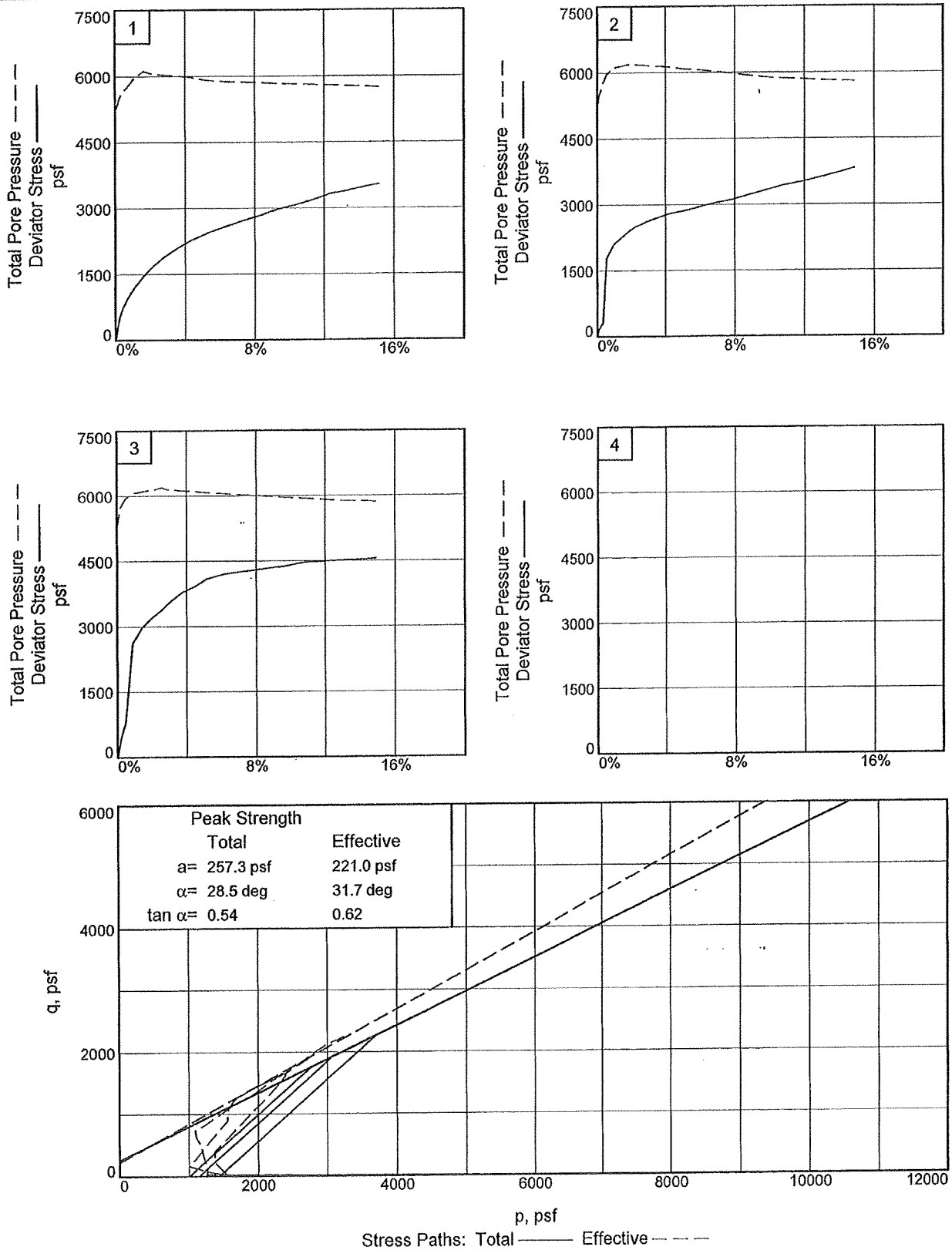
Client: GET

Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-7 **Depth:** 8'-10'

Proj. No.: 12-S-331 **Date Sampled:** 11/14/12

ITS, INC. Consultants

Figure 5



Client: GET

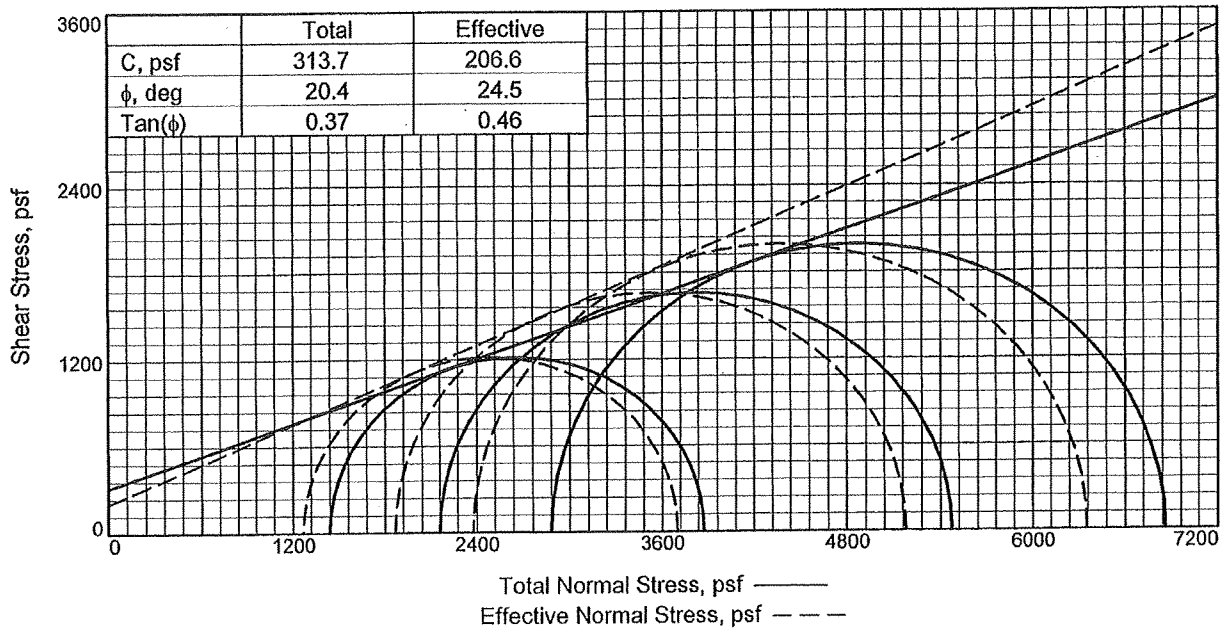
Project: Channel Improvement of W140-01-00

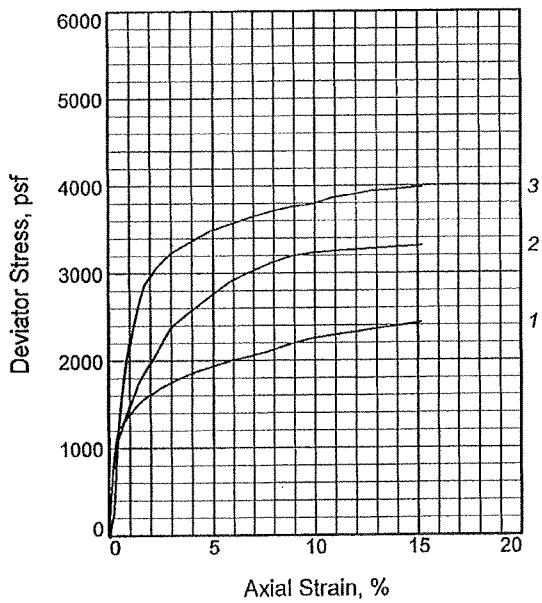
Depth: 8'-10' **Sample Number:** B-7

Project No.: 12-S-331

Figure _____

HTS, Inc.





Sample No.		1	2	3
Initial	Water Content, %	22.8	15.2	14.6
	Dry Density, pcf	102.9	117.5	118.6
	Saturation, %	99.4	98.7	97.6
	Void Ratio	0.6074	0.4081	0.3953
	Diameter, in.	2.79	2.81	2.81
	Height, in.	5.59	5.60	5.58
At Test	Water Content, %	24.4	22.6	16.7
	Dry Density, pcf	100.5	103.4	114.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6459	0.5998	0.4427
	Diameter, in.	2.83	3.01	2.88
	Height, in.	5.54	5.54	5.51
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, psi		38.000	38.000	38.000
Cell Pressure, psi		48.000	53.000	58.000
Fail. Stress, psf		2433.7	3312.9	3978.8
Total Pore Pr., psf		5644.8	5767.2	5976.0
Ult. Stress, psf		2433.7	3312.9	3978.8
Total Pore Pr., psf		5644.8	5767.2	5976.0
$\bar{\sigma}_1$ Failure, psf		3700.9	5177.7	6354.8
$\bar{\sigma}_3$ Failure, psf		1267.2	1864.8	2376.0

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Percent Passing -200 Sieve= 95%
"B" Coefficient = 0.95(1), 1.01(2), 0.98(3)
LL= 62 **PL=** 20 **PI=** 42
Assumed Specific Gravity= 2.65
Remarks: Tested by: MC Date: 12/16/12
Checked by: BFM Date: 12/19/12

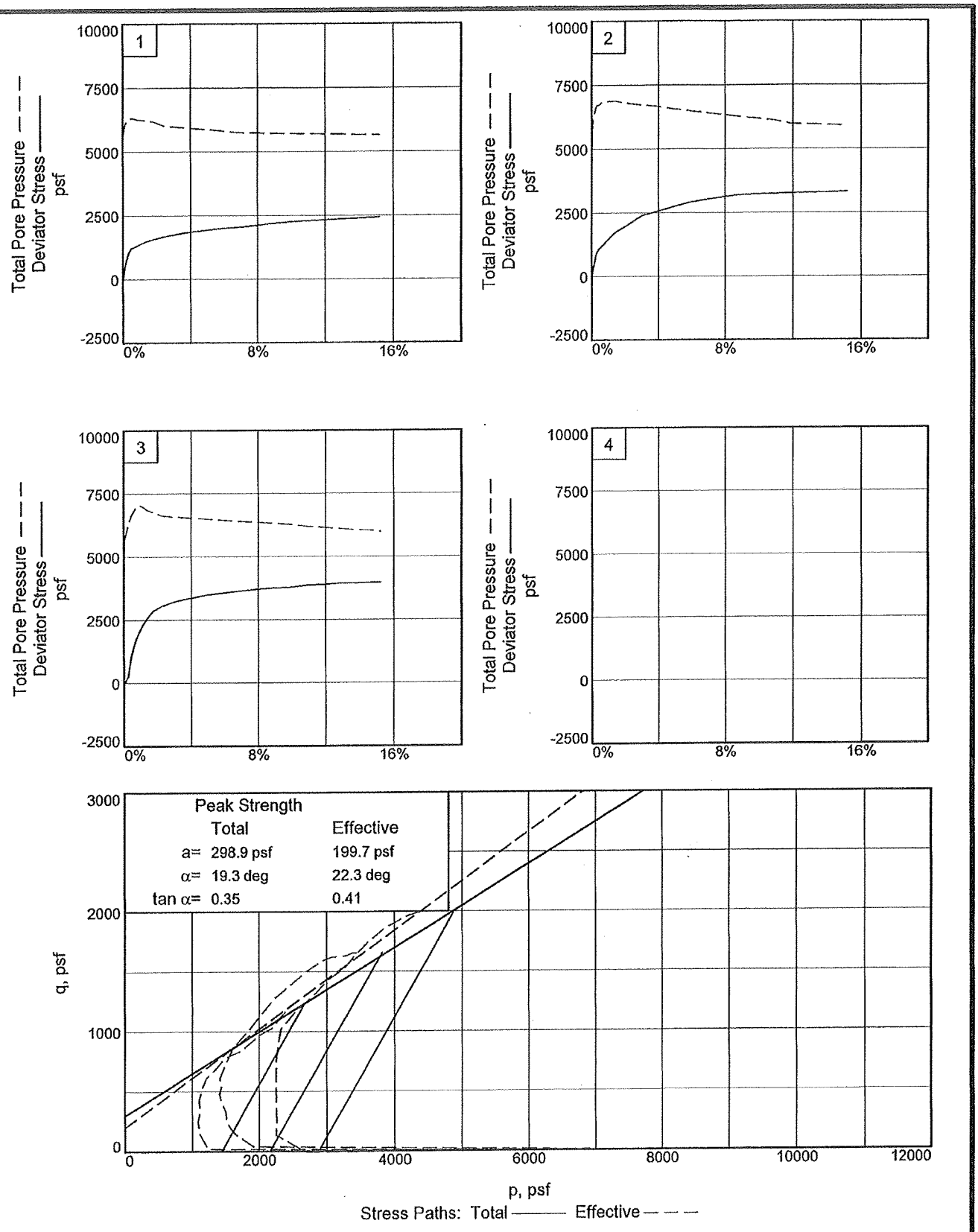
Client: GET

Project: Channel Improvement of W140-01-00
GET Project No. 12-568
Sample Number: B-12 **Depth:** 20'-22'

Proj. No.: 12-S-331 **Date Sampled:** 12/16/12

HTS, INC. Consultants

Figure 6



Client: GET

Project: Channel Improvement of W140-01-00

Depth: 20'-22' **Sample Number:** B-12

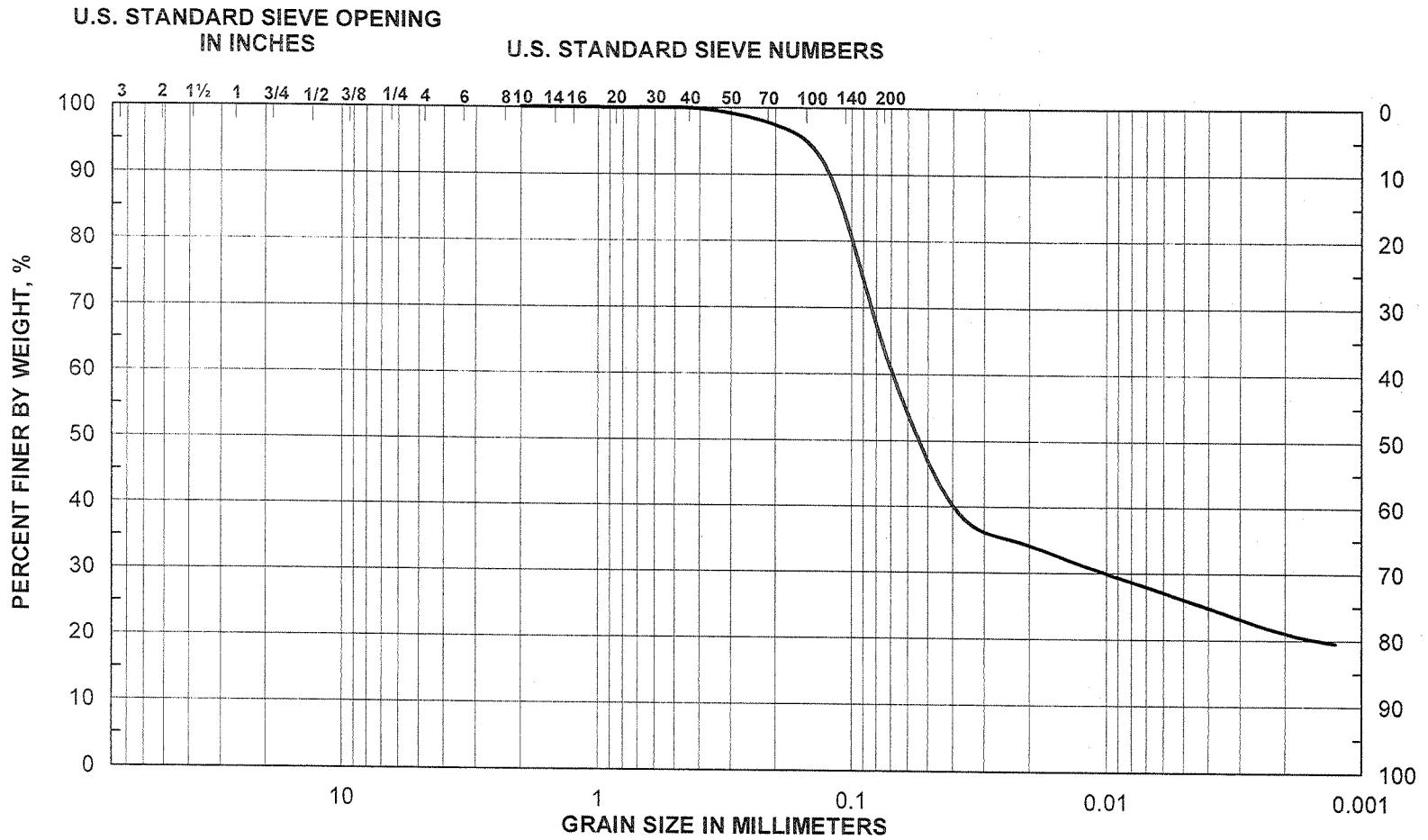
Project No.: 12-S-331

Figure _____

HTS, Inc.

APPENDIX C

Particle Size Distribution Curves



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

USCS Soil Classification: Sandy Lean Clay (CL)
Percent Passing No. 200 Sieve: 60%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 2 (10' TO 12')

Report No. 12-568E

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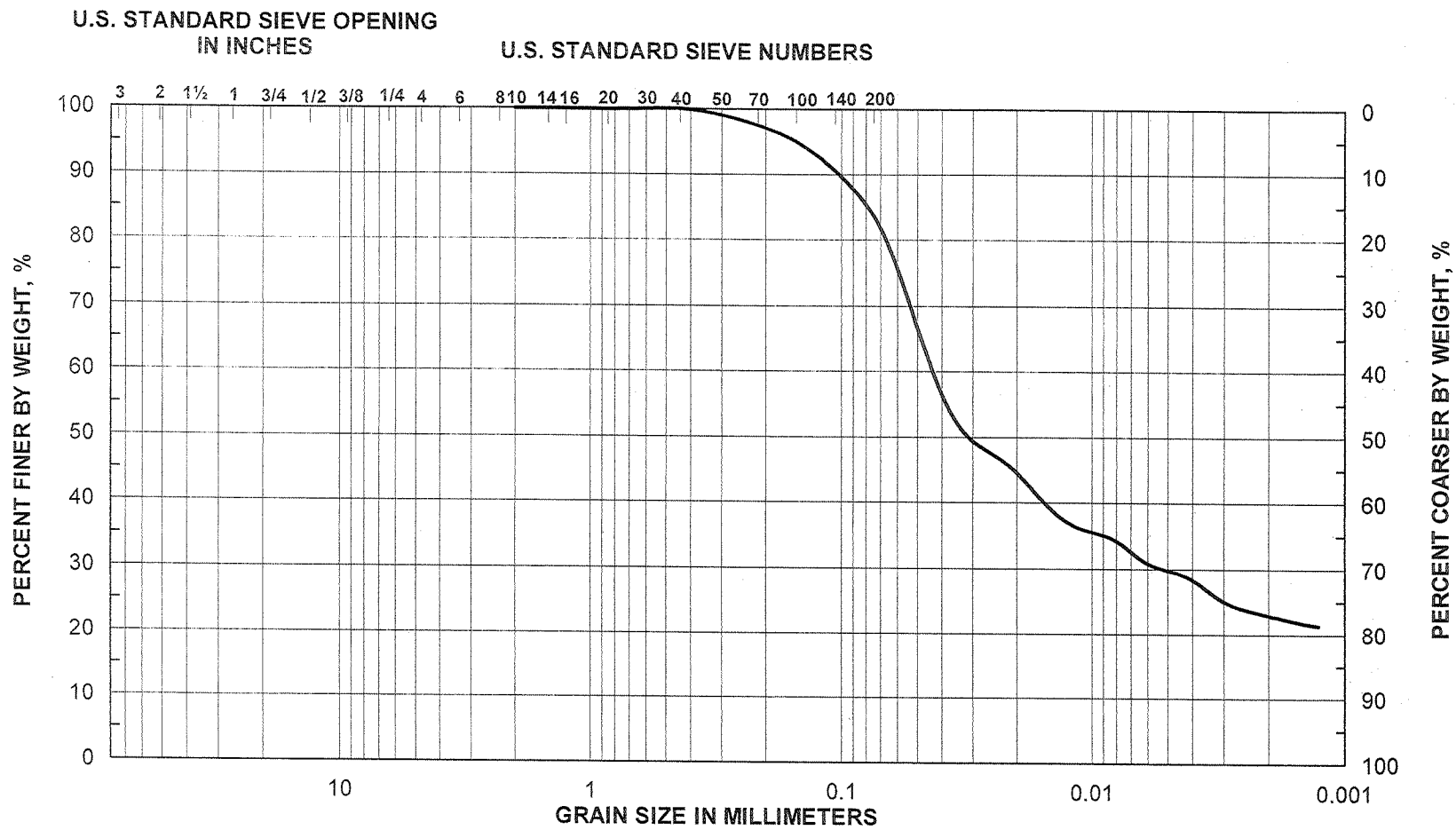
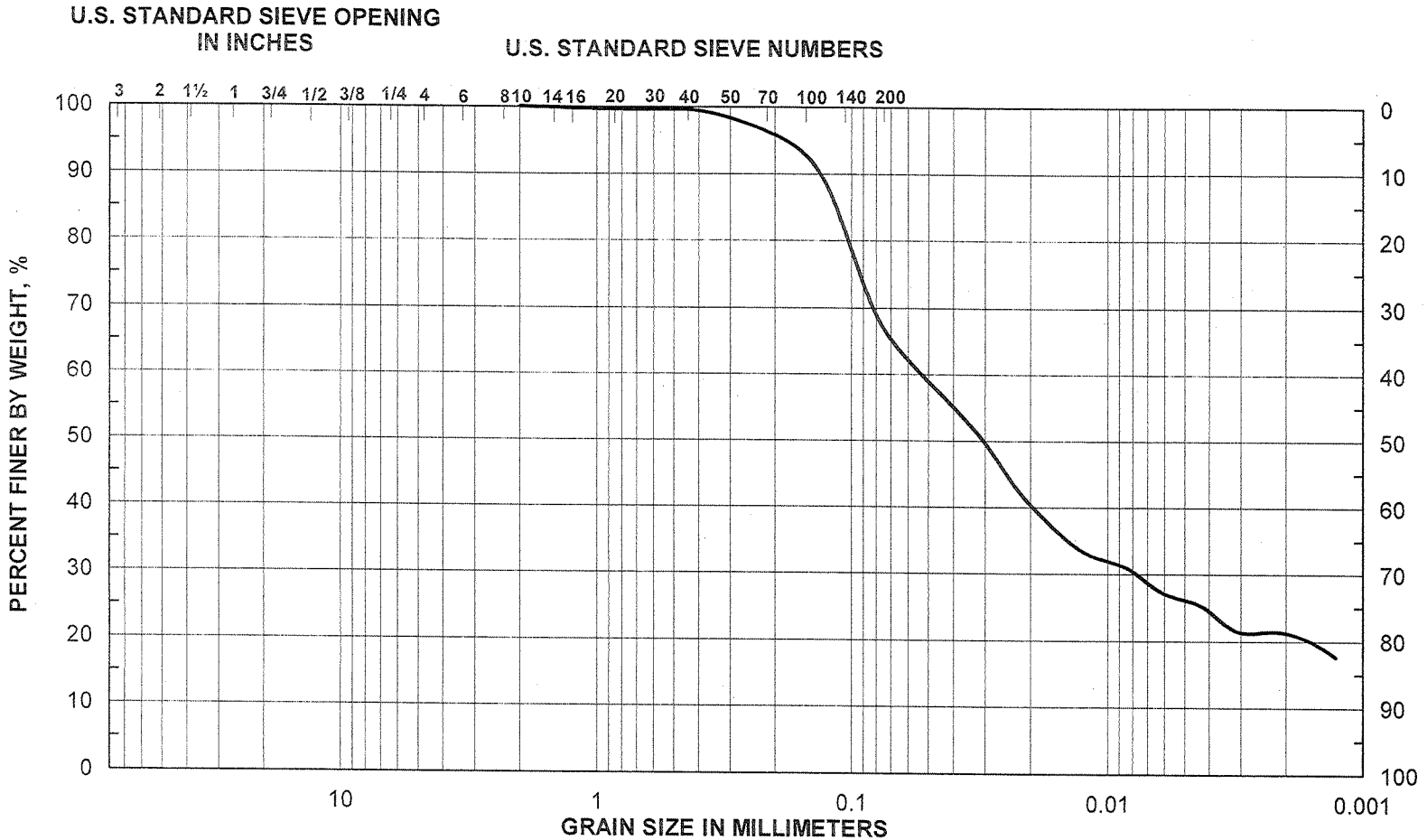


GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

USCS Soil Classification: Lean Clay with Sand (CL)
Percent Passing No. 200 Sieve: 75%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 3 (6' TO 8')

Report No. 12-568E

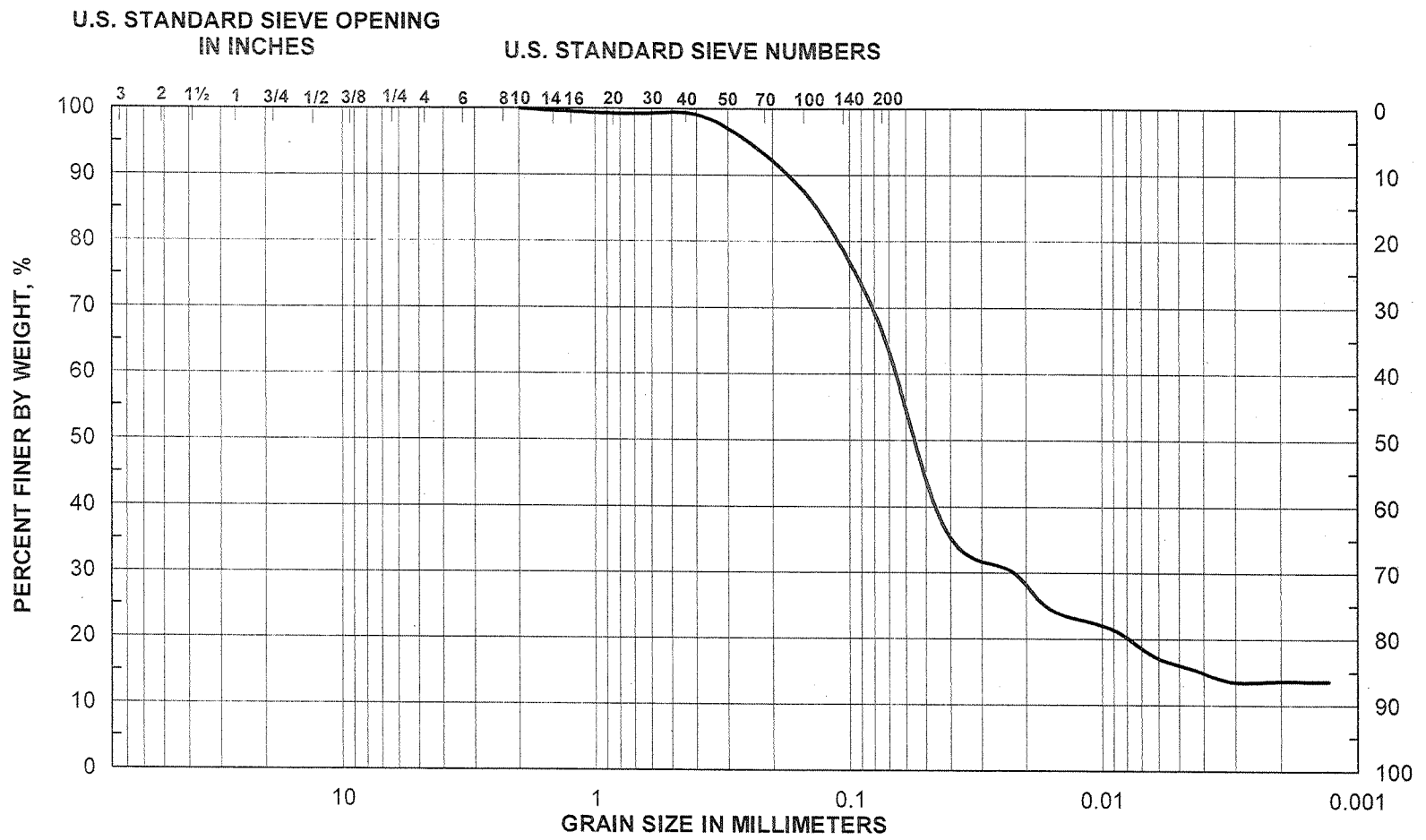
PLATE C-2



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

USCS Soil Classification: Sandy Lean Clay (CL)
Percent Passing No. 200 Sieve: 70%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 4 (10' TO 12')

Report No. 12-568E

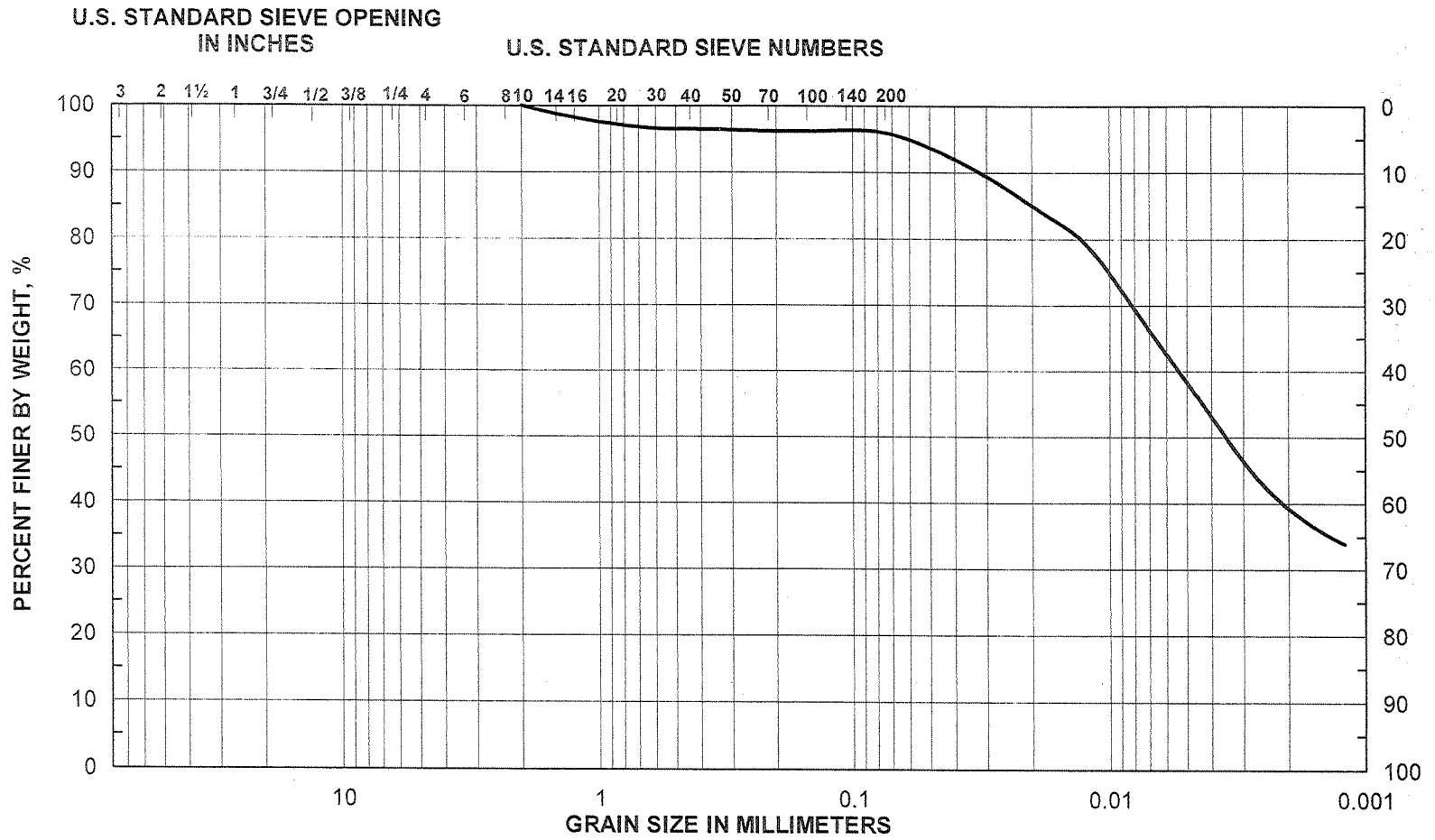


GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

USCS Soil Classification: Sandy Lean Clay (CL)
Percent Passing No. 200 Sieve: 68%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 6 (2' TO 4')

Report No. 12-568E

GEOTECH ENGINEERING AND TESTING

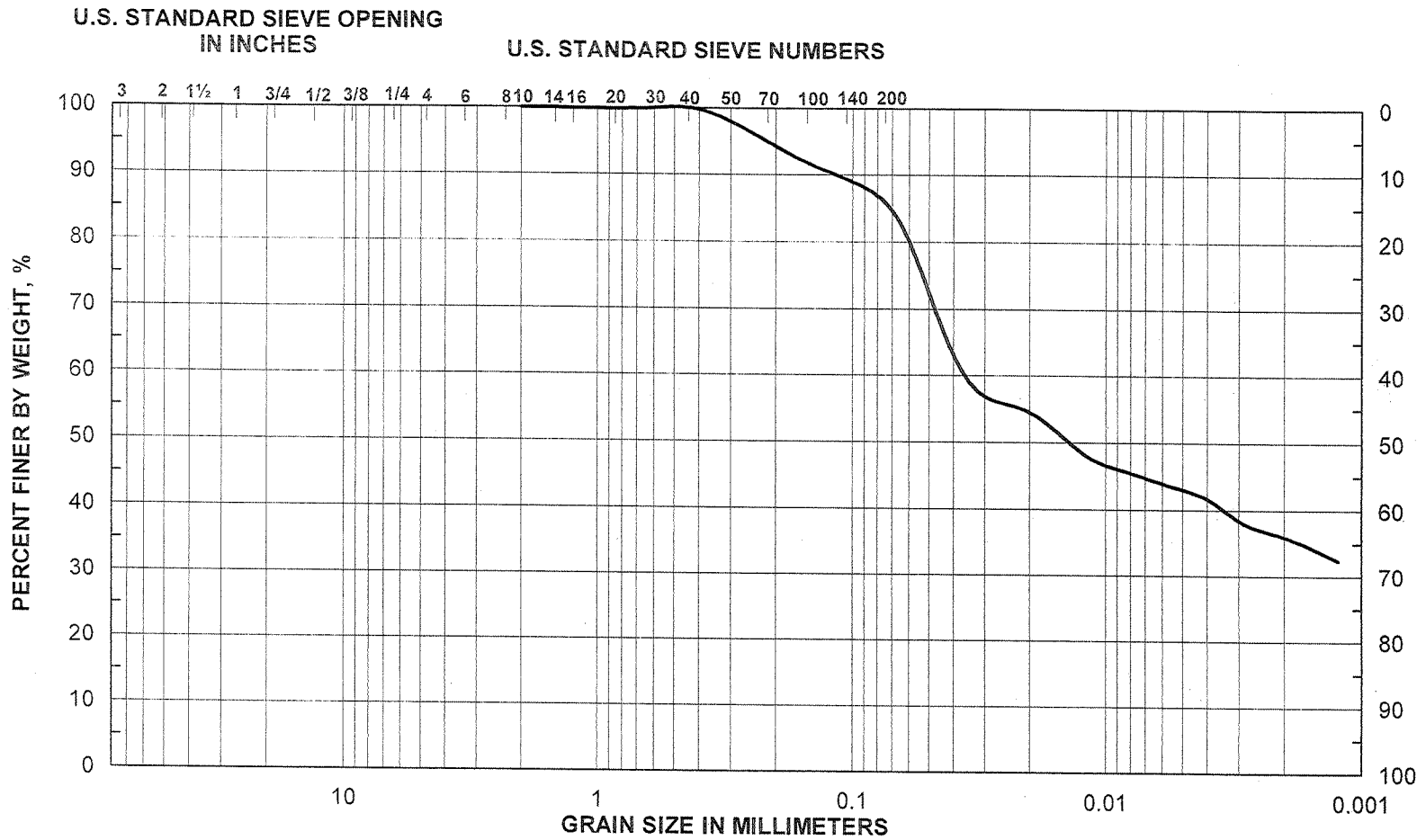


GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

USCS Soil Classification: Fat Clay (CH)
Percent Passing No. 200 Sieve: 95%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 7 (22' TO 24')

Report No. 12-568E

PLATE C-5



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

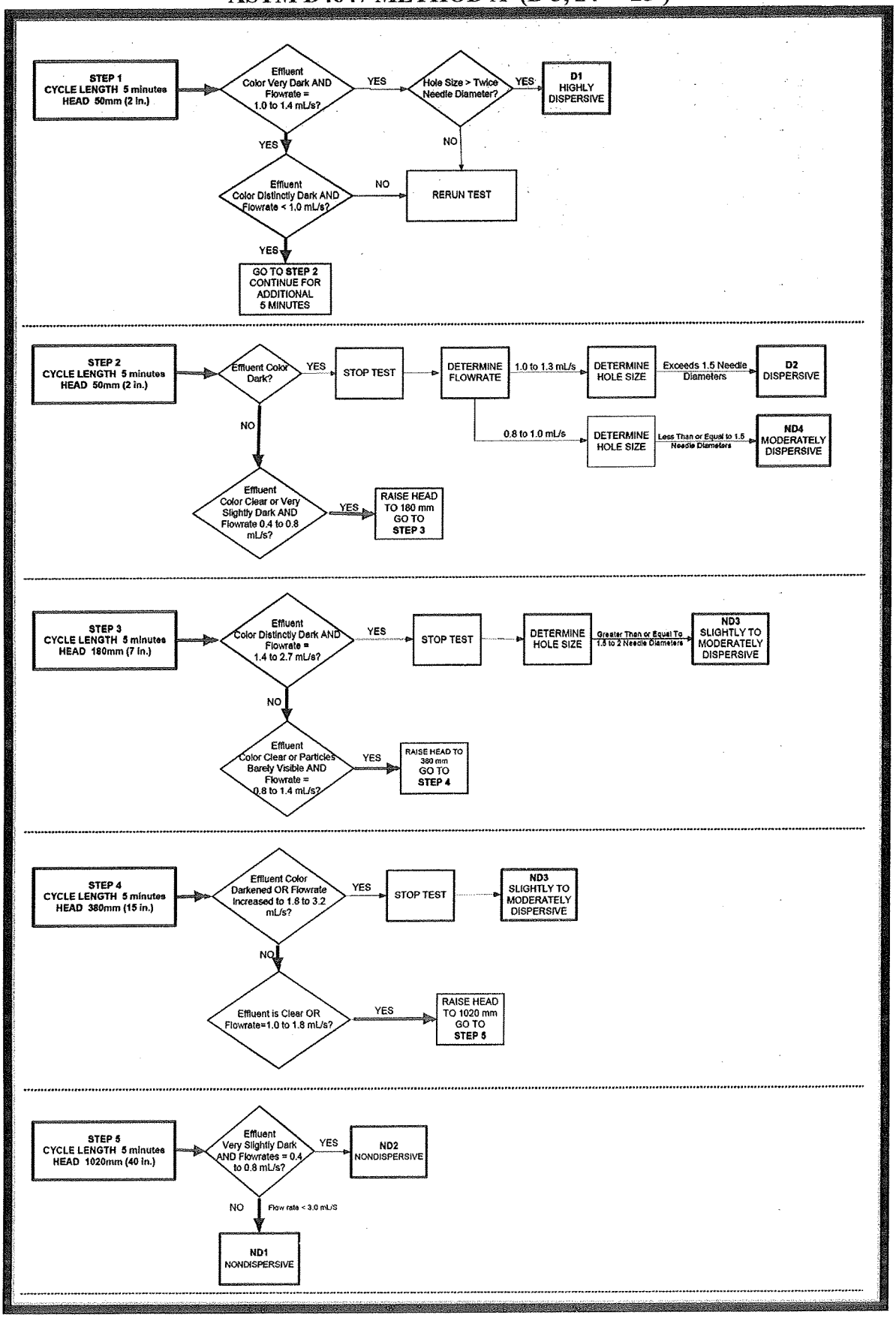
USCS Soil Classification: Fat Clay (CH)
Percent Passing No. 200 Sieve: 86%
PARTICLE SIZE DISTRIBUTION CURVES FOR B- 12 (20' TO 22')

Report No. 12-568E

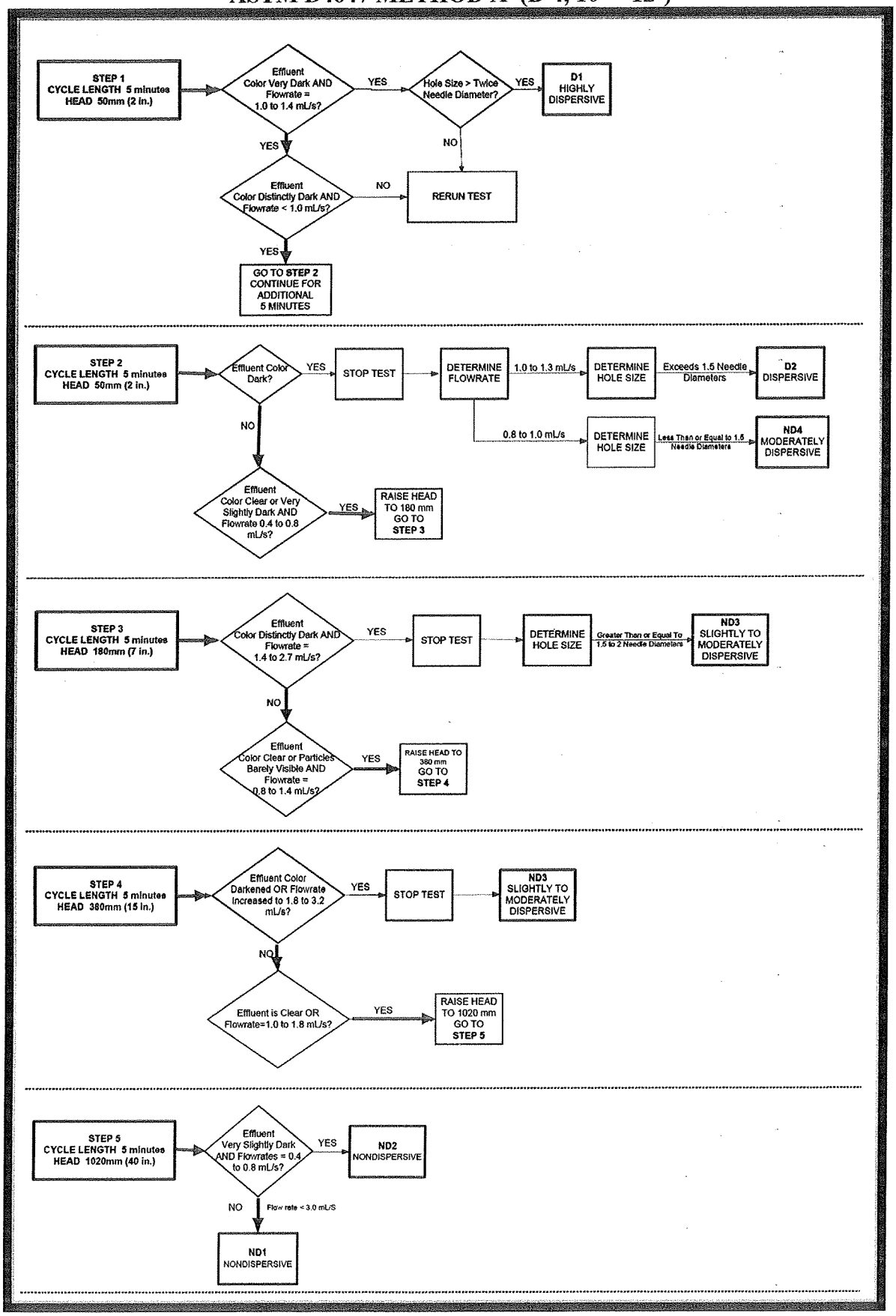
APPENDIX D

Dispersive Soil Characterization Test Results

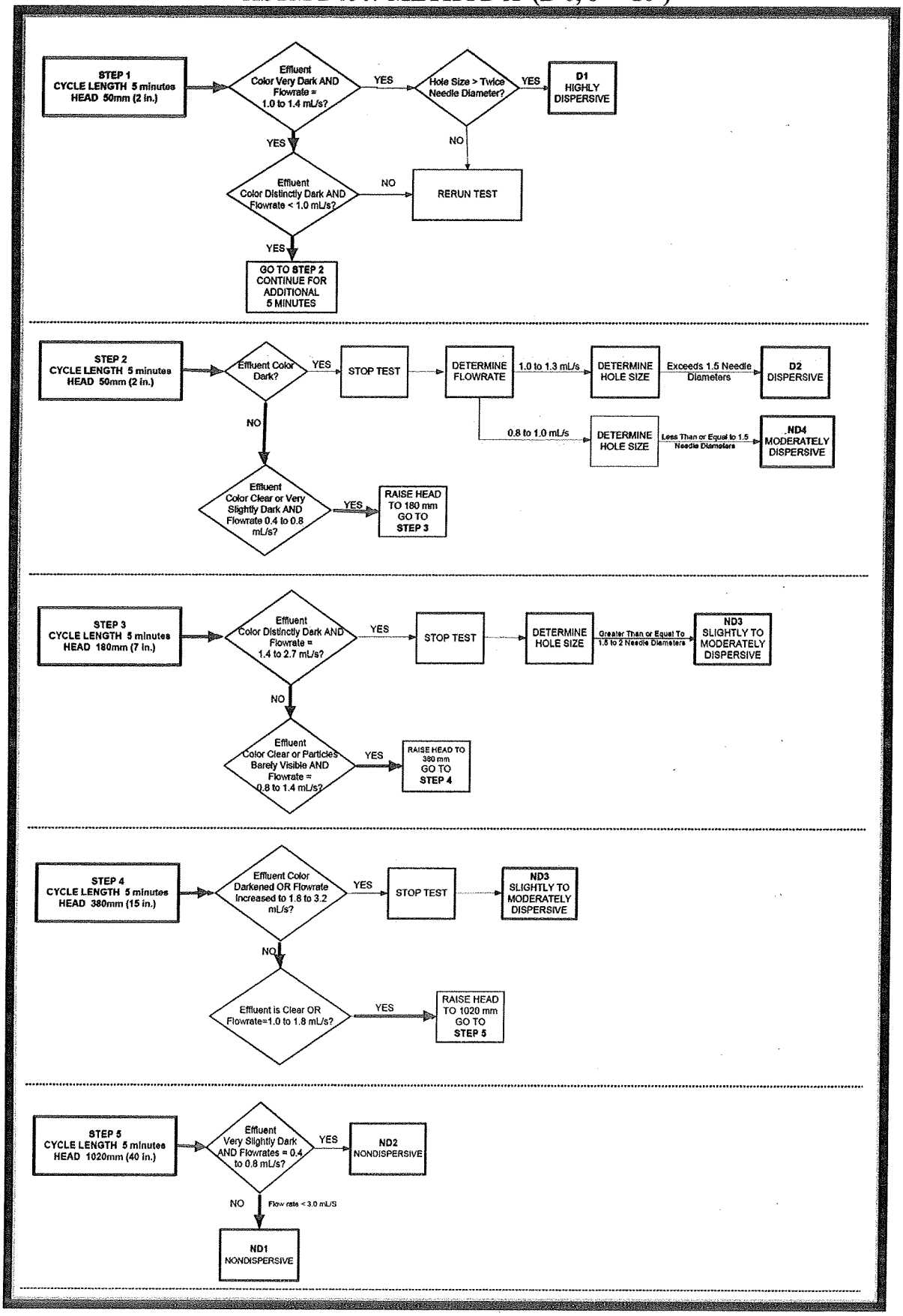
ASTM D4647 METHOD A (B-3, 24' – 25')



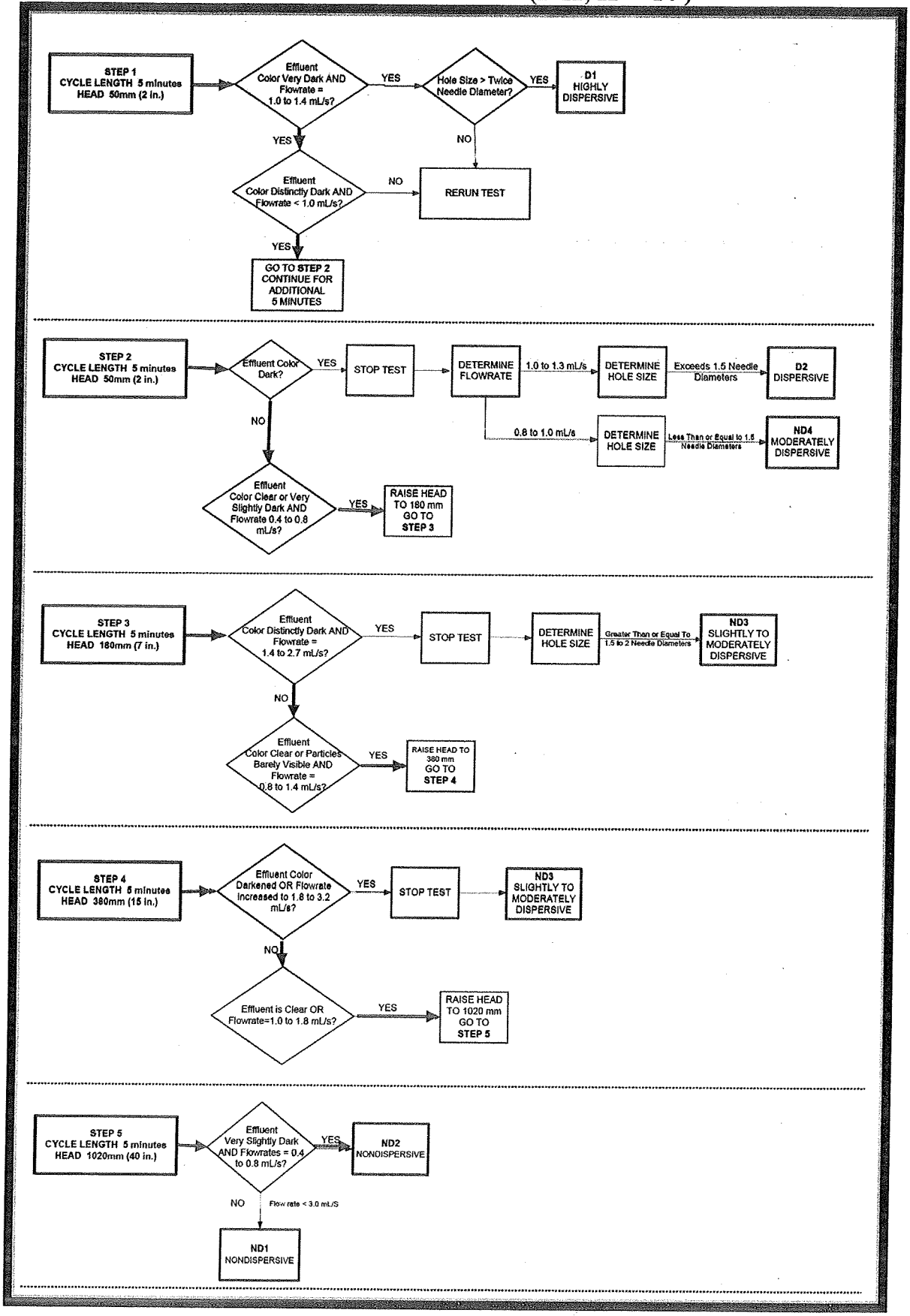
ASTM D4647 METHOD A (B-4, 10' – 12')



ASTM D4647 METHOD A (B-6, 8' – 10')



ASTM D4647 METHOD A (B-12, 12' – 14')



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Pin Hole Test No. 1

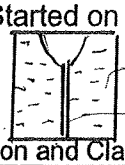
Date 09-28-12 Project Name Channel Improvement Job No. 12-568

Boring No. B-3 Sample No. _____ Penetration (m) 24-25

Material Description _____

Compaction Characteristics _____ Moisture content (%) _____

Curing Time _____ Flow Started on _____ Trial Distilled Water Added: ☐ Yes or ☐ No

Specimen after Test:  Tested Specimen. Hole did not enlarge.

ASTM D 4647(Identification and Classification of Dispersive Clay Soils by the Pinhole Tests)

Clock Time	Head	Flow Rate ml	Flow Rate Sec	Color from Side: Dark	Slight to Medium	Barely Visiable	Completely Clear	Completely Clear from Top	Particles Falling: None	Few	Heavy		Remarks
	2"	34	60				✓	✓	✓			0.56	
		32	60				✓	✓	✓			0.53	
		32	60				✓	✓	✓			0.53	
		32	60				✓	✓	✓			0.53	
		32	60				✓	✓	✓			0.53	
	2"	34	60				✓	✓	✓			0.56	
		34	60				✓	✓	✓			0.56	
		34	60				✓	✓	✓			0.56	
		36	60				✓	✓	✓			0.60	
		34	60				✓	✓	✓			0.56	
	7"	42	60				✓	✓	✓			0.70	NO.1
		44	60				✓	✓	✓			0.73	
		44	60				✓	✓	✓			0.73	
		42	60				✓	✓	✓			0.70	
		42	60				✓	✓	✓			0.70	
	15"	56	60				✓	✓	✓			0.93	
		54	60				✓	✓	✓			0.90	
		54	60				✓	✓	✓			0.90	
		54	60				✓	✓	✓			0.90	
		52	60				✓	✓	✓			0.86	
	40"	152	60				✓	✓	✓			2.53	
		150	60				✓	✓	✓			2.50	
		150	60				✓	✓	✓			2.50	
		154	60				✓	✓	✓			2.56	
		154	60				✓	✓	✓			2.56	

Tested by George Date 09-28-12

Computed by George Date 09-28-12

Checked by PAZ Date 09-28-12

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Pin Hole Test No. 2

Date 09-27-12 Project Name Channel Improvement Job No. 12-568

Boring No. B-4 Sample No. _____ Penetration (m) 10-12

Material Description _____

Compaction Characteristics _____ Moisture content (%) _____

Curing Time _____ Flow Started on _____ Trial Distilled Water Added: ☐ Yes or ☐ No

Specimen after Test:

ASTM D 4647(Identification and Classification of Dispersive Clay Soils by the Pinhole Tests)

Clock Time	Head	Flow Rate ml	Flow Rate Sec	Color from Side: Dark	Slight to Medium	Barely Visiable	Completely Clear	Completely Clear from Top	Particles Falling: None	Few	Heavy	mV DC	Remarks
	2"	48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	
	2"	48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	
		50	60				✓	✓	✓			0.83	
	7"	80	60				✓	✓	✓			1.33	
		80	60				✓	✓	✓			1.33	
		82	60				✓	✓	✓			1.36	Classify ND-1
		80	60				✓	✓	✓			1.33	
		82	60				✓	✓	✓			1.36	
	15"	112	60				✓	✓	✓			1.86	
		112	60				✓	✓	✓			1.86	
		112	60				✓	✓	✓			1.86	
		110	60				✓	✓	✓			1.83	
		112	60				✓	✓	✓			1.86	
	40"	142	60				✓	✓	✓			2.36	
27"		143	60				✓	✓	✓			2.36	
		144	60				✓	✓	✓			2.40	
		142	60				✓	✓	✓			2.36	
		140	60				✓	✓	✓			2.33	

Tested by George Date 09-27-12

Computed by George Dat 09-27-12

Checked by Paul D 09-27-12

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Pin Hole Test No. 3

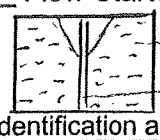
Date 09-26-12 Project Name Channel Job No. 12-568

Boring No. B-6 Sample No. _____ Penetration (m) 8-10

Material Description _____

Compaction Characteristics _____ Moisture content (%) _____

Curing Time _____ Flow Started on _____ Trial Distilled Water Added: ☐ Yes or ☐ No

Specimen after Test:  Tested soil specimen. Hole did not enlarge.

ASTM D 4647(Identification and Classification of Dispersive Clay Soils by the Pinhole Tests)

Clock Time	Head	Flow Rate ml	Flow Rate Sec	Color from Side: Dark	Slight to Medium	Barely Visiable	Completely Clear	Completely Clear from Top	Particles Falling: None	Few	Heavy	ml/sec	Remarks
	2"	32	60				✓	✓	✓			0.53	
		32	60				✓	✓	✓			0.53	
		30	60				✓	✓	✓			0.50	
		30	60				✓	✓	✓			0.50	
		32	60				✓	✓	✓			0.53	
	2"	30	60				✓	✓	✓			0.50	
		30	60				✓	✓	✓			0.50	
		28	60				✓	✓	✓			0.46	
		30	60				✓	✓	✓			0.50	
		32	60				✓	✓	✓			0.53	
	7"	48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	Classify ND 1
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	
	15"	64	60				✓	✓	✓			1.06	
		64	60				✓	✓	✓			1.06	
		64	60				✓	✓	✓			1.06	
		64	60				✓	✓	✓			1.06	
		66	60				✓	✓	✓			1.10	
	40"	132	60				✓	✓	✓			2.20	
		130	60				✓	✓	✓			2.16	
		130	60				✓	✓	✓			2.16	
		132	60				✓	✓	✓			2.20	
		134	60				✓	✓	✓			2.23	

Tested by Orozco Date 09-26-12

Computed by V Date 09-26-12

Checked by PAT

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Texas • Louisiana • New Mexico • Oklahoma
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Pin Hole Test No. 4

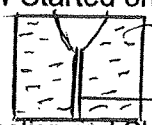
Date 09-28-12 Project Name Channel Improvement Job No. 12-568

Boring No. B-12 Sample No. _____ Penetration (m) 12-14

Material Description _____

Compaction Characteristics _____ Moisture content (%) _____

Curing Time _____ Flow Started on _____ Trial Distilled Water Added: ☐ Yes or ☐ No

Specimen after Test:  Tested Soil Specimen

Hole did not enlarge.

ASTM D 4647(Identification and Classification of Dispersive Clay Soils by the Pinhole Tests)

Clock Time	Head	Flow Rate ml	Flow Rate Sec	Color from Side: Dark	Slight to Medium	Barely Visiable	Completely Clear	Completely Clear from Top	Particles Falling: None	Few	Heavy	ml/sec	Remarks
	2"	50	60				✓	✓	✓			0.83	
		48	60				✓	✓	✓			0.80	
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	
		48	60				✓	✓	✓			0.80	
	2"	50	60				✓	✓	✓			0.83	
		50	60				✓	✓	✓			0.83	
		50	60				✓	✓	✓			0.83	
		48	60				✓	✓	✓			0.80	
		50	60				✓	✓	✓			0.83	
	7"	90	60				✓	✓	✓			1.50	
		92	60				✓	✓	✓			1.53	
		92	60				✓	✓	✓			1.53	
		92	60				✓	✓	✓			1.53	
		92	60				✓	✓	✓			1.53	
	15"	128	60				✓	✓	✓			2.13	
		128	60				✓	✓	✓			2.13	
		128	60				✓	✓	✓			2.13	
		128	60				✓	✓	✓			2.13	
		130	60				✓	✓	✓			2.16	
	40"	198	60				✓	✓	✓			3.30	
		198	60				✓	✓	✓			3.30	
		198	60				✓	✓	✓			3.30	
		200	60				✓	✓	✓			3.33	
		200	60				✓	✓	✓			3.33	

Channel ID 2

Date 09-28-12 Date 09-28-12 Date 09-28-12

Tested by _____ Computed by _____ Checked by _____

CRUMB TEST RESULTS
(ASTM D 6572)

Boring No.	Sample Depth, ft.	2-minute		1-hour		6-hour	
		Grade	°C	Grade	°C	Grade	°C
B-1	6 – 8	1	25	1	23	1	22.5
B-2	10 – 12	2	25	2	25	1	23
B-3	8 – 10	1	24.5	1	23	1	24
B-4	6 – 8	1	25	1	24	1	24
B-5	14 – 16	1	25	1	24	1	23
B-6	10 – 12	1	26	1	24	1	22
B-8	10 – 12	1	24	1	24	1	22
B-9	20 – 22	1	24	1	24	1	22
B-10	4 – 6	1	24	1	23	1	22

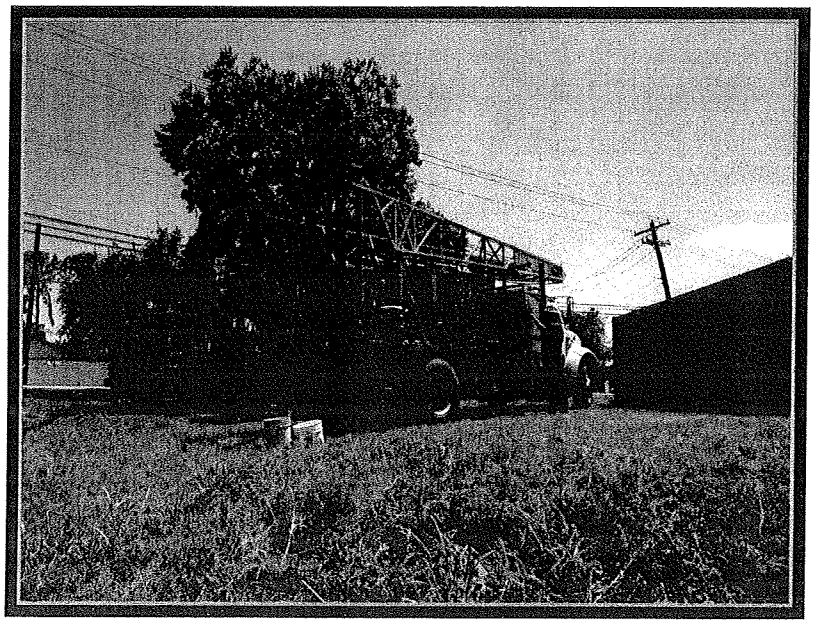
Note:

Grade 1, Non-dispersive – No Reaction
Grade 2, Intermediate – Slight Reaction
Grade 3, Dispersive – Moderate Reaction
Grade 4, Highly Dispersive – Strong Reaction

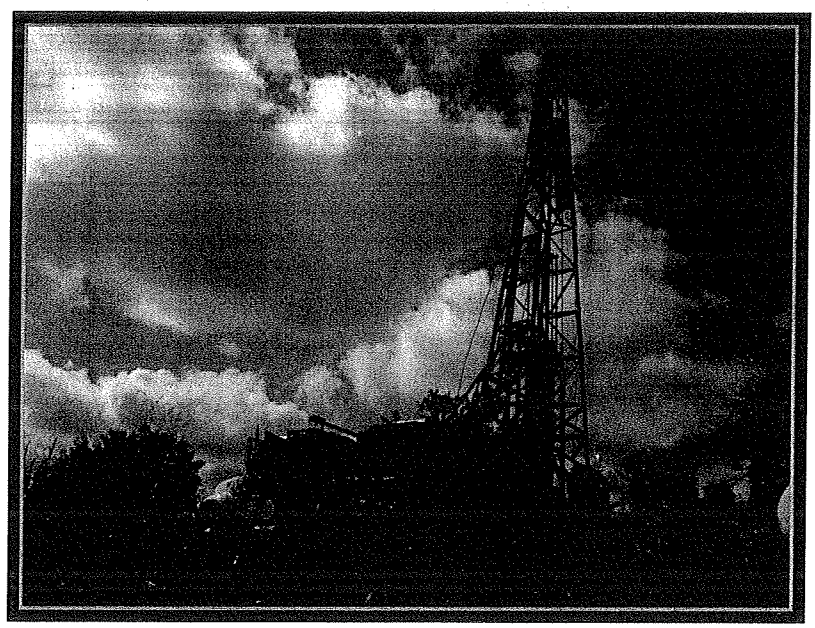
APPENDIX E

Project Site Pictures

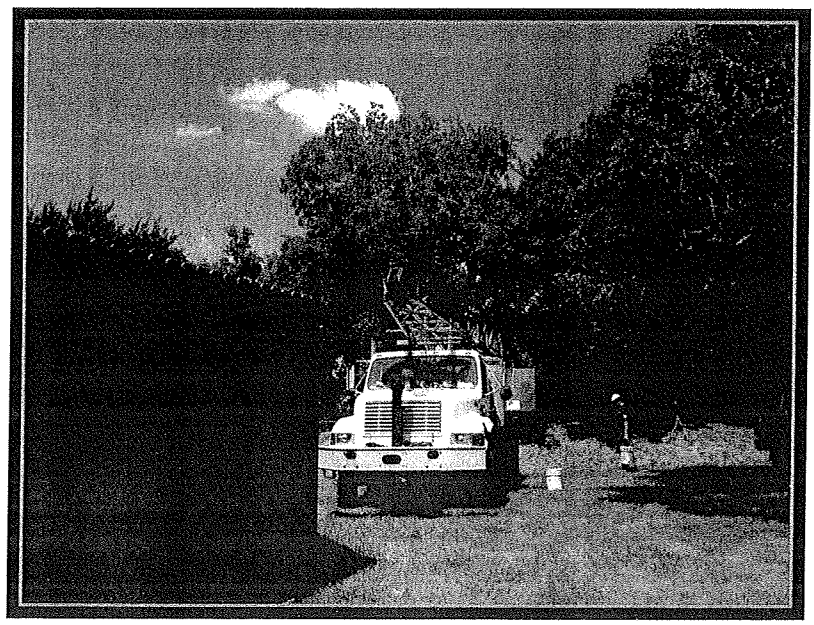
P-1



P-2



P-3



P-4

P-5

P-6

APPENDIX F

Slope Stability Analysis Results

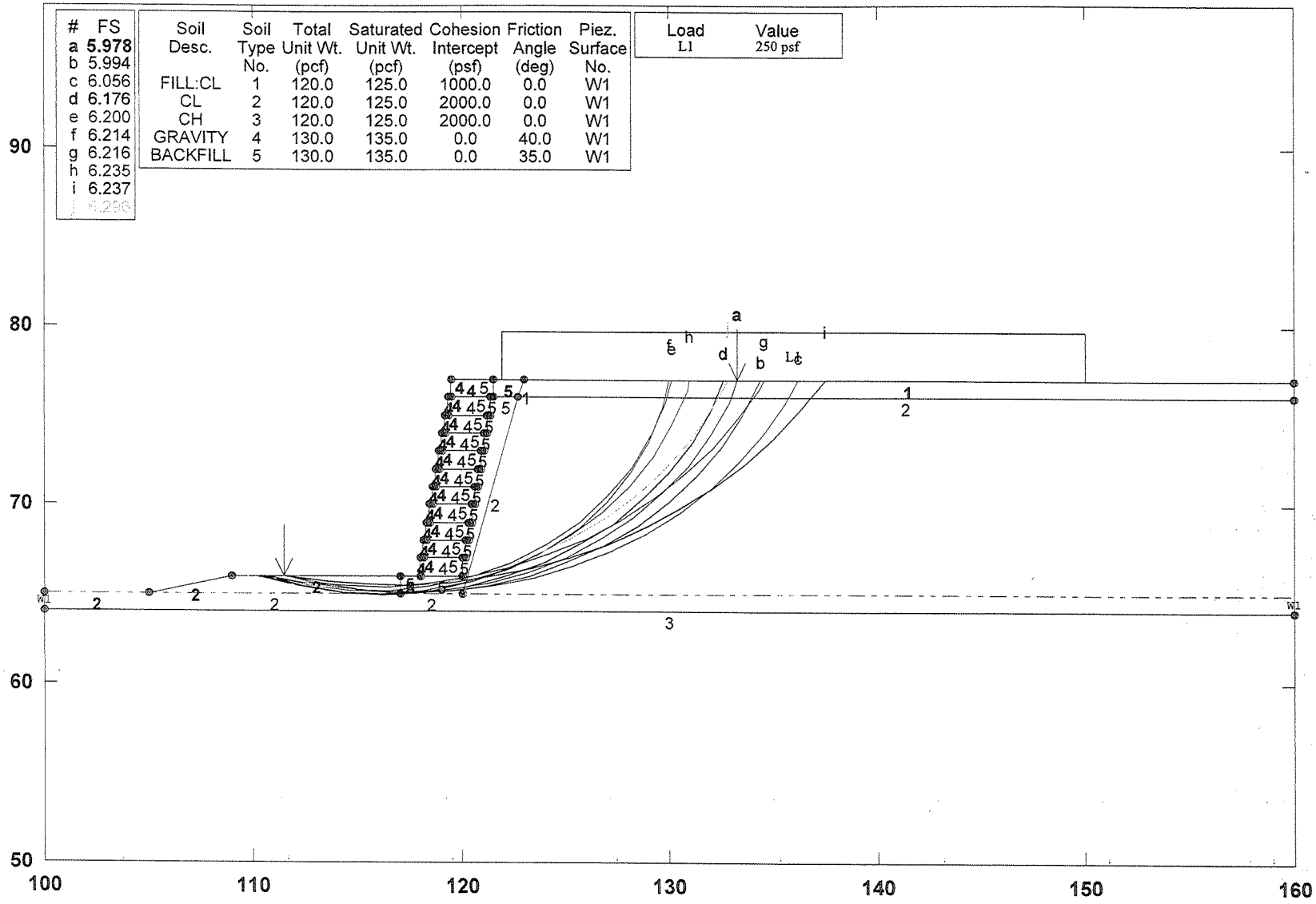
Channel Improvement W140-01-00 Sta.11+00SHORT TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta11+00_st.pl2 Run By: GET 2/5/2013 11:42AM

#	FS
a	**5.978**
b	5.994
c	6.056
d	6.176
e	6.200
f	6.214
g	6.216
h	6.235
i	6.237
j	6.296

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	1000.0	0.0	W1
CL	2	120.0	125.0	2000.0	0.0	W1
CH	3	120.0	125.0	2000.0	0.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	135.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=5.978

Safety Factors Are Calculated By The Modified Bishop Method

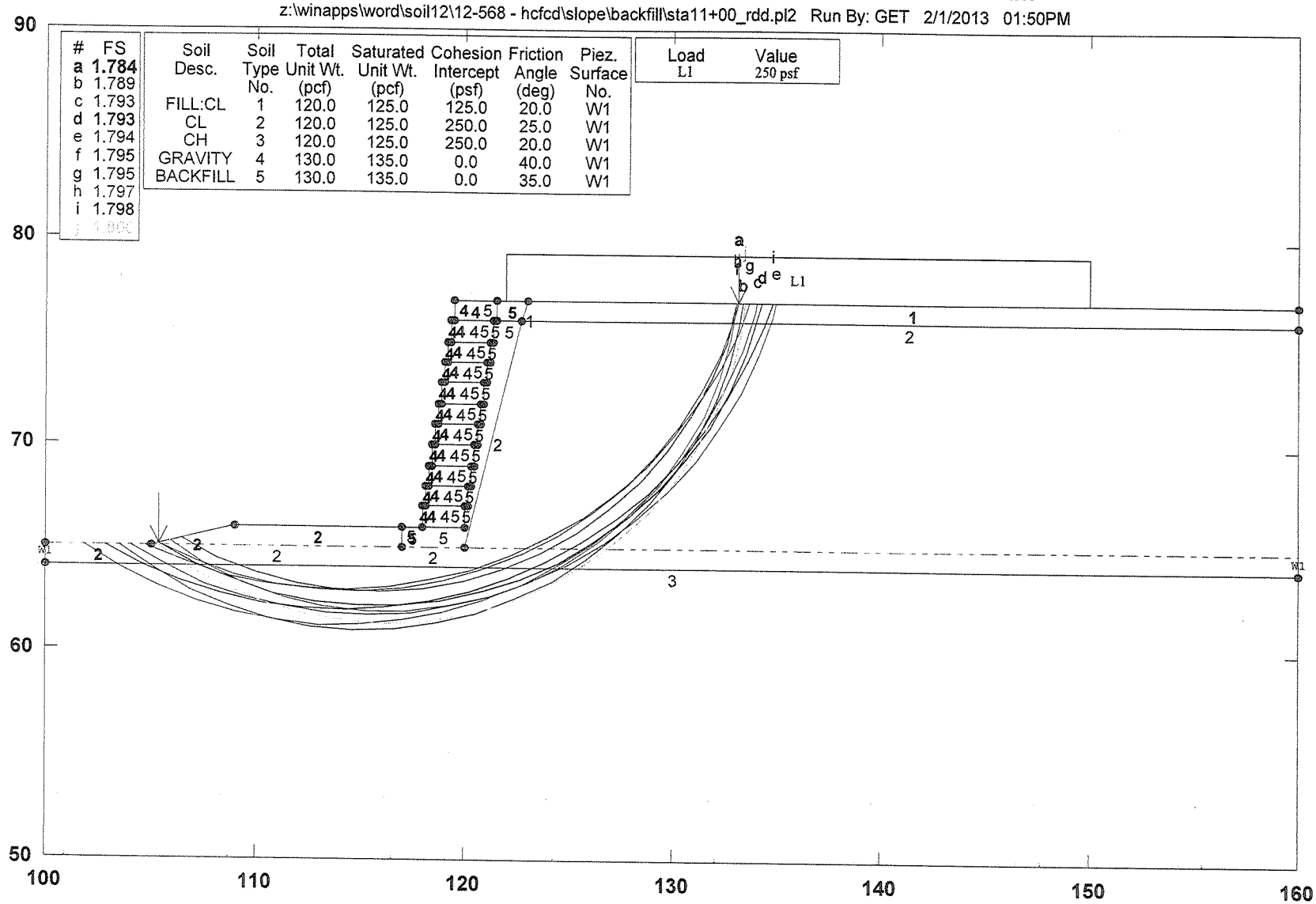
Channel Improvement W140-01-00 Sta.11+00LONG TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta11+00_rdd.pl2 Run By: GET 2/1/2013 01:50PM

#	FS
a	1.784
b	1.789
c	1.793
d	1.793
e	1.794
f	1.795
g	1.795
h	1.797
i	1.798

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	125.0	20.0	W1
CL	2	120.0	125.0	250.0	25.0	W1
CH	3	120.0	125.0	250.0	20.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	135.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=1.784

Safety Factors Are Calculated By The Modified Bishop Method

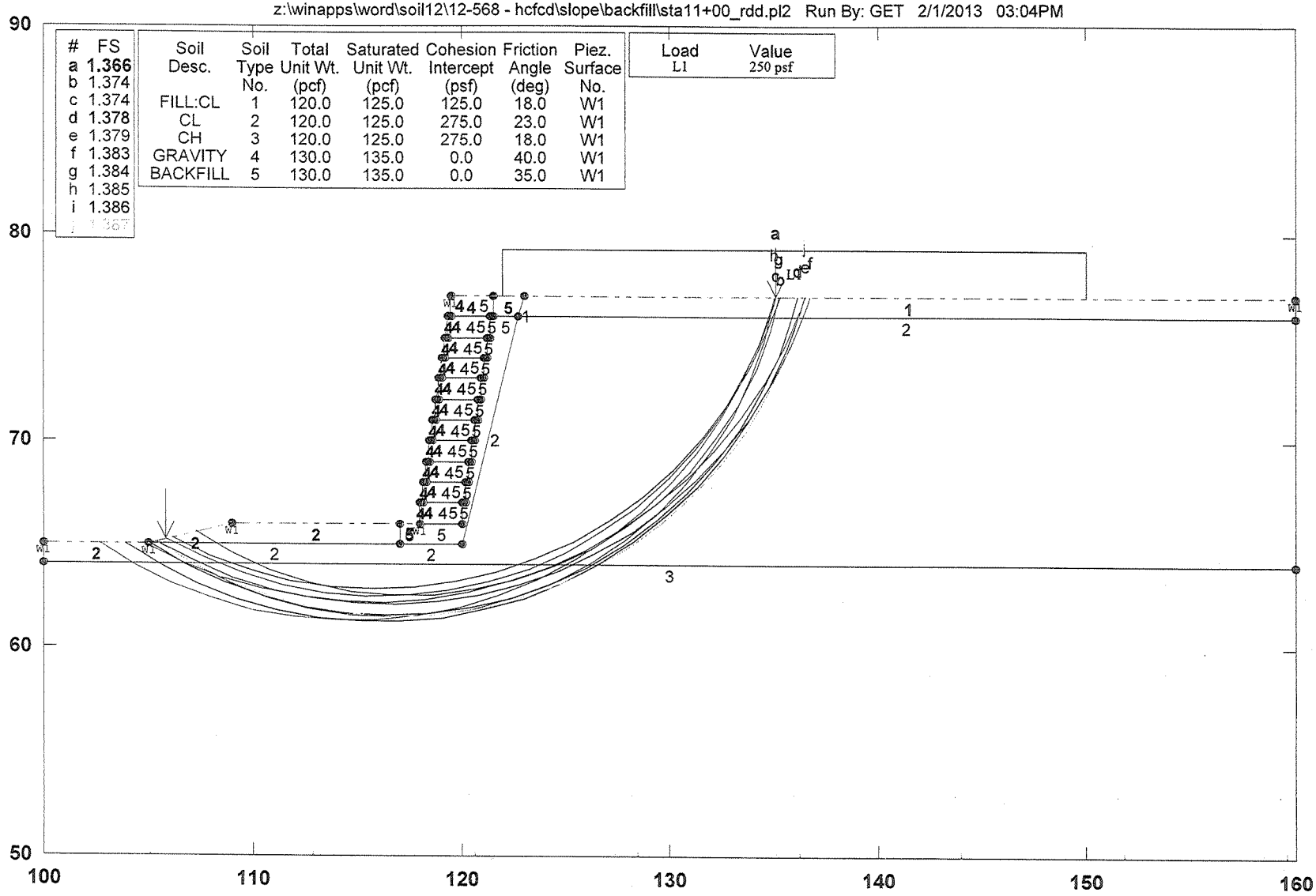
Channel Improvement W140-01-00 Sta.11+00RAPID DRAW DOWN

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta11+00_rdd.pl2 Run By: GET 2/1/2013 03:04PM

#	FS
a	1.366
b	1.374
c	1.374
d	1.378
e	1.379
f	1.383
g	1.384
h	1.385
i	1.386
j	1.387

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	125.0	18.0	W1
CL	2	120.0	125.0	275.0	23.0	W1
CH	3	120.0	125.0	275.0	18.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	135.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=1.366

Safety Factors Are Calculated By The Modified Bishop Method

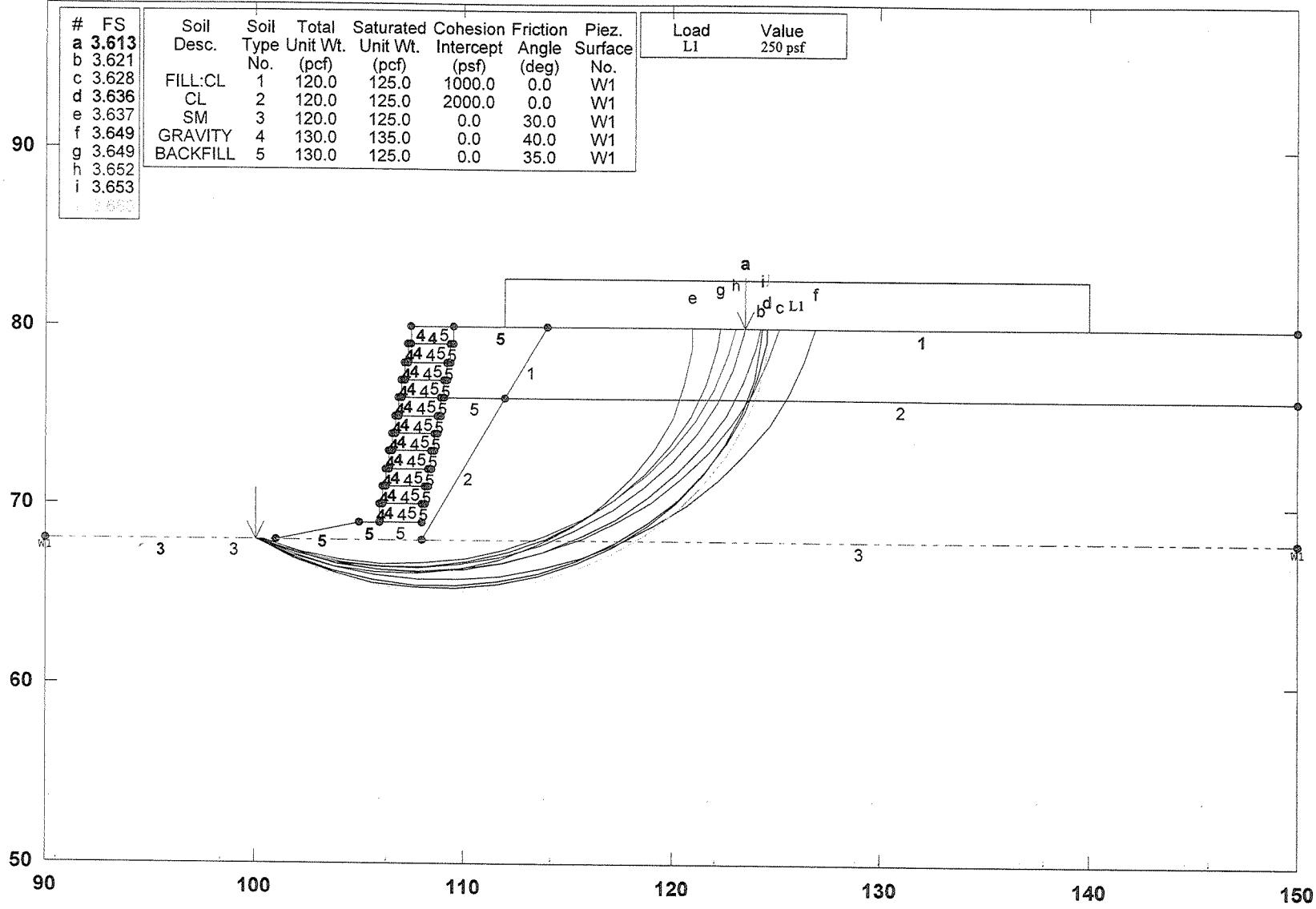
Channel Improvement W140-01-00 Sta.32+00SHORT TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta32+00_st.pl2 Run By: GET 2/5/2013 11:44AM

#	FS
a	**3.613**
b	3.621
c	3.628
d	**3.636**
e	3.637
f	3.649
g	3.649
h	3.652
i	3.653

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	1000.0	0.0	W1
CL	2	120.0	125.0	2000.0	0.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=3.613

Safety Factors Are Calculated By The Modified Bishop Method

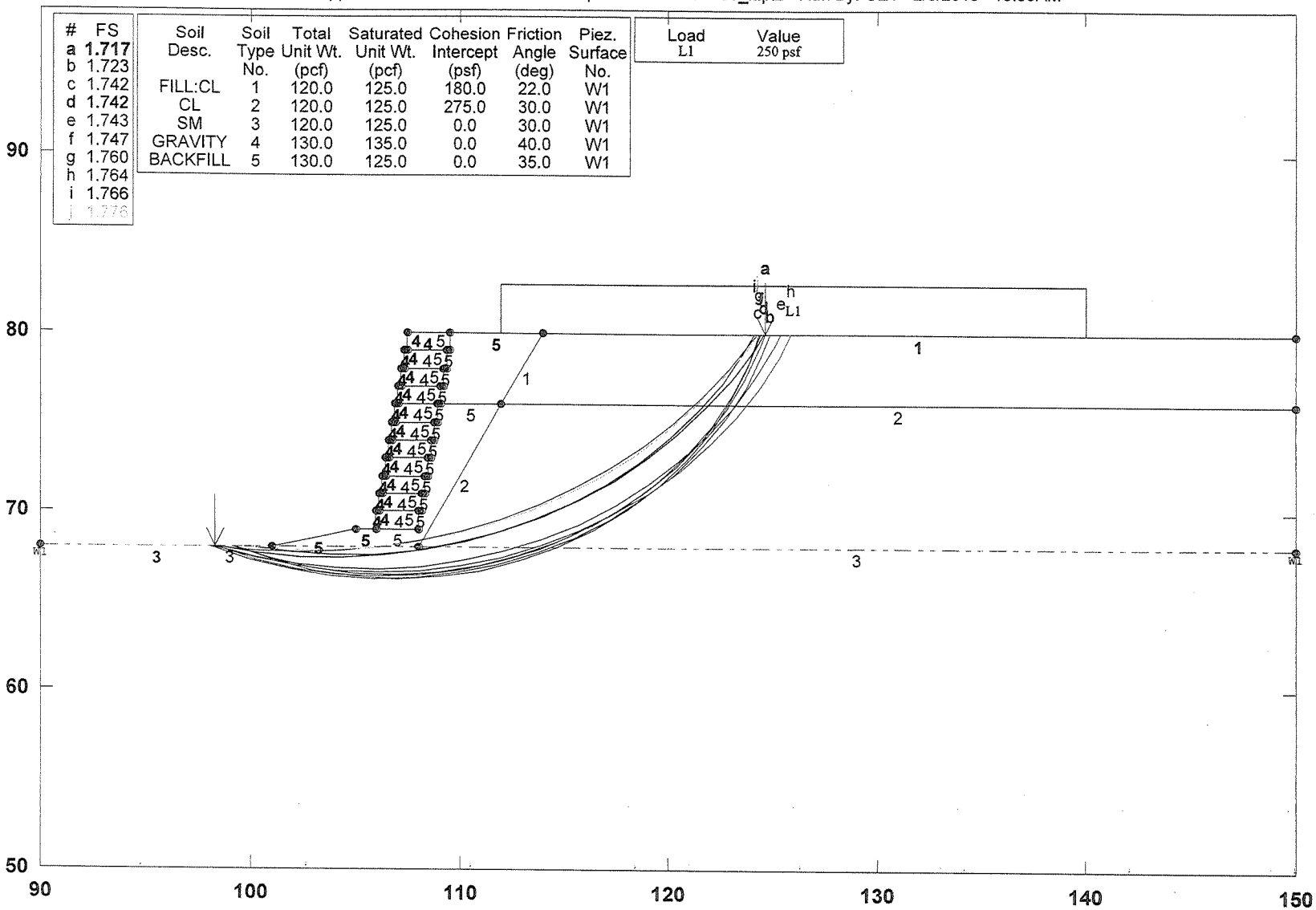
Channel Improvement W140-01-00 Sta.32+00LONG TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta32+00_lt.pl2 Run By: GET 2/5/2013 10:59AM

#	FS
a	1.717
b	1.723
c	1.742
d	1.742
e	1.743
f	1.747
g	1.760
h	1.764
i	1.766
j	1.776

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	180.0	22.0	W1
CL	2	120.0	125.0	275.0	30.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=1.717

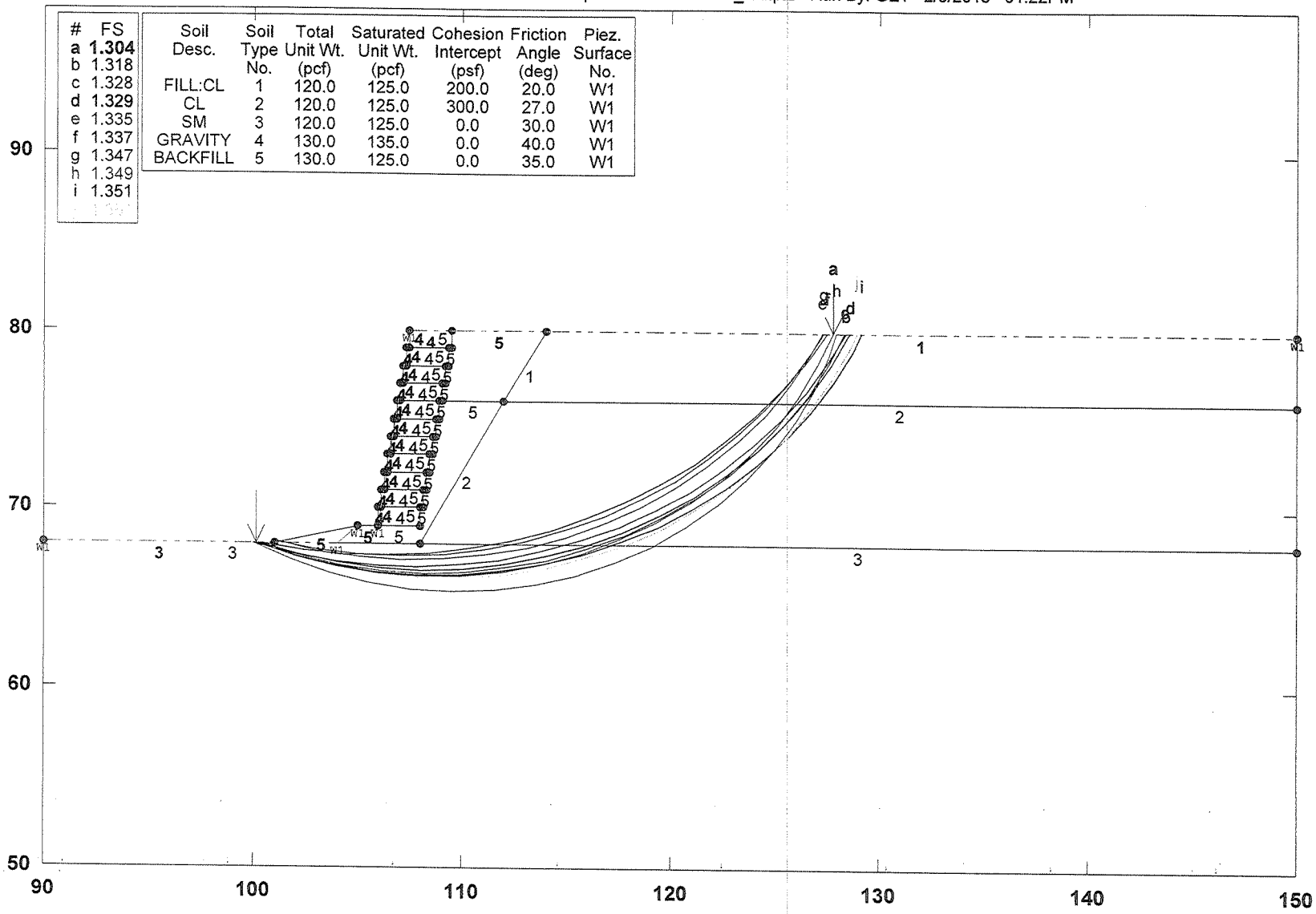
Safety Factors Are Calculated By The Modified Bishop Method

Channel Improvement W140-01-00 Sta.32+00RAPID DRAW DOWN

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta32+00_rdd.pl2 Run By: GET 2/5/2013 01:22PM

#	FS
a	**1.304**
b	1.318
c	1.328
d	**1.329**
e	1.335
f	1.337
g	1.347
h	1.349
i	1.351

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	200.0	20.0	W1
CL	2	120.0	125.0	300.0	27.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1



GSTABL7 v.2 FSmin=1.304

Safety Factors Are Calculated By The Modified Bishop Method

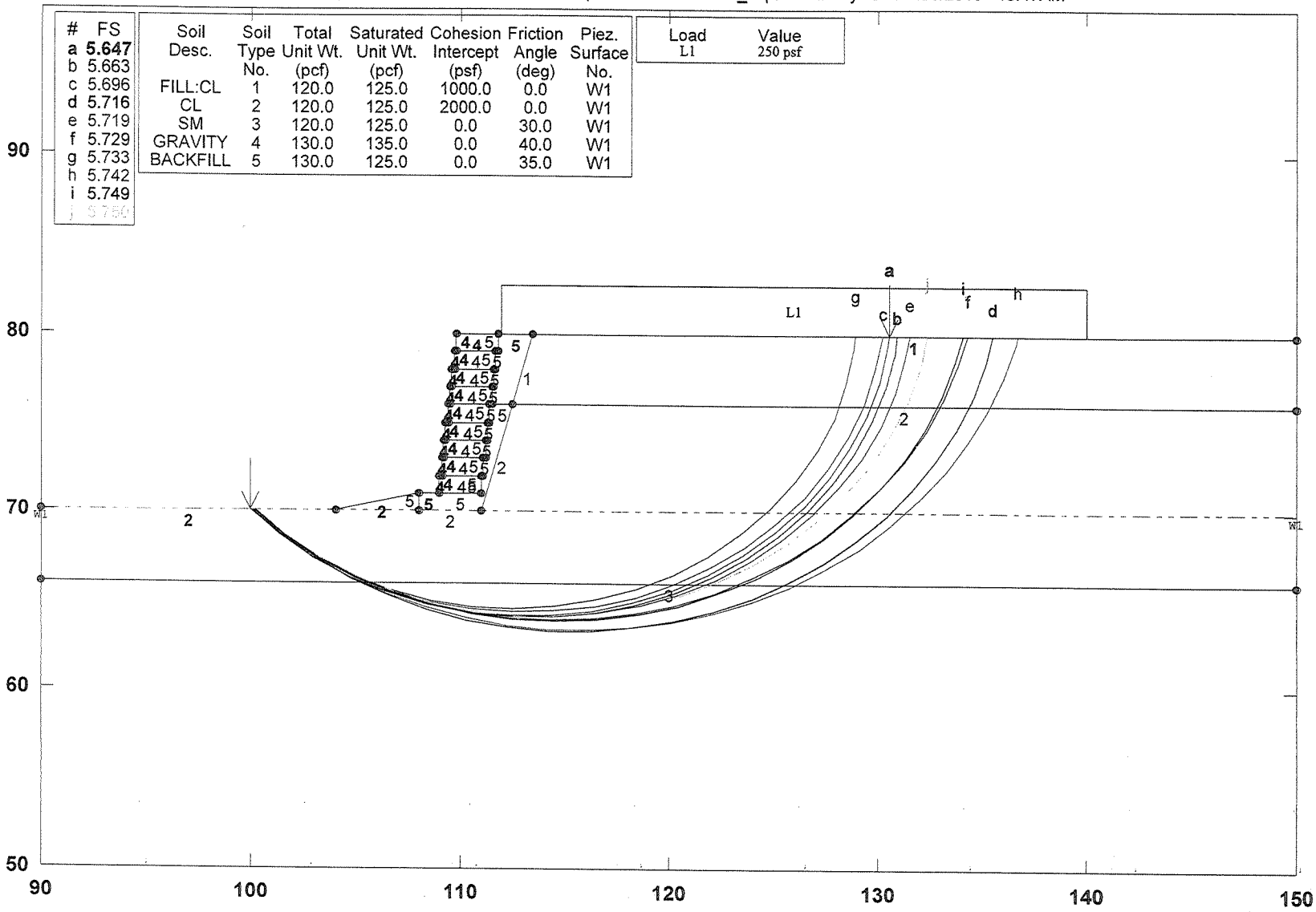
Channel Improvement W140-01-00 Sta.53+00SHORT TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta53+00_st.pl2 Run By: GET 2/5/2013 10:47AM

#	FS
a	**5.647**
b	5.663
c	5.696
d	5.716
e	5.719
f	5.729
g	5.733
h	5.742
i	5.749
j	5.750

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	1000.0	0.0	W1
CL	2	120.0	125.0	2000.0	0.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=5.647

Safety Factors Are Calculated By The Modified Bishop Method

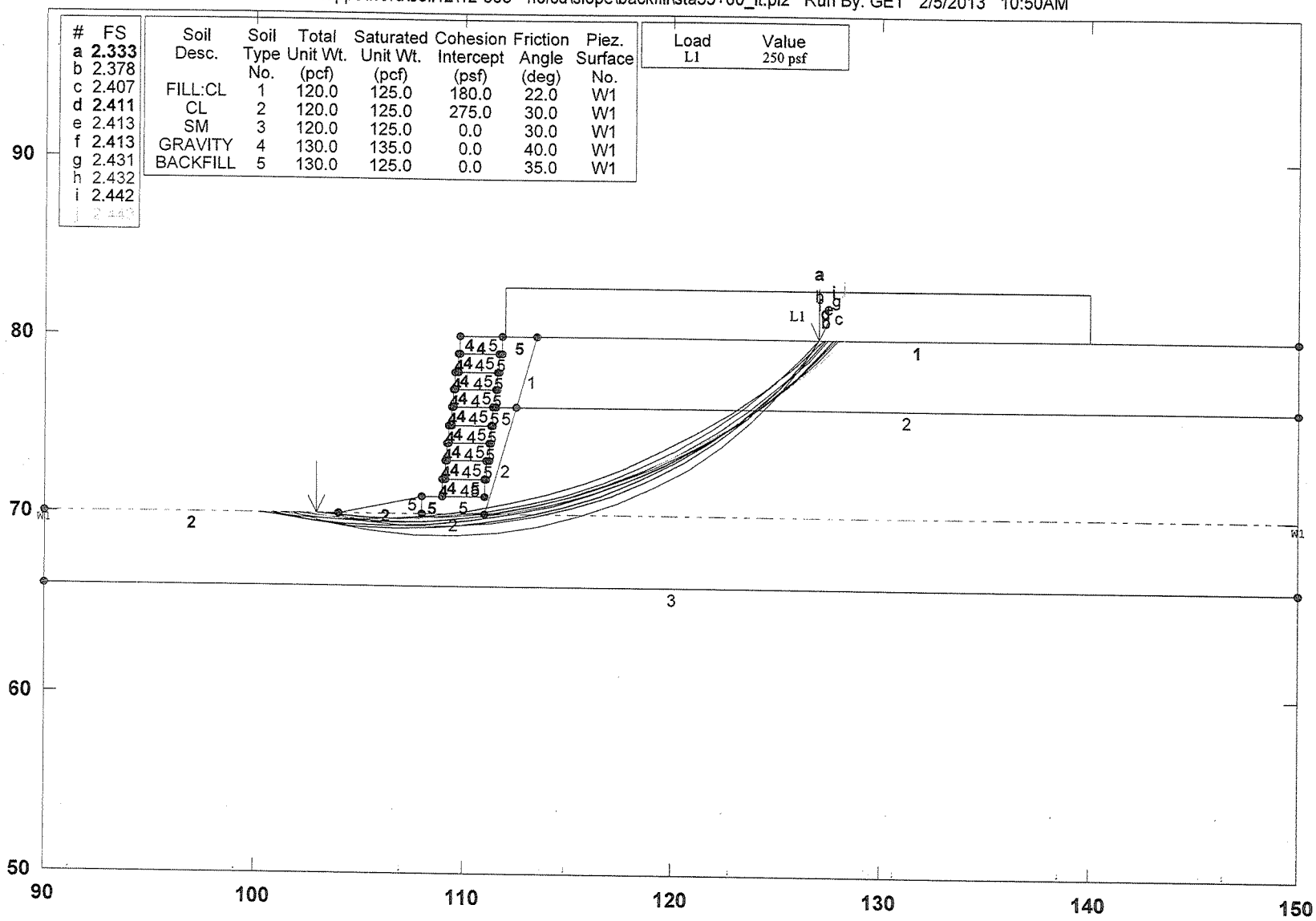
Channel Improvement W140-01-00 Sta.53+00LOMG TERM

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta53+00_lt.pl2 Run By: GET 2/5/2013 10:50AM

#	FS
a	**2.333**
b	2.378
c	2.407
d	**2.411**
e	2.413
f	2.413
g	2.431
h	2.432
i	2.442

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	180.0	22.0	W1
CL	2	120.0	125.0	275.0	30.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=2.333

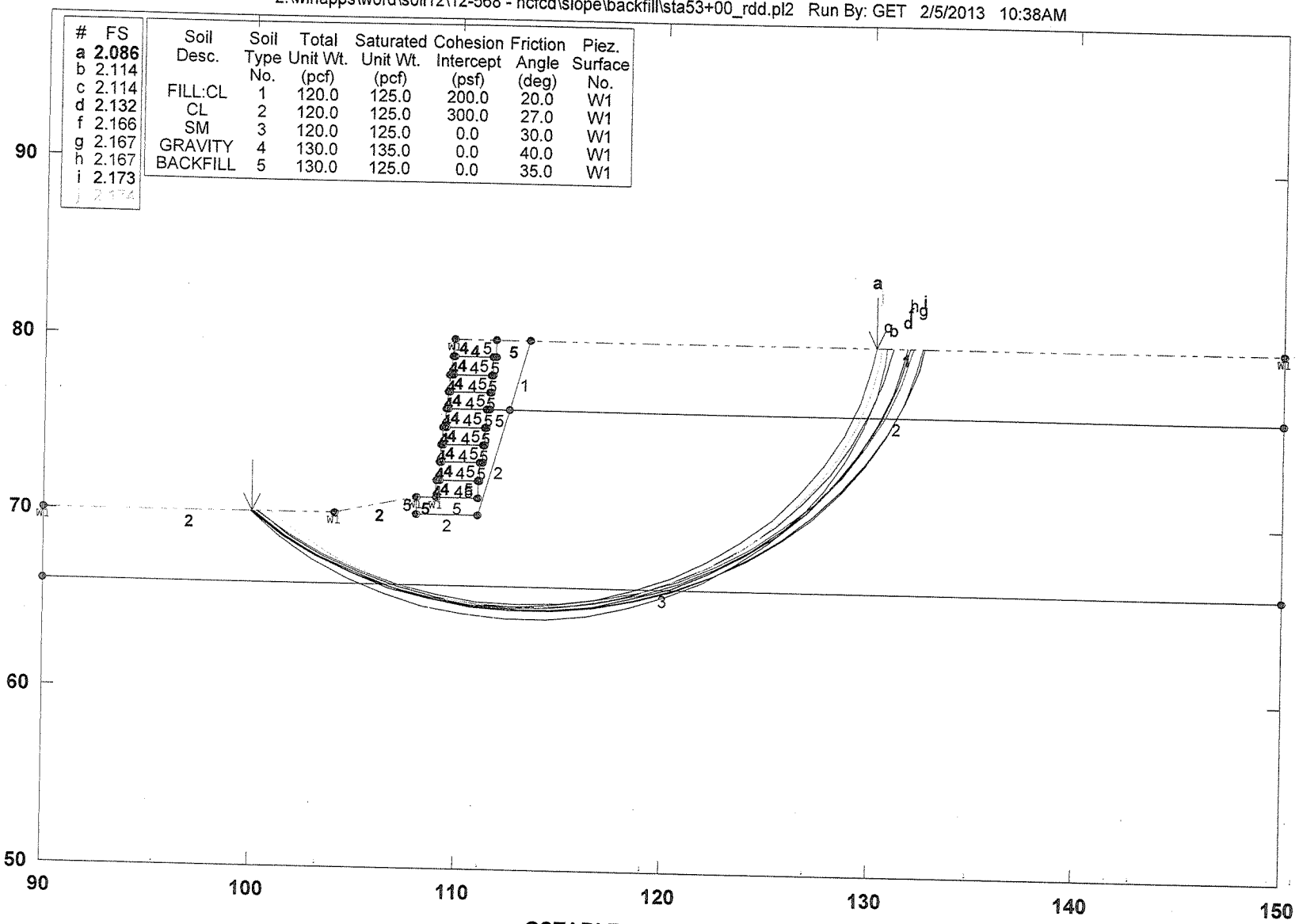
Safety Factors Are Calculated By The Modified Bishop Method

Channel Improvement W140-01-00 Sta.53+00RAPID DRAW DOWN

z:\winapps\word\soil12\12-568 - hcfcd\slope\backfill\sta53+00_rdd.pl2 Run By: GET 2/5/2013 10:38AM

#	FS
a	2.086
b	2.114
c	2.114
d	2.132
f	2.166
g	2.167
h	2.167
i	2.173
j	2.174

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FILL:CL	1	120.0	125.0	200.0	20.0	W1
CL	2	120.0	125.0	300.0	27.0	W1
SM	3	120.0	125.0	0.0	30.0	W1
GRAVITY	4	130.0	135.0	0.0	40.0	W1
BACKFILL	5	130.0	125.0	0.0	35.0	W1



GSTABL7 v.2 FSmin=2.086

Safety Factors Are Calculated By The Modified Bishop Method

Appendix C: Cost Estimates

Item	Description	Qnty	Unit	Unit Cost	Total
1	Extention of Downstream Section, from Pond to Bunker Hill	1350	LF	$ 348	$ 470,000
2	Extention of Downstream Section, from Bunker Hill to Witte	2740	LF	$ 689	$ 1,886,765
3	Extention of Downstream Section, from Witte to Gessner	1270	LF	$ 649	$ 823,643
4	Landscaping	1	LS	$ 50,000	$ 50,000
5	Reconstruct exist storm sew outfall	12	EA	$10,000	$ 120,000

Subtotal	**$ 3,360,000**
Contingency (25%)	**$ 840,000**
Grand Total	**$ 4,200,000**

Section 1 Cost Calculation - Per LF of channel between pond and Bunker Hill					
Item	Description	Qnty	Unit	Unit Cost	Total
1a	Excavation	0	SF	$0.89	$0.00
1b	Embankment	0	SF	$0.33	$0.00
1c	Concrete	0	SF	$22	$0.00
1d	Redirock Blocks	0	EA	$56	$0.00
1e	Redirock Foundations	0	EA	$170	$0.00
1f	6'x3' RCB	1	LF	$300	$300.00
1g	Junction Boxes	0.004	EA	$10,000	$37.04
1h	4'x3' RCB	0.044	LF	$250	$11.11
1i	Removing Exist Conc	0.00	SF	$5	$0.00
				Subtotal:	$348

Section 2 Cost Calculation - Per LF of channel between Bunker Hill and Witte					
Item	Description	Qnty	Unit	Unit Cost	Total
2a	Excavation	47	SF	$0.89	$41.74
2b	Embankment	214.9	SF	$0.33	$71.64
2c	Concrete	25.9	SF	$22	$575.22
2d	Redirock Blocks	0	EA	$56	$0.00
2e	Redirock Foundations	0	EA	$170	$0.00
2f	Geocell	0	LF	$0.77	$0.00
2g	Sidewalk	0	EA	$40	$0.00
2h	Handrail	0	EA	$75	$0.00
				Subtotal:	$689

Section 3 Cost Calculation - Per LF of channel between Witte and Gessner					
Item	Description	Qnty	Unit	Unit Cost	Total
3a	Excavation	106.2	SF	$0.89	$94.38
3b	Embankment	1.2	SF	$0.33	$0.39
3c	Concrete	24.92	SF	$22	$553.78
3d	Redirock Blocks	0	EA	$56	$0.00
3e	Redirock Foundations	0	EA	$170	$0.00
3f	Geocell	0	LF	$0.77	$0.00
3g	Sidewalk	0	EA	$40	$0.00
3h	Handrail	0	EA	$75	$0.00
				Subtotal:	$649

Item	Description	Qnty	Unit	Unit Cost	Total
1	Extention of Downstream Section, from Pond to Bunker Hill	1350	LF	$ 1,387	$ 1,871,995
2	Extention of Downstream Section, from Bunker Hill to Witte	2740	LF	$ 1,313	$ 3,596,462
3	Extention of Downstream Section, from Witte to Gessner	1270	LF	$ 1,391	$ 1,766,982
4	Landscaping	1	LS	$ 250,000	$ 250,000
5	Reconstruct exist storm sew outfall	12	EA	$10,000	$ 120,000

Subtotal	**$ 7,610,000**
Contingency (25%)	**$ 1,910,000**
Grand Total	**$ 9,520,000**

Section 1 Cost Calculation - Per LF of channel between pond and Bunker Hill					
Item	Description	Qnty	Unit	Unit Cost	Total
1a	Excavation	273	SF	$0.89	$242.90
1b	Embankment	0.59	SF	$0.33	$0.20
1c	Concrete	0	SF	$22	$0.00
1d	Redirock Blocks	3.91	EA	$56	$219.13
1e	Redirock Foundations	0.52	EA	$170	$88.70
1f	Geocell	42	LF	$0.77	$32.41
1g	Sidewalk	2	EA	$40	$80.00
1h	Handrail	2	EA	$75	$150.00
1i	Temporary Shoring	26	SF	$20	$520.00
1j	Removing Exist Conc	10.67	SF	$5	$53.33
				Subtotal:	$1,386.66

Section 2 Cost Calculation - Per LF of channel between Bunker Hill and Witte					
Item	Description	Qnty	Unit	Unit Cost	Total
2a	Excavation	258	SF	$0.89	$229.76
2b	Embankment	0.905	SF	$0.33	$0.30
2c	Concrete	0	SF	$22	$0.00
2d	Redirock Blocks	3.91	EA	$56	$219.13
2e	Redirock Foundations	0.52	EA	$170	$88.70
2f	Geocell	32	LF	$0.77	$24.69
2g	Sidewalk	2	EA	$40	$80.00
2h	Temporary Shoring	26	SF	$20	$520.00
2h	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,312.58

Section 3 Cost Calculation - Per LF of channel between Witte and Gessner					
Item	Description	Qnty	Unit	Unit Cost	Total
3a	Excavation	347	SF	$0.89	$308.81
3b	Embankment	0	SF	$0.33	$0.00
3c	Concrete	0	SF	$22	$0.00
3d	Redirock Blocks	3.91	EA	$56	$219.13
3e	Redirock Foundations	0.52	EA	$170	$88.70
3f	Geocell	32	LF	$0.77	$24.69
3g	Sidewalk	2	EA	$40	$80.00
3h	Temporary Shoring	26	SF	$20	$520.00
3i	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,391.32

Item	Description	Qnty	Unit	Unit Cost	Total
1	Extention of Downstream Section, from Pond to Bunker Hill	1350	LF	$ 1,584	$ 2,137,766
2	Extention of Downstream Section, from Bunker Hill to Witte	2740	LF	$ 1,445	$ 3,960,580
3	Extention of Downstream Section, from Witte to Gessner	1270	LF	$ 1,527	$ 1,939,838
4	Landscaping	1	LS	$ 350,000	$ 350,000
5	Reconstruct exist storm sew outfall	12	EA	$10,000	$ 120,000

Subtotal	**$ 8,510,000**
Contingency (25%)	**$ 2,130,000**
Grand Total	**$ 10,640,000**

Section 1 Cost Calculation - Per LF of channel between pond and Bunker Hill					
Item	Description	Qnty	Unit	Unit Cost	Total
1a	Excavation	400	SF	$0.89	$355.95
1b	Embankment	0.56	SF	$0.33	$0.19
1c	Concrete	0	SF	$22	$0.00
1d	Redirock Blocks	4.70	EA	$56	$262.96
1e	Redirock Foundations	0.52	EA	$170	$88.70
1f	Geocell	42	LF	$0.77	$32.41
1g	Sidewalk	2	EA	$40	$80.00
1h	Handrail	2	EA	$75	$150.00
1i	Temporary Shoring	28	SF	$20	$560.00
1j	Removing Exist Conc	10.67	SF	$5	$53.33
				Subtotal:	$1,583.53

Section 2 Cost Calculation - Per LF of channel between Bunker Hill and Witte					
Item	Description	Qnty	Unit	Unit Cost	Total
2a	Excavation	330	SF	$0.89	$293.24
2b	Embankment	1.49	SF	$0.33	$0.50
2c	Concrete	0	SF	$22	$0.00
2d	Redirock Blocks	4.43	EA	$56	$248.35
2e	Redirock Foundations	0.52	EA	$170	$88.70
2f	Geocell	32	LF	$0.77	$24.69
2g	Sidewalk	2	EA	$40	$80.00
2h	Temporary Shoring	28	SF	$20	$560.00
2i	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,445.47

Section 3 Cost Calculation - Per LF of channel between Witte and Gessner					
Item	Description	Qnty	Unit	Unit Cost	Total
3a	Excavation	423	SF	$0.89	$375.70
3b	Embankment	0	SF	$0.33	$0.00
3c	Concrete	0	SF	$22	$0.00
3d	Redirock Blocks	4.43	EA	$56	$248.35
3e	Redirock Foundations	0.52	EA	$170	$88.70
3f	Geocell	32	LF	$0.77	$24.69
3g	Sidewalk	2	EA	$40	$80.00
3h	Temporary Shoring	28	SF	$20	$560.00
3i	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,527.43

Item	Description	Qnty	Unit	Unit Cost	Total
1	Extention of Downstream Section, from Pond to Bunker Hill	1350	LF	$ 1,320	$ 1,782,000
2	Extention of Downstream Section, from Bunker Hill to Witte	2740	LF	$ 1,290	$ 3,534,600
3	Extention of Downstream Section, from Witte to Gessner	1270	LF	$ 1,290	$ 1,638,300
4	Landscaping	1	LS	$ 250,000	$ 250,000
5	Reconstruct exist storm sew outfall	12	EA	$10,000	$ 120,000

Subtotal	**$ 7,330,000**
Contingency (25%)	**$ 1,840,000**
Grand Total	**$ 9,170,000**

Section 1 Cost Calculation - Per LF of channel between pond and Bunker Hill					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
1a	Excavation	186	SF	$0.89	$164.95
1b	Embankment	0.49	SF	$0.33	$0.16
1c	Concrete	0	SF	$22	$0.00
1d	Redirock Blocks	4.43	EA	$56	$248.35
1e	Redirock Foundations	0.52	EA	$170	$88.70
1f	Geocell	6	LF	$0.77	$4.63
1g	Sidewalk	2	EA	$40	$80.00
1h	Handrail	2	EA	$75	$150.00
1i	Temporary Shoring	26	SF	$20	$520.00
1j	Removing Exist Conc	10.67	SF	$5	$53.33
				Subtotal:	$1,310.12

Section 2 Cost Calculation - Per LF of channel between Bunker Hill and Witte					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
2a	Excavation	187	SF	$0.89	$166.04
2b	Embankment	0.88	SF	$0.33	$0.29
2c	Concrete	0	SF	$22	$0.00
2d	Redirock Blocks	4.96	EA	$56	$277.57
2e	Redirock Foundations	0.52	EA	$170	$88.70
2f	Geocell	6	LF	$0.77	$4.63
2g	Sidewalk	2	EA	$40	$80.00
2h	Temporary Shoring	26	SF	$20	$520.00
2i	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,287.22

Section 3 Cost Calculation - Per LF of channel between Witte and Gessner					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
3a	Excavation	223	SF	$0.89	$197.88
3b	Embankment	0	SF	$0.33	$0.00
3c	Concrete	0	SF	$22	$0.00
3d	Redirock Blocks	4.43	EA	$56	$248.35
3e	Redirock Foundations	0.52	EA	$170	$88.70
3f	Geocell	6	LF	$0.77	$4.63
3g	Sidewalk	2	EA	$40	$80.00
3h	Temporary Shoring	26	SF	$20	$520.00
3i	Handrail	2	EA	$75	$150.00
				Subtotal:	$1,289.56

Item	Description	Qnty	Unit	Unit Cost	Total
1	Storm Sewer Box Enclosure, from Pond to Bunker Hill	1350	LF	$ 2,157	$ 2,911,312
2	Storm Sewer Box Enclosure, from Bunker Hill to Witte	2740	LF	$ 1,855	$ 5,081,779
3	Storm Sewer Box Enclosure, from Witte to Gessner	1270	LF	$ 1,867	$ 2,371,152
4	Landscaping	1	LS	$ 50,000	$ 50,000
5	Reconstruct exist storm sew outfall	12	EA	$10,000	$ 120,000

Subtotal	**$ 10,540,000**
Contingency (25%)	**$ 2,640,000**
Grand Total	**$ 13,180,000**

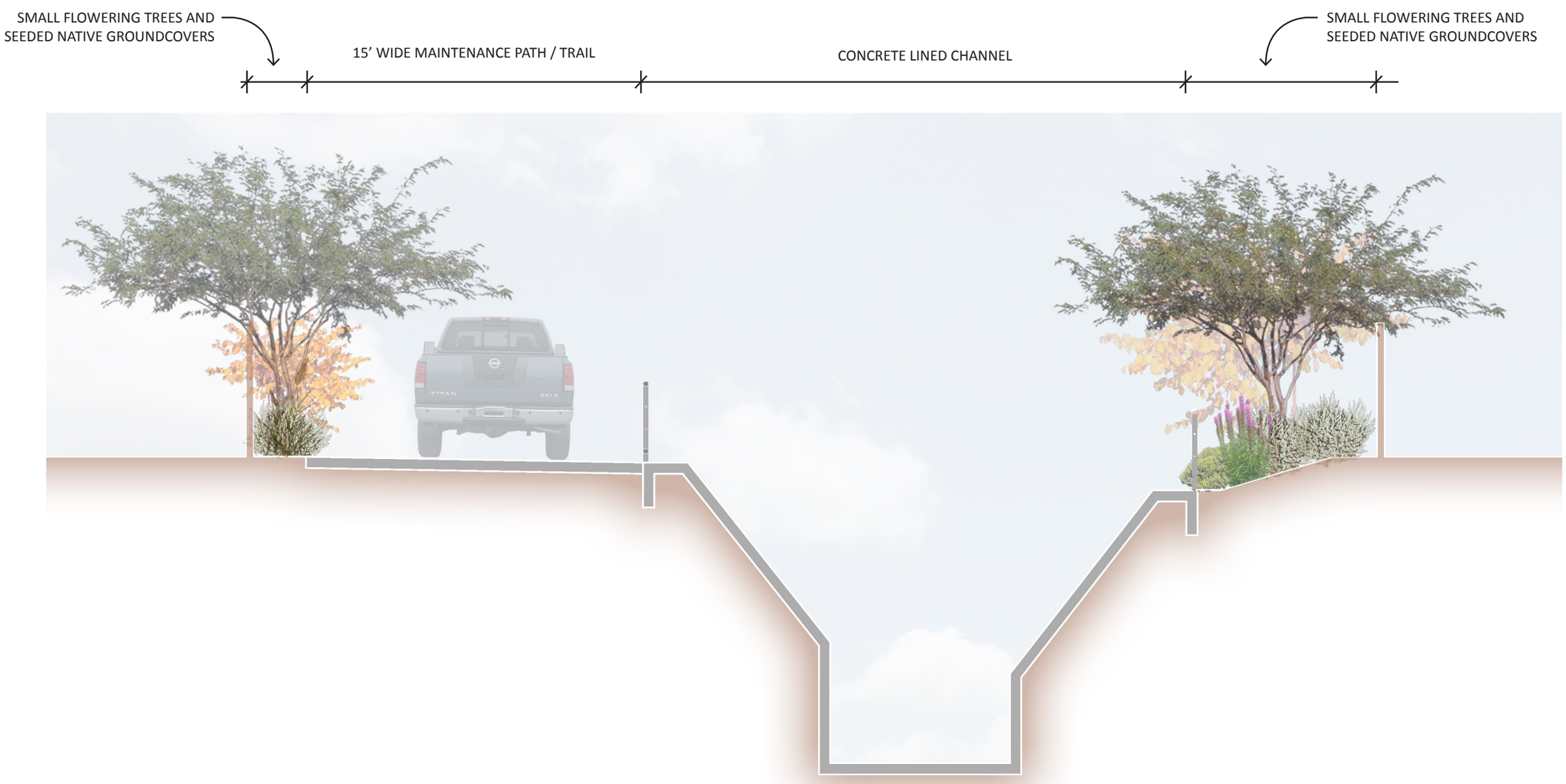
Section 1 Cost Calculation - Per LF of channel between pond and Bunker Hill					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
1a	Excavation	44	SF	$0.89	$38.92
1b	Embankment	1.57	SF	$0.33	$0.52
1c	Redirock Blocks	2.09	EA	$56	$116.87
1d	Redirock Foundations	0.52	EA	$170	$88.70
1e	12'x8' RCB	2	LF	$800	$1,600.00
1f	7'x7' RCB	0.12	LF	$600	$71.11
1g	24" CMP	0.03	LF	$50	$1.48
1h	24" RCP	0.01	LF	$75	$1.11
1i	36" RCP	0.01	LF	$100	$1.48
1j	72" CMP	0.01	LF	$150	$2.22
1k	72" RCP	0.01	LF	$275	$4.07
1l	Junction Box	0.002	EA	$15,000	$33.33
1m	Type C Manhole	0.0007	EA	$1,500	$1.11
1n	Sidewalk	2	EA	$20	$40.00
1o	Handrail	2	EA	$75	$150.00
1p	Restrictor	0.001	EA	$50	$0.04
1q	Type E Inlet	0.004	EA	$1,500	$5.56
				Subtotal:	$2,157

Section 2 Cost Calculation - Per LF of channel between Bunker Hill and Witte					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
2a	Excavation	35	SF	$0.89	$31.30
2b	Embankment	1.1	SF	$0.33	$0.35
2c	Redirock Blocks	2.09	EA	$56	$116.87
2d	Redirock Foundations	0.52	EA	$170	$88.70
2e	8'x8' RCB	2	LF	$700	$1,400.00
2f	2" stl. Pipe	0.007299	LF	$10	$0.07
2g	8" RCP	0.007299	LF	$30	$0.22
2h	24" RCP	0.021898	LF	$75	$1.64
2i	24" CMP	0.014599	LF	$50	$0.73
2j	30" CMP	0.014599	LF	$70	$1.02
2k	48" CPP	0.014599	LF	$50	$0.73
2l	Junction Box	0.001	EA	$15,000	$16.42
2m	Type C Manhole	0.0011	EA	$1,500	$1.64
2n	Sidewalk	2	EA	$20	$40.00
2o	Handrail	2	EA	$75	$150.00
2p	Restrictor	0.0007	EA	$50	$0.04
2q	Type E Inlet	0.003	EA	$1,500	$4.93
				Subtotal:	$1,855

Section 3 Cost Calculation - Per LF of channel between Witte and Gessner					
Item	**Description**	**Qnty**	**Unit**	**Unit Cost**	**Total**
3a	Excavation	44.6	SF	$0.89	$39.68
3b	Embankment	1.2	SF	$0.33	$0.38
3c	Redirock Blocks	2.09	EA	$56	$116.87
3d	Redirock Foundations	0.52	EA	$170	$88.70
3e	8'x8' RCB	2	LF	$700	$1,400.00
3f	36" RCP	0.015748	LF	$100	$1.57
3g	Junction Box	0.002	EA	$15,000	$23.62
3h	Type C Manhole	0.0008	EA	$1,500	$1.18
3i	Sidewalk	2	EA	$20	$40.00
3j	Handrail	2	EA	$75	$150.00
3k	Restrictor	0.0008	EA	$50	$0.04
3l	Type E Inlet	0.003	EA	$1,500	$5.00

Subtotal: $1,867

Appendix D: Amenity Concepts



ALTERNATE A: EXTENSION OF DOWNSTREAM SECTION

FEET 0 1 5 10 15

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

GRAVITY RETAINING WALL

15’ WIDE MAINTENANCE PATH / TRAIL

RIP RAP ARMORED CHANNEL WITH POCKETS OF SEEDED GROUNDCOVER

GRAVITY RETAINING WALL

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

ALTERNATE B: DRY BOTTOM STORAGE CHANNEL

FEET 0 1 5 10 15

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

GRAVITY RETAINING WALL

15’ WIDE MAINTENANCE PATH / TRAIL

RIP RAP ARMORED CHANNEL WITH POCKETS OF LOW WETLAND PLANTS

GRAVITY RETAINING WALL

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

ALTERNATE C: WET BOTTOM STORAGE CHANNEL

FEET 0 1 5 10 15

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

GRAVITY RETAINING WALL

15’ WIDE MAINTENANCE PATH / TRAIL

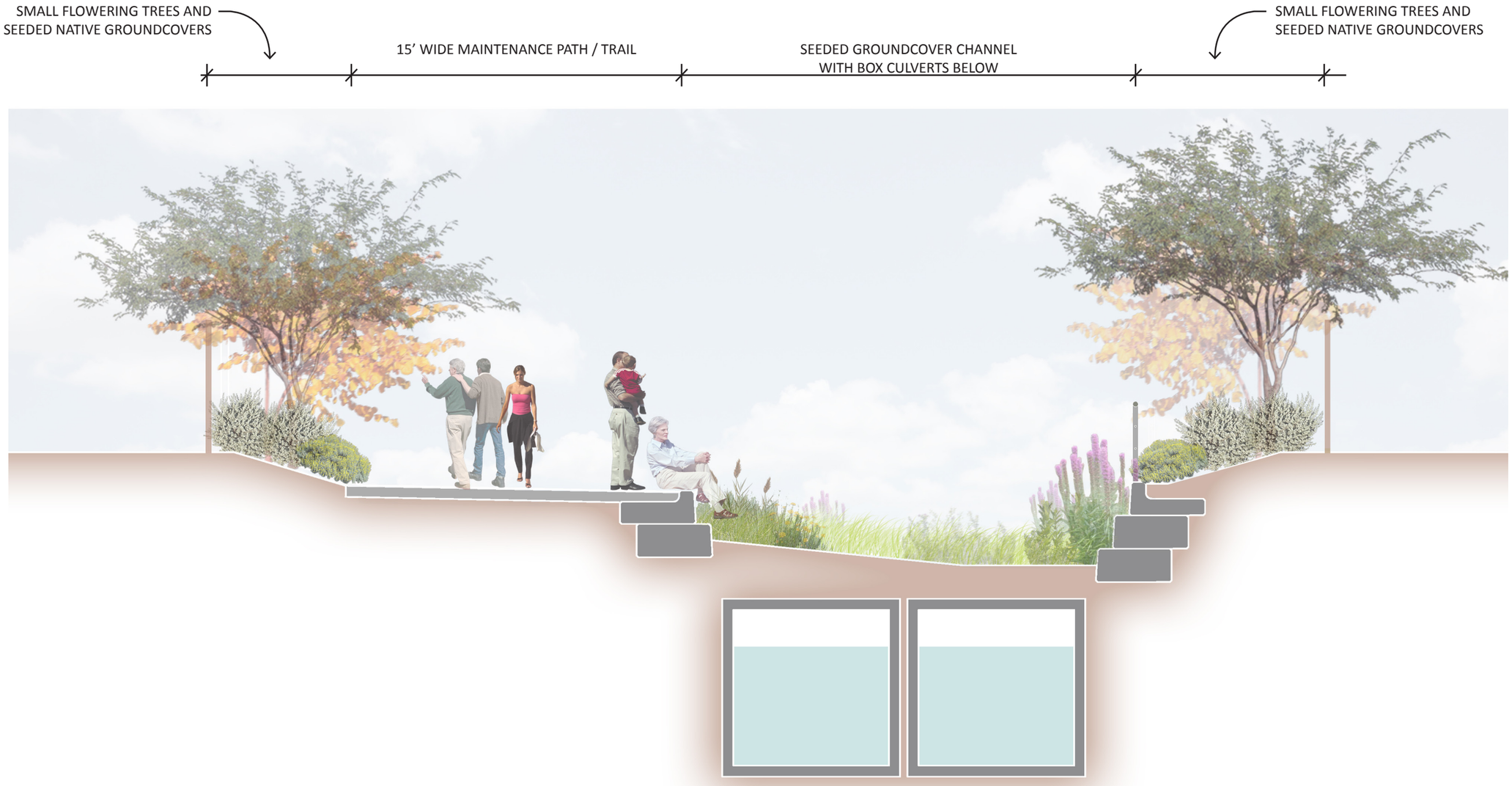
RIP RAP ARMORED CHANNEL WITH POCKETS OF SEEDED GROUNDCOVER

GRAVITY RETAINING WALL

SMALL FLOWERING TREES AND SEEDED NATIVE GROUNDCOVERS

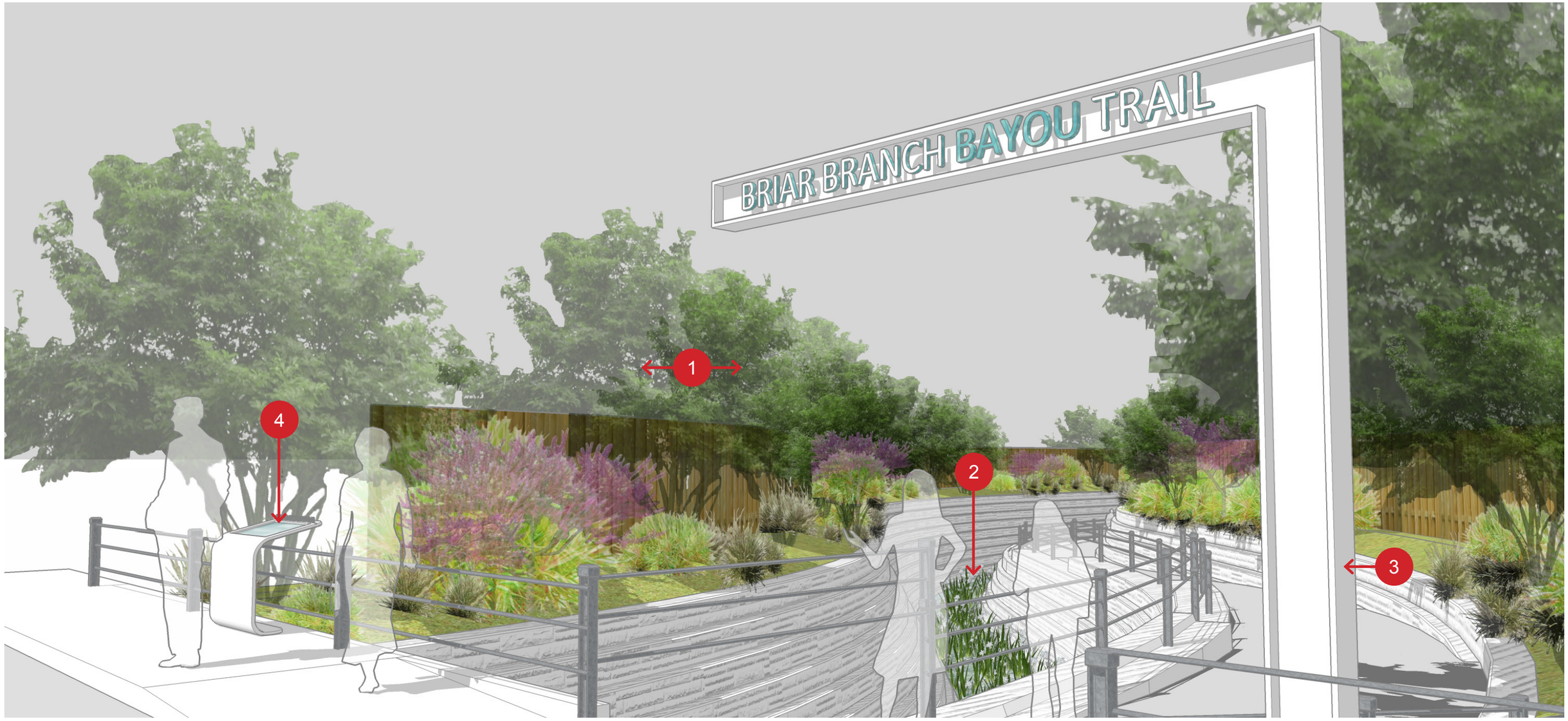
ALTERNATE D: HYBRID STORAGE CHANNEL

FEET 0 1 5 10 15



ALTERNATE E: STORM SEWER BOX ENCLOSURE

FEET 0 1 5 10 15



ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

1. SMALL TREES AND LOW PLANTINGS INCREASE PRIVACY FOR PRIVATE PROPERTY AND PROVIDE SHADE FOR TRAIL USERS.
2. LOW WETLAND PLANTINGS IN THE CHANNEL BUILD HABITAT AND REDUCE SILT TRANSPORT DOWNSTREAM.
3. GATEWAY MARKINGS INCREASE VISIBILITY OF AMENITY
4. WAY FINDING AND NARRATIVE PLACARDS ORIENT USERS AND CAN BE USED TO COMMUNICATE ENVIRONMENTAL STRATEGIES.

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

1. SMALL TREES AND LOW PLANTINGS INCREASE PRIVACY FOR PRIVATE PROPERTY AND PROVIDE SHADE FOR TRAIL USERS.
2. LOW WETLAND PLANTINGS IN THE CHANNEL BUILD HABITAT AND REDUCE SILT TRANSPORT DOWNSTREAM.
3. GATEWAY MARKINGS INCREASE VISIBILITY OF AMENITY
4. WAY FINDING AND NARRATIVE PLACARDS ORIENT USERS AND CAN BE USED TO COMMUNICATE ENVIRONMENTAL STRATEGIES.

ALTERNATE D: HYBRID STORAGE CHANNEL
BIRD'S EYE PERSPECTIVE

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

1. SMALL TREES AND LOW PLANTINGS INCREASE PRIVACY FOR PRIVATE PROPERTY AND PROVIDE SHADE FOR TRAIL USERS.
2. LOW WETLAND PLANTINGS IN THE CHANNEL BUILD HABITAT AND REDUCE SILT TRANSPORT DOWNSTREAM.
3. GATEWAY MARKINGS INCREASE VISIBILITY OF AMENITY
4. WIDE MAINTANENCE PATHS ENSURE ACCESS FOR EQUIPMENT AND DOUBLE AS RECREATIONAL TRAIL BUFFERED FROM PRIVATE PROPERTY.

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

1. SMALL TREES AND LOW PLANTINGS INCREASE PRIVACY FOR PRIVATE PROPERTY AND PROVIDE SHADE FOR TRAIL USERS.
2. LOW WETLAND PLANTINGS IN THE CHANNEL BUILD HABITAT AND REDUCE SILT TRANSPORT DOWNSTREAM.
3. GATEWAY MARKINGS INCREASE VISIBILITY OF AMENITY

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE

1. SMALL TREES AND LOW PLANTINGS INCREASE PRIVACY FOR PRIVATE PROPERTY AND PROVIDE SHADE FOR TRAIL USERS.
2. LOW WETLAND PLANTINGS IN THE CHANNEL BUILD HABITAT AND REDUCE SILT TRANSPORT DOWNSTREAM.
3. GATEWAY MARKINGS INCREASE VISIBILITY OF AMENITY

ALTERNATE D: HYBRID STORAGE CHANNEL
GROUND LEVEL PERSPECTIVE