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DRAINAGE STUDY

North Houston Highway Improvement Project

Segment 3B Addendum
Alabama Street to McGowen Street

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Harris County, Texas

Texas Department of Transportation

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EXECUTIVE SUMMARY

General

This report is an addendum to the "North Houston Highway Improvement (NHHIP) Project Segment 3B from Alabama Street to Canal Street Drainage Study" prepared by AECOM, Inc. dated July 2018. The AECOM report documents the drainage analysis from Alabama Street to Canal Street which has been broken into two separate projects: NHHIP 3B from Alabama Street to McGowen Street; and NHHIP 3D from McGowen Street to Buffalo Bayou. This report documents the preliminary results and the drainage analysis and design from Alabama Street to McGowen Street, which is the NHHIP 3B project, to assist TxDOT and IDCUS, Inc in the design phase of the project. **This document is preliminary and subject to change due to the ongoing design.**

Project Overview

The proposed project, NHHIP 3B, includes the reconstruction of I-69 and SH 288 depressed freeway sections from Alabama Street to McGowen Street. The major drainage components of the project include:

- Hamilton Street Collector from Winbern Street to Polk Street, protecting the depressed section from overland flow west of the I-69 corridor for flood frequencies up to and including the 100-year storm event,
- Storm drain systems,
- I-45 Pump station facility and St Emanuel Collector/I-45 pump outfall, and
- Pond A & A2 Mitigation facilities

These design features are shown on the NHHIP 3B proposed schematic, which is included in **Appendix A.**

The design criteria for this study was established in coordination with TxDOT. The I-69 corridor serves as an evacuation route; therefore, TxDOT requires a 100-year level of protection for the main lanes. The project specific design criteria for the NHHIP 3B project includes designing the depressed section pump station and storm sewer system to convey the ATLAS 14 100-year storm event. The rainfall depths used this study were updated to Atlas 14 rainfall data taken from the National Oceanic Atmospheric Administration (NOAA) volume 11, version 2 Houston WB City, station ID 79-0056. The drainage design criteria and the complete Atlas 14 partial duration precipitation frequency table used for this study and the NHHIP 3B design is included in **Appendix B.**

Overland Flow Analysis

The I-69 corridor is proposed to be depressed from Spur 527 to Canal Street (NHHIP Segments 3A, 3B, and 3D). It is necessary to quantify the overland flow draining to the proposed depressed section and design a collector system to prevent overland flow from entering the depressed section for frequency events up to and including the 100-year storm event. The overland flow analysis was completed using PCSWMM for the 100-year storm event.

The overland flow analysis identified overland flow paths across the existing I-69 corridor and overland flow access points into the existing depressed section. For the existing condition 100-year storm event, the analysis results indicate the low area along Hamilton Street near Holman Street is where the majority of the overland flow (estimated at 682 cfs for the 100-year storm event) enters the existing depressed section. In the AECOM report, an oversized Hamilton Street Collector is recommended, to capture overland flow before it reaches the I-69 corridor except at the low point on Hamilton near Holman Street. For this project, the proposed schematic profile for Hamilton Street has been raised allowing for the Hamilton Street Collector system to collect all overland flow for frequencies up to and including the 100-year storm event in a proposed 12 ft. x 12 ft. system from Winbern Street to Polk Street. The existing depressed section ends at approximately Bell Street and the I-69 existing bridge section starts just west of Polk Street; this allows the Hamilton Street Collector to cross under the existing I-69 roadway via a proposed 12 ft. x 12 ft. RCB, tie into the proposed 8 ft. x 8 ft. St. Emanuel Collector/I-45 pump outfall, and then drain along St. Emanual Street via a 12 ft. x 12 ft. RCB to Buffalo Bayou. The I-45 pump outfall will capture the overland flow along St. Emanuel replacing the St. Emanuel Collector recommended in the AECOM report. The existing storm sewers crossing St. Emanuel Street will be connected to the St. Emanuel Collector/I-45 pump outfall, and the lines west of St. Emanuel draining west to the existing Chartres Street trunkline will be plugged and remain in place for the NHHIP 3B project. The existing 6 ft. x 3.5 ft. Elgin siphon will be removed. The proposed 12 ft. x 12 ft. Hamilton Street collector will be connected to the St. Joseph siphon with a junction box, leaving the St. Joseph siphon to remain in place as part of this project. The existing St. Joseph siphon will be removed as part of the future NHHIP 3D project and the City of Houston system north of I-69 that is connected to the 12 ft. x 12 ft. Hamilton Collector will remain.

There is no overland flow collector system recommended for the Chartres Street system as the overland flow in this area drains away from the depressed section. The proposed storm sewer system was designed for the 10-year storm event as part of this project to drain local flow. From McIlhenny to I-45 the existing Chartres Street system will remain in place for this Project. However, a proposed storm sewer system was design along

St Emanuel from McIlhenny to I-45 to drain the local flow and the existing storm sewers crossing St. Emanuel Street will be connected to the proposed storm sewer and outfall into the existing I-45 storm sewer system at St. Joseph Street.

In addition, the proposed roadway profiles were evaluated to identify potential locations overland flow could access the proposed depressed section based on the proposed 100-year water surface elevations. In general, these overland flow access points are located at exit and entrance ramp locations to the depressed section. The proposed schematic profile was modified to be above the estimated 100-year water surface elevation or high enough that a barrier wall can be used to keep the 100-year overland flow from entering the proposed depressed section.

Storm Drain Design

The preliminary sizing of the proposed drainage systems is provided for the following roadways within the project limits:

- The Collector system along Hamilton Street (I-69 southbound frontage road) from Winbern Street to Polk Street (Outfall – Buffalo Bayou)
- The main lanes of the proposed depressed section from Alabama Street to McGowen Street, including I-69 northbound and southbound, SH-288 southbound, and I-45 northbound and southbound direct connectors (Outfall – Buffalo Bayou)
- Chartres Street (I-69 northbound frontage road), outfalls to the COH storm sewer system along Elgin Street, and ultimately to Brays Bayou.

Pump Station Design

The I-45 pump station design from the AECOM report was updated for this project. The I-45 pump station was relocated adjacent to the St. Emanuel and St. Joseph intersection. The I-45 pump station continues to discharge to an 8 ft. x 8 ft. gravity system along St. Emanuel Street that connects to the Hamilton Collector System and increases to a 12 ft. x 12 ft. RCB. This system is restricted with a 42" RCP that combines with the Detention Pond A 36" RCP outflow pipe and then outfalls via a 54-inch RCP with a backflow preventer allowing flow to drain directly to Buffalo Bayou when tailwater conditions allow. Higher flows will enter Detention Pond A through Three (3) – 10 ft. x 5 ft. RCB inflow structure with an upstream flowline elevation of 10.00 feet and a

downstream flowline elevation of 9.50 feet. The pump station was sized such that there is no roadway flooding for the 100-year, 24-hour storm event. The following summarizes the updated pump configuration:

- I-45 Pump Station (Total Capacity - 160,192 GPM)
    - 1 – 1,652 GPM sump pump
    - 2 – 8,694 GPM pumps
    - 8 – 17,644 GPM pumps (including one spare)

Two natural gas-powered generators will provide emergency backup power instead of the diesel power generators recommended in the AECOM report.

Mitigation Analysis

A mitigation analysis was performed to determine detention needs due to the increase in runoff associated with the proposed roadway and drainage improvements (system hydraulics). The analysis also evaluated the mitigation needs associated with the loss of floodplain storage from Buffalo Bayou due to the proposed project.

Detention Pond A will provide 235 ac-ft of volume below the 100-year water surface elevation. An additional 46 ac-ft of volume is provided within the Hamilton Street Collector and I-45 pump St. Emanuel outfall, which together will exceed the 232 ac-ft of required mitigation volume for the NHHIP 3B project.

Detention Pond A2 located within the TxDOT ROW between Holman Street and Chenevert Street will provide 5.16 ac-ft of volume. The existing local roadways currently flood in this area resulting in overland flow entering the existing depressed section. For proposed conditions, the overland flow will enter the Hamilton Street collector and backflow into Detention Pond A2 via a 24-inch inflow/outflow pipe. Detention pond A2 provides additional mitigation to lower the water surface elevations in this area thus reducing ponding depths.

No detention is required for the Chartres system as the proposed drainage plan results in no increases in flow or water surface elevations along the Elgin system.

Summary

The proposed depressed section drainage system was designed to maintain all main lanes passable under a 100-year, 24-hour storm event. Note, this analysis did not consider inlet capacity. It is expected that some roadway flooding could potentially occur due to the inlet capacity under the 100-year storm event. It is

recommended that a detailed evaluation of the capacity of the inlet structures in the depressed section and the Hamilton Street and St. Emanuel Street Collectors be completed in the design phase of the project to determine the anticipated level of ponding for the100-year storm event.

Major changes to the NHHIP 3B system design from the AECOM report include the following:

- Increase the size of the Hamilton Street Collector to a 12 ft. x 12 ft. trunkline from Winbern Street to Polk Street, which will connect to the proposed 8 ft. x 8 ft. pump outfall on St. Emanual Street via a proposed 12 ft. x 12 ft. RCB crossing under the existing I-69 bridge.
- The Hamilton Street profile has been raised to eliminate overland flow into the proposed depressed section.
- Increase the size of the St. Emanuel Collector/I-45 pump outfall to a 12 ft. x 12 ft. trunkline from the Polk Street connection with the Hamilton Collector to 800 feet south of Canal Street. From 800 feet south of Canal Street to Detention Pond A the pump outfall will change to 2-12 ft. x 6 ft trunkline and be relocated to avoid right-of-way conflicts. The proposed system is restricted by a 42" RCP and higher flow will enter Detention Pond A through 3- 10 ft. x 5 ft. RCB and the system ultimately outfall to Buffalo Bayou via 54" RCP with a backflow preventor.
- Replace St. Emanuel Street Collector with I-45 pump outfall. Connect existing storm sewer systems crossing St. Emanuel to proposed trunkline and plug systems west of St. Emanuel.
- Construct 2-90" RCP siphon under Polk Street to avoid conflict with 60" water line and transmission line with a dewatering pump. This siphon will be temporary and will be replaced with a 12 ft. x 12 ft. RCB in the future, when the utilities are moved prior to NHHIP project 3D.
- Construct 2-90" RCP under the Metro Light Rail at Texas Avenue and lower the outfall trunkline elevation by 5 ft. to meet the 12 ft. desirable clearance requested by Metro with a 4 ft. buffer.
- Replace the end section of the existing 102-inch outfall with three (3) 72-inch RCPs with backflow preventors.
- Connect the existing 102-inch depressed system to the proposed depressed system with a 30-inch RCP, just north of McGowen.
- The existing St. Joseph Siphon will remain in place and will be connected to the Hamilton Street Collector System.
- Replace the proposed two (2) 6 ft. x 4 ft. depressed system outfall from McGowen to the I-45 pump with a single 90-inch RCP.
- Construct only the portion of the proposed Detention Pond A needed for this 3B project and add Detention Pond A2. The proposed Detention Pond A will have an overflow weir to Buffalo Bayou at an elevation of 25 feet, a length of 40 feet, and 5:1 side slopes.
- The I-45 pump station is relocated and the proposed pump configuration includes one (1) 1,652 GPM sump pump, two (2) 8,694 GPM pumps, and eight (8) 17,644 GPM pumps, which includes one spare pump.

A preliminary cost estimate was developed for the proposed drainage features. The cost estimate included the storm drain trunklines and I-45 pump station. The total cost estimate including contingency is $135.2 million.

The proposed roadway improvements will not adversely impact the existing conditions at each outfall within the project limits for storm events up to and including the 100-year storm event.

1 INTRODUCTION

1.1 Overall Study Introduction

This report is an addendum to the report entitled "North Houston Highway Improvement Project (NHHIP) Segment 3B from Alabama Street to Canal Street Drainage Study" dated July 2018 by AECOM. The AECOM report documents the drainage analysis from Alabama Street to Canal Street which has been broken into two separate projects NHHIP 3B from Alabama Street to McGowen Street and NHHIP 3D from McGowen Street to Buffalo Bayou. The purpose of this study is to analyze the drainage features specific to NHHIP 3B project from Alabama Street to McGowen Street and identify any mitigation needs associated with the proposed roadway improvements. Additionally, this study includes the preliminary storm sewer trunkline design of the roadways within NHHIP 3B project.

1.2 Study Purpose

Teague Nall and Perkins, inc. (TNP) was contracted to provide general engineering services to provide engineering and planning support for the NHHIP 3B project, CSJ No. 0027-13-200. This drainage study provides a preliminary assessment of the drainage features, impacts, and required mitigation for the proposed NHHIP 3B project. This report documents the preliminary results of the drainage design and analysis and will be used to assist TxDOT and IDCUS, Inc. in the design phase of the project.

1.3 Project Location

The project limits of NHHIP 3B project consists of reconstruction of the I-69/SH-288 depressed mainlanes from Alabama Street and McGowen Street, Hamilton Street from Winbern Street to Polk Street, Chartres Street from Cleburne Street to McGowen Street, and St Emanual from Webster Street to Commerce Street. The proposed project is located within the Buffalo Bayou and Brays Bayou Watersheds in Harris County, as shown in **Exhibit 1**.

1.4 Project Scope

A detailed scope of work was authorized by TxDOT, and the major tasks include the following:

- Update drainage analyses and preliminary drainage design for NHHIP 3B project with ATLAS 14 rainfall data.
- Analyze proposed roadway drainage systems for the proposed I-69 depressed section and associated frontage road system including Hamilton Street and Chartres Street.

- Analyze proposed I-45 pump station for the proposed project.
- Complete roadway impact mitigation analysis and determine preliminary detention needs for the proposed project.

2 DATA COLLECTION

2.1 Data Sources

All mapping, CAD data, and survey data in this study are referenced to NAD 83, Texas State Plane South Central, US Survey Feet, with a grid-to-surface scaling factor of 1.00013. Vertical elevations are referenced to NAVD 1988 (Unadjusted). The data collected and used for this study includes the following:

- The 2008 Non-Uniform Subsidence Adjustment (NUSA) digital elevation model (DEM) for Harris County, flown in 2008 and vertically adjusted by the Harris County Flood Control District (HCFCD) to the 2001 vertical datum adjustment. This LiDAR dataset was originally produced for Houston-Galveston Area Council (HGAC). The AECOM report states the vertical adjustment from NAVD 1988 (unadjusted), the project datum, to the NAVD 1988, 2001 vertical datum adjustment is approximately -0.06 feet in the project area. For this study, it was assumed that no datum adjustment was needed between the project datum (NAVD 1988) and the NAVD 1988, 2001 adjustment.
- Project topography and project triangular irregular network (TIN) data.
- AECOM Segment 3B survey data from RODS Surveying, Inc., including existing storm sewer flowline elevations in the project vicinity and information on existing roadway features.
- Aerial imagery from Texas Natural Resources Information System.
- Record drawings provided by TxDOT regarding existing roadway and storm sewer information. Surveyed elevation points were compared along the St. Joseph/Calhoun Street siphon to determine a datum adjustment of -9.38 to adjust to the project datum. Relevant record drawings are included in **Appendix C**.
- Preliminary schematic plan for the NHHIP 3B project, included in **Appendix A**.
- AECOM NHHIP Segment 3B drainage report and PCSWMM existing and mitigated models.

3 PROJECT OVERVIEW

The project, NHHIP 3B, is limited to the realignment of I-69 and the proposed depressed section from Alabama Street to McGowen Street, as shown in **Exhibit 1**. The major components of the project include:

- Hamilton Street Stormwater collector system (Hamilton System) from Winbern Street to Polk Street protecting the depressed section form overland flow west of I-69,
- Depressed Section storm drain systems from Alabama Street to McGowen Street,
- Chartres Street storm drain system from Cleburne Street to McGowen Street,
- I-45 Pump station facility & St. Emanuel Collector/I-45 pump outfall, and
- Mitigation facilities.

A detailed discussion of each of the major drainage components is provided in **Sections 4** trough **Section 8**.

3.1 Existing Conditions

The NHHIP 3B project includes the I-69/SH-288 corridor and associated frontage road systems from Alabama Street to McGowen Street. The existing roadway configuration includes:

- Depressed mainlanes between Alabama Street and McGowen Street:
    - I-69 North and south bound travel lanes, total 16 travel lanes
- Frontage Roads between Alabama Street and McGowen Street:
    - Hamilton Street – southbound travel lanes, total 4 travel lanes
    - Chartres Street – northbound travel lanes, total 4 travel lanes

The existing drainage system for this section includes curb and gutter and storm sewers. The I-69 mainlane roadway from Alabama Street to approximately Bell Street is currently depressed, located approximately 17 feet below the natural ground with a minimum roadway elevation at 25.75 feet. The existing depressed section system drains via a 102-inch RCP storm sewer line that begins at Alabama Street and gravity drains north to its outfall at Buffalo Bayou as shown in **Exhibit 2**.

Additionally, there are two inverted siphons, one located at Elgin Street, and one located at St. Joseph Parkway, that run west-east beneath the depressed section. The siphons allow high flows in the COH storm systems from large storms to cross the depressed section in a west to east direction and ultimately drain to

Brays Bayou. In addition, each siphon is connected to the 102-inch RCP that drains the depressed section by a 2 ft. x 1 ft. orifice. The orifices allow part of the COH flow to drain into the 102-inch RCP, which drains to Buffalo Bayou, to prevent the siphons from remaining wet between storm events. Both siphons were updated in the existing model based on the as-built plans which are included in **Appendix C**.

The drainage outfalls and their associated drainage systems for the NHHIP 3B project include the following (refer to **Exhibit 2** for approximate locations):

- Outfall System (Buffalo Bayou)
    - I-69/SH-288 depressed section via 102-inch storm sewer
- Outfall System (Brays Bayou) – St. Joseph Parkway storm sewer (60-inch RCP)
    - Hamilton Street from McIlhenny Street to Clay Street via COH storm sewer systems
    - Chartres Street from Hadley Street to Franklin Street
- Outfall System (Brays Bayou) – Elgin Street Storm Sewer (90-inch RCP)
    - Hamilton Street from Winbern Street to McIlhenny Street
    - Chartres Street from Alabama Street to McIlhenny Street

3.2 Proposed Conditions

The NHHIP 3B project includes the I-69/SH-288 corridor and associated frontage road systems from Alabama Street to McGowen Street. The proposed roadway configuration includes:

- Depressed mainlanes between Alabama Street and McGowen Street:
    - I-69 North bound travel lanes, 6-12' travel lanes with 10' shoulders
    - I-69 South bound travel lanes, 7-12' travel lanes with 10' shoulders
    - SH 288 South bound travel lanes, 4-12' travel lanes with 10' shoulders
    - SH 288 to I-45 North bound direct connector, 1-14' and 2-12' travel lanes with 8' shoulders
- Frontage Roads between Alabama Street and McGowen Street:
    - Hamilton Street – southbound travel lanes, total 3-11' travel lanes
    - Chartres Street – northbound travel lanes, total 3-11' travel lanes

The main drainage components of the NHHIP 3B proposed roadway system for I-69/SH-288 from Alabama Street to McGowen Street include the following:

- Depressed mainlanes between Alabama Street and McGowen Street drained by proposed storm sewer to the I-45 pump station.
- 12 ft. x 12ft. Hamilton Street Collector from Winbern Street to Polk Street to capture overland flow and eliminate 100-year overflow into the proposed depressed section. The Hamilton Street Collector will outfall to the proposed 8 ft. x 8 ft. St. Emanuel Collector/I-45 pump outfall via a 12 ft. x 12ft. RCB crossing under the existing I-69 bridge just west of Polk Street.
- The existing St. Joseph siphon will remain in place and will be connected to the Hamilton Street Collector system.
- St. Emanuel Collector/I-45 pump station 8 ft. x 8 ft. RCB outfall from the I-45 pump station will be constructed to Polk Street; from Polk Street, the storm sewer will be increased to a 12 ft. x 12 ft. RCB to 800 ft south of Canal Street, where the outfall alignment has been relocated and changed to a 2-12 ft. x 6 ft. trunkline to avoid right-of-way conflicts. The proposed system is restricted by a 42" RCP and higher flow will enter Detention Pond A through 3- 10 ft. x 5 ft. RCB and the system ultimately outfall to Buffalo Bayou via 54" RCP with a backflow preventor.
- Construct 2-90" RCP siphon under Polk Street to avoid conflict with 60" water line and transmission line with a dewatering pump. This siphon will be temporary and will be replaced with a 12 ft. x 12 ft. RCB in the future, when the utilities are moved.
- Construct 2-90" RCP under the Metro Light Rail at Texas Avenue and lower the outfall trunkline elevation by 5 ft. to meet the 12 ft. desirable clearance requested by Metro with a 4 ft. buffer.
- Chartres Street proposed storm sewer will outfall to the existing COH Elgin Street system.
- The existing depressed section 102-inch RCP will be connected to the proposed depressed section storm sewer outfall via a 30-inch RCP.
- The existing 102-inch RCP outfall will be replaced with 3-72" RCP with flex valves to eliminate backflow form Buffalo Bayou into the proposed depressed section (See **Exhibit 3**).
- Construct Detention Ponds A and A2.
- Construct I-45 Pump Station.

The NHHIP 3B proposed system layout is shown on **Exhibit 4**.

3.3 Drainage Criteria

TxDOT developed a project specific drainage design criteria for the NHHIP 3B Drainage Study and PS&E design. The following table summarizes design criteria for the drainage design of the NHHIP 3B project. For more information refer to **Appendix B** for the design criteria document provided by TxDOT.

Table 3-1 – Drainage Design Frequencies Criteria

Roadway	Criteria	Additional Design Criteria
Main Lanes (I-69/SH 288) in Depressed Section	100-year Capacity	N/A
Pump Station	100-year	N/A
Collector System (Hamilton Street)	Minimum 10-year Capacity	Sized for no adverse impacts to the 100-year WSE Under Proposed Conditions
Chartres Street	10-year Capacity	Check for no adverse impacts to the 100-year WSE Under Proposed Conditions

Note, the I-69 corridor serves as an evacuation route; therefore, TxDOT requires a 100-yer level of protection for the main lanes.

The following 24-hour rainfall data was used for this drainage design. These values were taken from the National Oceanic Atmospheric Administration (NOAA) volume 11, version 2 Houston WB City, station ID 79-0056. The complete Atlas 14 partial duration precipitation frequency table used for this analysis is included in **Appendix B**.

Table 3-2 – Rainfall Depths for the 24-Hour Storm Event

Frequency	Depth (in.)
10-Year	8.76
100-Year	17.00

The Atlas 14 rainfall shows an increase of 3.8 inches in the 100-year, 24-hour rainfall depth compared to the rainfall depth used in the AECOM report.

4 OVERLAND FLOW ANALYSIS

4.1 Purpose of Analysis

The section of I-69 between Alabama and Bell Street, receives runoff from areas east and west of the I-69 corridor, as shown in **Exhibit 2**. The area west of the I-69 corridor between Alabama and I-45 has overland flow paths that lead towards I-69, while the storm sewer network generally runs from south to the north, where it outfalls into Buffalo Bayou. East of the I-69 corridor, the overland flow paths drain away from I-69.

As the I-69 corridor is proposed to be depressed, it was necessary to quantify the overland flow draining to the existing depressed section and design a collector system to prevent the overland flow from entering the depressed section for proposed conditions. The following discusses the overland flow analysis methods and results.

4.2 Methodology

The overland flow analysis was completed for the 100-year storm event. The hydrologic analysis was completed using HEC-HMS version 3.5. The hydraulic analysis was completed for existing and proposed conditions using EPA SWMM version 5.1.012 computational engine, facilitated by the PCSWMM 2021 user interface. SWMM will be used within this report to reference the storm water modeling system using the PCSWMM interface and the EPA SWMM computational engine. ArcGIS was used to compare the water surface elevation results of the SWMM models to the LiDAR ground surface to create a map of the maximum depths in each grid cell and allow comparisons of existing and proposed water surface elevations (WSEs) throughout the overland flow area.

The AECOM overland flow analysis hydrologic methodology, included in **Appendix B**, was used for this analysis. The rational method peak flows were updated based on TxDOT Atlas 14 BDE coefficients. Hydrographs were developed using HEC-HMS following the Clark Unit Hydrograph method and using the Atlas 14 rainfall data. The Clark UH "R" value for each drainage area was adjusted to match the 100-year peak flow value. The hydrologic calculations and models are included on the USB drive in **Appendix F**.

4.3 Design Criteria

The overland flow collector systems were designed to have a minimum capacity to convey the 10-year storm event and checked for the 100-year storm event to confirm no adverse impacts to the surrounding areas. For

the overland flow analysis, no adverse impact is considered to be no increase in WSEs greater than 0.10 feet between the existing and proposed conditions.

4.4 Existing Conditions

Updates were made to the AECOM Segment 3B existing overland flow PC SWMM model to create the existing conditions model for this analysis. The runoff hydrographs were updated to Atlas 14 rainfall as discussed in **Section 4.2**. The Elgin Street and St. Joseph Street siphons were updated in the model based on as-built plans included in **Appendix C**. Surveyed elevations were compared to as-built elevations, and a datum adjustment of -9.38' was used to adjusted to the project datum. The existing 102-inch outfall flowlines were also adjusted based on this datum adjustment and the as-built plans. The existing depressed section elevation storage relationship was updated in the model based on project TIN data. All other components remained the same.

The Buffalo Bayou and Brays Bayou outfall tailwater conditions were updated in the existing conditions model. The Buffalo Bayou tailwater was taken from the City of Houston North Canal existing conditions HEC-RAS model documented in the report "Hydraulics and Hydrology Impact Analysis Report North Canal High Flow Diversion Channel Preliminary Engineering Report (PER) Study" dated April 19, 2022, by HDR Engineering, Inc. The COH North Canal model is updated to Atlas 14 rainfall data and therefore the best available data of tailwater conditions on Buffalo Bayou. The Brays Bayou FEMA Effective and LOMR stage hydrographs were developed. The 500-year LOMR stage hydrographs were comparable to the FEMA Effective 100-year stage hydrograph. Therefore, the Atlas 14 rainfall with the LOMR improvements are expected to result in water surface elevations along Brays Bayou similar to those in the FEMA Effective 100-year model. The FEMA Effective 100-year stage hydrographs were used as the tailwater conditions on Brays Bayou.

4.5 Existing Conditions 100-Year Storm Event Results

The existing conditions model results were evaluated to determine the general extents of flooding along the study area, identify overland flow paths across the I-69 corridor, and approximate the magnitude of flow entering the existing depressed sections.

In general, the existing SWMM model results show the majority of ponding was limited to the street ROW during the 100-year storm event, as shown in **Exhibit 2**. There were three locations within the project vicinity where more significant ponding, extensive ponding outside the street ROW, was seen, these areas include:

- West Alabama Street and I-69, from Greenbriar Drive to Mandell Street
- Milam Street to I-69, from Alabama Street to McGowen Street, and

- Sauer Street to Velasco Street, from Elgin Street to I-45

The model results were evaluated to determine the overland flow paths across the I-69 project corridor. After identification of the overland flow paths, the model results were processed to approximate the magnitude of runoff crossing the I-69 corridor. **Table 4-1** provides a summary of the major overland flow paths across the I-69 corridor. These locations are also shown on **Exhibit 2**.

Table 4-1 – Major 100-Year Overland Flow Paths Across the I-69 Corridor

Location at I-69	SWMM Link ID	Direction of Flow	Peak Flow (cfs)	Exhibit 2 Sheet Number
Main Street	OL_J3486_to_J3485	NE to SW	257	3
In Between Main St. and Fannin St.	OL_J1280_to_J1210	NE to SW	186	3
Wheeler St.	OL_J1297_to_J1251	NW to SE	85	3
Cleburne St.	OL_J1338_to_J1282	NW to SE	87	3
Almeda Rd.	OL_J1334_to_J1250	NE to SW	299	3
Polk St.	OL_J2920_to_J2884	NW to SE	39	5
Texas St.	OL_J3313_to_J3280	NW to SE	66	6

As shown in Table 4-1 the overland flow across the I-69 corridor ranges from 39 cfs to 299 cfs. These overland flow paths are all outside the limits of the existing depressed section of I-69 and the NHHIP 3B project area. The overland flow paths from Main Street to Almeda Road are in Segment 3A and the overland flow paths from Polk Street to Texas Street are in NHHIP 3D. Note, on the east side of the existing depressed section, along Chartres Street, the model results indicate that overland flow drains away from the depressed section, as shown on **Exhibit 2**.

A separate evaluation of the model results was performed to identify the overland flow access points to the existing I-69 depressed sections, between SH-288 and Bell Street and between Greenbriar Drive and Spur 527. Between SH-288 and Bell Street, the ponding results show that a large section of Midtown drains overland to the current I-69 corridor, as shown on **Exhibit 2**. The midtown area is located south of I-45 and west of I-69. It's western boundary is approximately Spur 527 and Bagby Street and its eastern boundary is the I-69 corridor. The calculated 100-year ponding depths along Hamilton Street range between 1.0 and 2.5 feet and do not overtop the existing concrete barrier (approximately 3-feet high) along the east side of Hamilton Street, adjacent to the I-69 depressed section. In addition, minimal flow enters the depressed section via the overpass bridges as the ponding depths do not exceed the top of curb elevation along most bridge sections. These paths for flow to enter the depressed section are explicitly included in the model.

There are isolated locations along the existing depressed section where overland flow enters the depressed section. **Table 4-2** includes a summary of the depressed section entry elevations at the main access points to the depressed section and the corresponding 100-year WSEs and peak flows. These locations are also shown on **Exhibit 2**.

Table 4-2 – Overland flow Access Points and Peak Flows to the I-69 Corridor

Location	Approximate Depressed Section Entry Elevation (ft.)	Existing 100-Year WSE (ft.)	Existing 100-Year Peak Flow (cfs)
Northbound Exit Ramp at Berry Street	41.70	42.35	46
Alabama Street at Chenevert Street	42.50	43.77	111
Hamilton Street at Holman Street	37.50	39.09	682
Hamilton Street at Elgin Street	43.82	44.11	12
Hamilton Street at Tuam Street	43.36	44.11	68
Hamilton Street at McGowen Street	43.07	44.11	81
Hamilton Street at McIlhenney Street	43.60	44.04	91

The largest area of concern is along Hamilton Street near Holman Street. At this location, there is a large sag in Hamilton Street to accommodate the existing SH-288 direct connectors that cross over Hamilton Street and tie into the local streets, Chenevert Street and Jackson Street. The profile of Hamilton Street drops from an elevation of approximately 43 feet down to an elevation of approximately 37 feet. This section of Hamilton Street is lower than the existing Hamilton Street storm sewer system. Therefore, overland flow reaching Hamilton Street between Elgin Street to just east of Chenevert Street initially ponds in this low area before draining to the existing depressed section via an existing storm sewer system. The existing condition 100-year storm event model results indicate approximately 682 cfs enters the depressed section at this location.

For the existing I-69 depressed section between Greenbriar Drive and Spur 527, the ponding results show that a large section of Montrose drains overland too the I-69 corridor, as shown on **Exhibit 2**. In general, overland flow ponds at the edge of the depressed section, and a small amount enters the depressed section via the existing weir boxes along the west side of the depressed section.

5 STORM DRAIN DESIGN

5.1 General

The AECOM preliminary design of the proposed storm sewer systems within the NHHIP 3B project limits was used as a starting point to develop the proposed storm sewer design for this analysis. Updates were made to the AECOM preliminary sizes due to design criteria, constructability, and changes to the outfall location. This

drainage study includes the preliminary sizing of the proposed drainage systems for the roadways within the NHHIP 3B project; refer to **Exhibit 4** for approximate locations:

- The Collector system along Hamilton Street (I-69 southbound frontage road) from Winbern Street to Polk Street (Outfall – Buffalo Bayou)
- The Main lanes of the proposed depressed section from Alabama Street to McGowen Street, including I-69 northbound and southbound, SH-288 southbound, and SH-288 to I-45 northbound and southbound direct connectors (Outfall – Buffalo Bayou)
- Chartres Street (I-69 northbound frontage road), outfalls to the City of Houston storm sewer system along Elgin Street, and ultimately to Brays Bayou.

The impact analysis for the proposed storm drainage design is discussed in **Section 8**.

5.1.1 Methodology

The preliminary design of the storm sewer systems was completed using a combination of Bentley's Power GEOPAK Drainage V8i, SELECT Series 4 and the overland flow SWMM model. The storm sewer systems were analyzed for the 100-year storm events using the overland SWMM model to confirm the proposed systems had no adverse impact to existing conditions. Discussion on the overland flow analysis and associated methodology for the SWMM model can be found in **Section 4**.

5.2 Collector Systems

Preliminary designs for two overland flow collector systems were developed as part of the NHHIP 3B project, the Hamilton Street Collector and the St. Emanuel Street Collector/I-45 pump outfall. The proposed storm sewer systems along Hamilton Street and St. Emanuel Street were upsized to collect the 100-year overland flow thus eliminating overflow into the proposed depressed section. Preliminary designs for the Hamilton Street Collector from Winbern Street to Polk Street and the St. Emanuel Street Collector/I-45 pump outfall from St. Joseph Street to the Outfall at Buffalo Bayou, were developed as part of this drainage study. Note, there is no overland flow collector system recommended for the section of Chartres Street between Alabama Street and I-45 as the overland flow in this area drains away from the depressed section.

5.2.1 Design Criteria

The Hamilton Street Collector and the St. Emanuel Street Collector were initially sized based on the AECOM Segment 3B design and then checked for the 100-year storm event in the overland SWMM model to confirm

the design had no adverse impact on existing conditions. Where, necessary, the collector system capacities were increased to eliminate adverse impacts that would have been present with the NHHIP 3B project.

5.2.2 Hydrology

The proposed drainage areas from the AECOM report were used for this analysis. The existing drainage area sizes in the transition area were adjusted as needed. The rational method peak flows were updated based on TxDOT Atlas 14 BDE coefficients. Hydrographs were developed using HEC-HMS following the Clark Unit Hydrograph method and using the Atlas 14 rainfall data. The Clark UH "R" value for each drainage area was adjusted to match the 100-year peak flow value. The Clark UH "R" value calculated for the 100-year storm event was utilized for all other frequency storm events. The hydrologic calculations and models are included on the USB drive in **Appendix F**.

5.2.3 Proposed Conditions

Preliminary design of the Hamilton Street Collector was developed from Winbern to Buffalo Bayou as part of the AECOM Segment 3B drainage study. For the NHHIP 3B project, the Hamilton Street Collector will be constructed from Winbern Street to Polk Street and the proposed trunkline size was increased to a 12 ft. x 12 ft. RCB in order to drain the 100-year overland flow at Hamilton and Holman Street and eliminate overland flow into the proposed depressed section for this project. The Hamilton Street Collector was sized to eliminate increases in water surface elevations for the 100-year storm event. The AECOM Segment 3B Hamilton Street Collector from Polk Street to the outfall at Buffalo Bayou will not be built as part of this project; therefore, the proposed Hamilton Street system will temporarily outfall just south of Polk Street under the existing I-69 bridge via a 12 ft. x 12 ft. RCB and connect to the 8 ft. x 8 ft. St. Emanuel Street Collector, which is the I-45 pump station outfall.

The proposed I-45 pump station is re-located to the northwest intersection of St. Emanuel Street and St. Joseph Parkway for the NHHIP 3B project. The St. Emanuel Street Collector runs from the I-45 pump station at St. Joseph Parkway to the outfall at Buffalo Bayou. The proposed St. Emanuel Street Collector/I-45 pump outfall is an 8 ft. x 8ft. RCB from the I-45 pump station to the connection to the Hamilton Street Collector at Polk Street. The proposed St. Emanuel Street Collector/I-45 pump outfall will then increase to a proposed 12 ft. x 12 ft. RCB from Polk Street to 800 feet south of Canal Street. From 800 feet south of Canal Street to Detention Pond A the pump outfall will change to 2-12 ft. x 6 ft. trunckline and be relocated to avoid right-of-way conflicts. At Polk Street 2-90" RCP Siphon will be constructed to avoid an existing 60-inch waterline and an existing transmission line. The Polk Street Siphon is temporary, since both utilities will be relocated in the future,

and the 12 ft. x 12 ft. outfall will be constructed to replace the 2-90" RCP Siphon. At Texas Avenue the 12 ft. x 12 ft. St. Emanuel Collector/ I-45 pump outfall will change to 2-90" RCP and the flowline will be lowered by 5 ft under the existing Metro Light Rail to meet the 12 ft. desirable clearance with a 4 ft. buffer.

The existing 6 ft. x 3.5 ft. inverted siphon at Elgin Street will be removed. The existing St. Joseph siphon will remain and be connected to the Hamilton Collector System. The St. Joseph siphon will be removed as part of the future Segment 3D project. The proposed storm sewer system is shown on **Exhibit 4**.

5.3 Depressed Section Storm Sewers

The preliminary storm sewer design for the proposed depressed section from Alabama Street to McGowen Street was completed as part of this drainage study. This included the preliminary sizing and layout of storm sewers for each roadway system within the proposed depressed section, including I-69 northbound and southbound mainlanes, SH-288 southbound direct connector, and SH-288 northbound to I-45 direct connectors.

5.3.1 Design Criteria

The depressed storm sewer systems were designed for a 100-year storm event. Note, this analysis did not consider inlet capacity. The inlet capacity and ponding widths should be checked and verified during the design phase.

5.3.2 Hydrology

The proposed drainage areas south of McGowen were updated based on the NHHIP 3B proposed profile. North of McGowen, the existing drainage areas and systems will remain in place for this project. Proposed drainage areas were delineated for each roadway system and subarea breaks were generally set every 300 feet. All drainage areas remained under 200 acres; therefore, the Rational Method was used to develop peak flows in GEOPAK Drainage.

HEC-HMS version 3.5 was utilized to transform the Rational Method peak flows into hydrographs to use as input into the SWMM model. The Clark Unit Hydrograph method was utilized to create hydrographs for each drainage area. For each drainage area, a subbasin was created and assigned the appropriate area, time of concentration (tc), percent impervious cover, and Green & Ampt loss parameters. All drainage areas within the depressed section were assumed to be 100% impervious. The Clark storage coefficient (R) was then adjusted in an iterative process until the peak flow from each HEC-HMS subbasin was approximately equal to

the peak flow developed using the Rational Method. The HEC_HMS model for proposed conditions is included on the USB in **Appendix F.**

The Green and Ampt Loss method parameters, including initial loss, moisture deficit, suction, and conductivity, remained unchanged from the HCFCD M3 effective HEC-HMS model for Buffalo Bayou. These parameters are summarized in Table 5-1.

Table 5-1 – Green & Ampt Loss Parameters for all Drainage Areas

Parameter	Canopy Initial Storage (%)	Canopy Max Storage (in)	Initial Loss (in)	Moisture Deficit	Suction (in)	Conductivity (in/hr)
Value Used	0.00	0.93	0.03	0.46	10.03	0.37

5.3.3 Proposed Conditions

The proposed depressed section storm sewer network extends from Alabama Street to McGowen Street and drains to the I-45 pump station located just north of the I-69 & I-45 interchange. The pump station outfalls along St. Emanuel Street to Buffalo Bayou via an 8 ft. x 8 ft. RCB to Polk Street and then continues as a 12 ft. x 12 ft. RCB from Polk Street to Buffalo Bayou after it combines with the Hamilton Street collector. The I-45 pump outfall along St. Emanuel will replace the St. Emanuel collector system, and the proposed inlets along St. Emanuel will drain to this system. The existing storm sewer systems approaching St. Emanuel from the east will be connected to the outfall trunkline. The remaining system west of St. Emanuel draining west to the Chartres Street trunkline will be plugged and remain in place for this project. Additional information on the I-45 pump station design is included in **Section 7.0**. The proposed depressed section storm sewer network is made up of four main storm sewers, servicing the following main lanes; see **Exhibit 4** for locations:

- I-69 northbound
- I-69 southbound
- SH-288 southbound direct connector
- SH-288 northbound to I-45 direct connectors

The proposed storm sewer systems are connected via a 90-inch lateral located just north of McGowen Street that drains to the I-45 pump station. The proposed systems range in size from 24-inch RCP to 5 ft. x 4 ft. RCB,

below is the size range for each system and the layout is shown on **Exhibit 4** and the proposed storm sewer profiles are shown on **Exhibit 5**:

- I-69 Northbound – 30-inch RCP to 5 ft. x 4 ft. RCB
- I-69 Southbound – 36-inch RCP to 5 ft. x 4 ft. RCB
- I-45 Northbound to I-69 Northbound Connector – 24-inch RCP to 42-inch RCP
- SH-288 Southbound to I-45 Southbound Connector – 30-inch RCP to 48-inch RCP

The AECOM study proposed Two (2) 4 ft. x 3 ft. RCB located at the sag along Hamilton Street near Holman Street that allowed overland flow to drain into the I-69 southbound depressed storm sewer system will no longer be built. The Hamilton Street profile was raised to allow the overland flow to drain into the Hamilton Street collector, and barrier walls will be used to eliminate overflow into the proposed depressed section for the 100-year storm event.

Just north of McGowen Street, the proposed depressed section will transition to tie into the existing depressed section roadway. Since the proposed depressed section is lower than the existing depressed section, a 30-inch lateral is proposed to connect the existing 102-inch RCP to the proposed 90-inch RCP that drains to the I-45 pump stations. This 30-inch RCP lateral will prevent flows in the 102-inch RCP from surcharging and sheet-flowing from the existing depressed roadway into the proposed depressed roadway. Additionally, under existing conditions, flow from Buffalo Bayou backflows into the 102-inch RCP for lower frequency storm events and floods the existing depressed section. To meet the 100-year design criteria for the proposed depressed section, the existing 102-inch RCP will be replaced with three (3) 72-inch RCP with flex valves at the outfall to prevent flooding due to backflow from Buffalo Bayou. See **Exhibit 3** for the 102-inch outfall detail to Buffalo Bayou.

5.4 Chartres Street Storm Sewer

A storm sewer level preliminary drainage design was completed for the I-69 northbound frontage road, Chartres Street, from Cleburne Street to Webster Street. The Chartres Street Storm Sewer was designed for the ultimate NHHIP 3D project. The proposed storm sewer from Cleburne Street to just north of McGowen will be built as part to the NHHIP 3B project.

5.4.1 Existing Conditions

Under existing conditions, Chartres Street from Alabama Street to McIlhenny Street is drained by storm sewers to the Elgin Street storm sewer system which outfalls to Brays Bayou. Existing storm sewer and overland flow from north of I-69 are conveyed to the Elgin Street storm sewer via a 6 ft. x 3.5 ft. siphon under the existing I-69 corridor. The Elgin siphon also connects to the existing depressed section 102-inch RCP outfall. The as-built plans for the Elgin Street siphon are included in **Appendix C**.

5.4.2 Design Criteria

The Chartres Street drainage system was preliminarily designed to convey, at a minimum, the 10-year storm event. The storm sewer was checked for the 100-year storm event in the overland SWMM model to confirm the design had no adverse impact on existing conditions.

5.4.3 Hydrology

The proposed drainage areas for the Chartres Street storm sewer were updated based on the crest and sag information from the preliminary schematic roadway profile. The rational method peak flows were calculated based on TxDOT Atlas 14 BDE coefficients. Hydrographs were developed using HEC-HMS following the Clark Unit Hydrograph method and using the Atlas 14 rainfall data for the overland flow analysis. The Clark UH "R" value for each drainage area was adjusted to match the 100-year peak flow value. The hydrologic calculations and models are included on the USB drive in **Appendix F**.

5.4.4 Proposed Conditions

Under proposed conditions the Chartres Street storm sewer is proposed to drain everything north of Cleburne Street and South of Webster. For the NHHIP 3B project the Chartres Street proposed storm sewer will be built from Cleburne Street to just north of McGowen and includes the following; refer to **Exhibit 4** for locations:

- SH-288 Southbound Main Lanes from Cleburne Street to Alabama Street – Proposed storm sewer drains north to Alabama Street and east on Alabama Street to connect to the Chartres Street system that drains north to Elgin Street. The proposed storm sewer ranges in size from 24-inch to 42-inch RCP.
- Cleburne Street to Elgin Street – Proposed storm sewer drains north to Elgin Street and outfalls to the Elgin Street storm sewer system. The proposed storm sewer system ranges in size from 36-inch RCP to 6 ft. x 5 ft. RCB.
- North of McGowen Street to Elgin Street – Proposed storm sewer drains south to Elgin Street and outfalls to the Elgin Street storm sewer system. The proposed storm sewer ranges in size from 48-inch RCP to 7 ft. x 5 ft. RCB.

The existing 42-inch RCP, draining the I-69 and SH-288 interchange, west of Chartres Street will be removed under proposed conditions. The existing 6 ft. x 3.5 ft. inverted siphon at Elgin Street will be removed and the existing COH system west of I-69 will be connected to the Hamilton Collector System.

6 CROSS STORM DRAIN DESIGN

This section identifies the potential changes to the existing storm sewer systems in the vicinity of the proposed depressed section to accommodate the proposed roadway modifications. The following storm sewer systems cross the I-69 corridor under existing conditions. To accommodate the proposed depressed section, the changes shown below in **Table 6-1** will be constructed as part of this project.

Table 6-1 – Existing Storm Sewer Changes Due to Proposed Depressed Section

Location	Existing Size	Proposed Change
SH 288 & I-69 Interchange Crossing near Alabama Street	24-inch	Redirected to NHHIP 3B I-45 Pump Station
Elgin Inverted Siphon	6 ft. x 3.5 ft.	Removed existing Siphon & Connect COH System to Hamilton Collector
Bell Street to Chartres Street	36-inch	Redirected to Hamilton Collector and plug/remove existing line

Table 6-2 identifies the existing storm sewer sewers that need to be removed to accommodate the proposed depressed section and ROW expansion.

Table 6-2 – Existing Storm Sewer Removed Under Proposed Conditions

Location	Existing Size
Existing Depressed Section from Alabama St. to McGowen St.	102-inch

Table 6-3 identifies the existing storm sewer that will be replaced under proposed conditions by the proposed Chartres Street storm sewer and the Hamilton Street Collector.

Table 6-3 – Existing Storm Sewer Replaced Under Proposed Conditions

Location	Existing Size	Replaced By
Northbound frontage road from Alabama St. to Elgin St.	36-inch to 60-inch	Chartres St. System
Hamilton St. from Winbern St. to Elgin St.	48-inch	Hamilton Collector
Chartres St. from Mcilhenny St. to Elgin St.	18-inch to 48-inch	Chartres St. System
Hamilton St. from McGowen St. to Elgin St.	44-inch	Hamilton Collector
Hamilton St. from south of Hadley to St. Joseph Parkway	18-inch to 30-inch	Hamilton Collector
Hamilton St. from just north of Jefferson to St. Joseph Parkway	18-inch	Hamilton Collector
Hamilton St. from just south of Leeland St. to Bell St.	24-inch	Hamilton Collector
St. Emanuel St. from Rusk St. to Capitol St.	30-inch	St. Emanuel I-45 Pump Outfall
St. Emanuel St. from Preston St. to Franklin St.	24-inch	St. Emanuel I-45 Pump Outfall

These changes to the existing storm sewer were incorporated in the mitigated condition overland flow SWMM model. The SWMM model results show the proposed changes result in no adverse impacts to existing conditions for storm events up to and including the 500-year storm event.

7 PUMP STATION

The NHHIP 3B proposed depressed section is serviced by the proposed I-45 pump station facility. The proposed pump station facility is re-located northeast of the I-69 and I-45 interchange in the northwest corner of the St Emanuel Street and St. Joseph Parkway intersection. The pump station discharges to a proposed gravity system that runs along St. Emanuel Street and ultimately outfalls to Buffalo Bayou. The pump station was analyzed using the overland flow SWMM model.

7.1 Summary of Capacity Requirements

The I-45 pump station provides flood control for the proposed depressed section from Alabama Street to McGowen Street. This section of the report provides detailed design and analysis of the proposed pump station. The pump station was designed to handle the Atlas 14 100-year 24-hour storm event. The peak flow to the I-45 pump station for the NHHIP 3B project is 319 cfs, obtained from the mitigated 100-year SWMM overland flow model.

7.2 Design Criteria

TxDOT has provided the following design constraints to the storm water pump stations to assure design and equipment selection is consistent with other TxDOT pump stations.

- Even number of installed units;
- Redundancy, one spare installed;
- Submersible column pumps;
- Individual pump capacity not to exceed 20,000 gallons per minute;
- 480V AC/3 phase primary electrical service;
- Two natural gas-powered emergency generators, as backup power supply, sized to provide electrical power for full pump station capacity;

7.3 Pump Station Configuration

The proposed depressed section storm sewer outfalls to the I-45 pump station via the 90-inch RCP. The proposed 90-inch RCP outfall to a proposed junction box near St. Joseph Parkway. The future Seg 3D project will outfall a proposed 12 ft. x 8 ft. RCB to the proposed junction box. A proposed 12 ft. x 10 ft. RCB will drain the Seg 3B and future Seg 3D flows into the proposed pump station at a flowline elevation of -12.50 feet. The proposed pump station wet well has a minimum elevation of -20 feet and top elevation at the natural ground elevation which is approximately 44 feet. The proposed pumps will discharge into a head box that will gravity flow by an 8 ft. x 8 ft. RCB to Polk Street where it joins with the Hamilton Collector and outfalls to Buffalo Bayou via a 12 ft. x 12 ft. RCB. The proposed flowline elevation of the pump discharge headbox is 29.79 feet.

The proposed pump configuration was designed using the overland flow SWMM model. For the I-45 pump station 2 – 8,694 gallons per minute (GPM) and 8 - 17,644 GPM pumps are needed with 7 of the 17,644 GPM pumps operating for the required peak flow and one standby unit in case of a pump failure. A 1,652 GPM sump pump is needed to drain the low flows entering the pump station. The pump curves provided by IDC as part of the PS&E design were used for this analysis and are included in **Appendix D**. **Table 7-1** below shows the pump design including start and stop elevations for the I-45 pump station.

Table 7-1 – I-45 Pump Design

Pump No.	Pump Rate (GPM)	Start Elevation (ft)	Stop Elevation (ft)
Sump	1,652	-12.50	-20.00
1	8,694	-8.00	-12.50
2	8,694	-7.00	-11.50
3	17,644	-4.00	-11.00
4	17,644	-3.00	-10.50
5-6	17,644	-2.00	-10.00
7-8	17,644	0.00	-9.00
9	17,644	1.00	-8.50
10	17,644	4.00	-8.00

The pump configuration has been checked using the pump curve data from the pumps selected during design. The NHHIP 3D ultimate pump design will need to be updated based on the Atlas 14 rainfall data and the elimination of the Hamilton overflow to the depressed section to determine additional pump capacity needed for the future project. No other changes were made to the pump station design due to this analysis.

8 MITIGATION ANALYSIS

A mitigation analysis was performed for the NHHIP 3B project to determine detention needs due to the increase in runoff associated with the proposed roadway and drainage improvements (system hydraulics) for the following roadways:

- The depressed section of I-69/SH-288/I-45 corridor from Alabama Street to McGowen Street, including the Hamilton Street Collector System and the St. Emanuel Street Collector System (Outfall – Buffalo Bayou).
- Chartres Street between Cleburne Street and McIlhenny Street (Outfall – COH storm sewer system along Elgin Street)

The analysis also evaluated the mitigation needs associated with loss of floodplain storage from Buffalo Bayou due to the proposed project. The overland flow SWMM model was used to evaluate the detention and floodplain mitigation needs for the project. See **Section 4** of this report for more detailed information on the overland flow analysis and methodology.

8.1 Depressed Section/Buffalo Bayou Mitigation

The depressed section outfall to Buffalo Bayou includes all the drainage from the depressed section as served by the I-45 pump station, plus the Hamilton Street and St. Emanuel Street Collector systems and the existing 102-inch outfall. The depressed section mitigation needs were separated into floodplain storage mitigation

and detention storage mitigation associated with the increase in impervious and improved drainage systems under proposed conditions.

8.1.1 Floodplain Storage Mitigation

The existing I-69 corridor between Alabama Street and Canal Street drains to Buffalo Bayou via the existing 102-inch storm sewer. The existing 102-inch storm sewer has no flap gate or backflow preventer at its outfall to Buffalo Bayou. Based on the City of Houston North Canal existing conditions HEC-RAS model, the 100-year water surface elevation in Buffalo Bayou is 27.50 feet, and the minimum roadway elevation in the existing depressed section is approximately 24.00 feet, which is approximately 4 feet lower than the Buffalo Bayou 100-year water surface elevation. Therefore, flow from Buffalo Bayou can drain into the existing depressed section under certain high flow events. The overland flow SWMM model was used to estimate the volume of flow stored in the existing depressed section under a 100-year storm event. **Figure 8-1** shows the 100-year flow hydrograph taken from the existing overland flow SWMM model at the 102-inch outfall to Buffalo Bayou. Negative flow on the hydrograph represents flow draining away from Buffalo Bayou into the existing depressed Section. As shown in Figure 8-1, the 100-year outflow into Buffalo Bayou is reduced during the peak stage in Buffalo Bayou, however no backflow from Buffalo Bayou occurs during the 100-year storm event. Therefore, the 100-year flooding that occurs in the existing depressed section between Alabama Street and Bell Street is due to the local overland flows and is not considered floodplain storage. The overland flow SWMM model shows the 100-year water surface elevation in the existing depressed section at 32.21 feet. The 100-year storage provided within the existing depressed section was estimated to be 226.5 ac-ft.

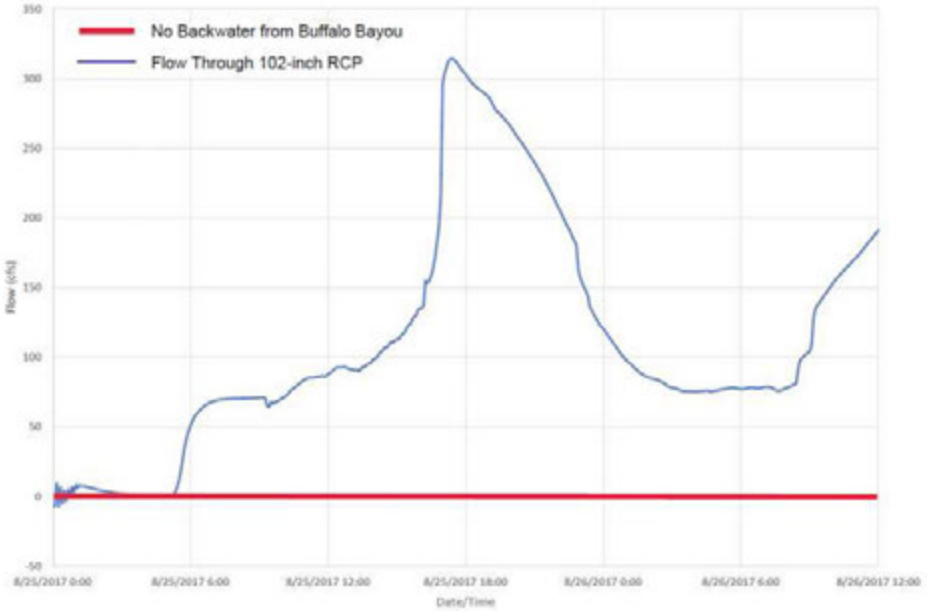


Figure 8-1 - Existing 100-Year Flow Through 102-inch RCP

Under proposed conditions, the 102-inch RCP outfall will be replaced with three (3) 72-inch RCP with backflow preventors, as shown in **Exhibit 3**, and the proposed depressed section will drain to Buffalo Bayou via the I-45 pump station and the St. Emanuel Outfall. The proposed drainage system will isolate the existing and proposed depressed sections from Buffalo Bayou. Therefore, the existing storage volume within the depressed section will not be available to mitigate the local flows into Buffalo Bayou. The 226.5 ac-ft of local storage volume that is lost will be accounted for in the proposed system hydraulics mitigation analysis in section 8.1.2.

The proposed Detention Pond A is located within the existing Buffalo Bayou floodplain. The proposed drainage design criteria requires a minimum of 1 foot of freeboard above the 100-year storm event for detention pond design. Based on the overland SWMM analysis the proposed 100-year water surface elevation in Detention Pond A is 29.58 feet; therefore, the top of berm elevation for Detention Pond A is 31 feet. Based on the proposed Detention Pond A layout and existing contours the top of pond berm will require approximately 20 ac-ft of floodplain storage mitigation.

8.1.2 System Hydraulics Mitigation

Due to the improved conveyance provided by the proposed depressed section storm sewer system and collector system along Hamilton Street, as presented in Section 5, and the increase in impervious cover due to the proposed roadway features within the depressed section, mitigation storage is required to ensure the proposed peak flows into Buffalo Bayou are less than or equal to existing. Approximately 212 ac-ft of storage is needed to mitigate the proposed drainage systems that outfall to Buffalo Bayou. This is less than the 226.5 ac-ft of storage being lost in the existing depressed section because the SWMM model is accounting for approximately 47 ac-ft of storage that is provided within the proposed storm sewer collector systems and the I-45 pump station wet well.

The proposed peak flow from the depressed section system will be mitigated through Detention Pond A, located adjacent to Buffalo Bayou. Approximately 212 ac-ft of storage is required in the basin during the time of the local peak to ensure the proposed peak flows into Buffalo Bayou are less than or equal to existing peak flows. **Figure 8-2** shows a comparison of the existing and proposed conditions 100-year flows discharging to Buffalo Bayou. The existing condition flow is the combined flow from the Austin Street storm sewers and the 102-inch RCP draining the existing depressed section. The proposed flow is the combined flow from the Austin Street storm sewers, the 102-inch RCP, and the I-45 pump station 12 ft. x12 ft. outfall.

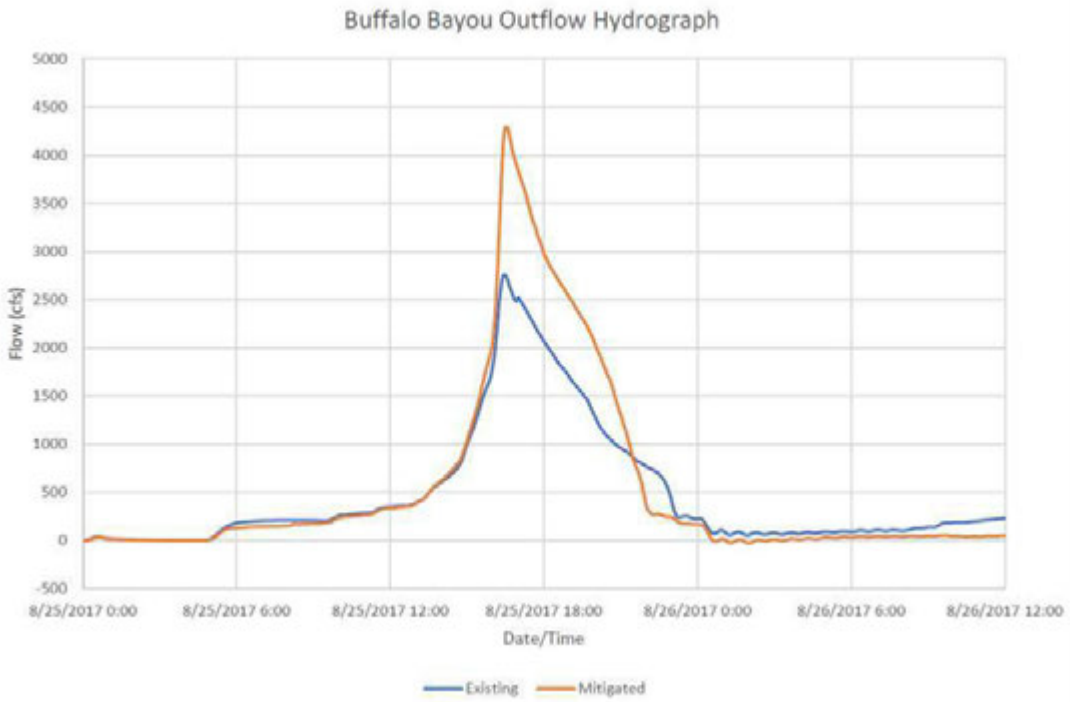


Figure 8-2 - 100-Year Flow Existing vs. Proposed Comparison at Buffalo Bayou Outfall

8.1.3 Depressed Section/Buffalo Bayou Mitigation Summary

Table 8-1 summarizes the mitigation needs for the depressed section for the NHHIP 3B project.

Table 8-1 – Depressed Section Mitigation Summary

Required Mitigation	Volume ac-ft
Mitigation Volume Needed for Floodplain Storage	20
Mitigation Volume Needed for System Hydarulics	212
Total Mitigation Required	**232**

The 212 ac-ft of storage needed to mitigate the roadway and drainage improvements along with the 20 ac-ft of floodplain storage will be provided in proposed Detention Pond A. Detention Pond A is a 12.79-acre site located east of I-69 and south of Buffalo Bayou. The proposed pond has a flowline elevation at 4 feet with a toe of slope elevation at 5 feet and a top of bank elevation at 31 feet with 4:1 side slopes. The 2-12 ft. x 6 ft. St. Emanuel Collector/I-45 pump outfall is restricted with a 42-inch RCP. The 42-inch RCP restrictor combines with the 36" RCP pond outflow pipe and then outfalls via a 54-inch RCP with a backflow preventer allowing flow to drain directly to Buffalo Bayou when tailwater conditions allow. Higher flows will enter the pond through Three (3) – 10 ft. x 5 ft. RCB inflow structure with an upstream flowline elevation of 10.00 feet and a downstream flowline elevation of 9.50 feet. The proposed pond has a 36-inch outflow pipe and a

trapezoidal shaped overflow weir set at an elevation of 25 feet with a length of 40 feet and 5:1 side slopes. The total storage volume provided below the 100-year water surface elevation in Detention Pond A is 235 ac-ft. The proposed St. Emanuel Collector/I-45 pump outfall and Hamilton Street Collector systems provide an additional 46 ac-ft of floodplain storage. Therefore, a total of 281 ac-ft of storage volume is provided for proposed conditions. The proposed Detention Pond A layout is shown on **Exhibit 6** and the proposed 54-inch outfall to Buffalo Bayou is shown in **Exhibit 3**.

Table 8-2 – Depressed Section Flow & Mitigation Summary

100-Year Flow (cfs)				Required Mitigation Volume (ac-ft)	Provided Mitigation Volume (ac-ft)
Existing	Proposed	Mitigated	Impact/Benefit (+/-)		
2,766	4,297	2,762	-4	232	281

As shown in **Table 8-2,** the proposed project with mitigation results in a decrease in flow of 4 cfs at Buffalo Bayou for the 100-year storm event. Based on the above results, it was determined the proposed depressed section and Hamilton Street collector storm sewer systems do not adversely impact existing conditions for the 100-year storm event. **Figure 8-3** shows a comparison of the existing and mitigated conditions 100-year flows discharging to Buffalo Bayou.

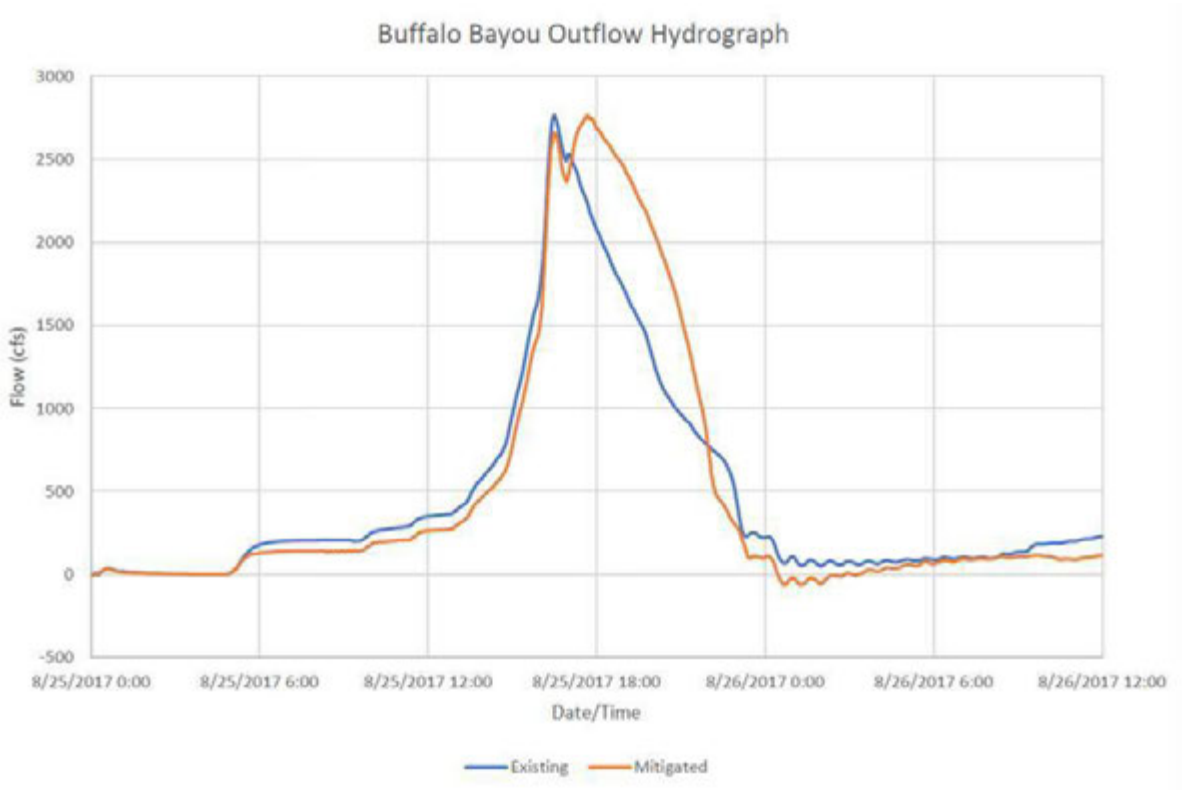


Figure 8-3 - 100-Year Flow Existing vs. Mitigated Comparison at Buffalo Bayou Outfall

Detention Pond A2 is a 0.95-acre site located within the existing TxDOT right-of-way north of Hamilton Street between Holman Street and Chenevert Street. The proposed pond has a flowline elevation at 35 feet with a toe of slope elevation at 37 feet and a top of bank elevation at 43 feet with 4:1 side slopes. The existing local roadways currently flood in this area resulting in overland flow entering the existing depressed section. For proposed conditions, the overland flow will enter the Hamilton Street collector and backflow into Detention Pond A2 via a 24-inch inflow/outflow pipe. The 100-year water surface elevation in the pond area exceeds the natural ground elevation, thus exceeding the Detention Pond A2 top of bank elevation of 43 feet. The Detention Pond A2 area of 0.95 acres was used to model the detention volume above elevation 43 feet. Detention Pond A2 provides an additional 5.16 ac-ft of mitigation volume at the 100-year water surface elevation of 44.08 feet. The proposed Detention Pond A2 layout is shown on **Exhibit 6.**

8.2 Chartres Street Mitigation

The study limits for the mitigation analysis along Chartres Street from Cleburne Street to McIlhenny Street, as shown on **Exhibit 4**. West of I-69, runoff will be redirected in the Hamilton Street system, which outfalls to the pump station outfall to Buffalo Bayou. The existing 6 ft. x 3.5 ft. siphon at Elgin will be removed eliminating the outflow to the Chartres System for west of I-69.

8.2.1 Existing Conditions

The existing storm sewer system was updated near the SH 288 and I-69 interchange to include the I-69 crossing south of Alabama. The existing storm sewers west of I-69 combine and drain under I-69 in the existing 6 ft. x 3.5 ft. siphon along Elgin Street. The existing Chartres Street storm sewers outfall into a 90-inch RCP that continues east along Elgin Street and ultimately outfalls into Brays Bayou.

8.2.2 Proposed Conditions

The proposed Chartres Street storm sewer system redirects the flow west of I-69 into the Hamilton Street collector system resulting in a large reduction in drainage area and peak flows at the outfall at Elgin Street. For the NHHIP 3B project, the Hamilton Street Collector System will only be built to Polk Street and will temporarily outfall into the proposed St. Emanuel pump outfall to Buffalo Bayou. The Hamilton Street Collector was increased to a 12 ft. x 12 ft. RCB, and the Hamilton roadway profile was adjusted near Holman to eliminate the overflow into the depressed section for up to the 100-year storm event. The proposed NHHIP 3B Chartres system drains everything north of Cleburne Street and South of Webster.

8.2.3 Chartres Street Mitigation Summary

Table 8-2 summarizes the 100-year peak flows from the Chartres System at the Elgin Street outfall. This project was designed to reduce the proposed flows below existing conditions; therefore, no mitigation is proposed for the Chartres Street System. The limits of the Chartres Street system are located outside the Brays Bayou floodplain; therefore, no floodplain mitigation is needed for this system.

Table 8-3 – Chartres Street Peak Flow & Mitigation Summary

100-Year Flow (cfs)			Required Mitigation Volume (ac-ft)
Existing	Proposed	Impact/Benefit (+/-)	
173	127	-46	0

As shown in **Table 8-3**, the proposed project results in a decrease in flow of 46 cfs at the Elgin outfall for the Chartres System for the 100-year storm event. Therefore, the proposed project results in no adverse impact to the Elgin system for storm events up to and including the 100-year storm event, and no mitigation is needed

8.3 Overland Flow Impact Analysis

The intent of the overland flow impact analysis was to evaluate the impact, if any, the proposed project would have on existing overland flow conditions in the 100-year storm event and to determine revisions to the project that mitigate those impacts. A comparison of the existing and proposed maximum ponding depths was made to determine the impact of the proposed drainage systems.

The results show that within the project vicinity there is minimal change in ponding depths under proposed conditions for the 100-year storm even. The change in ponding depth for the 100-year proposed conditions is generally a decrease of 0.05 ft. The following areas are shown to have the largest benefits:

- Hamilton Street from Elgin Street to Bell Street. Benefits range from 0.02 – 1.48 ft. for the 100-year storm event.
- Chartres Street system. Benefits range from 0.02 – 0.34 ft. for the 100-year storm event.

There are minor increases in water surface elevations along Hamilton Street from Winbern Street to Stuart Street. For existing conditions, overland flow enters the depressed section in this area. For proposed condition, the profile has been raised and overflow is no longer allowed to enter the depressed section and is redirected to the Hamilton Street System. Additional inlets may be required in this area to allow overland flow to enter the proposed systems to limit ponding depths. The increase in this area is due to the profile adjustment and increases in water surface elevations are below 0.10 feet outside the TxDOT ROW. For the purpose of this

study, no adverse impact is considered to be no increase in water surface elevations greater than 0.10 feet between existing and proposed conditions. Therefore, the proposed project results in no adverse impacts for the 100-year storm event outside of the TxDOT ROW. The proposed 100-year storm event ponding is shown on **Exhibit 7** and the change in ponding depths between the existing and proposed conditions is shown on **Exhibit 8**.

9 PRELIMINARY DRAINAGE COST ESTIMATE & CONSTRUCTION PHASING

A preliminary cost estimate for the primary drainage features was completed for the proposed NHHIP 3B project. This includes the storm drain trunklines and the I-45 pump station. The quantities for each component were based on the preliminary drainage design shown in **Exhibit 4**. Unit cost values were referenced from TxDOT's bid item averages website in August 2023. **Table 9-1** provides a summary of the cost estimate.

Table 9-1 – Drainage Cost Estimate Summary

Drainage Component	Estimated Cost
Hamilton Collector System	$35,328,547
Chartres System	$4,348,661
Depressed Section System	$12,200,331
I-45 Pump Station & St. Emanuel Outfall	$50,629,670
Detention Ponds	$32,728,543
Total	**$135,235,752**

The above cost estimate includes a 20% contingency and a 10% mobilization. A detailed breakdown of the cost estimate is provided in **Appendix E**.

The following constraints should be taken into consideration when developing the construction phasing and schedules:

- Excavation for storm drains will be deep and wide at many locations. Contractor or TxDOT should perform soil borings to accurately determine geotechnical risks.
- Trench protection for all storm drains must accommodate geotechnical conditions and will require careful study.
- Storm drains under depressed roadways cannot be installed until right of way is acquired and general roadway excavation is completed. This will delay the stormwater work.
- The depressed section storm drain system cannot be used until the I-45 pump station and outfall are complete.

10 RECOMMENDATIONS & DESIGN CONSIDERATIONS

10.1 Overland Flow Hamilton Street Collector System

The existing roadway profile for the section of Hamilton Street that acts as an underpass to the SH-288 direct connector to downtown is lower than the proposed 100-year HGL along the Hamilton Street Collector System. Therefore, the proposed roadway profile was adjusted to eliminate overland flow into the depressed section for storm events up the 100-year storm. For proposed conditions this area was designed to drain to the Hamilton Street System as shown in **Exhibit 4**.

10.2 Potential Overland Flow Access Points to Depressed Section

To prevent overland flow from entering the proposed depressed section, it is recommended that the proposed roadway profile at the following locations shown in **Table 10-1** be raised above the 100-year water surface elevation or to an elevation to prevent overland flow from entering the depressed section with the use of barrier walls. This information is presented on **Exhibit 4**.

Table 10-1 – Potential Sheet flow Access Points

Location	Storage Node ID	100-Year WSEL (ft.)
Hamilton Street at Winbern Street	J1452	44.06
Hamilton Street at Chenevert Street	J1489	44.07
Hamilton Street at Holman Street	J1544	44.07
Hamilton Street at Stuart Street	J1643	44.08
Hamilton Street at Elgin Street	J1709	44.09
Hamilton Street at McGowen Street	J2062	44.08
Hamilton Street at McIlhenny SB Exit Ramp	J2146	43.94
Elgin Street at NB Exit Ramp	C-13	42.14
McGowen Street at NB Enterance Ramp	C-20	41.84

The profile grade lines (PGLs) of the frontage roads and collector streets need to be designed to eliminate the overland flow from entering the depressed section system at these locations. See **Figure 10-1** for the roadway locations that need to be checked during the design phase to ensure no overland flow can enter the depressed section for the 100-year storm event.

Figure 10-1 – Overland Flow Locations

10.3 Depressed Section

The lowest section of the depressed section storm sewer occurs at the discharge pipe into the I-45 pump station, at an elevation of -12.50 feet. The ground water could potentially be an issue during construction, and appropriate measures should be taken to minimize potential groundwater issues throughout the life of the storm sewer systems.

10.4 Detention Basin and Outfall Pipes to Buffalo Bayou

To mitigate the increase in impervious cover due to the proposed roadways and increased conveyance capacity of the proposed storm sewer systems, Detention Pond A near Buffalo Bayou and Detention Pond A2 near Hamilton and Holman Streets will be utilized for storage purposes to reduce the proposed peak flows into Buffalo Bayou below existing conditions peak flows. The existing 102-inch RCP outfall to Buffalo Bayou will be replaced with three (3) 72-inch RCP with backflow preventors. The St. Emanuel Collector/I-45 pump outfall will be restricted with a 42-inch RCP and outfall into Buffalo Bayou via a 54-inch RCP with a backflow preventor. The proposed detention pond layouts are shown in **Exhibit 6** and the proposed Buffalo Bayou outfall details are shown in **Exhibit 3**.

11 CONCLUSION

The drainage analysis and preliminary drainage design completed as part of this study includes analysis and design of the following major drainage components:

- Hamilton Street Collector System protecting the depressed section from overland flow west of I-69,
- Storm drain systems,

- I-45 Pump station facility and St. Emanuel Collector/I-45 pump outfall, and
- Pond A and A2 Mitigation facilities.

11.1 Overland Flow/Stormwater Collector System

An overland flow analysis was completed for the purpose of determining a recommended solution for isolating the depressed section from overland flow. The recommended solution includes the Hamilton Street Collector along the west side of the depressed section that will capture overland flow and prevent it from entering the depressed section. The proposed collector systems for the NHHIP 3B project includes:

- Hamilton Street Collector (12 ft. x 12 ft. RCB) from Alabama Street to Polk Street
- St. Emanuel Street Collector/I-45 Pump Outfall from St. Josephs Parkway to Buffalo Bayou

The Hamilton Street Collector will be constructed from Alabama Street to Polk Street for this project. The Hamilton Street Collector will temporarily outfall via 12 ft. x 12 ft. RCB into the St. Emanuel Collector/I-45 pump outfall by crossing under the existing I-69 bridge just south of Polk Street, at the end of the existing depressed section.

The proposed St. Emanuel Street Collector is the I-45 Pump Station Outfall. The proposed St. Emanuel Collector/I-45 pump outfall is an 8 ft. x 8ft. RCB from the I-45 pump station to the connection to the Hamilton Street Collector at Polk Street. The proposed St. Emanuel Collector/I-45 pump outfall will then increase to a proposed 12 ft. x 12 ft. RCB from Polk Street to 800 feet south of Canal Street. From 800 feet south of Canal Street to Detention Pond A the pump outfall will change to 2-12 ft. x 6 ft. trunckline and be relocated to avoid right-of-way conflicts. At Polk Street 2-90" RCP Siphon will be constructed to avoid an existing 60-inch waterline and an existing transmission line. The Polk Street Siphon is temporary, since both utilities will be relocated in the future, and the 12 ft. x 12 ft. outfall will be constructed to replace the 2-90" RCP Siphon. At Texas Avenue the 12 ft. x 12 ft. St. Emanuel Collector/ I-45 pump outfall will change to 2-90" RCP and the flowline will be lowered by 5 ft under the existing Metro Light Rail to meet the 12 ft. desirable clearance with a 4 ft. buffer. The existing storm sewers crossing St. Emanuel Street will be connected to the St. Emanuel Collector/I-45 pump outfall, and the lines west of St. Emanuel draining west to the existing Chartres Street trunkline will be plugged and remain in place for the NHHIP 3B project. The existing 6 ft. x 3.5 ft. Elgin siphon will be removed. The proposed 12 ft. x 12 ft. Hamilton Street collector will be connected to the St. Joseph siphon with a junction box, leaving the St. Joseph siphon to remain in place as part of this project. The existing St. Joseph siphon will be removed as part of the future NHHIP 3D project and the City of Houston system connected to the 12 ft. x 12 ft. Hamilton Collector will remain.

In addition, the overland flow analysis results were used to identify potential locations where overland flow may access the depressed section under proposed conditions. The identified access points and the corresponding proposed 100-year water surface elevations at these locations are provided in **Table 11-1**.

Table 11-1 – Potential Sheet flow Access Points

Location	Storage Node ID	100-Year WSEL (ft.)
Hamilton Street at Winbern Street	J1452	44.06
Hamilton Street at Chenevert Street	J1489	44.07
Hamilton Street at Holman Street	J1544	44.07
Hamilton Street at Stuart Street	J1643	44.08
Hamilton Street at Elgin Street	J1709	44.09
Hamilton Street at McGowen Street	J2062	44.08
Hamilton Street at McIlhenny SB Exit Ramp	J2146	43.94
Elgin Street at NB Exit Ramp	C-13	42.14
McGowen Street at NB Enterance Ramp	C-20	41.84

The roadway designer needs to consider the above referenced water surface elevations when finalizing the roadway profiles at these access points.

11.2 Proposed Storm Drain System

The proposed NHHIP 3B storm drain system includes the following sections:

- Depressed section between Alabama Street and McGowen Street.
- The Hamilton Street Collector system (I-69 southbound frontage road) from Winbern Street to Polk Street.
- The Chartres Street system (I-69 northbound frontage road) from Cleburne Street to just north of McGowen Street.

The proposed depressed section system includes a separate trunkline system for each roadway section; for example, I-69 northbound and I-69 southbound have separate trunkline systems. The Hamilton Street Collector and the depressed section storm sewer were designed for a 100-year storm event, and the Chartres Street system was designed for the 10-year storm event.

11.3 Proposed I-45 Pump Station Facility

The proposed depressed section outfalls into the I-45 pump station located north of the I-69 and I-45 interchange. The I-45 pump station discharges to an 8 ft. x 8 ft. gravity system along St. Emanuel that combines with the Hamilton Street Collector at Polk Street and increases to a 12 ft. x 12 ft. RCB that ultimately outfalls to Buffalo Bayou. The pump station was designed such that there is no roadway flooding for the 100-year storm event. **Table 11-2** provides a summary of the pump configuration for the I-45 pump station.

Table 11-2 – Pump Station Configuration

Pump Station	No. of Active Pumps	Pump Rate (GPM)	No. of Active Pumps	Pump Rate (GPM)	No. of Redundant Pumps	Pump Rate (GPM)
I-45 Pump Station	2	8,694	7	17,644	1	17,644

11.4 Mitigation Facility

A mitigation analysis was performed for the NHHIP 3B project to determine detention needs due to the increase runoff associated with the proposed roadway and drainage improvements (system hydraulics). The analysis also evaluated the mitigation needs associated with loss of floodplain storage from Buffalo Bayou due to the proposed project. **Table 11-3** summarizes the mitigation needs for the depressed section.

Table 11-3 – Summary of Mitigation Needs

Required Mitigation	Volume ac-ft
Mitigation Volume Needed for Floodplain Storage	20
Mitigation Volume Needed for System Hydarulics	212
Total Mitigation Required	**232**

The 212 ac-ft of storage needed to mitigate the roadway and drainage improvements along with the 20 ac-ft of floodplain storage will be provided in proposed Detention Pond A. The total storage volume provided in Detention Pond A below the 100-year water surface elevation is 235 ac-ft. The proposed St. Emanuel Collector/I-45 pump outfall and Hamilton Street Collector systems provide an additional 46 ac-ft of floodplain storage. Therefore, a total of 281 ac-ft of storage volume is provided for proposed conditions.

An additional 5.16 ac-ft of mitigation storage volume is provided in Detention Pond A2 located within the existing TxDOT right-of-way north of Hamilton Street between Holman Street and Chenevert Street. The existing local roadways currently flood in this area resulting in overland flow entering the existing depressed section. For proposed conditions the overland flow will enter the Hamilton Street collector and backflow into Detention Pond A2 via a 24-inch inflow/outflow pipe. Detention Pond A2 provides additional mitigation to lower the water surface elevations in this area thus reducing ponding depths.

For the Chartres system, mitigation is not needed since the proposed drainage improvements result in a decrease in flow. The results show a decrease in water surface elevations, and the proposed improvements are located outside the Brays Bayou floodplain; therefore, no mitigation is required for this system.

11.5 Summary

The proposed depressed section drainage system was designed to maintain all main lanes passable under a 100-year storm event. Note, that this analysis did not consider inlet capacity. It is expected that some roadway flooding could potentially occur due to the inlet capacity under the 100-year storm event. It is recommended that a detail evaluation of the capacity of the inlet structures in the depressed section and along the Hamilton Street Collector system be completed in the design phase of the project to determine the anticipated level of ponding for the 100-year storm event.

Major changes to the NHHIP 3B system design include the following:

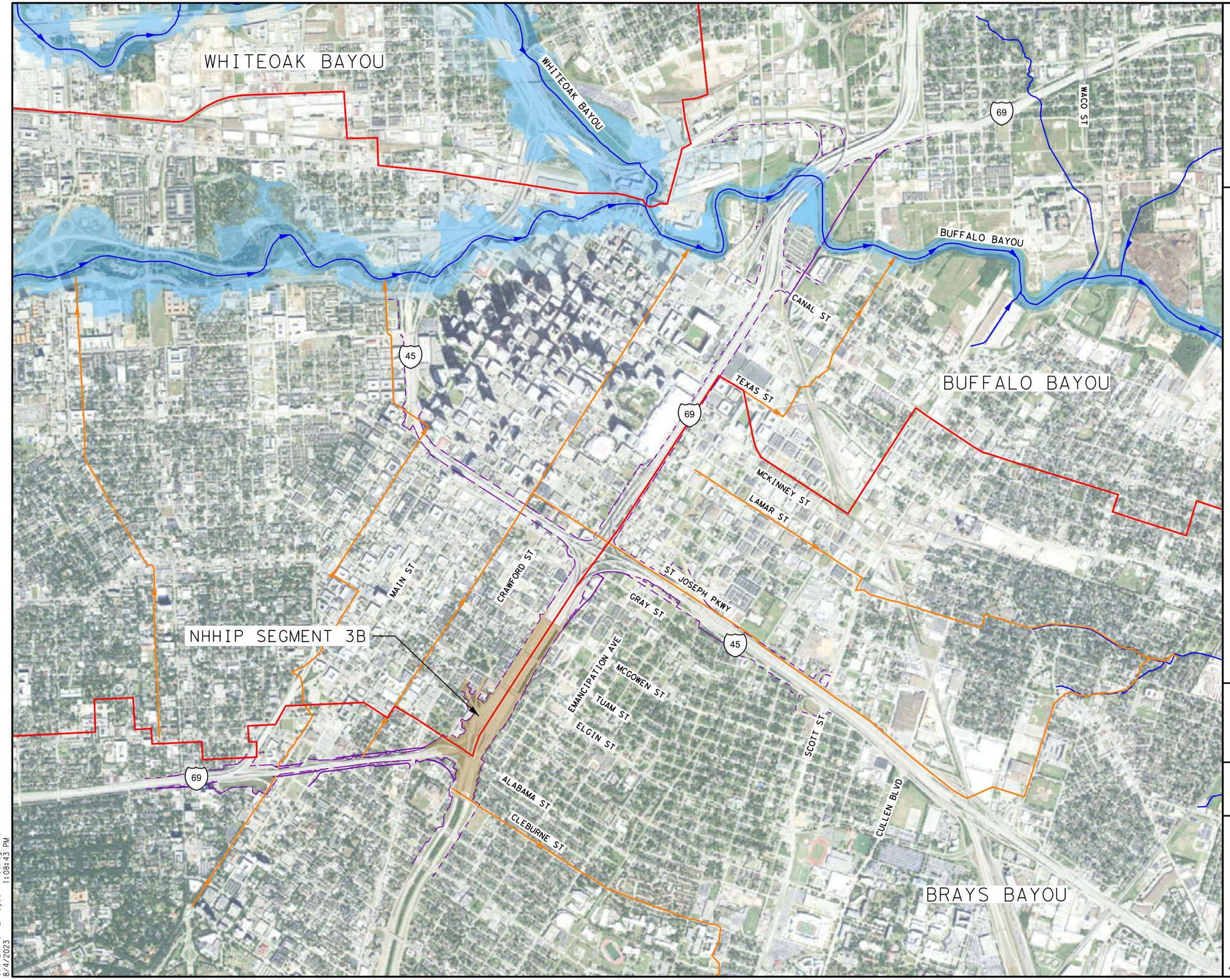
- Increase in size to Hamilton Street system to a 12 ft. x 12 ft. trunkline from Winbern Street to Polk Street, which will connect to the proposed 8 ft. x 8 ft. pump outfall on St. Emanual Street via 12 ft. x 12 ft. RCB crossing under the existing I-69 bridge.
- The Hamilton Street profile has been raised to eliminate overland flow into the proposed depressed section.
- Increase the size of the St. Emanuel Collector/I-45 pump outfall to a 12 ft. x 12 ft. trunkline from the Polk Street connection with the Hamilton Collector to 800 feet south of Canal Street. From 800 feet south of Canal Street to Detention Pond A the pump outfall will change to 2-12 ft. x 6 ft trunkline and be relocated to avoid right-of-way conflicts. The proposed system is restricted by a 42" RCP and higher flow will enter Detention Pond A through 3- 10 ft. x 5 ft. RCB and the system ultimately outfall to Buffalo Bayou via 54" RCP with a backflow preventor.
- Replace St. Emanuel Street Collector with I-45 pump outfall. Connect existing storm sewer systems crossing St. Emanuel to proposed trunkline and plug systems west of St. Emanuel.
- Construct 2-90" RCP siphon under Polk Street to avoid conflict with 60" water line and transmission line with a dewatering pump. This siphon will be temporary and will be replaced with a 12 ft. x 12 ft. RCB in the future, when the utilities are moved prior to NHHIP 3D project.

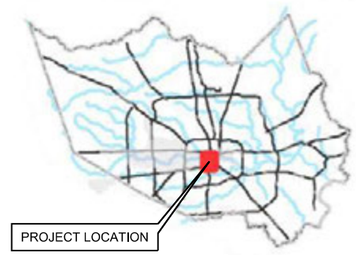
- Construct 2-90" RCP under the Metro Light Rail at Texas Avenue and lower the outfall trunkline elevation by 5 ft. to the 12 ft. desirable clearance requested by Metro with a 4 ft. buffer.
- Replace the end section of the existing 102-inch outfall with three (3) 72-inch RCPs with backflow preventors.
- Connect the existing 102-inch depressed system to the proposed depressed system with a 30-inch RCP, just north of McGowen.
- The existing St. Joseph Siphon will remain in place and will be connected to the Hamilton Street Collector System.
- Replace the AECOM two (2) 6 ft. by 4 ft. depressed system outfall to the I-45 pump with a single 90-inch RCP.
- Construction of the portion of the proposed Detention Pond A that is needed for this 3B project. The proposed Pond A will have a 36" RCP outfall pipe and an overflow weir to Buffalo Bayou at an elevation of 25 feet, a length of 40 feet, and 5:1 side slopes.
- Construction of Detention Pond A2 with a 24" RCP connection to the Hamilton Collector.
- Construct the 1-45 pump station at new location with pump configuration documented in this report, which includes one (1) 1,652 GPM sump pump, two (2) 8,694 GPM pumps, and eight (8) 17,644 GPM pumps, which includes one spare pump.

A preliminary cost estimate was developed for the proposed drainage features. The cost estimate included the storm drain trunklines and I-45 pump station. The total cost estimate including a contingency and mobilization is $135.2 million.

The proposed roadway improvements will not adversely impact the existing conditions at each outfall within the project limits for flood frequencies up to and including the 100-year storm event.

EXHIBITS





Legend

- Proposed TXDOT ROW
- Existing TXDOT ROW
- COH Primary Outfall
- HCFCD Watersheds
- HCFCD Open Channels

Segment

- NHHIP Seg 3B

FEMA Flood Hazard Zones

- Regulatory Floodway
- %1 Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazrad

0 500 1000'

SCALE: 1" = 1000'

FIRM REGISTRATION NO. F-230

tnp

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 1
Project Area Map

August 2023 SHEET 1 OF 1

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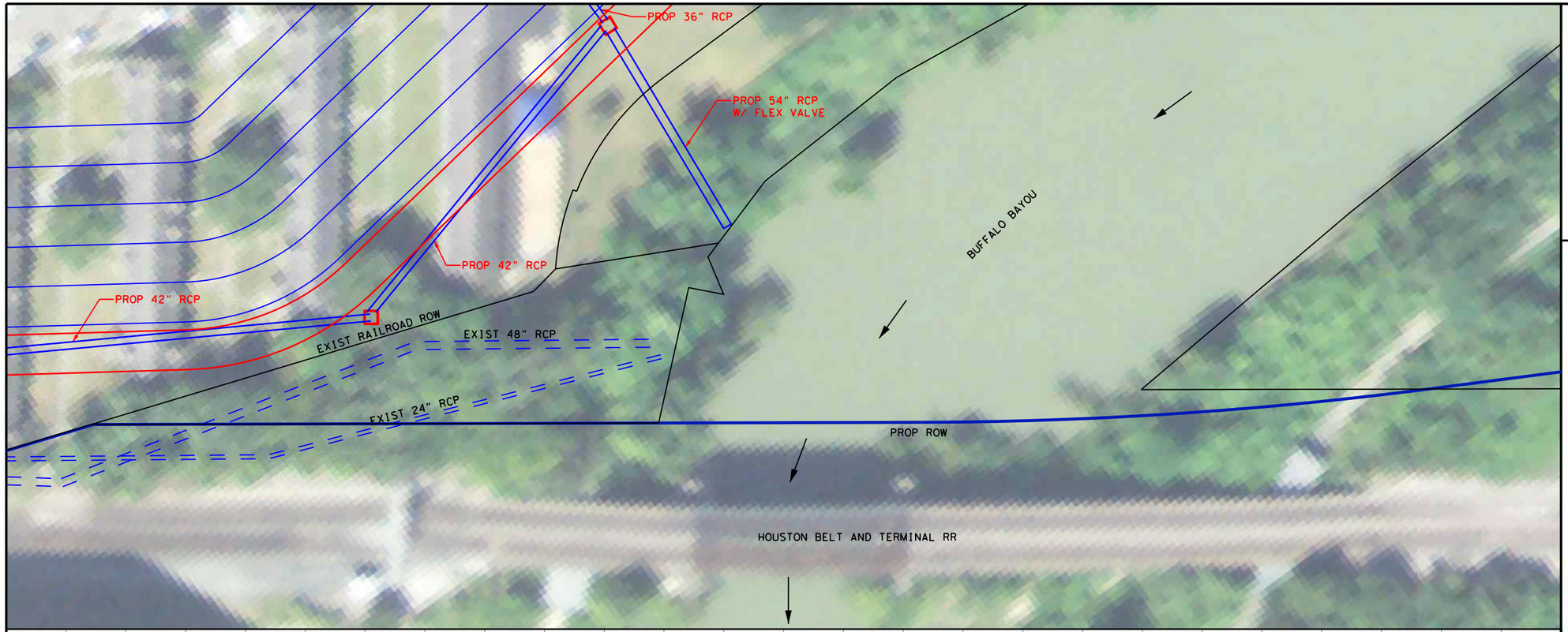
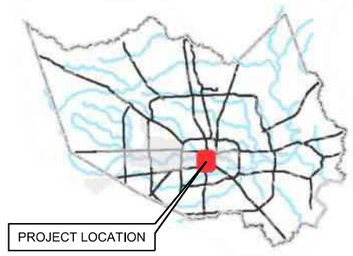
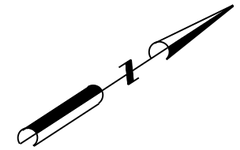




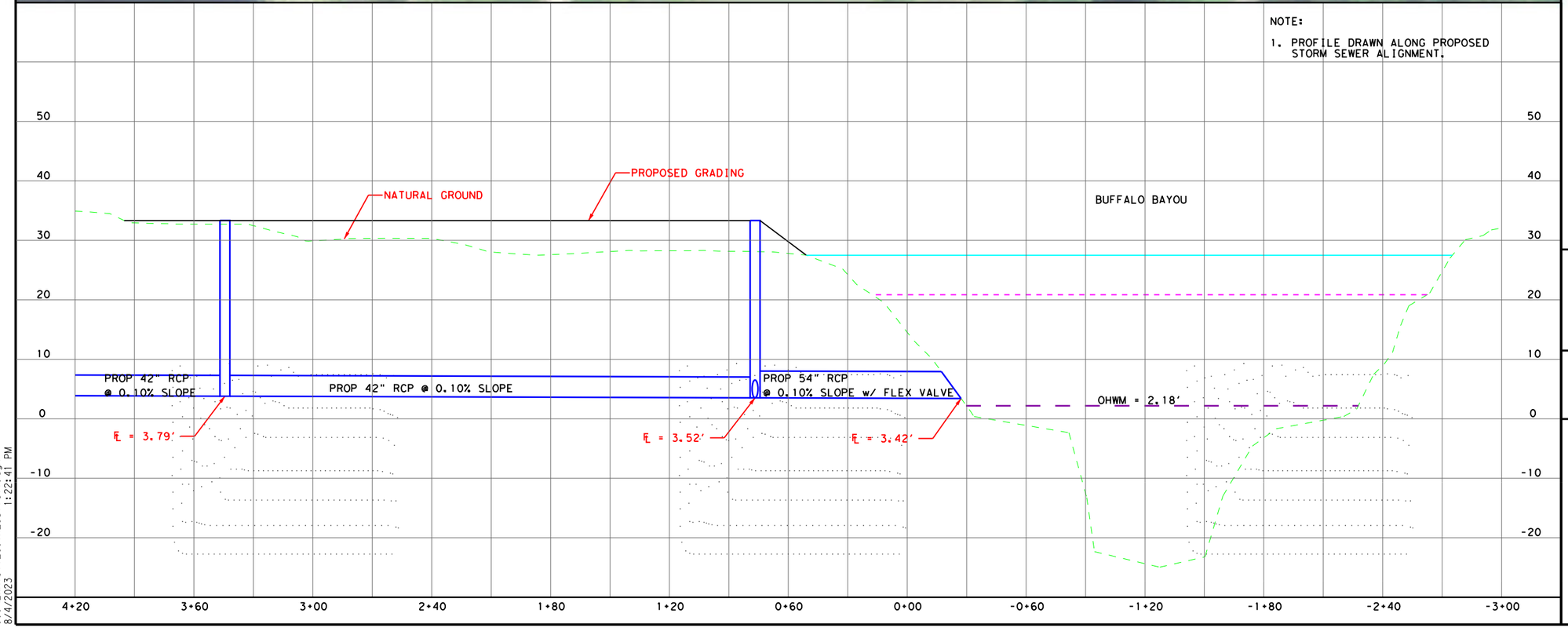


HORIZONTAL 0 30 60
SCALE: 1" = 60'

VERTICAL 0 10 20
SCALE: 1" = 20'

LEGEND

- EXIST STORM SEWER
- PROP STORM SEWER
- 10 YR WSEL
- 100 YR WSEL
- FLOW DIRECTION



FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 3
Proposed 54" Outfall
at Buffalo Bayou
CSJ No: 0050-03-601, etc.

August 2023

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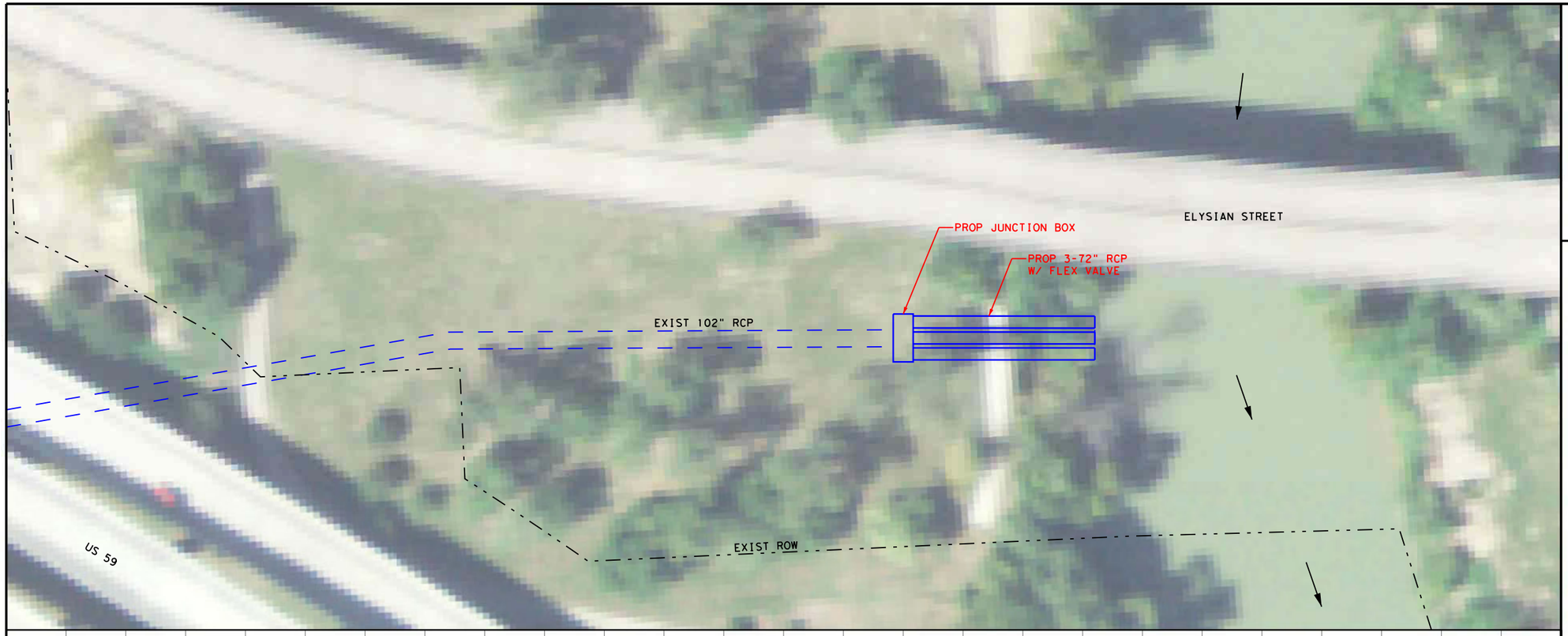

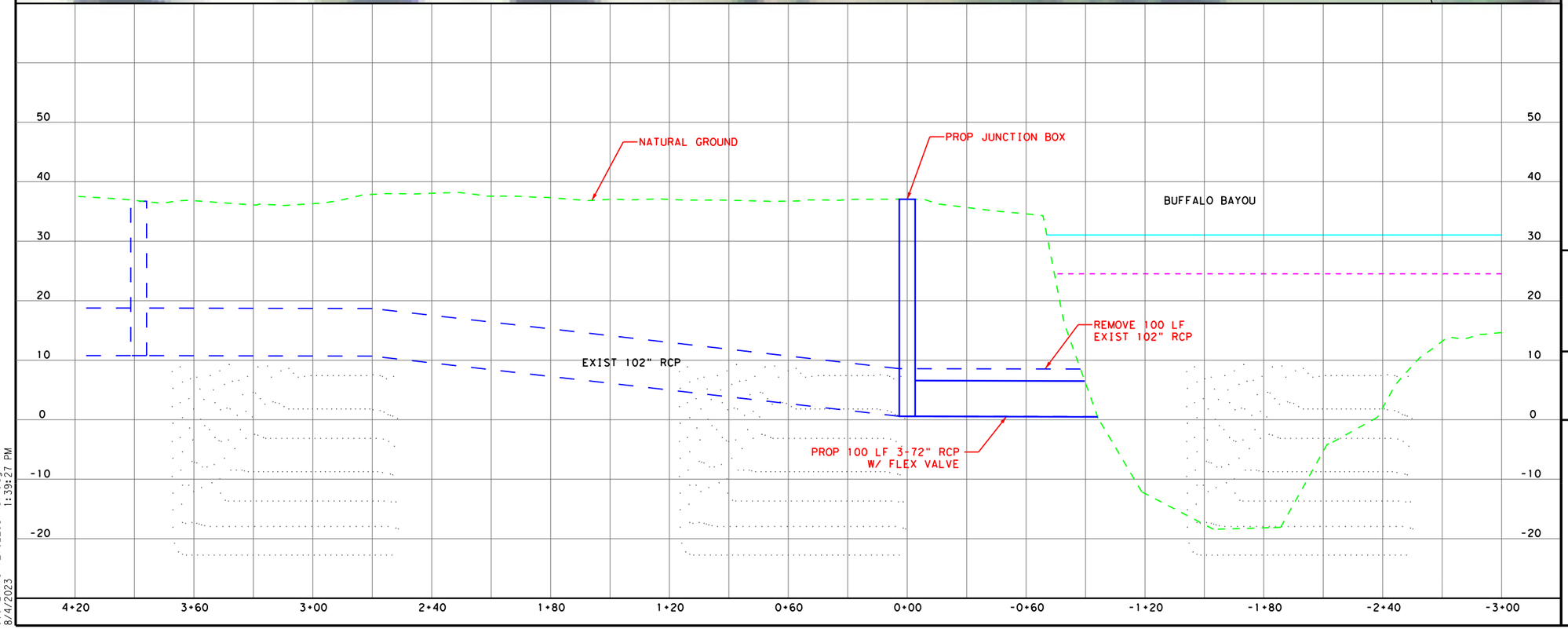

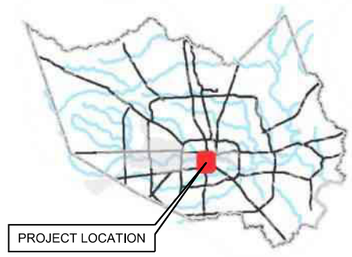

HORIZONTAL 0 30 60
SCALE: 1" = 60'

VERTICAL 0 10 20
SCALE: 1" = 20'

LEGEND

- EXIST STORM SEWER
- PROP STORM SEWER
- 10 YR WSEL
- 100 YR WSEL
- FLOW DIRECTION

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 3
Existing 102" Outfall
at Buffalo Bayou
CSJ No: 0050-03-601, etc.

August 2023

...\Exhibit_102_Outfall.dgn
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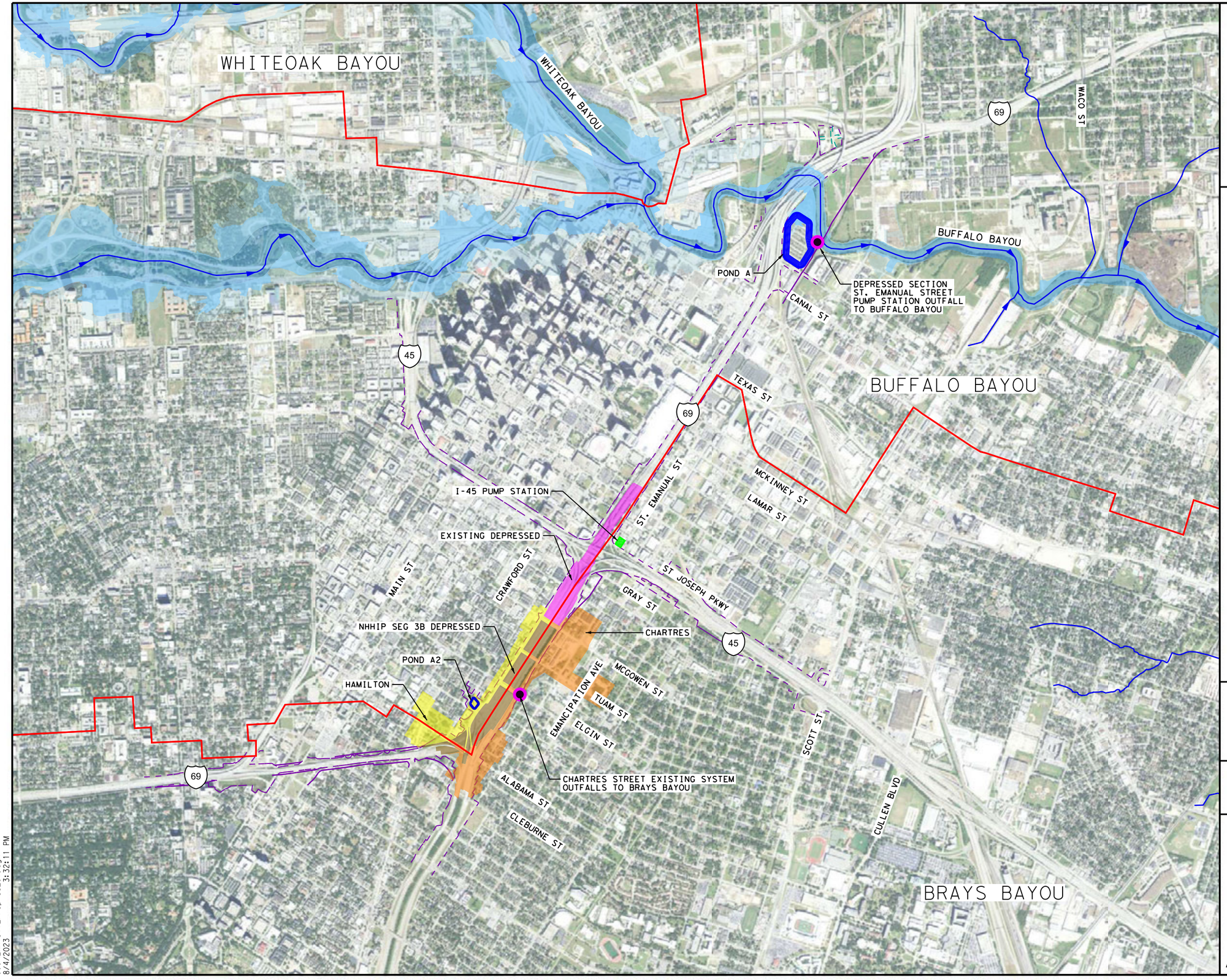

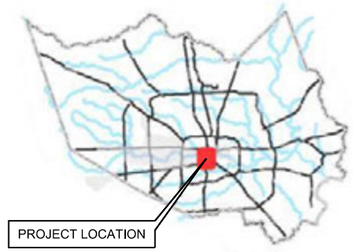

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- HCFCD Watershed Divide
- Water Feature
- Proposed Pump Station
- Proposed System Outfall

Proposed Drainage Area System

- Hamilton
- Chartres
- NHHIP Seg 3B Depressed
- Existing Depressed

FEMA Flood Hazard Zones

- Regulatory Floodway
- %1 Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazrad

N

0 500 1000'

SCALE: 1" = 1000'

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023 SHEET 1 OF 7

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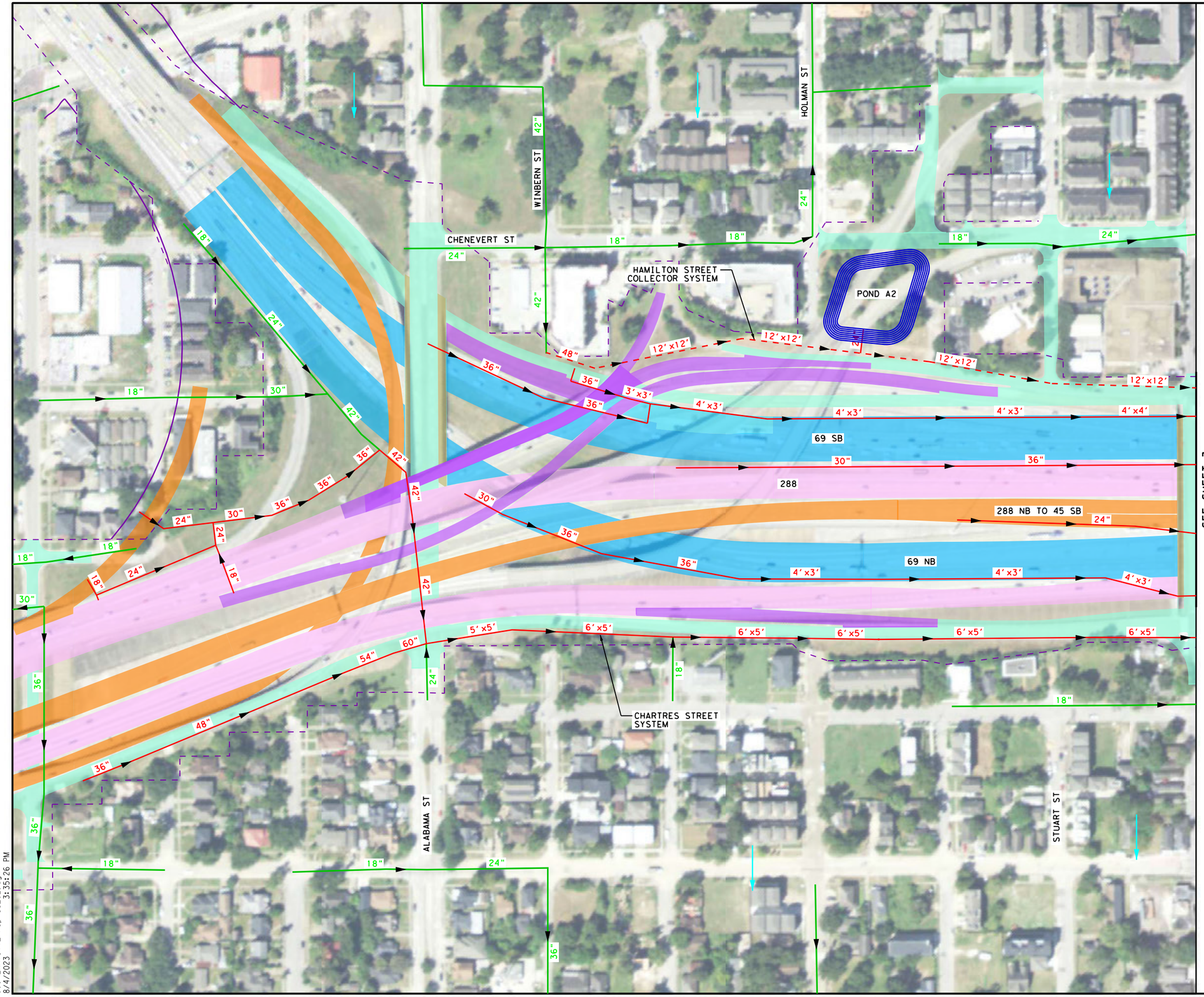

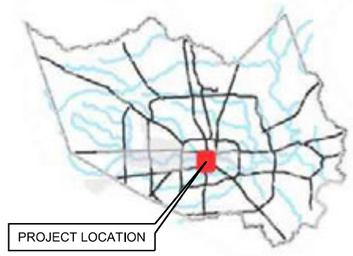

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Pond
- Sheetflow Direction

Proposed Roadways

- I-69/US 59 Mainlanes
- SH 288 Mainlanes
- Direct Connectors
- Ramps
- Frontage/Local Roads

0 100 200

SCALE: 1" = 200'

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023

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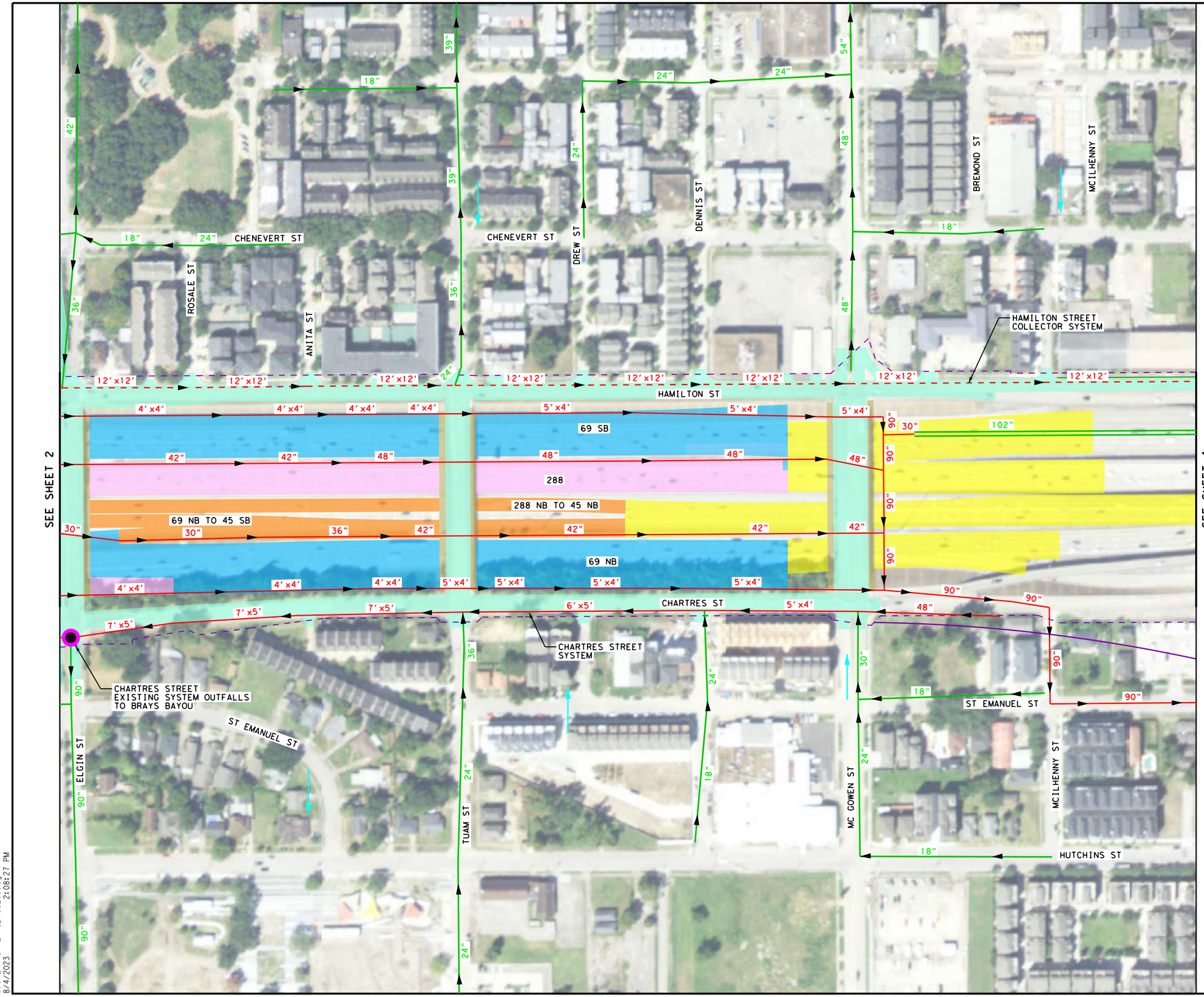

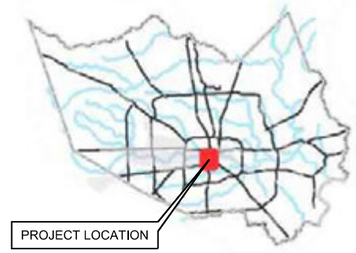

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Proposed System Outfall
- Sheetflow Direction

Proposed Roadways

- I-69/US 59 Mainlanes
- SH 288 Mainlanes
- Direct Connectors
- Frontage/Local Roads
- Transition Roadway

0 100 200

SCALE: 1" = 200'

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NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023 SHEET 3 OF 7

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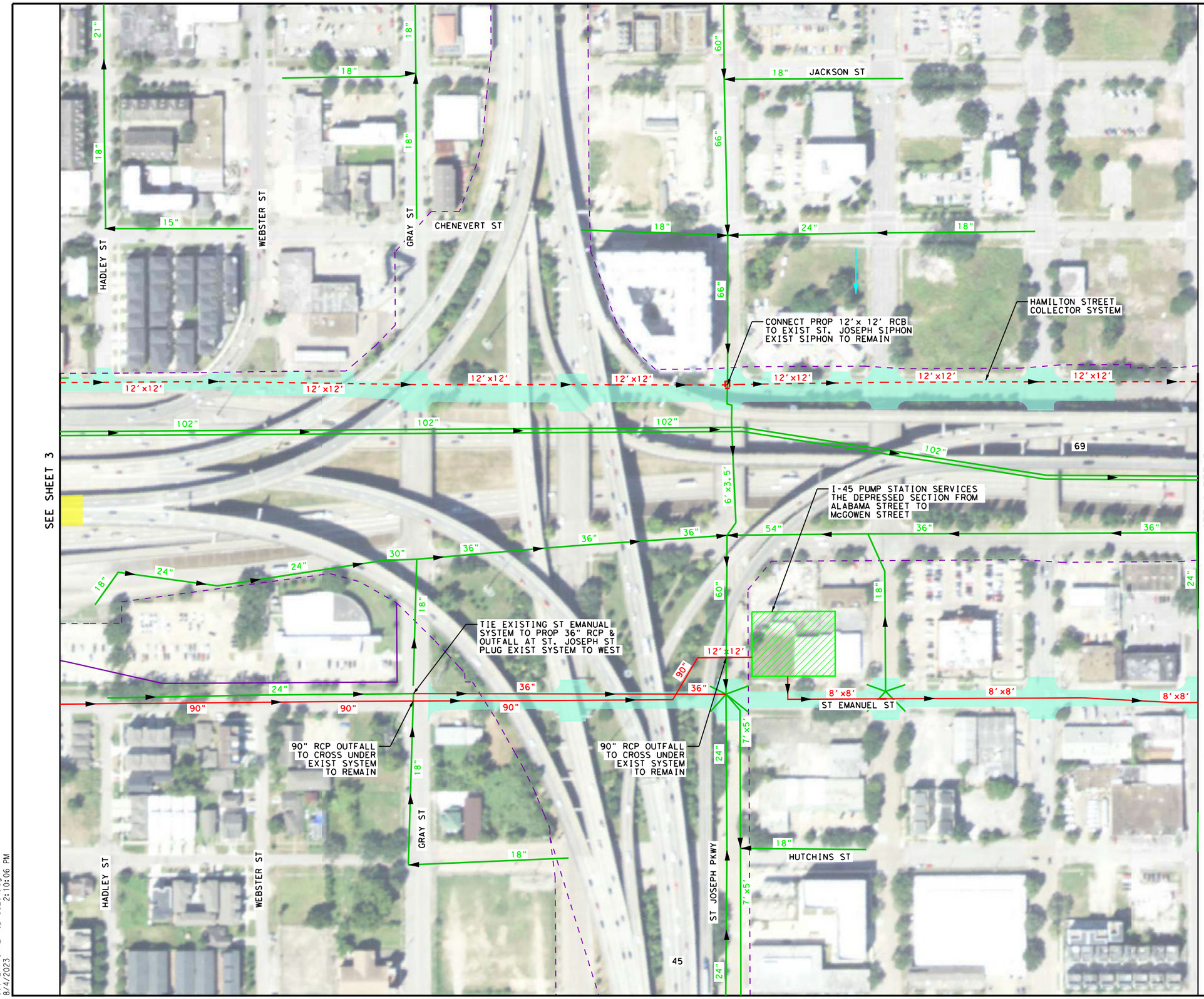

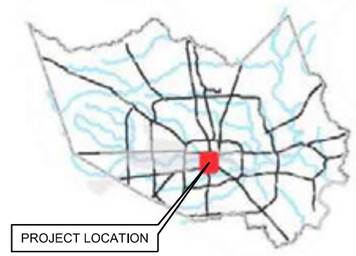

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Pump Station
- Sheetflow Direction

Proposed Roadways

- Frontage/Local Roads
- Transition Roadway

0 100 200

SCALE: 1" = 200'

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NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023

SHEET 4 OF 7

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JACKSON ST
BELL ST
DALLAS ST
POLK ST
ST EMANUEL ST
MCKINNEY ST
WALKER ST
LAMAR ST

TIE EXIST 36" RCP TO HAMILTON COLLECTOR

OUTFALL HAMILTON COLLECTOR TO ST EMANUEL OUTFALL WITH 12' X 12' RCB UNDER THE EXISTING US 59 BRIDGES

12'x12' RCB TO CROSS OVER EXIST 102" RCP TO REMAIN

12'x12' RCB TO CROSS UNDER EXIST 48" TO REMAIN

2-84" RCP SIPHON TO CROSS UNDER EXIST 60" WL & TRANSMISION LINE

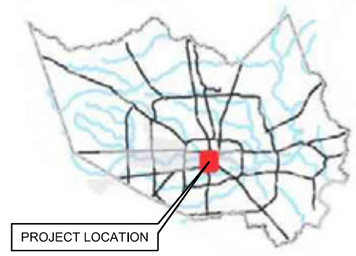
HAMILTON COLLECTOR OUTFALL TIE INTO ST EMANUEL COLLECTOR I45 PUMP STATION OUTFALL

TIE EXIST 18" TO ST. EMANUEL OUTFALL AND PLUG EXIST SYSTEM TO WEST

TIE EXIST 18" TO ST. EMANUEL OUTFALL AND PLUG EXIST SYSTEM TO WEST

SEE SHEET 4

SEE SHEET 6



Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Sheetflow Direction

Proposed Roadways

- Frontage/Local Roads

N

0 100 200

SCALE: 1" = 200'

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NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023

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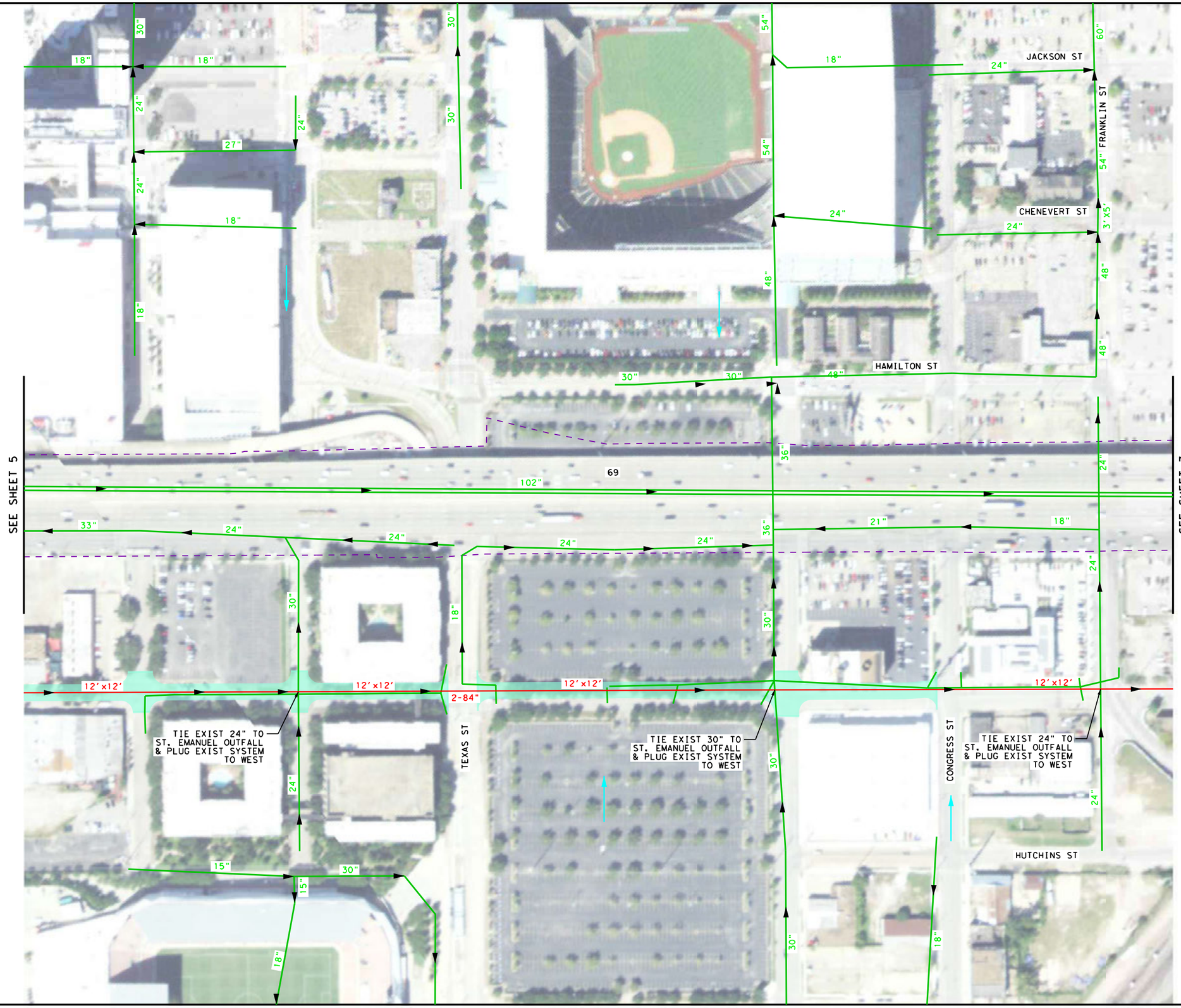

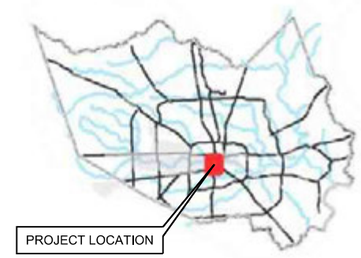

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Sheetflow Direction

Proposed Roadways

- Frontage/Local Roads

0 100 200

SCALE: 1" = 200'

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023

SHEET 6 OF 7

...\Exhibit_Prop SS_06.dgn
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N JACKSON ST
N CHENEVERT ST
N HAMILTON ST
RUIZ
69
POND A
RUNNELS ST
CANAL ST
LOTTMAN
NAVIGATION BLVD
COMMERCE ST
BUFFALO BAYOU
SEE SHEET 6
TIE EXIST 24" TO ST. EMANUEL OUTFALL & PLUG EXIST SYSTEM TO EAST
18"
24"
30"
102"
2-12'x6'
12'x12'
3-10'x5'
12'x10'
36"
42"
48"
54" RCP W/ FLEX VALVE

PROJECT LOCATION

Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Pond
- Sheetflow Direction

0 100 200
SCALE: 1" = 200'

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NHHIP Segement 3B

EXIHIBIT 4
Storm Drain Design
Proposed Storm Sewer System

August 2023

SHEET 7 OF 7

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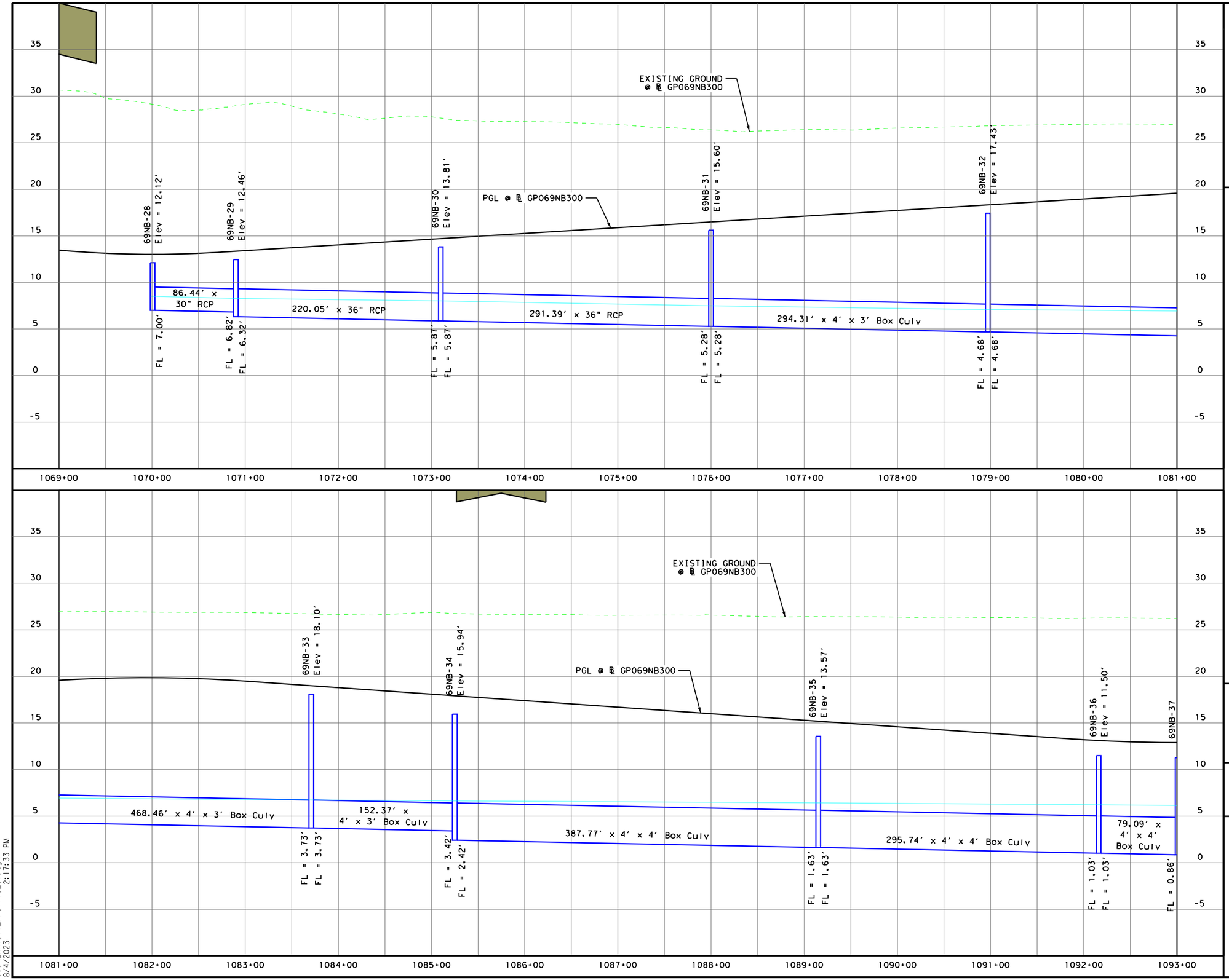

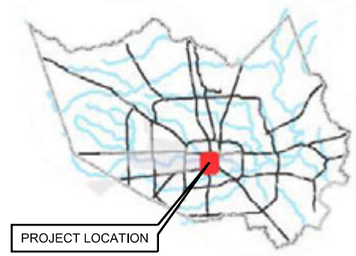

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
I-69 North Bound
Sta. 1069+00 to Sta. 1093+00

August 2023

SHEET 1 OF 18

..\Exhibit_Profile_01.dgn
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EXISTING GROUND
@ ℄ GP069NB300

PGL @ ℄ GP069NB300

69NB-38
Elev = 11.78'

69NB-39
Elev = 12.55'

69NB-40
Elev = 14.05'

69NB-41
Elev = 16.06'

Elev = 11.28'

136.25' x
5' x 4' Box Culv

149.64' x
5' x 4' Box Culv

294.36' x 5' x 4' Box Culv

402.97' x 5' x 4' Box Culv

FL = 0.86'
FL = 0.58'
FL = 0.58'
FL = 0.27'
FL = 0.27'
FL = -0.33'
FL = -0.33'
FL = -1.15'
FL = -4.65'

35 30 25 20 15 10 5 0 -5

1093+00 1094+00 1095+00 1096+00 1097+00 1098+00 1099+00 1100+00 1101+00 1102+00 1103+00 1104+00 1105+00

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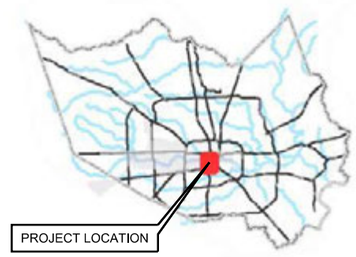

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
I-69 North Bound
Sta. 1093+00 to Sta. 1105+00

August 2023

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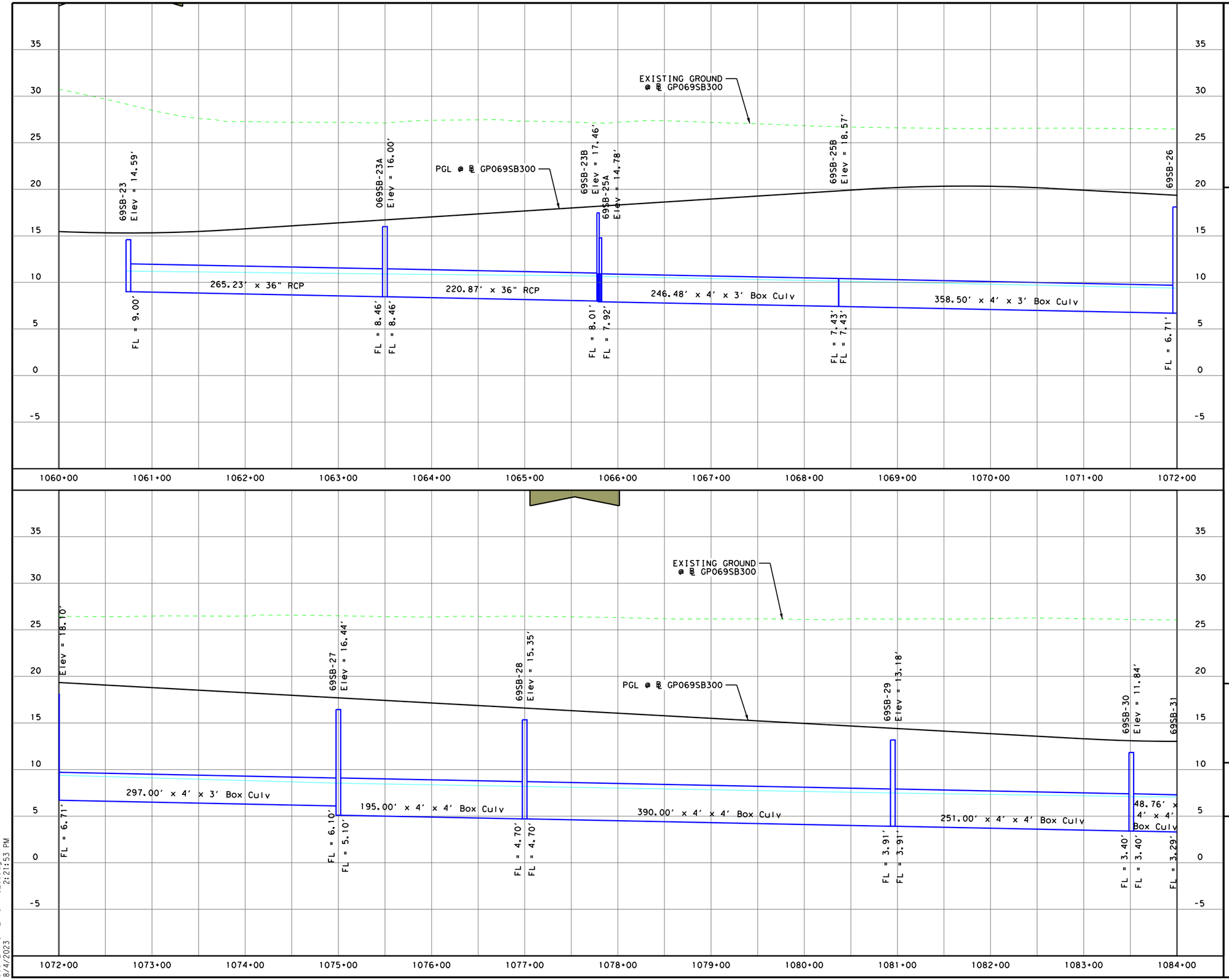

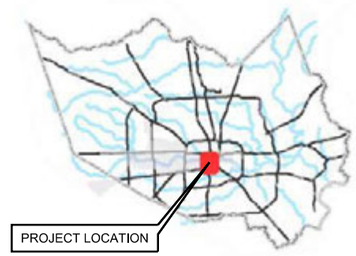

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

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NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
I-69 South Bound
Sta. 1060+00 to Sta. 1084+00

August 2023

SHEET 3 OF 18

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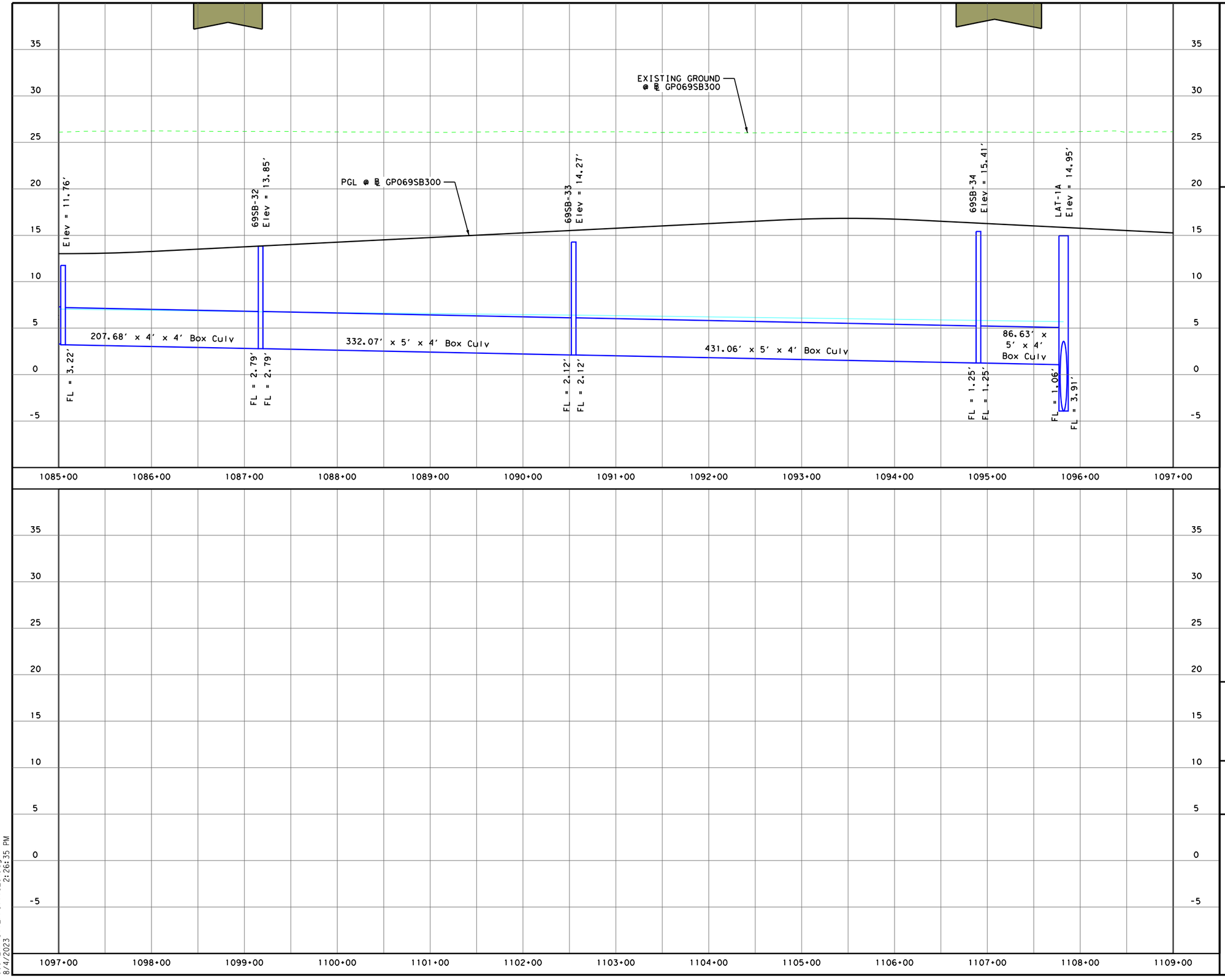

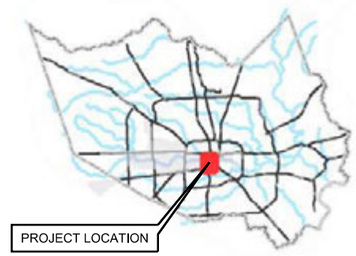

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
I-69 South Bound
Sta. 1084+00 to Sta. 1097+00

August 2023

SHEET 4 OF 18

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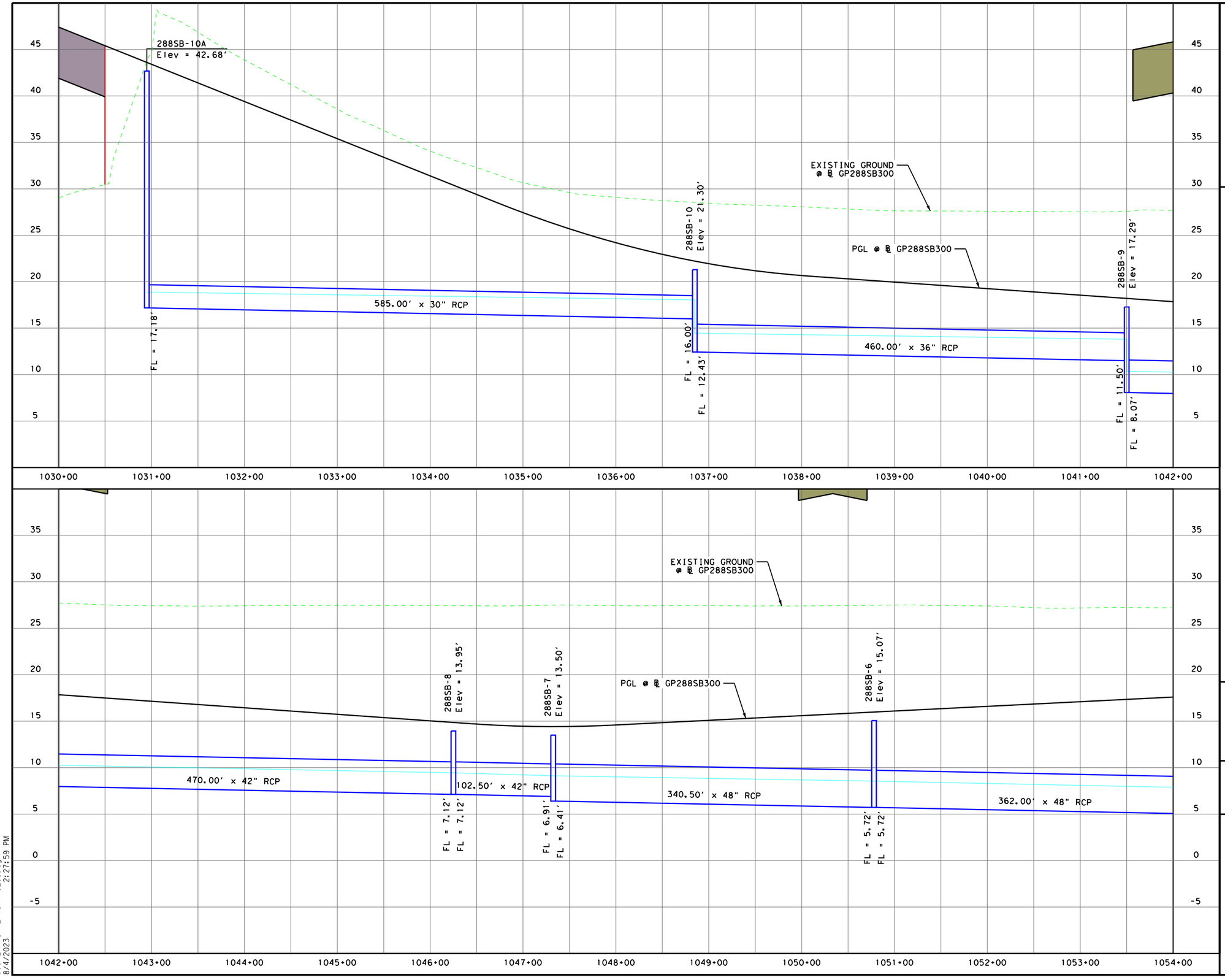

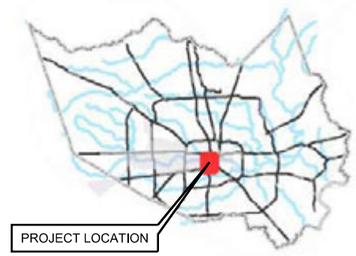

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
SH 288 South Bound
Sta. 1030+00 to Sta. 1054+00

August 2023

SHEET 5 OF 18

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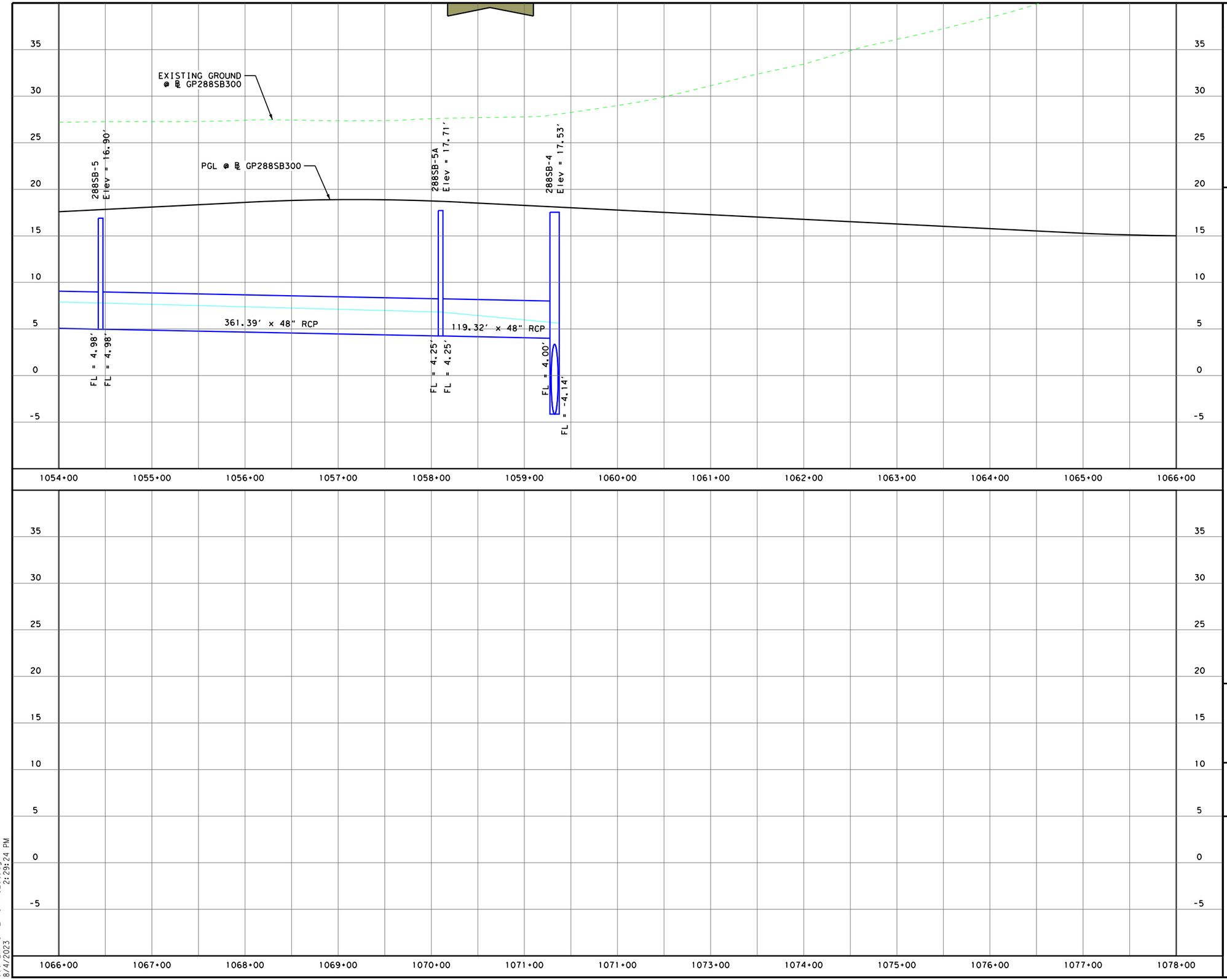

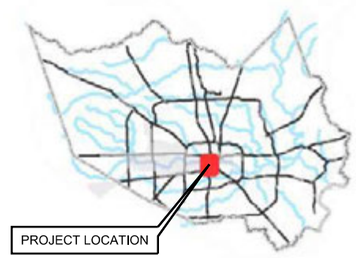

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

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NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
SH 288 South Bound
Sta. 1054+00 to Sta. 1066+00

August 2023

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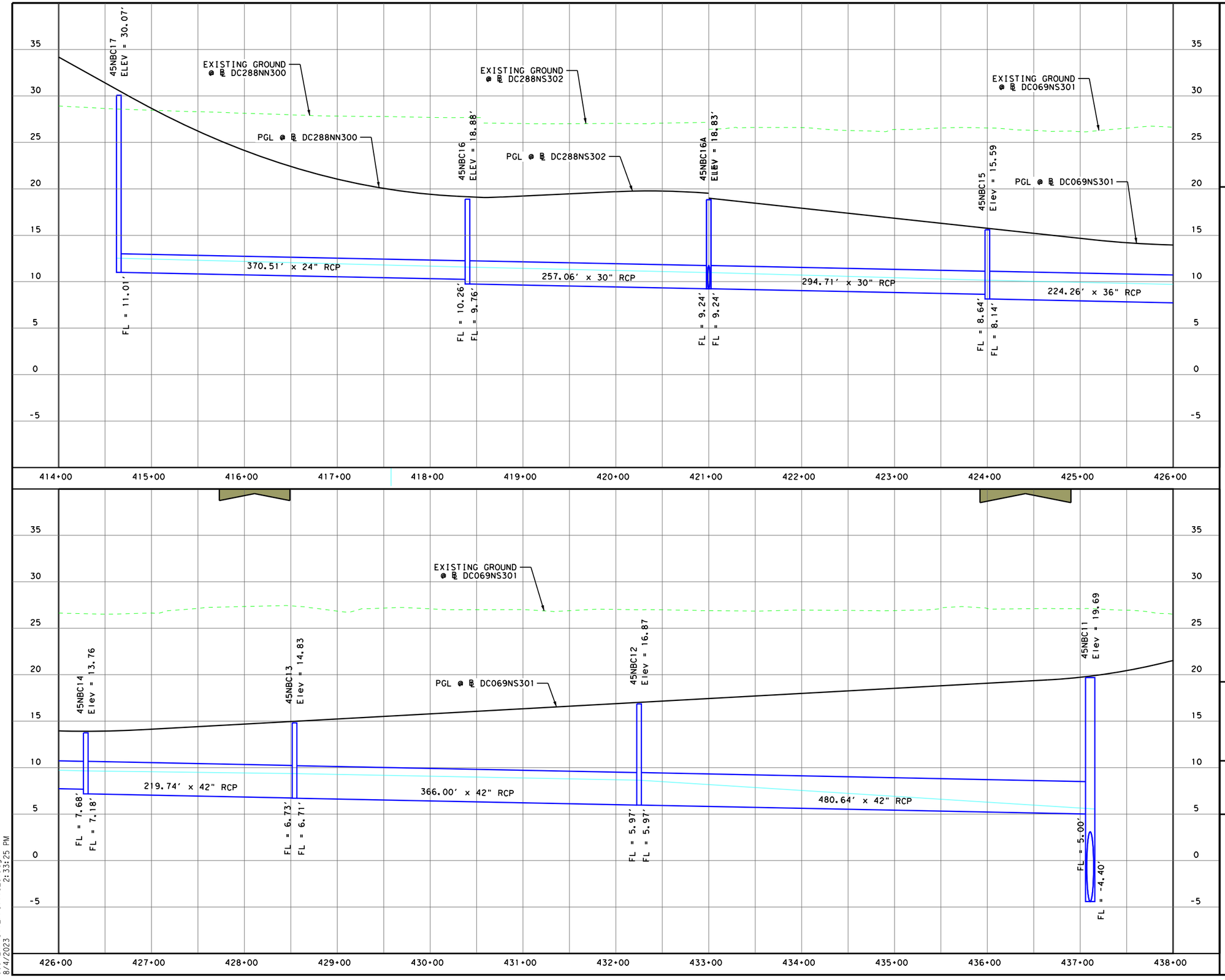

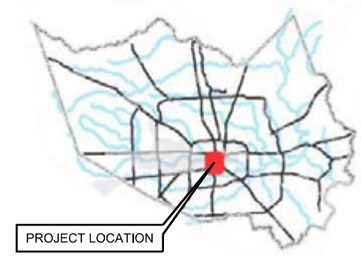

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Direct Connector SH 288 to I-45
Sta. 414+00 to Sta. 438+00

August 2023

SHEET 7 OF 18

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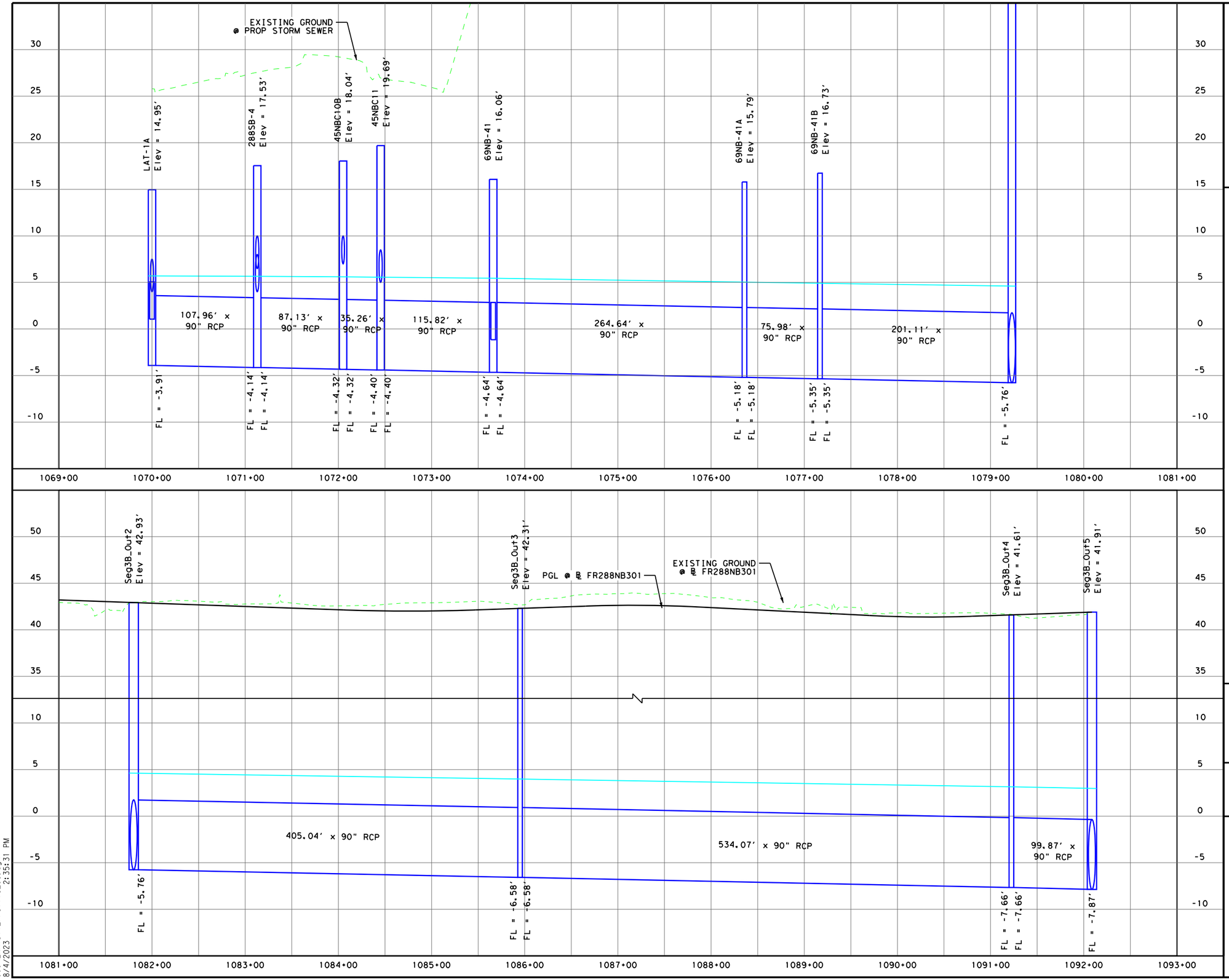

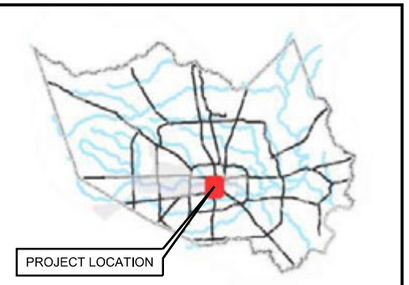

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
St. Emanuel / I-45 Pump Outfall
Sta. 1069+00 to Sta. 1093+00

August 2023

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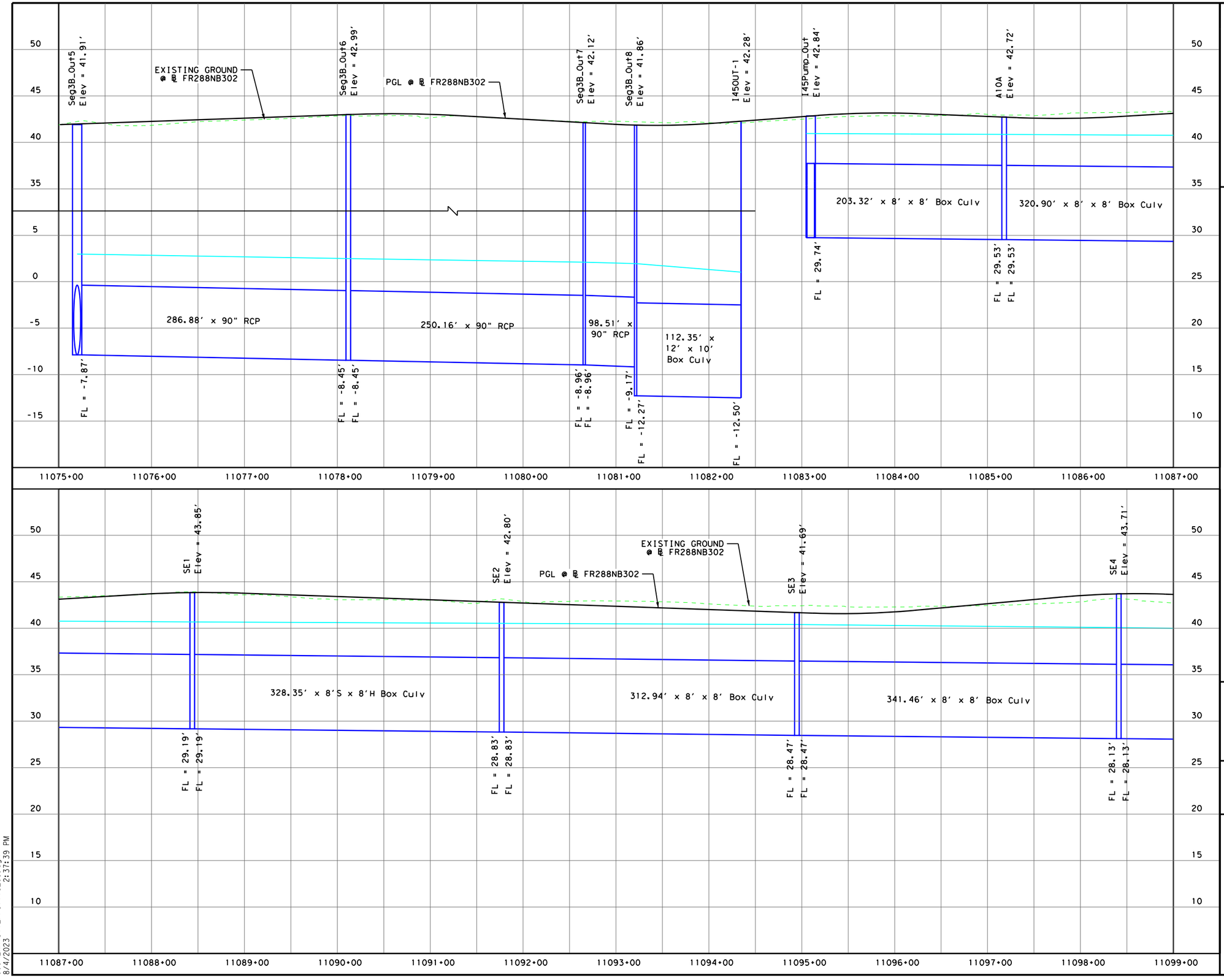

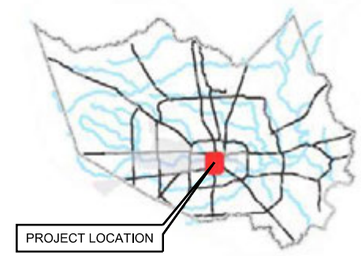

LEGEND

ROADWAY PROFILE

PROP STORM SEWER

100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
St. Emanuel / I-45 Pump Outfall
Sta. 11075+00 to Sta. 11099+00

August 2023

SHEET 9 OF 18

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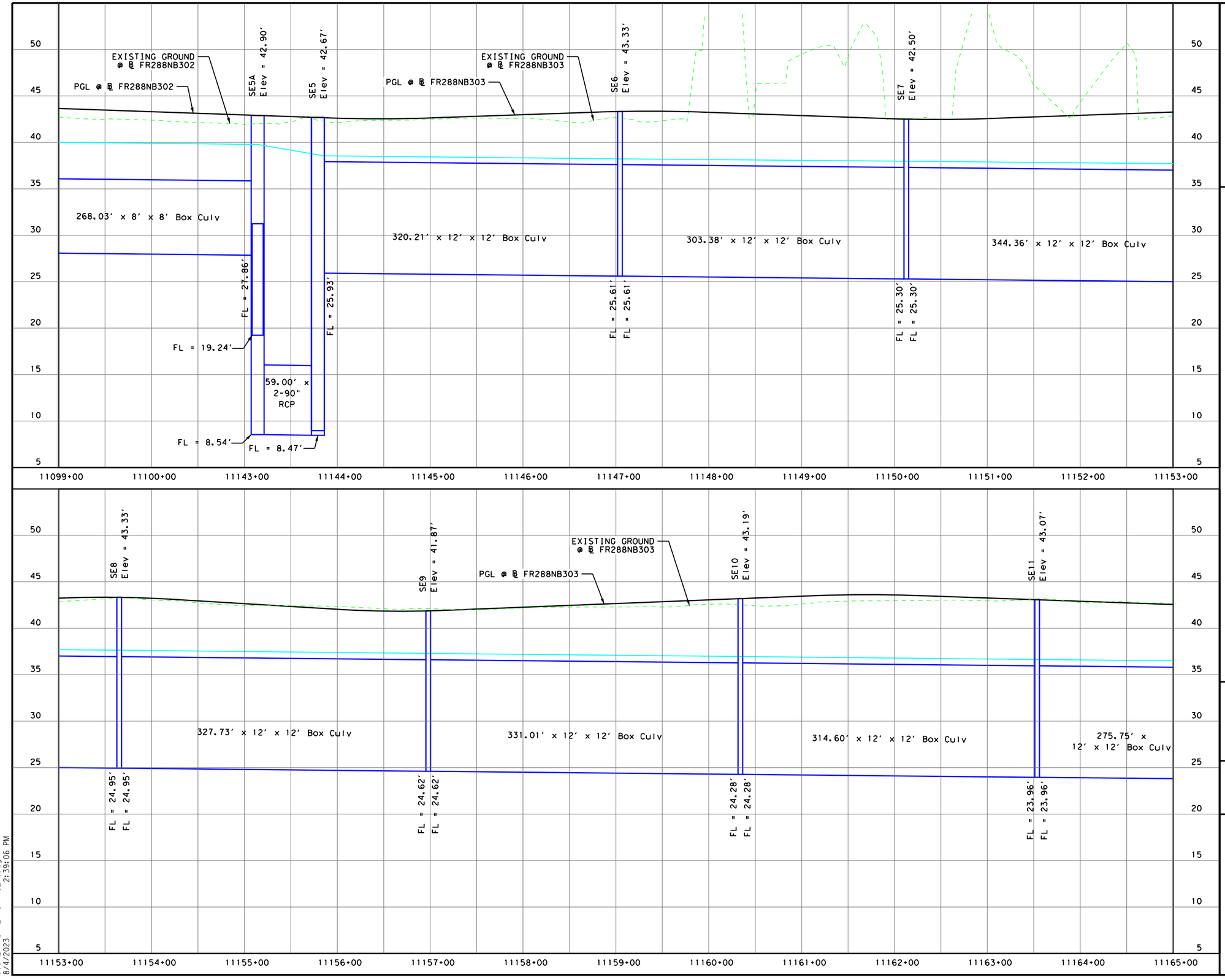

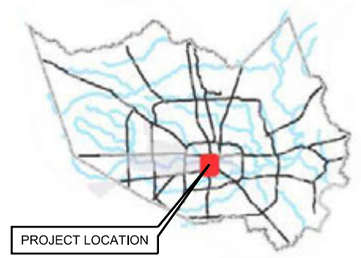

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
St. Emanuel / I-45 Pump Outfall
Sta. 11099+00 to Sta. 11164+00

August 2023

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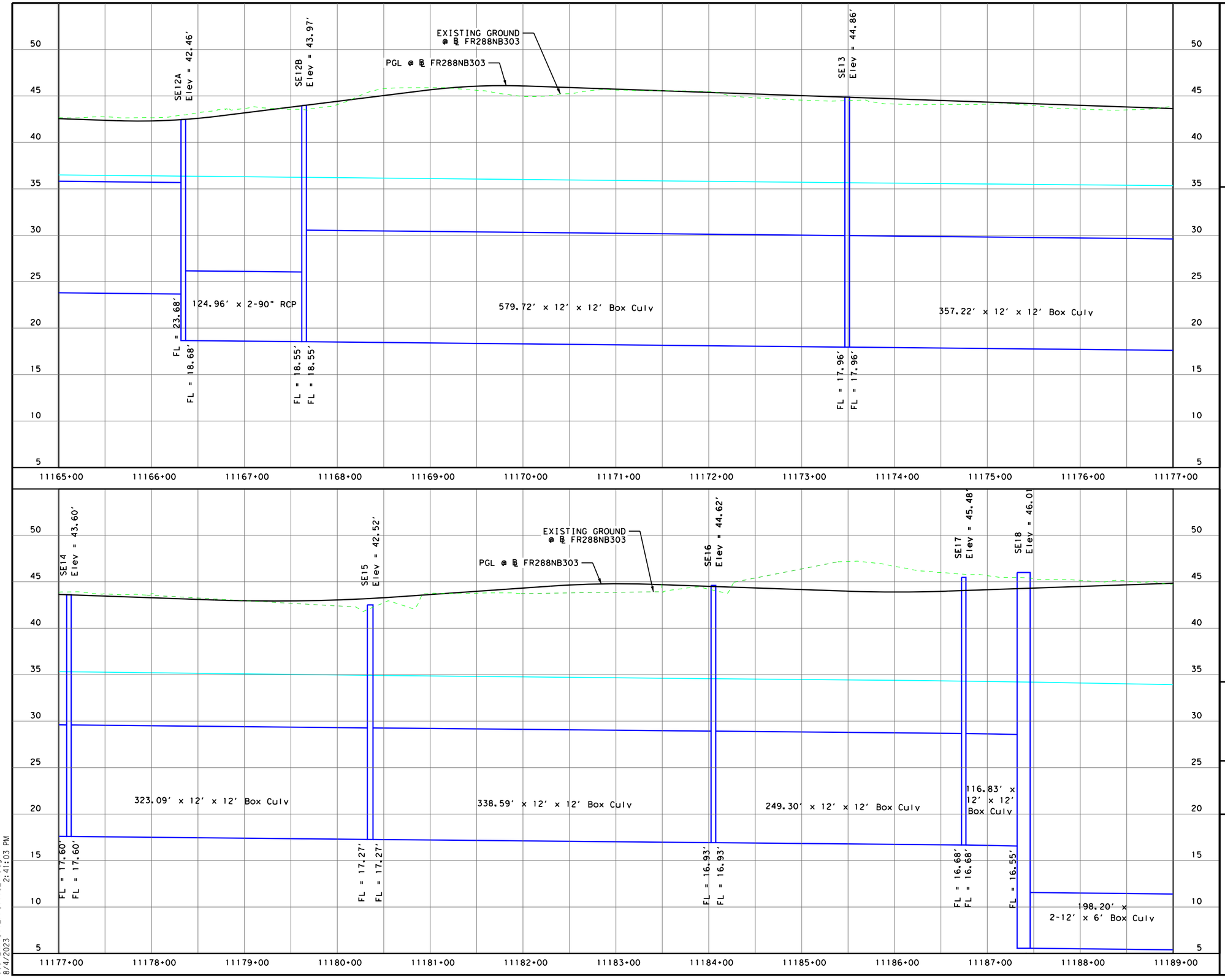

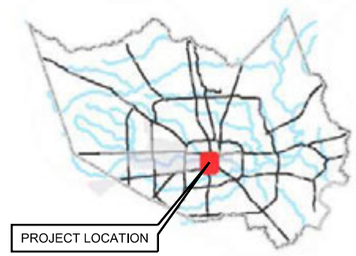

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
St. Emanuel / I-45 Pump Outfall
Sta. 11165+00 to Sta. 11189+00

August 2023

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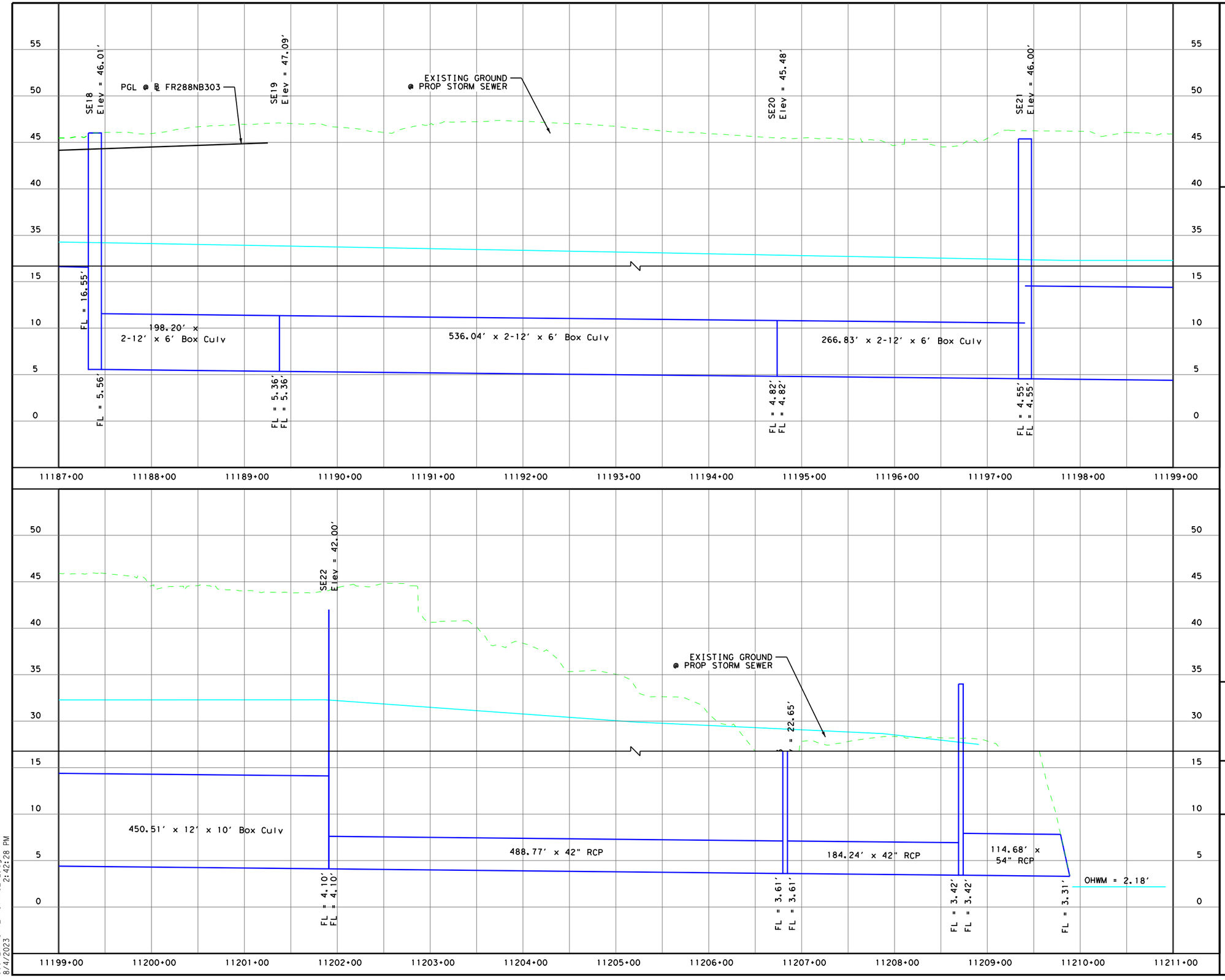

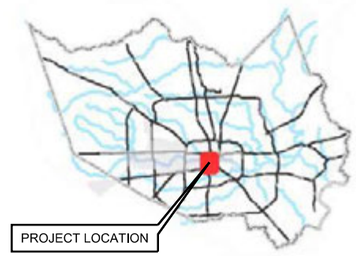

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
St. Emanuel / I-45 Pump Outfall
Sta. 11187+00 to Sta. 11211+00

August 2023

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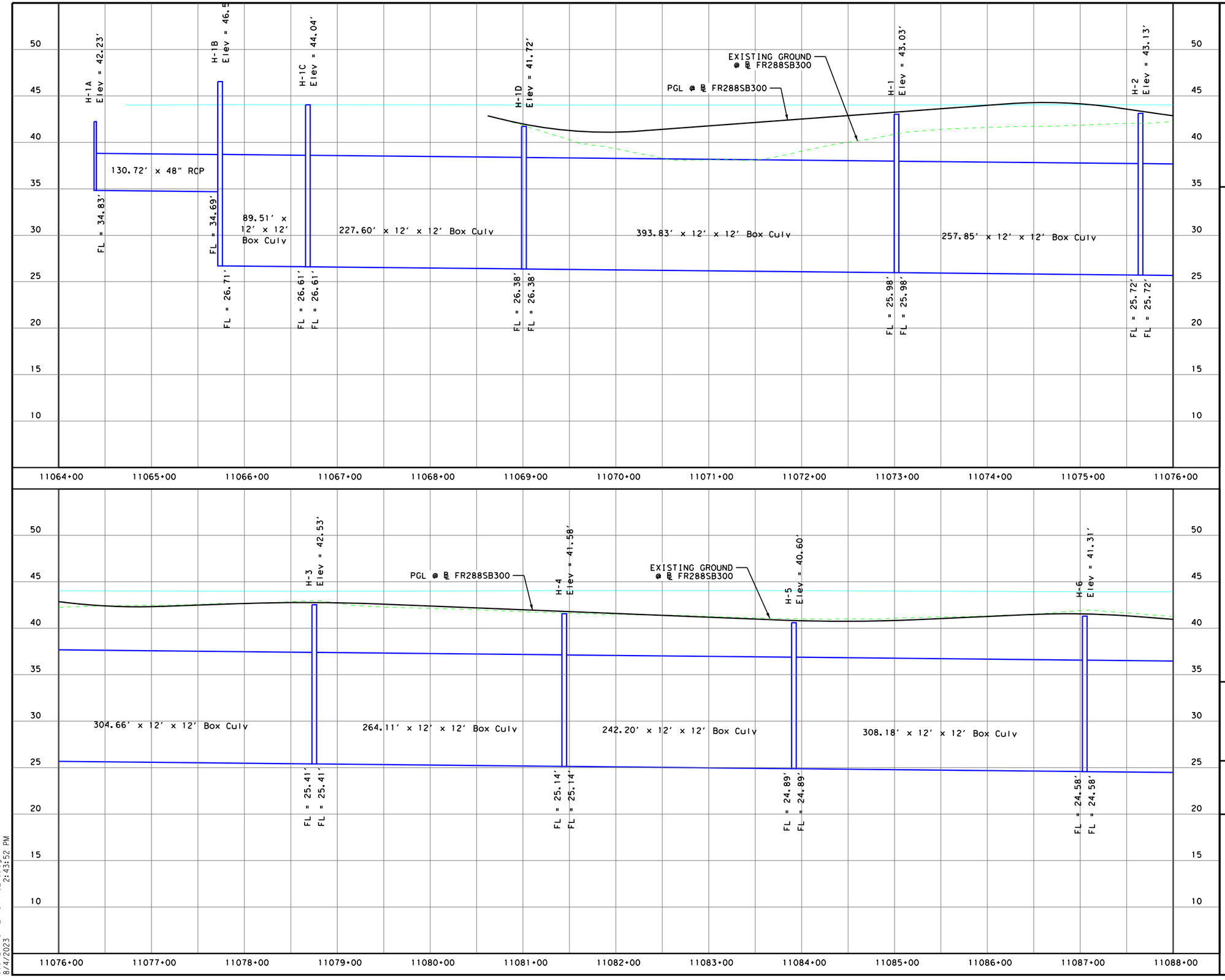

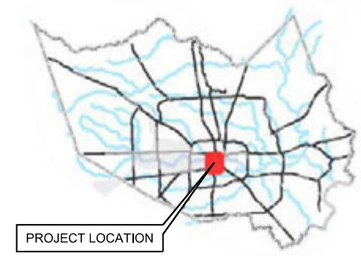

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Hamilton Street Collector
Sta. 11064+00 to Sta. 11088+00

August 2023

SHEET 13 OF 18

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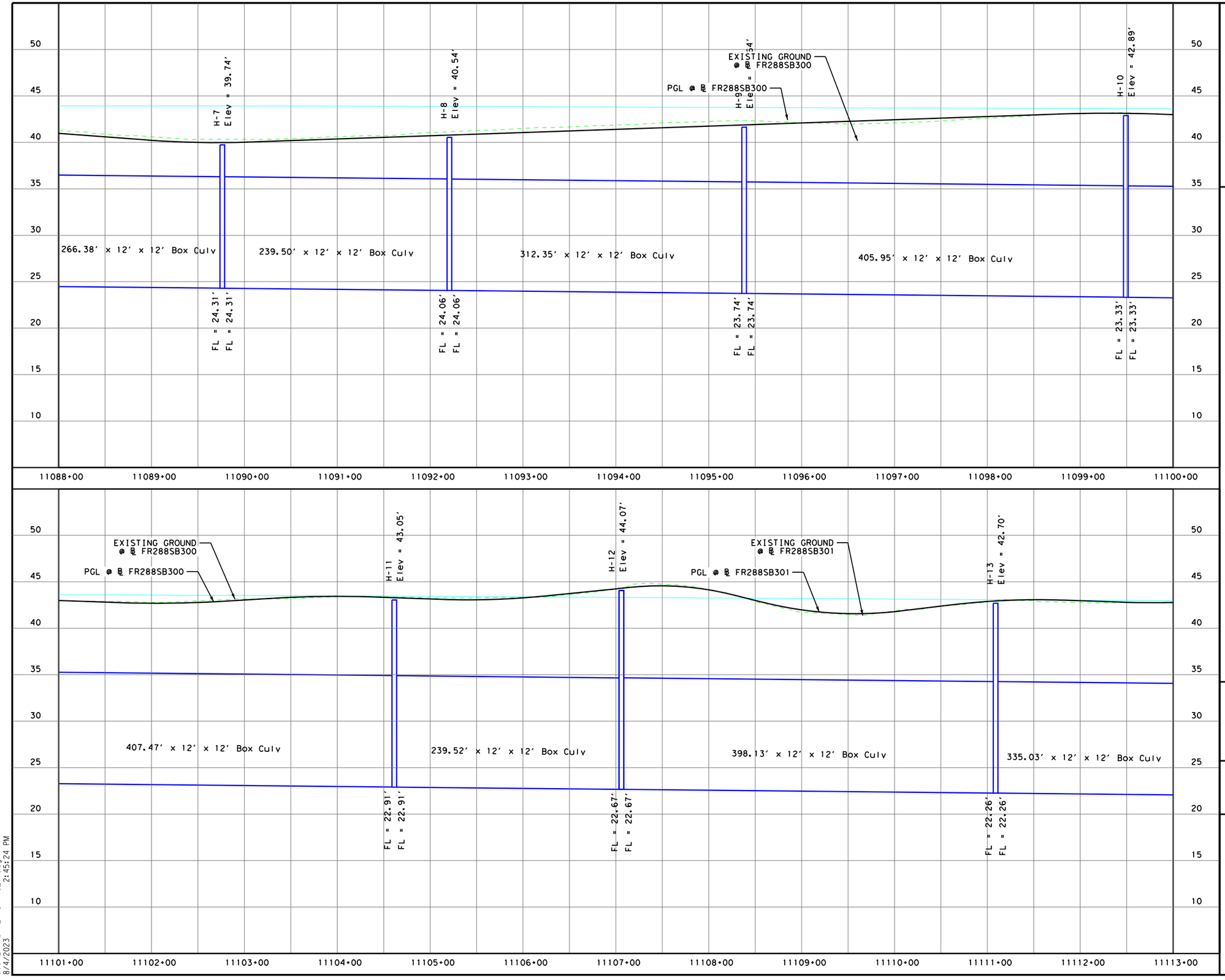

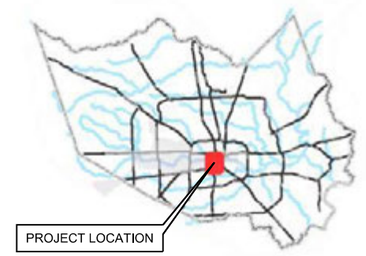

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Hamilton Street Collector
Sta. 11088+00 to Sta. 11113+00

August 2023

SHEET 14 OF 18

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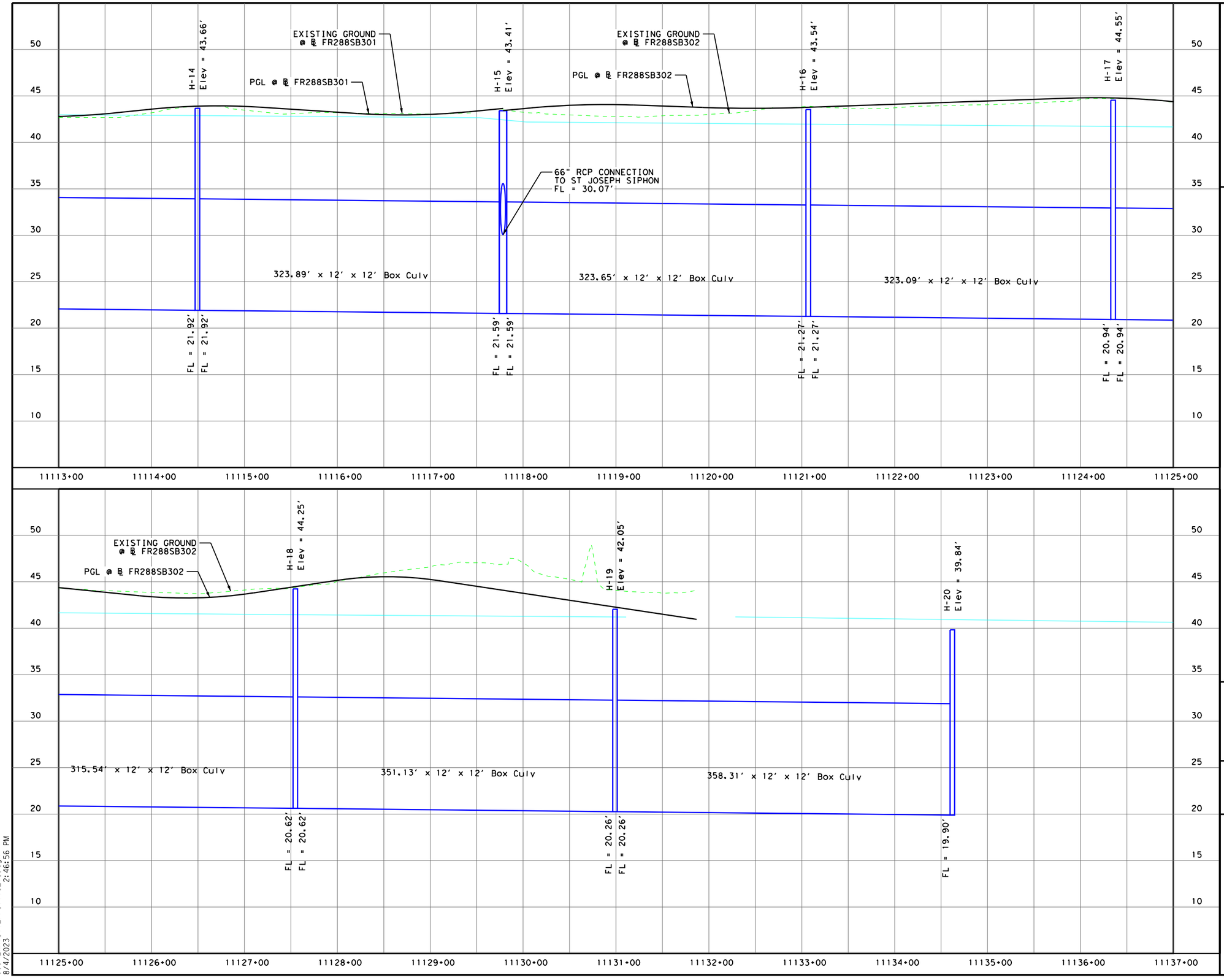

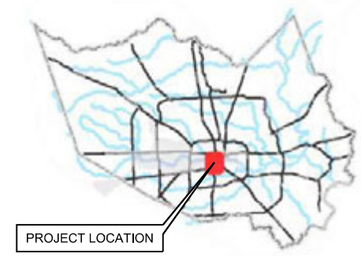

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

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NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Hamilton Street Collector
Sta. 11113+00 to Sta. 11137+00

August 2023

SHEET 15 OF 18

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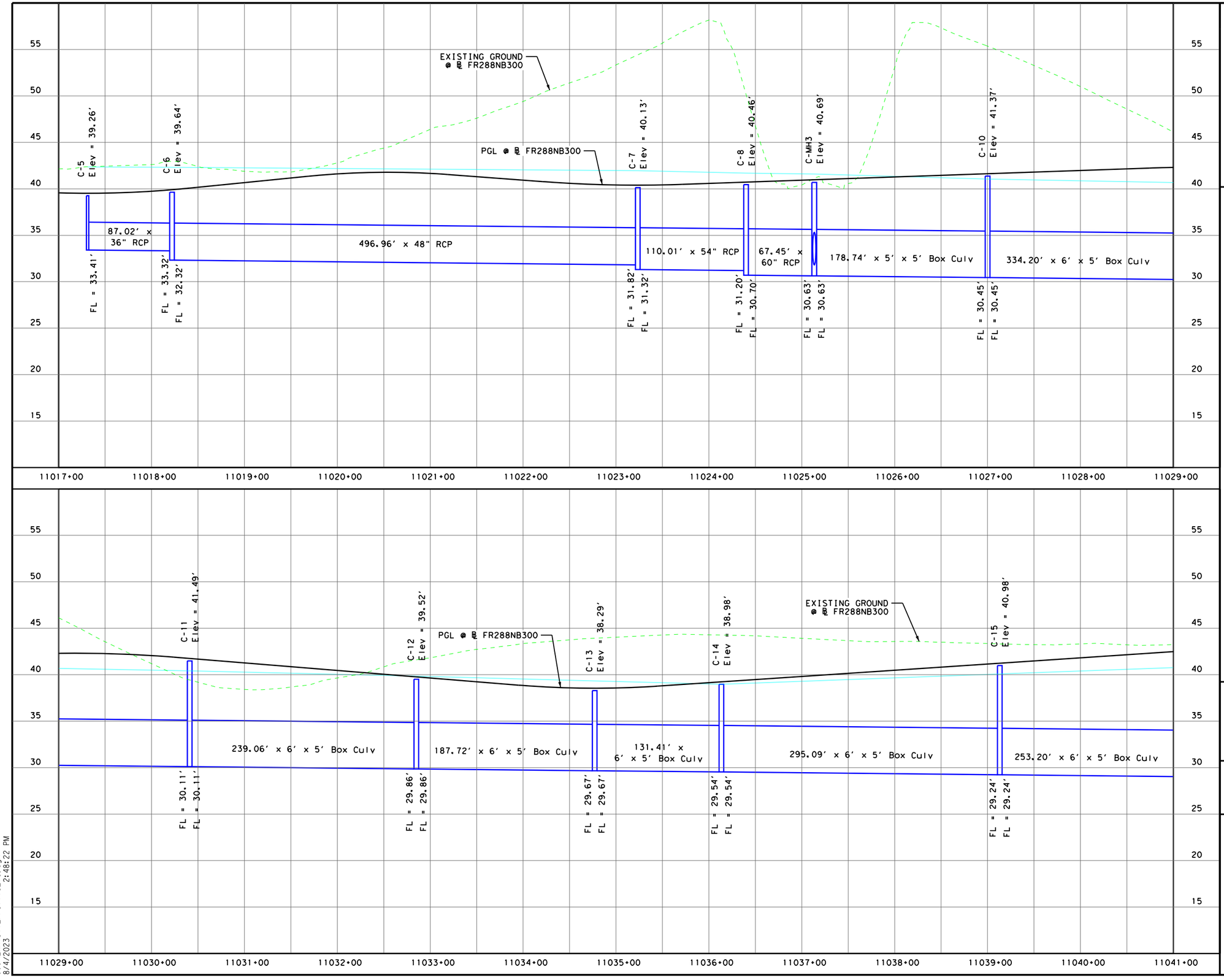

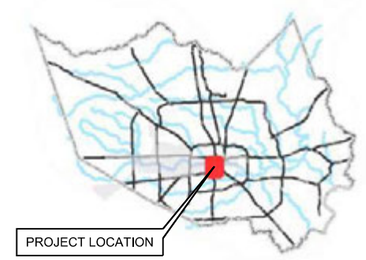

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Chartres Street
Sta. 11017+00 to Sta. 11041+00

August 2023

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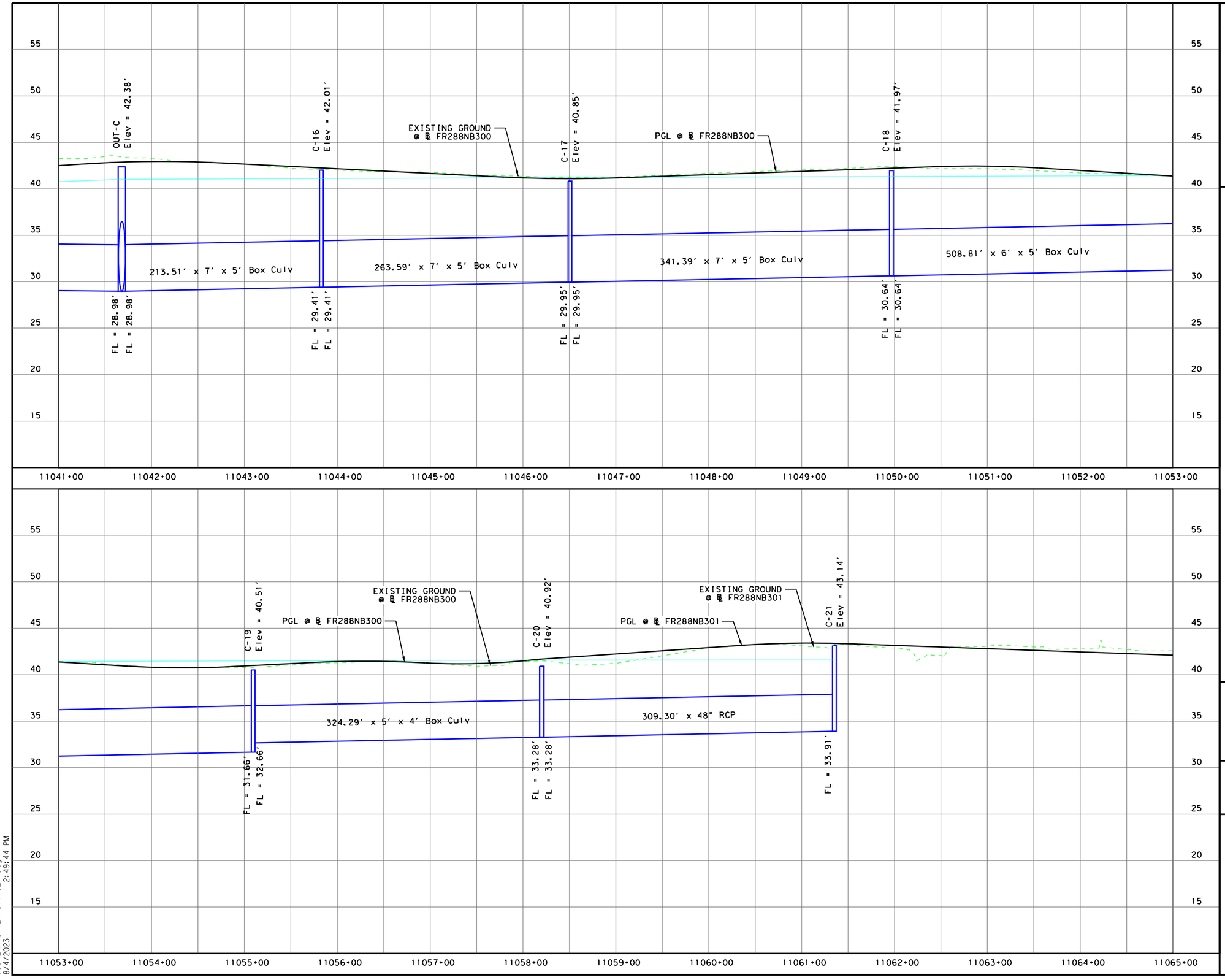

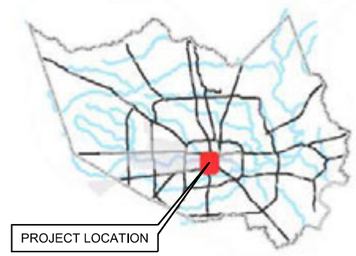

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Chartres Street
Sta. 11041+00 to Sta. 11065+00

August 2023

SHEET 17 OF 18

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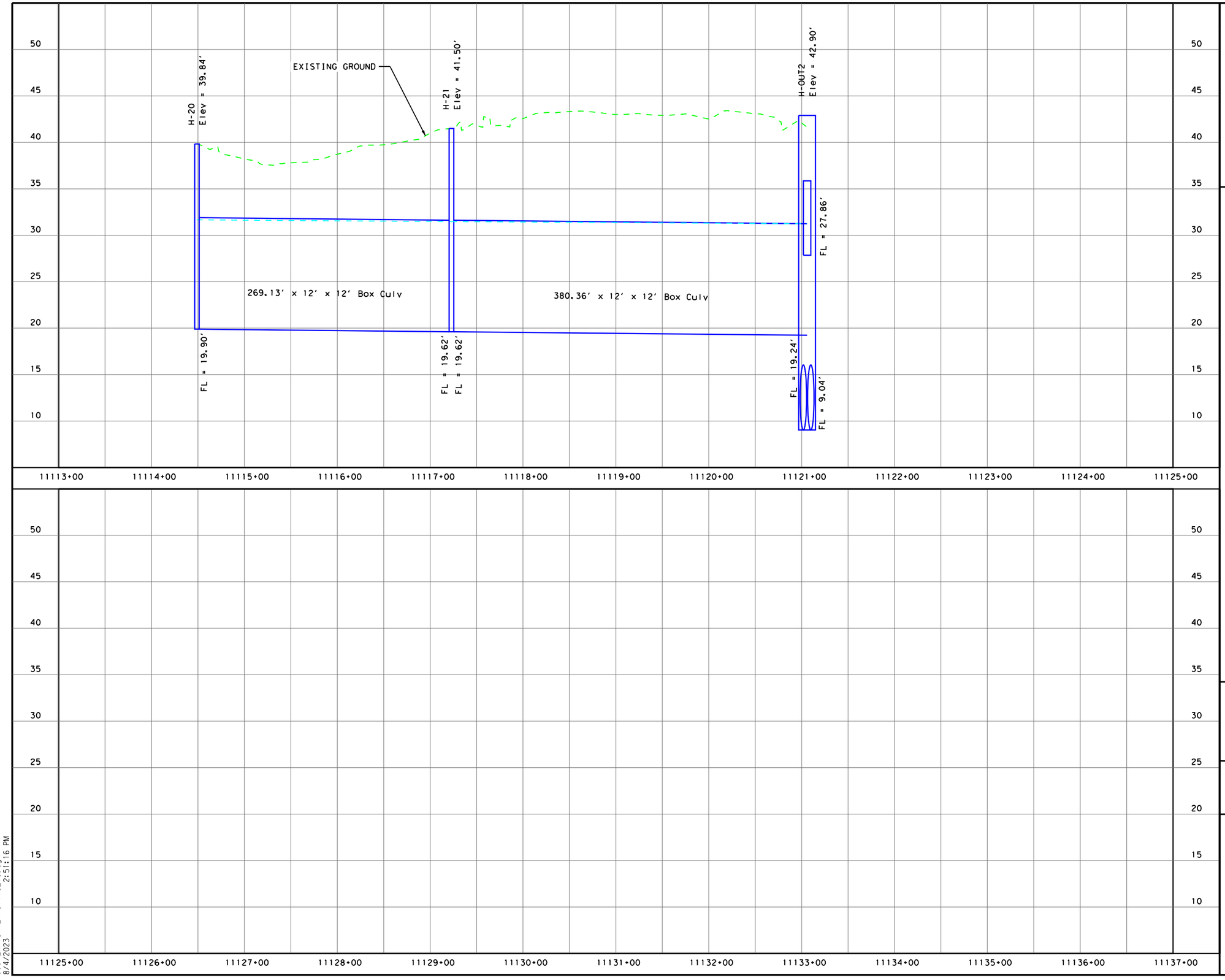

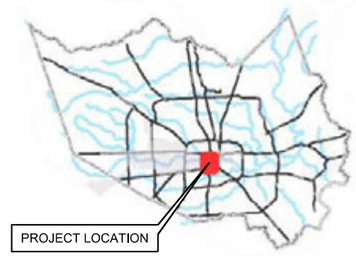

LEGEND

- ROADWAY PROFILE
- PROP STORM SEWER
- 100 YR WSEL

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 5
Proposed Storm Sewer Profile
Lateral Crossing at Polk Street

August 2023

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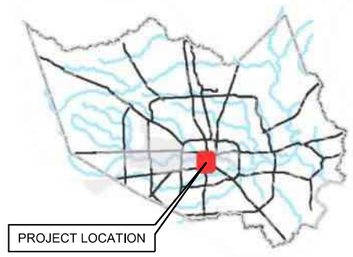
8/4/2023 2:51:16 PM

POND A	
Min Detention Volume Required, ac-ft	235
Detention Volume Provided, ac-ft	251
Floodplain Fill Compensation Volume, ac-ft	20.0
Basin Area, ac	12.79
Top of Pond, ft	31
Toe of Pond, ft	5
Inflow Pipe Size	3-10'x5'
Outflow Pipe Size	36"
Wier Elevation, ft	25
Wier Length, ft	40
Max Discharge, cfs	1207
Total Volume, ac-ft	251
100-year Water Surface Elevation, ft	29.58
Pond Volume Below 100-year WSE, ac-ft	235



Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Pond
- Sheetflow Direction

N

0 50 100

SCALE: 1" = 100'

FIRM REGISTRATION NO. F-230

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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 6
Proposed Detention Basin
Pond A

August 2023

SHEET 1 OF 2

...\Exhibit_Pond A.dgn
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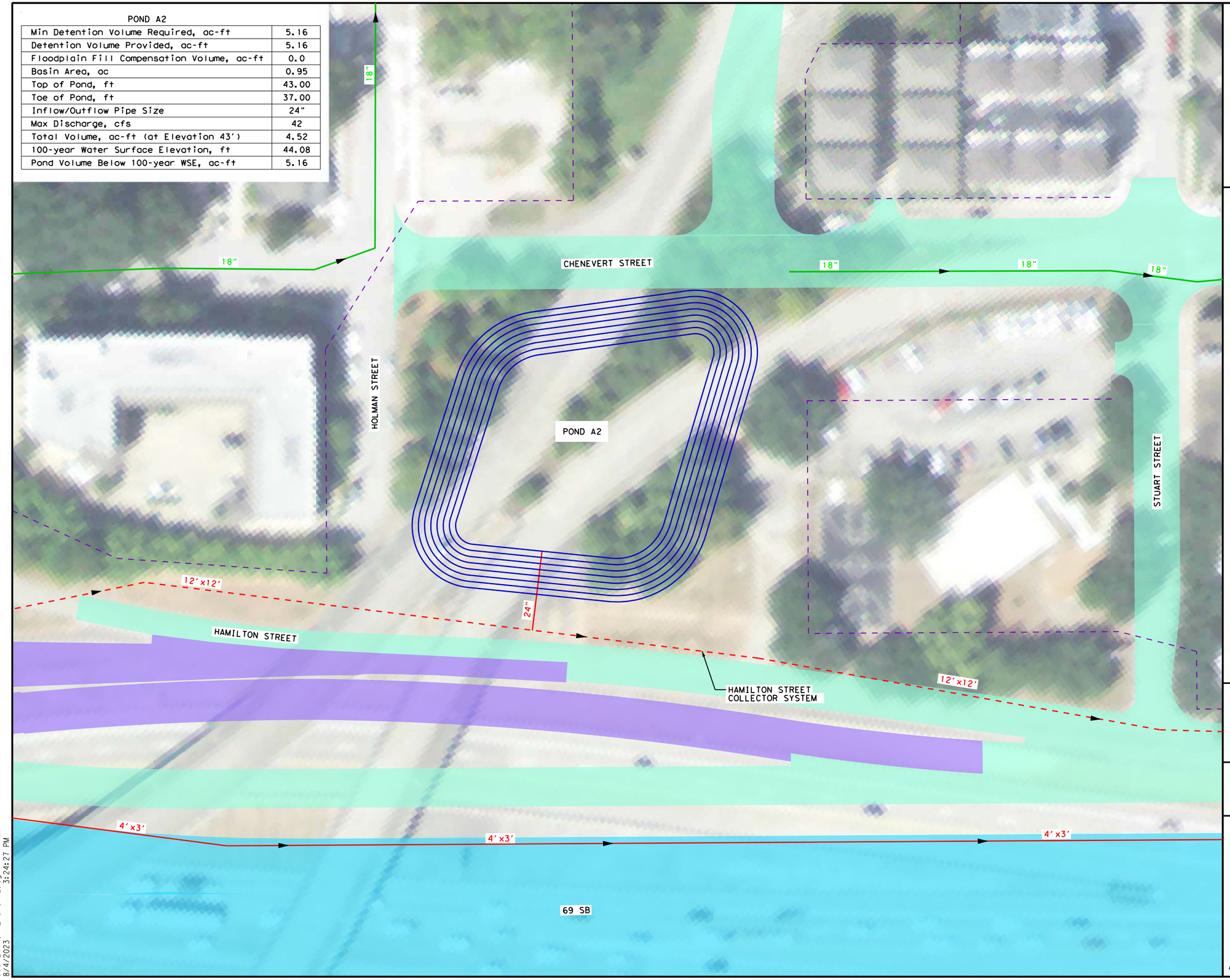
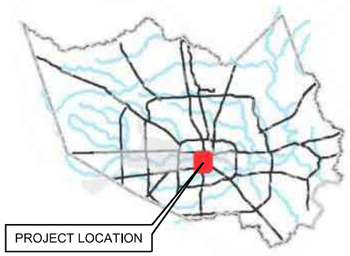
POND A2	
Min Detention Volume Required, ac-ft	5.16
Detention Volume Provided, ac-ft	5.16
Floodplain Fill Compensation Volume, ac-ft	0.0
Basin Area, ac	0.95
Top of Pond, ft	43.00
Toe of Pond, ft	37.00
Inflow/Outflow Pipe Size	24"
Max Discharge, cfs	42
Total Volume, ac-ft (at Elevation 43')	4.52
100-year Water Surface Elevation, ft	44.08
Pond Volume Below 100-year WSE, ac-ft	5.16





Legend

- Existing TXDOT ROW
- Proposed TXDOT ROW
- Existing Storm Sewer
- Proposed Storm Sewer Lines
- Proposed Collector Systems
- Proposed Drainage Areas
- Pond
- Sheetflow Direction

Proposed Roadways

- I-69/US 59 Mainlanes
- Frontage/Local Roads
- Ramps

N

0 30 60

SCALE: 1" = 60'

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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Drainage Study Report
NHHIP Segement 3B

EXHIBIT 6
Proposed Detention Basin
Pond A2

August 2023 SHEET 2 OF 2

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APPENDIX A

NHHIP 3B Proposed Schematic

FILE LOCATION: \\hoxw00\Jobs\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\20230417 - IDCUS Final Revised Schematic\DGN_HNTB Modified\NHHIP_I69_SH288 Interchange_RE_PP01_SH288.dgn DATE: 5/17/2023 TIME: 9:17:16 AM SCALE: 100.0000 ft / in. PEN TABLE: \\hoxw00\Jobs\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\202304

PREPARED BY: shartshorn

HOUSTON DISTRICT
PROJECT DEVELOPMENT

SCHEMATIC DESIGN - SH 288

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

SCHEMATIC DESIGN

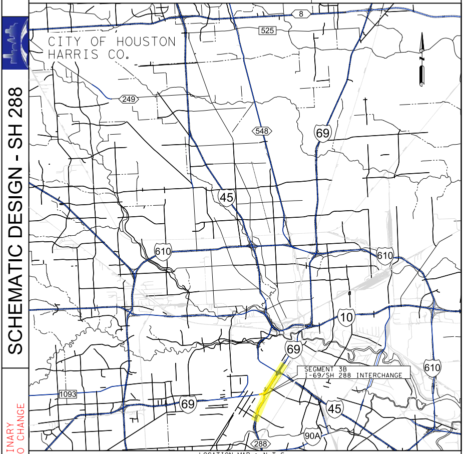
NHHIP
I-69/SH 288 INTERCHANGE
(SH 288)

COUNTY: HARRIS
LIMITS FROM: BLODGETT ST
LIMITS TO: MCGOWEN ST
DATE: 5/17/2023
CONSTRUCTION CSJ: 0027-13-200, 0027-13-221, 0598-01-109

SCHEMATIC DESIGN -SH 288

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200
VERT SCALE: 1"=20'
0 5 10 20



CITY OF HOUSTON
HARRIS CO.
8
525
249
548
69
45
610
10
SEGMENT 3B
I-69/SH 288 INTERCHANGE
1093
90A
288

LOCATION MAP : N.T.S.
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

PLAN LEGEND

SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR CODE	
CENTERLINE			— · —	2	BLACK	0
I-45 MAINLANES	🟨	🟥	—	2	BLACK	0
I-69/US 59 MAINLANES	🟦	▬	—	2	BLACK	0
I-10 MAINLANES	🟩	🟪	—	2	BLACK	0
SH 288 MAINLANES	🟪	▬	—	2	BLACK	0
I-610 MAINLANES	🟩	▬	—	2	BLACK	0
I-10 EXPRESS LANES	🟦	🟪	—	2	PINK	10
MAX LANES	🟪	🟪	—	2	PINK	28
LOCAL STREETS	▭	▬	—	2	BLUE	1
RAMPS	🟦	▬	—	2	RED	3
DIRECT CONNECTOR	🟧	▬	—	2	MAGENTA	5
PEDESTRIAN REALM	▬	▭	—	1	GREEN	155
EXISTING RDWY TO REMAIN	▬	▬	—	2		
HIGHWAY CAP/POTENTIAL OPEN SPACE			▨	7		
EXISTING RDWY TO BE REMOVED			▨	1		
SURPLUS ROW			▨	3	RED	3
CONVENTION CENTER STORAGE			▨	5	PURPLE	62
PROPOSED CONTROL OF ACCESS			—⊩—	0	RED	3
PROPOSED FEIS ROW			— - —	6	BLUE	126
EXISTING ROW			- - -	1	YELLOW	4
ACCESS ROAD			······	1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)			++++	1	RED	3
METRO RAIL(EAST END LINE)			++++	1	GREEN	156
METRO RAIL(SOUTHEAST LINE)			++++	1	PURPLE	203
RAILROAD			++++	1	BLACK	0
LIMITS OF FLOODWAY			—	1	BLUE	171
PLANIMETRIC			✿	2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			0000	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES			⇨	0	BLACK	0
TURNAROUNDS			⇨	0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES			➡	1	BLACK	0
TURNAROUNDS			➡	1	BLUE	168
RAMPS			➡	1	RED	3
DIRECT CONNECTOR			➡	1	RED	139
MAX LANES			➡	1	MAGENTA	5
DEPRESSED			—^—^—	3	RED	3
BY OTHERS			- - -	3	BLUE	1
RETAINING WALL			—	6	RED	3
PROPOSED AESTHETIC WALL			—	6	PURPLE	203
PROPOSED NOISE BARRIER			—	6	LT GREEN	196

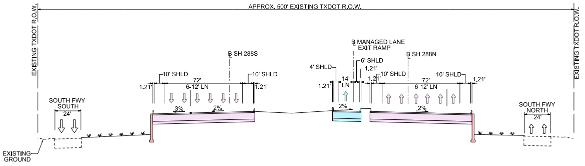
STEPHEN A. HRNCIR
67245
06/19/2023

TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVE ("APPROVED BY")
LETTER DATED

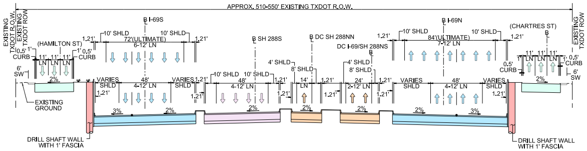
SHEET 1 OF 8

1
8



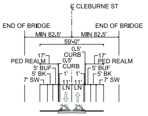
APPROX. 500' EXISTING TXDOT R.O.W.
EXISTING TXDOT R.O.W.
℄ SH 288S
℄ MANAGED LANE EXIT RAMP
℄ SH 288N
10' SHLD
72'
6-12' LN
4' SHLD
6' SHLD
14' LN
1.21'
3%
2%
SOUTH FWY SOUTH 24'
SOUTH FWY NORTH 24'
EXISTING GROUND

PROP. TYPICAL SECTION A-A
NTS



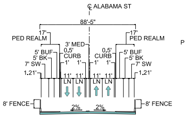
APPROX. 510-550' EXISTING TXDOT R.O.W.
EXISTING TXDOT ROW
℄ I-69S
℄ SH 288S
℄ DC SH 288NN
DC I-69/SH 288NS
℄ I-69N
(HAMILTON ST)
(CHARTRES ST)
10' SHLD
72'(ULTIMATE)
84'(ULTIMATE)
6-12' LN
7-12' LN
48'
4-12' LN
VARIES SHLD
8' SHLD
4' SHLD
24'
2-12' LN
14' LN
0.5' CURB
1' CURB
6' SW
EXISTING GROUND
DRILL SHAFT WALL WITH 1' FASCIA

PROP. TYPICAL SECTION B-B
NTS



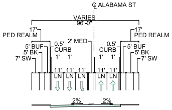
℄ CLEBURNE ST
END OF BRIDGE
MIN 82.5'
59'-0"
PED REALM
17'
0.5' CURB
5' BUF
5' BK
7' SW
11' LN

PROP. TYPICAL SECTION
CLEBURNE ST
NTS



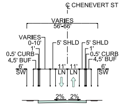
℄ ALABAMA ST
88'-5"
PED REALM
3' MED
5' BUF
5' BK
7' SW
8' FENCE
1.21'

PROP. BRIDGE TYPICAL SECTION
ALABAMA ST
NTS



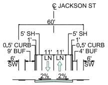
℄ ALABAMA ST
VARIES 96'-0"
PED REALM
2' MED
0.5' CURB
5' BUF
5' BK
7' SW

PROP. TYPICAL SECTION
AT NBFR
ALABAMA ST
NTS



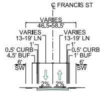
℄ CHENEVERT ST
VARIES 56'-66'
VARIES 0-10'
5' SHLD
0.5' CURB
4.5' BUF
6' SW

PROP. TYPICAL SECTION
CHENEVERT ST
NTS



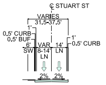
℄ JACKSON ST
60'
5' SH
0.5' CURB
9' BUF
4' BUF
6' SW
11' LN

PROP. TYPICAL SECTION
JACKSON ST
NTS



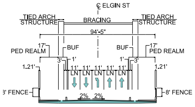
℄ FRANCIS ST
VARIES 46.5-58.5'
VARIES 13-19' LN
0.5' CURB
4.5' BUF
1' BUF
6' SW

PROP. TYPICAL SECTION
FRANCIS ST
NTS



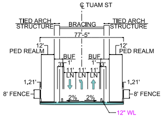
℄ STUART ST
VARIES 31.5-37.5'
0.5' CURB
0.5' BUF
6' SW
VAR 8-14' LN
14' LN

PROP. TYPICAL SECTION
STUART ST
NTS



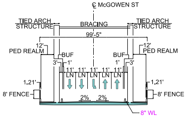
℄ ELGIN ST
TIED ARCH STRUCTURE
BRACING
94'-5"
PED REALM
BUF
17'
3' FENCE
8' FENCE
1.21'

PROP. BRIDGE TYPICAL SECTION
ELGIN ST
NTS



℄ TUAM ST
TIED ARCH STRUCTURE
BRACING
77'-5"
PED REALM
BUF
8' FENCE
12" WL

PROP. BRIDGE TYPICAL SECTION
TUAM ST
NTS



℄ McGOWEN ST
TIED ARCH STRUCTURE
BRACING
99'-5"
PED REALM
BUF
8' FENCE
8" WL

PROP. BRIDGE TYPICAL SECTION
McGOWEN ST
NTS

DC288NN300
PI STATION = 483+73.39
DELTA = 20° 14' 55.04" (LT)
DEGREE OF CURVE = 2° 16' 51.18"
TANGENT = 448.56
LENGTH = 887.75
RADIUS = 2,512.00
PC STATION = 479+24.84
PT STATION = 488+12.59

PI STATION = 527+45.83
DELTA = 2° 45' 21.72" (LT)
DEGREE OF CURVE = 0° 52' 46.48"
TANGENT = 156.70
LENGTH = 313.34
RADIUS = 6,514.00
PC STATION = 525+89.13
PT STATION = 529+02.47

DC288NS300
PI STATION = 304+74.50
DELTA = 21° 21' 41.40" (LT)
DEGREE OF CURVE = 2° 51' 53.24"
TANGENT = 377.21
LENGTH = 745.66
RADIUS = 2,000.00
PC STATION = 300+97.29
PT STATION = 308+42.95

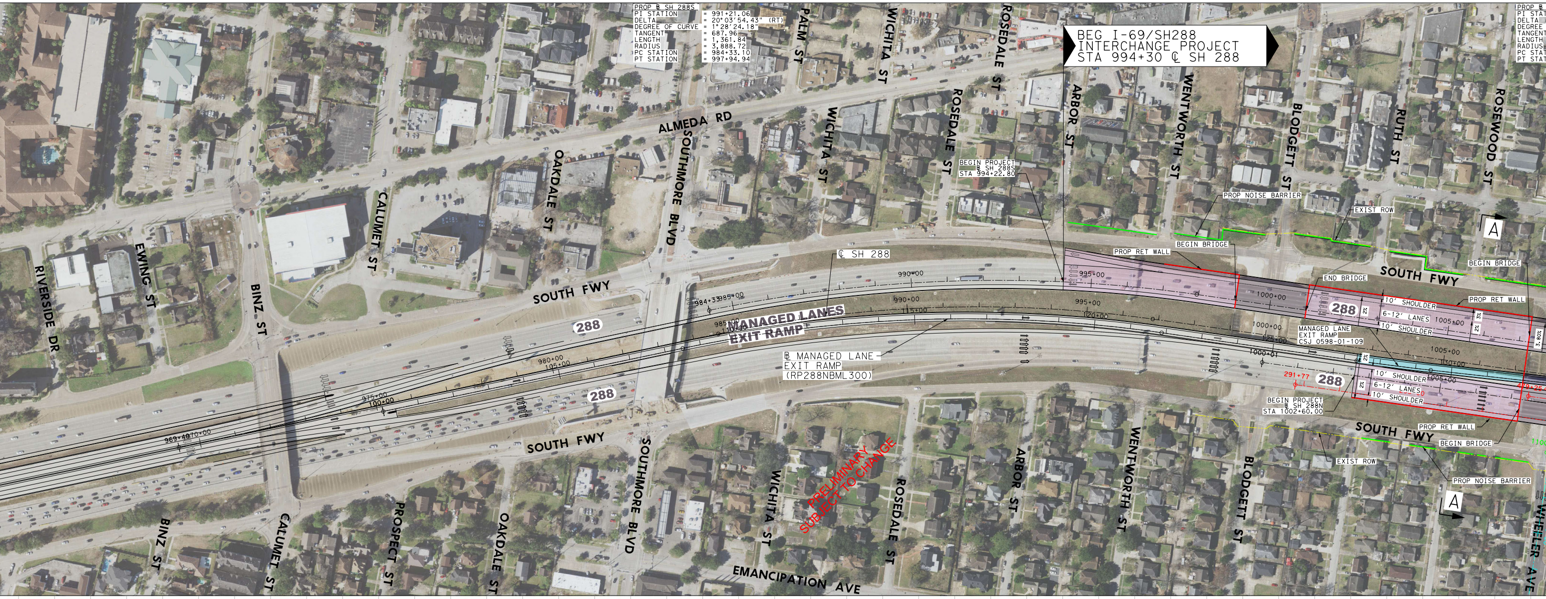
RP288NBML300
PI STATION = 115+25.83
DELTA = 20° 03' 54.43" (RT)
DEGREE OF CURVE = 1° 29' 59.60"
TANGENT = 675.81
LENGTH = 1,337.77
RADIUS = 3,820.00
PC STATION = 108+50.02
PT STATION = 121+87.79

DC069NS301
PI STATION = 416+63.24
DELTA = 3° 26' 18.54" (LT)
DEGREE OF CURVE = 0° 42' 53.81"
TANGENT = 240.54
LENGTH = 480.94
RADIUS = 8,014.00
PC STATION = 414+22.70
PT STATION = 419+03.64

DC288NS302
PI STATION = 112+34.64
DELTA = 3° 22' 18.88" (RT)
DEGREE OF CURVE = 1° 53' 49.96"
TANGENT = 88.89'
LENGTH = 177.73'
RADIUS = 3020.00'
PC STATION = 111+45.75
PT STATION = 113+23.48

PROFILE LEGEND

PROP. PGL @ CL/NB/EB MAINLANE	—
PROP. PGL @ SB/WB MAINLANE	— —
PROP. PGL @ MAX LANES	—
EXISTING GROUND @ PGL	— · —
100 YR. W.S.E.	▽
PROP. PGL @ NB/EB RAMP	—
PROP. PGL @ SB/WB RAMP	— —
PROP. PGL @ NB/EB DC	—
PROP. PGL @ SB/WB DC	— —
PROP. PGL @ NB/EB FRONTAGE	—
PROP. PGL @ SB/WB FRONTAGE	— —
PROP. PGL @ LOCAL ST	—
EXIST. GRND. @ NB/EB ROW	- - -
EXIST. GRND. @ SB/WB ROW	- - -


ALMEDA RD
SOUTH FWY
SOUTH FWY
SOUTH FWY
SOUTH FWY
RIVERSIDE DR
EWING ST
BINZ ST
BINZ ST
CALUMET ST
CALUMET ST
OAKDALE ST
OAKDALE ST
PROSPECT ST
SOUTHMORE BLVD
SOUTHMORE BLVD
PALM ST
WICHITA ST
WICHITA ST
WICHITA ST
ROSEDALE ST
ROSEDALE ST
ROSEDALE ST
ARBOR ST
ARBOR ST
WENTWORTH ST
WENTWORTH ST
BLODGETT ST
BLODGETT ST
RUTH ST
ROSEWOOD ST
WHEELER AVE
EMANCIPATION AVE
288
288
288
288
℄ SH 288
MANAGED LANES
EXIT RAMP
℄ MANAGED LANE
EXIT RAMP
(RP288NBML300)
BEGIN PROJECT
℄ SH 288S
STA 994+22.80
PROP NOISE BARRIER
EXIST ROW
PROP RET WALL
BEGIN BRIDGE
END BRIDGE
BEGIN BRIDGE
PROP RET WALL
10' SHOULDER
6-12' LANES
10' SHOULDER
MANAGED LANE
EXIT RAMP
CSJ 0598-01-109
10' SHOULDER
6-12' LANES
10' SHOULDER
BEGIN PROJECT
℄ SH 288N
STA 1002+60.00
PROP RET WALL
BEGIN BRIDGE
EXIST ROW
PROP NOISE BARRIER
A
A
2%
3%
3.80%
969+49
970+00
975+00
100+00
980+00
105+00
984+33
985+00
990+00
990+00
115+00
995+00
995+00
120+00
1000+00
1000+00
125+00
1000+01
1005+00
1005+00
130+00
291+77
PRELIMINARY
SUBJECT TO CHANGE

BEG I-69/SH288
INTERCHANGE PROJECT
STA 994+30 ℄ SH 288

PROP ℄ SH 288S
PI STATION = 991+21.06
DELTA = 20°03'54.43" (RT)
DEGREE OF CURVE = 1°28'24.18"
TANGENT = 687.96
LENGTH = 1,361.84
RADIUS = 3,888.72
PC STATION = 984+33.10
PT STATION = 997+94.94

PI STATION = 501+11.20
DELTA = 20° 11' 07.68" (RT)
DEGREE OF CURVE = 1° 53' 22.93"
TANGENT = 539.68
LENGTH = 1,068.18
RADIUS = 3,032.00
PC STATION = 495+71.52
PT STATION = 506+39.70

PI STATION = 510+49.67
DELTA = 1° 51' 07.80" (RT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 105.07
LENGTH = 210.12
RADIUS = 6,500.00
PC STATION = 509+44.60
PT STATION = 511+54.72

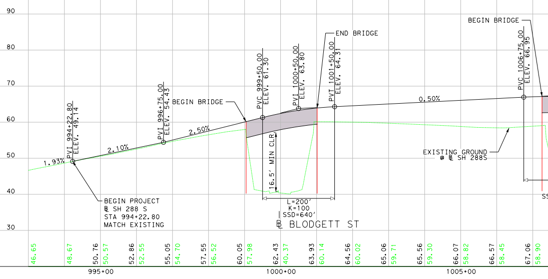
PI STATION = 512+49.54
DELTA = 1° 40' 04.53" (LT)
DEGREE OF CURVE = 0° 52' 46.48"
TANGENT = 94.82
LENGTH = 189.63
RADIUS = 6,514.00
PC STATION = 511+54.72
PT STATION = 513+44.35

PI STATION = 524+33.97
DELTA = 2° 44' 09.32" (RT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 155.22
LENGTH = 310.38
RADIUS = 6,500.00
PC STATION = 522+78.75
PT STATION = 525+89.13

PI STATION = 557+81.11
DELTA = 7° 18' 40.95" (RT)
DEGREE OF CURVE = 0° 42' 55.09"
TANGENT = 511.76
LENGTH = 1,022.14
RADIUS = 8,010.00
PC STATION = 552+69.34
PT STATION = 562+91.48

PI STATION = 320+85.49
DELTA = 111° 29' 20.22" (LT)
DEGREE OF CURVE = 9° 00' 31.57"
TANGENT = 933.90
LENGTH = 1237.56
RADIUS = 636.00
PC STATION = 311+51.59
PT STATION = 323+89.15

PI STATION = 330+94.18
DELTA = 3° 56' 27.64" (RT)
DEGREE OF CURVE = 0° 53' 42.89"
TANGENT = 220.19
LENGTH = 440.22
RADIUS = 6,400.00
PC STATION = 328+73.99
PT STATION = 333+14.20


90
80
70
60
50
40
30
PVI 994+22.80
ELEV. 49.14
PVI 996+75.00
ELEV. 54.43
BEGIN BRIDGE
PVC 999+50.00
ELEV. 61.30
PVI 1000+50.00
ELEV. 63.80
END BRIDGE
PVT 1001+50.00
ELEV. 64.31
PVC 1006+75.00
ELEV. 66.95
BEGIN BRIDGE
1.93%
2.10%
2.50%
0.50%
16.5' MIN CLR
L=200'
K=100
SSD=640'
℄ BLODGETT ST
EXISTING GROUND
@ ℄ SH 288S
BEGIN PROJECT
℄ SH 288 S
STA 994+22.80
MATCH EXISTING
46.65
48.67
50.76
50.57
52.86
52.55
55.05
54.70
57.55
56.52
60.05
57.98
62.43
40.37
63.93
60.14
64.56
60.02
65.06
59.71
65.56
59.30
66.07
58.82
66.57
58.45
67.06
58.90
995+00
1000+00
1005+00

PI STATION = 128+38.62
DELTA = 1° 49' 43.31" (LT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 103.74
LENGTH = 207.46
RADIUS = 6,500.00
PC STATION = 127+34.88
PT STATION = 129+42.34

PI STATION = 138+04.56
DELTA = 18° 27' 38.65" (LT)
DEGREE OF CURVE = 2° 17' 04.27"
TANGENT = 407.57
LENGTH = 808.08
RADIUS = 2,508.00
PC STATION = 133+96.99
PT STATION = 142+05.07

PI STATION = 421+87.93
DELTA = 3° 34' 59.88" (RT)
DEGREE OF CURVE = 1° 13' 27.37"
TANGENT = 146.39
LENGTH = 292.69
RADIUS = 4,680.00
PC STATION = 420+41.54
PT STATION = 423+34.23

PI STATION = 455+46.82
DELTA = 90° 34' 06.23" (RT)
DEGREE OF CURVE = 7° 38' 21.97"
TANGENT = 757.48
LENGTH = 1,185.54
RADIUS = 750.00
PC STATION = 447+89.34
PT STATION = 459+74.88

PI STATION = 469+65.45
DELTA = 4° 09' 16.01" (RT)
DEGREE OF CURVE = 0° 53' 03.10"
TANGENT = 235.03
LENGTH = 469.86
RADIUS = 6,480.00
PC STATION = 467+30.41
PT STATION = 472+00.27

PI STATION = 474+94.69
DELTA = 3° 27' 31.40" (LT)
DEGREE OF CURVE = 0° 52' 51.35"
TANGENT = 196.37
LENGTH = 392.62
RADIUS = 6,504.00
PC STATION = 472+98.32
PT STATION = 476+90.94

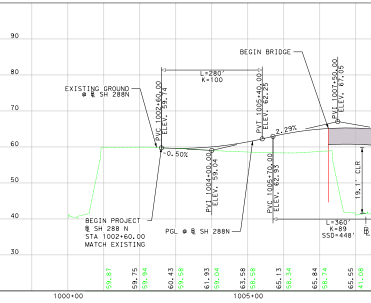
PI STATION = 479+53.00
DELTA = 0° 36' 18.51" (RT)
DEGREE OF CURVE = 0° 53' 10.98"
TANGENT = 34.14
LENGTH = 68.27
RADIUS = 6,464.00
PC STATION = 479+18.87
PT STATION = 479+87.14

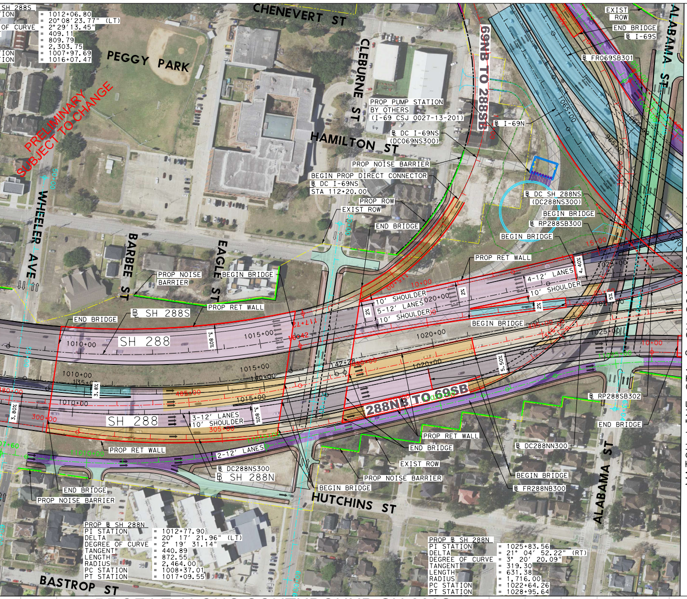
PI STATION = 483+83.31
DELTA = 0° 28' 22.85" (LT)
DEGREE OF CURVE = 0° 30' 51.57"
TANGENT = 45.98
LENGTH = 91.97
RADIUS = 11,140.00
PC STATION = 483+37.33
PT STATION = 484+29.30

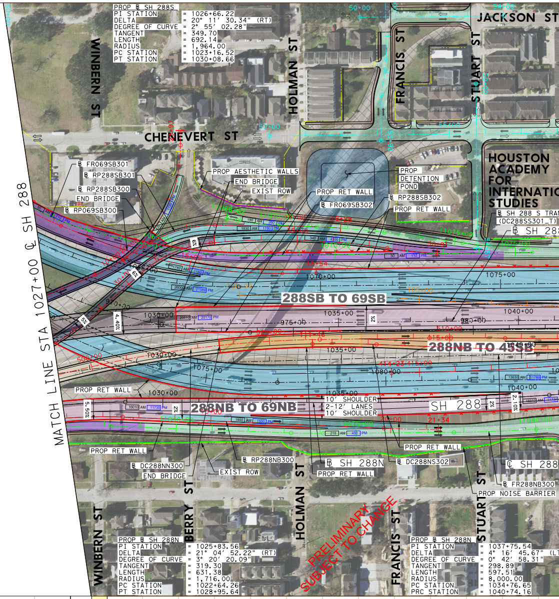
PI STATION = 117+18.87
DELTA = 2° 48' 05.82" (LT)
DEGREE OF CURVE = 0° 52' 46.48"
TANGENT = 159.29'
LENGTH = 318.52'
RADIUS = 6514.00'
PC STATION = 115+59.58
PT STATION = 118+78.10

PI STATION = 122+45.68
DELTA = 2° 48' 07.73" (RT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 158.98'
LENGTH = 317.89'
RADIUS = 6500.00'
PC STATION = 120+86.71
PT STATION = 124+04.60

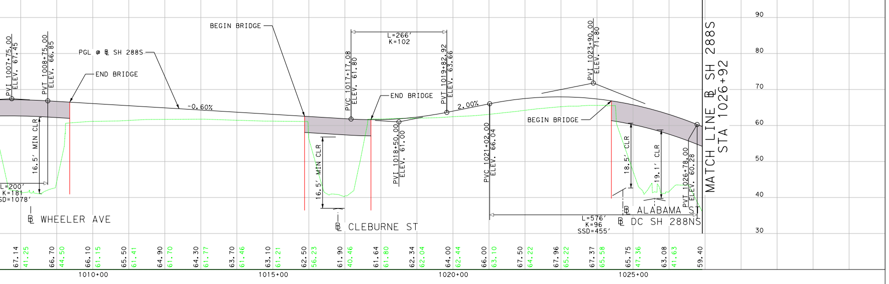
PI STATION = 125+67.12
DELTA = 2° 51' 30.17" (LT)
DEGREE OF CURVE = 0° 52' 46.48"
TANGENT = 162.52'
LENGTH = 324.97'
RADIUS = 6514.00'
PC STATION = 124+04.60
PT STATION = 127+29.57

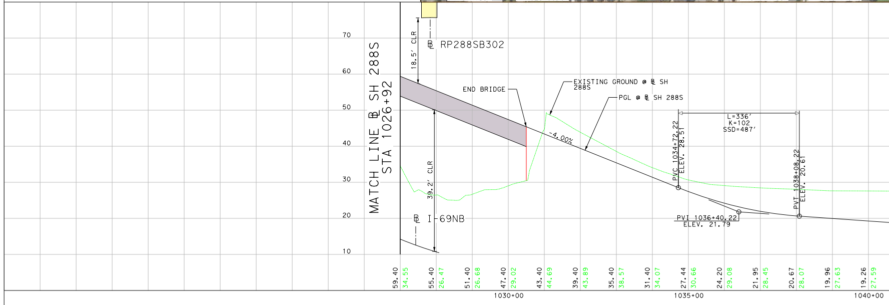

90
80
70
60
50
40
30
EXISTING GROUND
@ ℄ SH 288N
L=280'
K=100
PVC 1002+60.00
ELEV. 59.74
-0.50%
PVI 1004+00.00
ELEV. 59.04
PVT 1005+40.00
ELEV. 62.25
PVC 1005+70.00
ELEV. 62.93
2.29%
BEGIN BRIDGE
PVI 1007+50.00
ELEV. 67.05
19.1' CLR
L=360'
K=89
SSD=448'
BEGIN PROJECT
℄ SH 288 N
STA 1002+60.00
MATCH EXISTING
PGL @ ℄ SH 288N
59.87
59.75
59.94
60.43
59.58
61.93
59.04
63.58
58.58
65.13
58.34
65.84
58.74
65.55
41.08
1000+00
1005+00


SH 288S
TION = 1012+06.80
= 20°08′23.77″ (LT)
OF CURVE = 2°29′13.45″
= 409.11
= 809.79
= 2,303.75
TION = 1007+97.69
TION = 1016+07.47
PEGGY PARK
PRELIMINARY
SUBJECT TO CHANGE
CHENEVERT ST
CLEBURNE ST
HAMILTON ST
WHEELER AVE
BARBEE ST
EAGLE ST
HUTCHINS ST
BASTROP ST
ALABAMA ST
69NB TO 288SB
288NB TO 69SB
SH 288
PROP PUMP STATION BY OTHERS (I-69 CSJ 0027-13-201)
℄ DC I-69NS (DC069NS300)
PROP NOISE BARRIER
BEGIN PROP DIRECT CONNECTOR ℄ DC I-69NS STA 112+20.00
PROP ROW
EXIST ROW
END BRIDGE
BEGIN BRIDGE
PROP RET WALL
℄ DC 288NS (DC288NS300)
℄ RP288SB300
℄ FR069SB301
℄ I-69N
℄ I-69S
℄ SH 288S
℄ SH 288N
℄ DC288NS300
℄ DC288NN300
℄ RP288SB302
℄ FR288NB300
4-12′ LANES
10′ SHOULDER
5-12′ LANES
3-12′ LANES
2-12′ LANES
PROP ℄ SH 288N
PI STATION = 1012+77.90
DELTA = 20° 17′ 21.96″ (LT)
DEGREE OF CURVE = 2° 19′ 31.14″
TANGENT = 440.89
LENGTH = 872.55
RADIUS = 2,464.00
PC STATION = 1008+37.01
PT STATION = 1017+09.55
PROP ℄ SH 288N
PI STATION = 1025+83.56
DELTA = 21° 04′ 52.22″ (RT)
DEGREE OF CURVE = 3° 20′ 20.09″
TANGENT = 319.30
LENGTH = 631.38
RADIUS = 1,716.00
PC STATION = 1022+64.26
PT STATION = 1028+95.64
MATCH LINE STA 1027+00.00 ℄ SH 288

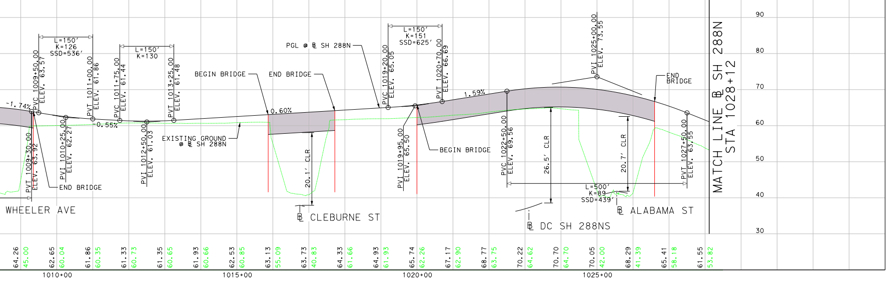

PROP ℄ SH 288S
PI STATION = 1026+66.22
DELTA = 20° 11′ 30.34″ (RT)
DEGREE OF CURVE = 2° 55′ 02.28″
TANGENT = 349.70
LENGTH = 692.14
RADIUS = 1,964.00
PC STATION = 1023+16.52
PT STATION = 1030+08.66
MATCH LINE STA 1027+00 ℄ SH 288
WINBERN ST
HOLMAN ST
FRANCIS ST
STUART ST
JACKSON ST
CHENEVERT ST
BERRY ST
HOUSTON ACADEMY FOR INTERNATIONAL STUDIES
288SB TO 69SB
288NB TO 45SB
288NB TO 69NB
SH 288
PROP AESTHETIC WALLS
PROP DETENTION POND
PROP RET WALL
END BRIDGE
EXIST ROW
℄ FR069SB301
℄ RP288SB301
℄ RP288SB300
℄ RP069SB300
℄ FR069SB302
℄ RP288SB302
℄ DC288NN300
℄ RP288NB300
℄ DC288NS302
℄ SH 288N
℄ FR288NB300
PROP NOISE BARRIER
10′ SHOULDER
2-12′ LANES
PRELIMINARY
SUBJECT TO CHANGE
PROP ℄ SH 288N
PI STATION = 1037+75.54
DELTA = 4° 16′ 45.67″ (LT)
DEGREE OF CURVE = 0° 42′ 58.31″
TANGENT = 298.89
LENGTH = 597.51
RADIUS = 8,000.00
PC STATION = 1034+76.65
PRC STATION = 1040+74.16

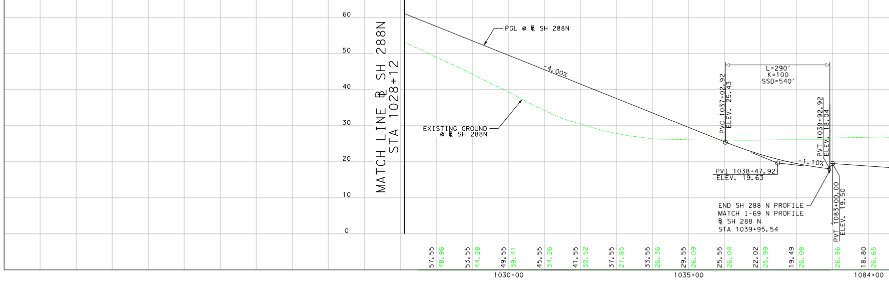
PROFILE ALONG SOUTHBOUND SH 288S

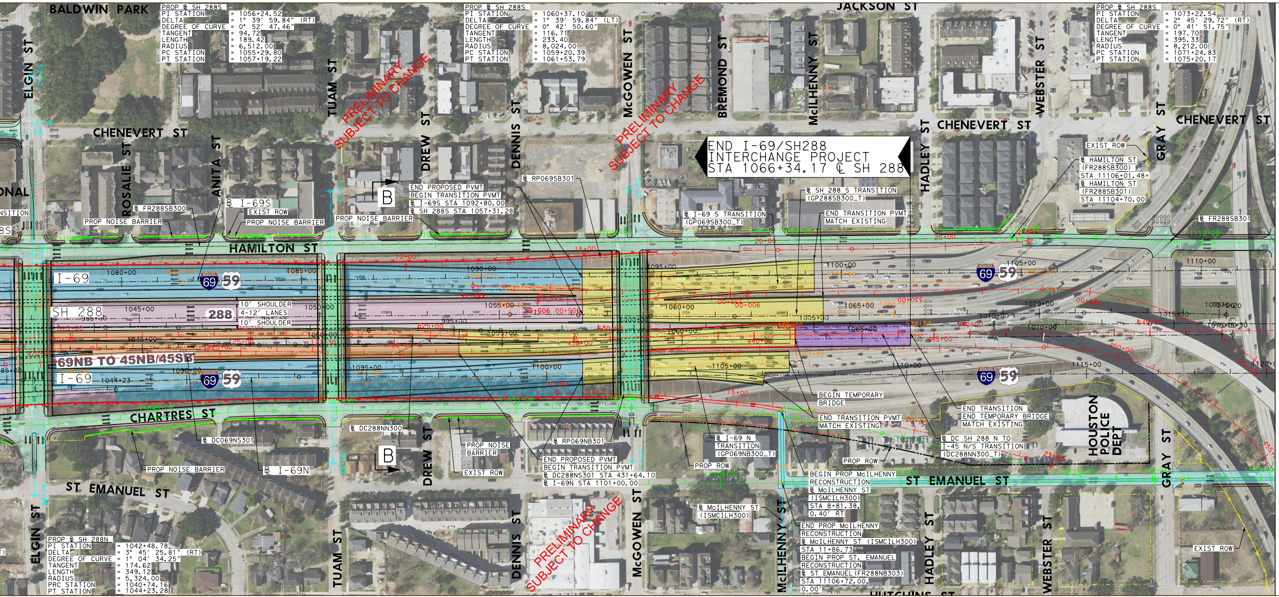

PGL @ ℄ SH 288S
END BRIDGE
BEGIN BRIDGE
PVI 1007+75.00 ELEV. 67.45
PVT 1008+75.00 ELEV. 66.85
16.5′ MIN CLR
L=200′ K=181 SSD=1078′
℄ WHEELER AVE
-0.60%
16.5′ MIN CLR
PVC 1017+17.08 ELEV. 61.80
L=266′ K=102
PVI 1018+50.00 ELEV. 61.00
PVT 1019+82.92 ELEV. 63.66
℄ CLEBURNE ST
2.00%
PVC 1021+02.00 ELEV. 66.04
PVI 1023+90.00 ELEV. 71.80
L=576′ K=96 SSD=455′
18.5′ CLR
19.1′ CLR
PVT 1026+78.00 ELEV. 60.28
℄ ALABAMA ST
℄ DC SH 288NS
MATCH LINE ℄ SH 288S STA 1026+92
1010+00
1015+00
1020+00
1025+00
90
80
70
60
50
40
30


℄ RP288SB302
18.5′ CLR
39.2′ CLR
℄ I-69NB
END BRIDGE
EXISTING GROUND @ ℄ SH 288S
PGL @ ℄ SH 288S
-4.00%
PVC 1034+72.22 ELEV. 28.51
L=336′ K=102 SSD=487′
PVI 1036+40.22 ELEV. 21.79
PVT 1038+08.22 ELEV. 20.61
MATCH LINE ℄ SH 288S STA 1026+92
1030+00
1035+00
1040+00
70
60
50
40
30
20
10

PROFILE ALONG NORTHBOUND SH 288N


-1.74%
PVC 1009+50.00 ELEV. 63.57
L=150′ K=126 SSD=536′
PVT 1009+30.00 ELEV. 63.92
PVI 1010+25.00 ELEV. 62.27
END BRIDGE
PVT 1011+00.00 ELEV. 61.86
-0.55%
L=150′ K=130
PVC 1011+75.00 ELEV. 61.44
PVI 1012+50.00 ELEV. 61.03
PVT 1013+25.00 ELEV. 61.48
EXISTING GROUND @ ℄ SH 288N
BEGIN BRIDGE
END BRIDGE
0.60%
20.1′ CLR
℄ CLEBURNE ST
PGL @ ℄ SH 288N
PVC 1019+20.00 ELEV. 65.05
L=150′ K=151 SSD=625′
PVI 1019+95.00 ELEV. 65.50
PVT 1020+70.00 ELEV. 66.69
1.59%
BEGIN BRIDGE
PVC 1022+50.00 ELEV. 69.56
26.5′ CLR
PVI 1025+00.00 ELEV. 73.55
L=500′ K=89 SSD=439′
20.7′ CLR
END BRIDGE
PVT 1027+50.00 ELEV. 63.55
℄ DC SH 288NS
℄ ALABAMA ST
WHEELER AVE
MATCH LINE ℄ SH 288N STA 1028+12
1010+00
1015+00
1020+00
1025+00
90
80
70
60
50
40
30


PROFILE ALONG NORTHBOUND SH
PGL @ ℄ SH 288N
-4.00%
EXISTING GROUND @ ℄ SH 288N
PVC 1037+02.92 ELEV. 25.43
L=290′ K=100 SSD=540′
PVI 1038+47.92 ELEV. 19.63
-1.10%
PVT 1039+92.92 ELEV. 18.04
END SH 288 N PROFILE
MATCH I-69 N PROFILE
℄ SH 288 N
STA 1039+95.54
PVT 1083+00.00 ELEV. 19.50
MATCH LINE ℄ SH 288N STA 1028+12
1030+00
1035+00
1084+00
60
50
40
30
20
10
0


BALDWIN PARK
PROP ℄ SH 288S
PI STATION = 1056+24.52
DELTA = 1° 39′ 59.84" (RT)
DEGREE OF CURVE = 0° 52′ 47.46"
TANGENT = 94.72
LENGTH = 189.42
RADIUS = 6,512.00
PC STATION = 1055+29.80
PT STATION = 1057+19.22
PROP ℄ SH 288S
PI STATION = 1060+37.10
DELTA = 1° 39′ 59.84" (LT)
DEGREE OF CURVE = 0° 42′ 50.60"
TANGENT = 116.71
LENGTH = 233.40
RADIUS = 8,024.00
PC STATION = 1059+20.39
PT STATION = 1061+53.79
JACKSON ST
PROP ℄ SH 288S
PI STATION = 1073+22.54
DELTA = 2° 45′ 29.72" (RT)
DEGREE OF CURVE = 0° 41′ 51.75"
TANGENT = 197.70
LENGTH = 395.33
RADIUS = 8,212.00
PC STATION = 1071+24.83
PT STATION = 1075+20.17
ELGIN ST
TUAM ST
DREW ST
DENNIS ST
McGOWEN ST
BREMOND ST
McILHENNY ST
HADLEY ST
WEBSTER ST
GRAY ST
CHENEVERT ST
ROSALIE ST
ANITA ST
HAMILTON ST
CHARTRES ST
ST EMANUEL ST
PRELIMINARY SUBJECT TO CHANGE
END I-69/SH288 INTERCHANGE PROJECT STA 1066+34.17 ℄ SH 288
END PROPOSED PVMT
BEGIN TRANSITION PVMT
℄ I-69S STA 1092+80.00
℄ SH 288S STA 1057+31.28
℄ RP069SB301
℄ FR288SB300
℄ I-69S
EXIST ROW
PROP NOISE BARRIER
℄ SH 288 S TRANSITION (GP288SB300_T)
℄ I-69 S TRANSITION (GP069SB300_T)
END TRANSITION PVMT MATCH EXISTING
EXIST ROW
℄ HAMILTON ST (FR288SB300)
STA 11106+01.48
℄ HAMILTON ST (FR288SB301)
STA 11104+70.00
℄ FR288SB301
I-69
SH 288
10' SHOULDER
4-12' LANES
10' SHOULDER
69NB TO 45NB/45SB
69
59
288
BEGIN TEMPORARY BRIDGE
END TRANSITION PVMT MATCH EXISTING
END TRANSITION
END TEMPORARY BRIDGE
MATCH EXISTING
℄ DC SH 288 N TO I-45 N/S TRANSITION (DC288NN300_T)
HOUSTON POLICE DEPT
℄ DC069NS301
℄ DC288NN300
℄ RP069NB301
PROP NOISE BARRIER
EXIST ROW
END PROPOSED PVMT
BEGIN TRANSITION PVMT
℄ DC288NS301 STA 431+64.10
℄ I-69N STA 1101+00.00
℄ I-69N
℄ I-69 N TRANSITION (GP069NB300_T)
PROP ROW
BEGIN PROP McILHENNY RECONSTRUCTION
℄ McILHENNY ST (ISMCILH300)
STA 8+81.38, 0.40' RT
END PROP McILHENNY RECONSTRUCTION
℄ McILHENNY ST (ISMCILH300)
STA 11+86.73
BEGIN PROP ST. EMANUEL RECONSTRUCTION
℄ ST EMANUEL (FR288NB303)
STA 11106+72.00, 0.00'
℄ McILHENNY ST (ISMCILH300)
PROP ℄ SH 288N
PI STATION = 1042+48.78
DELTA = 3° 45′ 25.81" (RT)
DEGREE OF CURVE = 1° 04′ 34.25"
TANGENT = 174.62
LENGTH = 349.12
RADIUS = 5,324.00
PRC STATION = 1040+74.16
PT STATION = 1044+23.28
HUTCHINS ST
1045+00
1050+00
1055+00
1060+00
1065+00
1070+00
1080+00
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00

RP288SB300

PI STATION = 11+27.66
DELTA = 1° 51′ 05.47" (LT)
DEGREE OF CURVE = 0° 43′ 30.95"
TANGENT = 127.66
LENGTH = 255.29
RADIUS = 7,900.00
PC STATION = 10+00.00
PT STATION = 12+55.29

PI STATION = 21+58.62
DELTA = 68° 01′ 30.22" (LT)
DEGREE OF CURVE = 14° 50′ 36.48"
TANGENT = 260.48
LENGTH = 458.28
RADIUS = 386.00
PC STATION = 18+98.13
PT STATION = 23+56.42

RP288SB301

PI STATION = 10+80.74
DELTA = 2° 43′ 53.21" (RT)
DEGREE OF CURVE = 13° 34′ 37.92"
TANGENT = 10.06
LENGTH = 20.12
RADIUS = 422.00
PC STATION = 10+70.67
PT STATION = 10+90.79

PI STATION = 11+86.87
DELTA = 30° 47′ 00.60" (RT)
DEGREE OF CURVE = 16° 25′ 01.66"
TANGENT = 96.08
LENGTH = 187.51
RADIUS = 349.00
PC STATION = 10+90.79
PT STATION = 12+78.30

PI STATION = 15+68.83
DELTA = 3° 21′ 02.98" (RT)
DEGREE OF CURVE = 2° 50′ 36.47"
TANGENT = 58.94
LENGTH = 117.84
RADIUS = 2,015.00
PC STATION = 15+09.89
PT STATION = 16+27.73

RP288SB302

PI STATION = 20+42.90
DELTA = 7° 04′ 52.51" (RT)
DEGREE OF CURVE = 0° 53′ 00.15"
TANGENT = 401.32
LENGTH = 801.61
RADIUS = 6,486.00
PC STATION = 16+41.58
PT STATION = 24+43.20

PI STATION = 35+06.69
DELTA = 14° 10′ 22.43" (RT)
DEGREE OF CURVE = 2° 53′ 05.94"
TANGENT = 246.89
LENGTH = 491.26
RADIUS = 1,986.00
PC STATION = 32+59.79
PT STATION = 37+51.06

PI STATION = 26+73.99
DELTA = 28° 01′ 11.02" (LT)
DEGREE OF CURVE = 6° 11′ 38.90"
TANGENT = 230.80
LENGTH = 452.36
RADIUS = 925.00
PC STATION = 24+43.20
PT STATION = 28+95.55

PI STATION = 38+20.91
DELTA = 5° 14′ 05.50" (LT)
DEGREE OF CURVE = 3° 44′ 59.01"
TANGENT = 69.85
LENGTH = 139.61
RADIUS = 1,528.00
PC STATION = 37+51.06
PT STATION = 38+90.66

PI STATION = 31+55.76
DELTA = 36° 19′ 54.15" (RT)
DEGREE OF CURVE = 16° 51′ 06.12"
TANGENT = 111.56
LENGTH = 215.60
RADIUS = 340.00
PC STATION = 30+44.20
PT STATION = 32+59.79

RP288NB300

PI STATION = 11+28.11
DELTA = 11° 15′ 21.02" (RT)
DEGREE OF CURVE = 4° 24′ 26.52"
TANGENT = 128.11
LENGTH = 255.39
RADIUS = 1,300.00
PC STATION = 10+00.00
PT STATION = 12+55.39

PI STATION = 20+57.81
DELTA = 2° 29′ 04.79" (LT)
DEGREE OF CURVE = 1° 38′ 13.28"
TANGENT = 75.90
LENGTH = 151.78
RADIUS = 3,500.00
PC STATION = 19+81.90
PT STATION = 21+33.68

DC045NS300

PI STATION = 301+23.01
DELTA = 3° 44′ 01.16" (LT)
DEGREE OF CURVE = 1° 31′ 05.42"
TANGENT = 123.01
LENGTH = 245.93
RADIUS = 3,774.00
PC STATION = 300+00.00
PT STATION = 302+45.93

PI STATION = 335+92.11
DELTA = 2° 28′ 11.82" (RT)
DEGREE OF CURVE = 0° 52′ 53.30"
TANGENT = 140.13
LENGTH = 280.21
RADIUS = 6,500.00
PC STATION = 334+51.99
PT STATION = 337+32.20

PI STATION = 303+76.31
DELTA = 3° 44′ 01.16" (RT)
DEGREE OF CURVE = 1° 25′ 56.62"
TANGENT = 130.38
LENGTH = 260.66
RADIUS = 4,000.00
PC STATION = 302+45.93
PT STATION = 305+06.59

PI STATION = 341+72.18
DELTA = 2° 28′ 11.82" (LT)
DEGREE OF CURVE = 2° 50′ 41.55"
TANGENT = 43.42
LENGTH = 86.82
RADIUS = 2,014.00
PC STATION = 341+28.76
PT STATION = 342+15.58

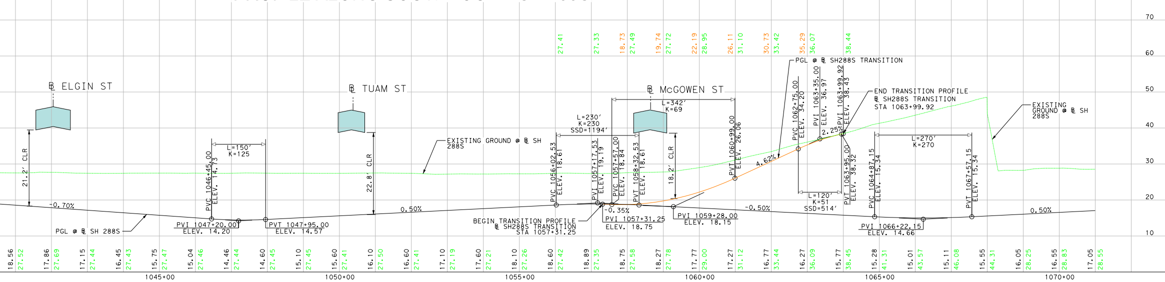
PI STATION = 320+93.62
DELTA = 91° 25′ 57.15" (LT)
DEGREE OF CURVE = 6° 04′ 10.09"
TANGENT = 967.90
LENGTH = 1,506.43
RADIUS = 944.00
PC STATION = 311+25.71
PT STATION = 326+32.15

DC045NS301

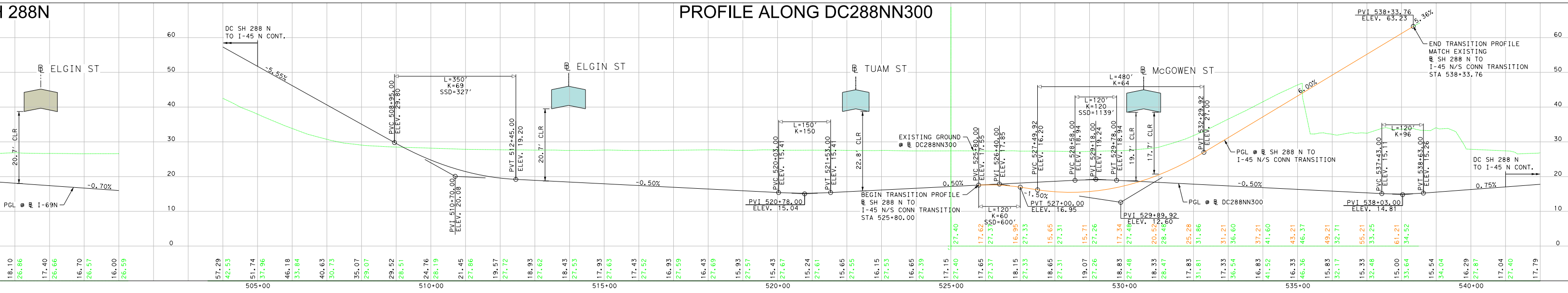
PI STATION = 901+26.96
DELTA = 2° 13′ 59.50" (LT)
DEGREE OF CURVE = 0° 52′ 46.48"
TANGENT = 126.96
LENGTH = 253.89
RADIUS = 6,514.00
PC STATION = 900+00.00
PT STATION = 902+53.89

PI STATION = 904+19.00
DELTA = 2° 55′ 08.54" (RT)
DEGREE OF CURVE = 0° 53′ 03.10"
TANGENT = 165.10
LENGTH = 330.14
RADIUS = 6,480.00
PC STATION = 902+53.89
PT STATION = 905+84.03

PROFILE ALONG SOUTHBOUND SH 288S



PROFILE ALONG DC288NN300



SCHEMATIC DESIGN - SH 288

HOUSTON DISTRICT
PROJECT DEVELOPMENT

Texas Department of Transportation

PRELIMINARY
SUBJECT TO CHANGE

HNTB
HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

1
8

PREPARED BY: shartshorn

FILE LOCATION: \\hoxw00\Jobs\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\20230417 - IDCUS Final Revised Schematic\DGN_HNTB Modified\5855

HOUSTON DISTRICT
PROJECT DEVELOPMENT

SCHEMATIC DESIGN - SH 288

DATE: 7/26/2023 TIME: 1:04:56 PM SCALE: 100.0000 ft / in. PEN TABLE: PEN

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

PREPARED BY: shartshorn FILE LOCATION: DGN

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(SH 288)

COUNTY: HARRIS
LIMITS FROM: BLODGETT ST
LIMITS TO: MCGOWEN ST
DATE: 7/26/2023

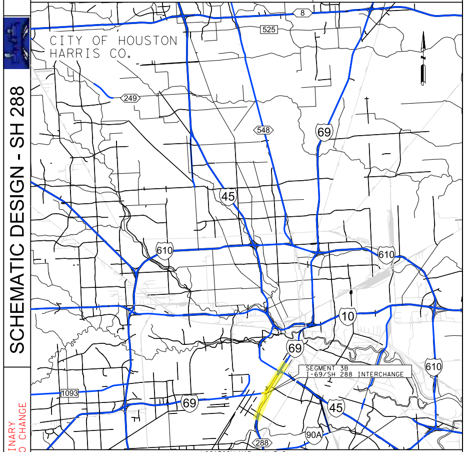
CONSTRUCTION CSJ: 0027-13-200, 0027-13-221, 0598-01-109

SCHEMATIC DESIGN - I-69

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200

VERT SCALE: 1"=20'
0 5 10 20


8
525
CITY OF HOUSTON
HARRIS CO.
249
548
69
45
610
610
10
69
610
SEGMENT 3B
I-69/SH 288 INTERCHANGE
1093
69
45
90A
288

LOCATION MAP : N.T.S.
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

PLAN LEGEND

SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR CODE	
CENTERLINE			—·—·—	2	BLACK	0
I-45 MAINLANES	🟨	🟥	—	2	BLACK	0
I-69/US 59 MAINLANES	🟦	🟦	—	2	BLACK	0
I-10 MAINLANES	🟩	🟪	—	2	BLACK	0
SH 288 MAINLANES	🟪	⬛	—	2	BLACK	0
I-610 MAINLANES	🟩	🟩	—	2	BLACK	0
I-10 EXPRESS LANES	🟦	🟪	—	2	PINK	10
MAX LANES	🟪	🟪	—	2	PINK	28
LOCAL STREETS	⬜	🟦	—	2	BLUE	1
RAMPS	🟦	🟦	—	2	RED	3
DIRECT CONNECTOR	🟧	🟦	—	2	MAGENTA	5
PEDESTRIAN REALM	🟫	⬜	—	1	GREEN	155
EXISTING RDWY TO REMAIN	⬜	⬜	—	2		
HIGHWAY CAP/POTENTIAL OPEN SPACE			▨	7		
EXISTING RDWY TO BE REMOVED			▩	1		
SURPLUS ROW			▩	3	RED	3
CONVENTION CENTER STORAGE			▭	5	PURPLE	62
PROPOSED CONTROL OF ACCESS			—‖—	0	RED	3
PROPOSED FEIS ROW			— - —	6	BLUE	126
EXISTING ROW			- - -	1	YELLOW	4
ACCESS ROAD			······	1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)			┼┼┼┼┼	1	RED	3
METRO RAIL(EAST END LINE)			┼┼┼┼┼	1	GREEN	156
METRO RAIL(SOUTHEAST LINE)			┼┼┼┼┼	1	PURPLE	203
RAILROAD			┼┼┼┼┼	1	BLACK	0
LIMITS OF FLOODWAY			—	1	BLUE	171
PLANIMETRIC			☁	2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			(0000)	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			[0000] AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			[0000] PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES			⇨	0	BLACK	0
TURNAROUNDS			⇨	0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES			➡	1	BLACK	0
TURNAROUNDS			➡	1	BLUE	168
RAMPS			➡	1	RED	3
DIRECT CONNECTOR			➡	1	RED	139
MAX LANES			➡	1	MAGENTA	5
DEPRESSED			—^—^—	3	RED	3
BY OTHERS			- - -	3	BLUE	1
RETAINING WALL			—	6	RED	3
PROPOSED AESTHETIC WALL			—	6	PURPLE	203
PROPOSED NOISE BARRIER			—	6	LT GREEN	196

STATE OF TEXAS
STEPHEN A. HRNCIR
67245
LICENSED
PROFESSIONAL ENGINEER

8/1/2023

TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED

SHEET 2 OF 8

DC069NS300

PI STATION = 114+45.85
DELTA = 108° 46' 10.20" (RT)
DEGREE OF CURVE = 8° 48' 53.05"
TANGENT = 907.40
LENGTH = 1,233.95
RADIUS = 650.00
PC STATION = 105+38.45
PT STATION = 117+72.40

FR069SB300

PI STATION = 52+00.08
DELTA = 38° 57' 40.55" (LT)
DEGREE OF CURVE = 35° 09' 02.83"
TANGENT = 57.66
LENGTH = 110.84
RADIUS = 163.00
PC STATION = 51+42.42
PT STATION = 52+53.26

PI STATION = 64+56.94
DELTA = 3° 56' 27.64" (LT)
DEGREE OF CURVE = 0° 53' 50.97"
TANGENT = 219.64
LENGTH = 439.11
RADIUS = 6,384.00
PC STATION = 62+37.30
PT STATION = 66+76.41

FR069SB301

PI STATION = 1061+42.08
DELTA = 32° 04' 39.07" (LT)
DEGREE OF CURVE = 9° 22' 38.56"
TANGENT = 175.65
LENGTH = 342.07
RADIUS = 611.00
PC STATION = 1059+66.43
PT STATION = 1063+08.51

PI STATION = 1065+96.59
DELTA = 15° 01' 38.58" (LT)
DEGREE OF CURVE = 4° 05' 33.20"
TANGENT = 184.65
LENGTH = 367.19
RADIUS = 1,400.00
PC STATION = 1064+11.93
PT STATION = 1067+79.12

FR288NB300

PI STATION = 11011+71.63
DELTA = 21° 24' 05.70" (LT)
DEGREE OF CURVE = 3° 10' 59.16"
TANGENT = 340.14
LENGTH = 672.35
RADIUS = 1,800.00
PC STATION = 11008+31.49
PT STATION = 11015+03.84

PI STATION = 11038+86.75
DELTA = 3° 16' 11.52" (LT)
DEGREE OF CURVE = 1° 25' 56.62"
TANGENT = 114.17
LENGTH = 228.28
RADIUS = 4,000.00
PC STATION = 11037+72.58
PT STATION = 11040+00.86

PI STATION = 11021+55.53
DELTA = 2° 35' 57.27" (LT)
DEGREE OF CURVE = 3° 47' 48.97"
TANGENT = 34.23
LENGTH = 68.46
RADIUS = 1,509.00
PC STATION = 11021+21.29
PT STATION = 11021+89.75

PI STATION = 11047+44.78
DELTA = 3° 09' 39.37" (RT)
DEGREE OF CURVE = 1° 54' 03.56"
TANGENT = 83.16
LENGTH = 166.28
RADIUS = 3,014.00
PC STATION = 11046+61.62
PT STATION = 11048+27.90

PI STATION = 11025+78.04
DELTA = 26° 44' 37.99" (RT)
DEGREE OF CURVE = 5° 27' 24.27"
TANGENT = 249.60
LENGTH = 490.11
RADIUS = 1,050.00
PC STATION = 11023+28.43
PT STATION = 11028+18.54

PI STATION = 11033+64.55
DELTA = 2° 35' 38.19" (LT)
DEGREE OF CURVE = 2° 53' 11.17"
TANGENT = 44.94
LENGTH = 89.87
RADIUS = 1,985.00
PC STATION = 11033+19.61
PT STATION = 11034+09.47

FR288NB301

PI STATION = 11063+87.30
DELTA = 12° 52' 05.98" (RT)
DEGREE OF CURVE = 1° 50' 11.05"
TANGENT = 351.85
LENGTH = 700.74
RADIUS = 3,120.00
PC STATION = 11060+35.45
PT STATION = 11067+36.19

PI STATION = 11073+52.03
DELTA = 12° 48' 59.97" (LT)
DEGREE OF CURVE = 7° 17' 55.77"
TANGENT = 88.17
LENGTH = 175.60
RADIUS = 785.00
PC STATION = 11072+63.86
PT STATION = 11074+39.46

FR288SB300

PI STATION = 11069+54.21
DELTA = 8° 40' 44.05" (LT)
DEGREE OF CURVE = 7° 09' 43.10"
TANGENT = 60.71
LENGTH = 121.18
RADIUS = 800.00
PC STATION = 11068+93.50
PT STATION = 11070+14.68

PI STATION = 11072+08.72
DELTA = 5° 19' 48.62" (RT)
DEGREE OF CURVE = 2° 50' 36.47"
TANGENT = 93.79
LENGTH = 187.45
RADIUS = 2,015.00
PC STATION = 11071+14.93
PT STATION = 11073+02.38

PI STATION = 11076+64.58
DELTA = 8° 06' 49.82" (LT)
DEGREE OF CURVE = 2° 51' 07.04"
TANGENT = 142.49
LENGTH = 284.50
RADIUS = 2,009.00
PC STATION = 11075+22.09
PT STATION = 11078+06.59

FR288SB301

PI STATION = 11106+46.70
DELTA = 3°12'07.93"(RT)
DEGREE OF CURVE = 2°49'45.92"
TANGENT = 56.60'
LENGTH = 113.18'
RADIUS = 2025.00'
PC STATION = 11105+90.10
PT STATION = 11107+03.28

PI STATION = 11109+78.75
DELTA = 2°59'47.08"(LT)
DEGREE OF CURVE = 2°51'53.24"
TANGENT = 52.31'
LENGTH = 104.59'
RADIUS = 2000.00'
PC STATION = 11109+26.44
PT STATION = 11110+31.03

FR288SB302

PI STATION = 11126+43.90
DELTA = 15°53'54.71"(RT)
DEGREE OF CURVE = 2°53'00.71"
TANGENT = 277.46'
LENGTH = 551.36'
RADIUS = 1987.00'
PC STATION = 11123+66.44
PT STATION = 11129+17.79

ISFRAN301(FRANCIS ST)

PI STATION = 51+77.73
DELTA = 9° 32' 26.20" (RT)
DEGREE OF CURVE = 32° 55' 42.99"
TANGENT = 14.52
LENGTH = 28.97
RADIUS = 174.00
PC STATION = 51+63.21
PT STATION = 51+92.18

PI STATION = 52+75.13
DELTA = 9° 28' 03.70" (LT)
DEGREE OF CURVE = 40° 55' 32.01"
TANGENT = 11.59
LENGTH = 23.13
RADIUS = 140.00
PC STATION = 52+63.54
PT STATION = 52+86.67

RP069NB301

PI STATION = 16+64.37
DELTA = 16° 09' 33.41" (RT)
DEGREE OF CURVE = 1° 13' 27.37"
TANGENT = 664.37
LENGTH = 1,319.91
RADIUS = 4,680.00
PC STATION = 10+00.00
PT STATION = 23+19.91

RP069SB300

PI STATION = 9+91.79
DELTA = 24° 48' 20.43" (LT)
DEGREE OF CURVE = 9° 11' 48.32"
TANGENT = 137.01
LENGTH = 269.72
RADIUS = 623.00
PC STATION = 8+54.78
PT STATION = 11+24.50

PI STATION = 14+89.98
DELTA = 22° 17' 31.38" (LT)
DEGREE OF CURVE = 4° 05' 33.20"
TANGENT = 275.84
LENGTH = 544.70
RADIUS = 1,400.00
PC STATION = 12+14.15
PT STATION = 17+58.84

RP069SB301

PI STATION = 11+43.44
DELTA = 2° 32' 10.04"(LT)
DEGREE OF CURVE = 0° 53' 03.10"
TANGENT = 143.44'
LENGTH = 286.83'
RADIUS = 6,480.00'
PC STATION = 10+00.00
PT STATION = 12+86.83

PI STATION = 18+91.03
DELTA = 2° 31' 50.91" (RT)
DEGREE OF CURVE = 0° 52' 51.35"
TANGENT = 143.67'
LENGTH = 287.29'
RADIUS = 6504.00'
PC STATION = 17+47.37
PT STATION = 20+34.65

PI STATION = 24+86.20
DELTA = 4° 20' 55.53" (LT)
DEGREE OF CURVE = 0° 53' 03.10"
TANGENT = 246.03'
LENGTH = 491.83'
RADIUS = 6,480.00'
PC STATION = 22+40.16
PT STATION = 27+32.00

GP069NB300_T

PI STATION = 1095+61.17
DELTA = 3° 54' 52.92" (LT)
DEGREE OF CURVE = 0° 42' 50.60"
TANGENT = 274.22
LENGTH = 548.23
RADIUS = 8,024.00
PC STATION = 1092+86.95
PT STATION = 1098+35.18

PI STATION = 1104+07.56
DELTA = 2° 51' 14.19" (RT)
DEGREE OF CURVE = 0° 43' 06.07"
TANGENT = 198.69
LENGTH = 397.29
RADIUS = 7,976.00
PC STATION = 1102+08.88
PT STATION = 1106+06.17

GP069SB300_T

PI STATION = 1084+73.90
DELTA = 2° 22' 29.18" (RT)
DEGREE OF CURVE = 0° 22' 55.10"
TANGENT = 310.90
LENGTH = 621.71
RADIUS = 15,000.00
PC STATION = 1081+63.00
PT STATION = 1087+84.71

PI STATION = 1090+92.90
DELTA = 2° 21' 14.57" (LT)
DEGREE OF CURVE = 0° 22' 55.10"
TANGENT = 308.19
LENGTH = 616.29
RADIUS = 15,000.00
PC STATION = 1087+84.71
PT STATION = 1094+01.00

DC288NN300_T

PI STATION = 525+44.57
DELTA = 0° 47' 08.41" (RT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 44.57
LENGTH = 89.13
RADIUS = 6,500.00
PC STATION = 525+00.00
PT STATION = 525+89.13

PI STATION = 527+45.83
DELTA = 2° 45' 21.72" (LT)
DEGREE OF CURVE = 0° 52' 46.48"
TANGENT = 156.70
LENGTH = 313.34
RADIUS = 6,514.00
PC STATION = 525+89.13
PT STATION = 529+02.47

PI STATION = 531+00.47
DELTA = 1° 36' 41.23" (LT)
DEGREE OF CURVE = 1° 04' 51.79"
TANGENT = 74.54
LENGTH = 149.06
RADIUS = 5,300.00
PC STATION = 530+25.93
PT STATION = 531+75.00

PI STATION = 532+30.90
DELTA = 1° 40' 30.30" (RT)
DEGREE OF CURVE = 1° 29' 53.95"
TANGENT = 55.90
LENGTH = 111.80
RADIUS = 3,824.00
PC STATION = 531+75.00
PT STATION = 532+86.79

GP288SB300_T

PI STATION = 1058+18.93
DELTA = 1° 33' 47.11" (RT)
DEGREE OF CURVE = 0° 30' 58.24"
TANGENT = 151.42
LENGTH = 302.82
RADIUS = 11,100.00
PC STATION = 1056+67.51
PT STATION = 1059+70.33

PI STATION = 1060+85.37
DELTA = 1° 33' 02.92" (LT)
DEGREE OF CURVE = 0° 40' 26.64"
TANGENT = 115.04
LENGTH = 230.07
RADIUS = 8,500.00
PC STATION = 1059+70.33
PT STATION = 1062+00.40

DC288SS301_T

PI STATION = 102+98.26
DELTA = 5° 15' 16.38" (RT)
DEGREE OF CURVE = 0° 52' 53.30"
TANGENT = 298.26
LENGTH = 596.11
RADIUS = 6,500.00
PC STATION = 100+00.00
PT STATION = 105+96.11

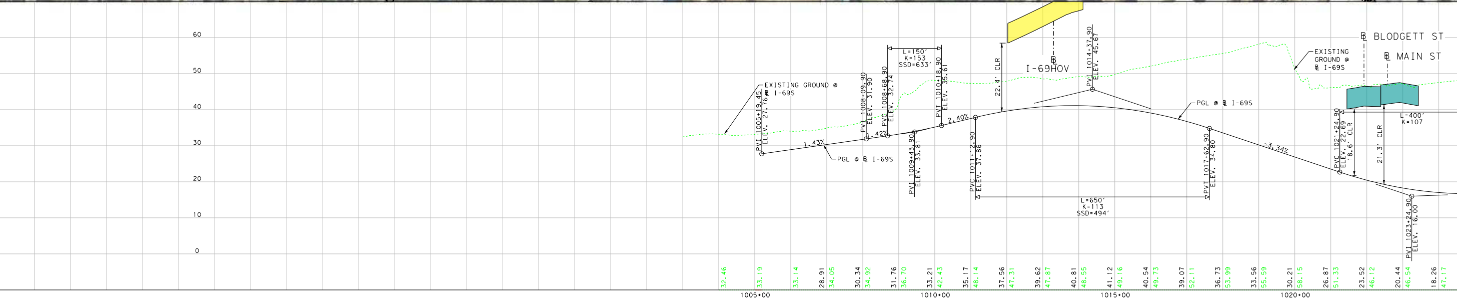
PI STATION = 108+10.33
DELTA = 4° 54' 24.00" (LT)
DEGREE OF CURVE = 1° 08' 45.30"
TANGENT = 214.22
LENGTH = 428.19
RADIUS = 5,000.00
PC STATION = 105+96.11
PT STATION = 110+24.30

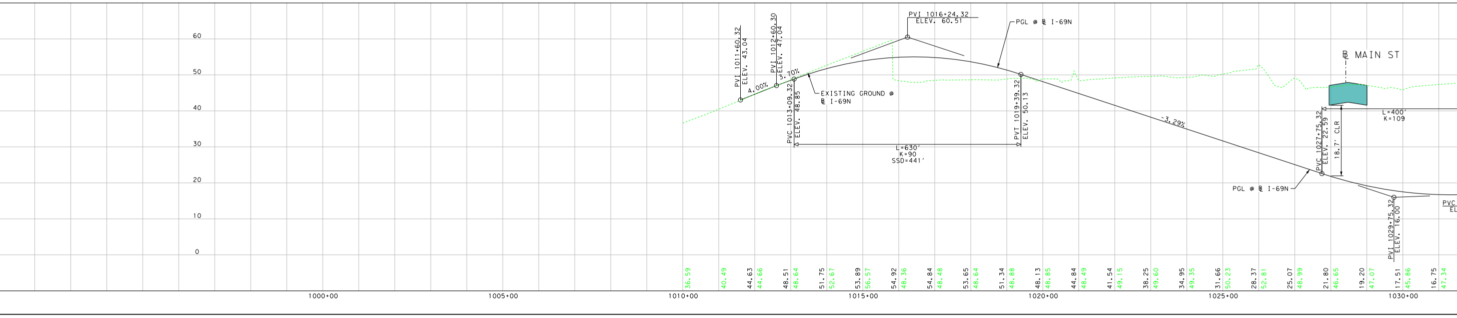
BONNIE BRAE ST
CT
885+00

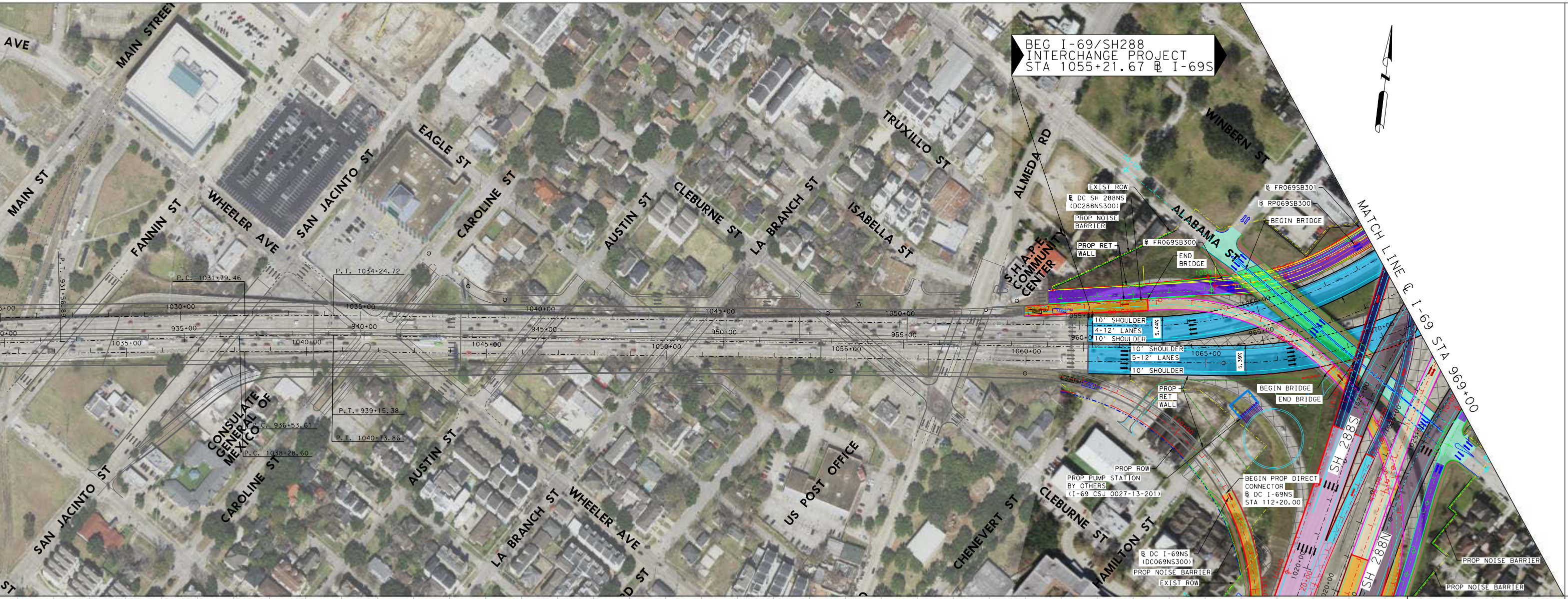
PROFILE LEGEND

PROP. PGL @ CL/NB/EB MAINLANE	——
PROP. PGL @ SB/WB MAINLANE	– – – –
PROP. PGL @ MAX LANES	——
EXISTING GROUND @ PGL	–·–·–
100 YR. W.S.E.	▽
PROP. PGL @ NB/EB RAMP	——
PROP. PGL @ SB/WB RAMP	– – – –
PROP. PGL @ NB/EB DC	——
PROP. PGL @ SB/WB DC	– – – –
PROP. PGL @ NB/EB FRONTAGE	——
PROP. PGL @ SB/WB FRONTAGE	– – – –
PROP. PGL @ LOCAL ST	——
EXIST. GRND. @ NB/EB ROW	- - - - -
EXIST. GRND. @ SB/WB ROW	- - - - -

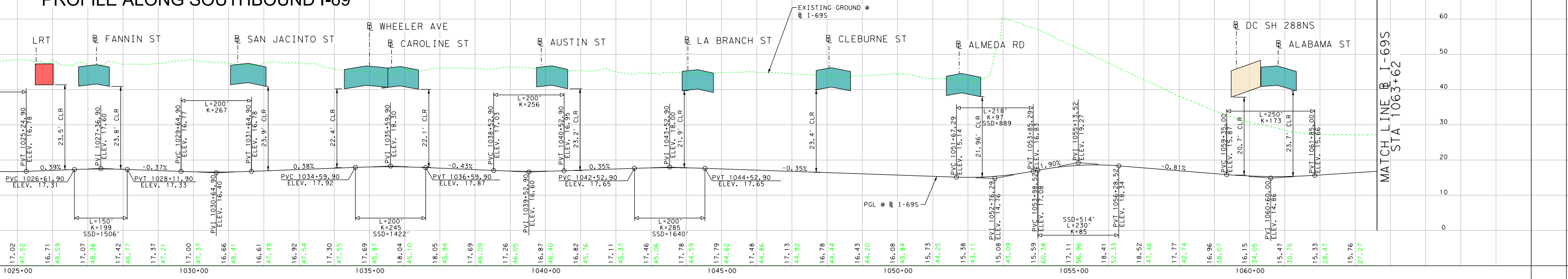
BONNIE BRAE ST
CASTLE CT
MIRAMAR ST
MOUNT VERNON ST
YOAKUM BLVD
MONTROSE BLVD
KYLE ST
ROSELAND ST
STANFORD ST
GREELEY ST
JACK ST
OAKLEY ST
WOODROW ST
RICHMOND
GARROTT ST
GRAUSTARK ST
VERNON ST
UM BLVD
SE BLVD
MAIN ST
FANNIN ST
WENTWORTH
P.C. 1005+46.13
P.T. 1006+75.19
890+00
895+00
900+00
905+00
910+00
915+00
920+00
925+00
990+11
995+00
996+61
1000+00
1005+00
1010+00
1015+00
1020+00
1025+00
1030+00


60
50
40
30
20
10
0
I-69HOV
22.4' CLR
L=150'
K=153
SSD=633'
EXISTING GROUND @ ℄ I-69S
PVI 1005+19.45 ELEV. 27.76
PVI 1008+09.90 ELEV. 31.90
PVC 1008+68.90 ELEV. 32.74
PVI 1009+43.90 ELEV. 33.81
PVT 1010+18.90 ELEV. 35.61
PVC 1011+12.90 ELEV. 37.86
PVI 1014+37.90 ELEV. 45.67
PVT 1017+62.90 ELEV. 34.80
1.43%
1.42%
2.40%
-3.34%
PGL @ ℄ I-69S
L=650'
K=113
SSD=494'
EXISTING GROUND @ ℄ I-69S
℄ BLODGETT ST
℄ MAIN ST
PVC 1021+24.90 ELEV. 22.69
18.6' CLR
21.3' CLR
L=400'
K=107
PVI 1023+24.90 ELEV. 16.00
32.46
33.19
33.14
28.91
34.05
30.34
34.92
31.76
36.70
33.21
42.43
35.17
48.14
37.56
47.31
39.62
47.87
40.81
48.55
41.12
49.16
40.54
49.73
39.07
52.11
36.73
53.99
33.56
55.59
30.21
58.15
26.87
51.33
23.52
46.12
20.44
46.54
18.26
47.17
1005+00
1010+00
1015+00
1020+00

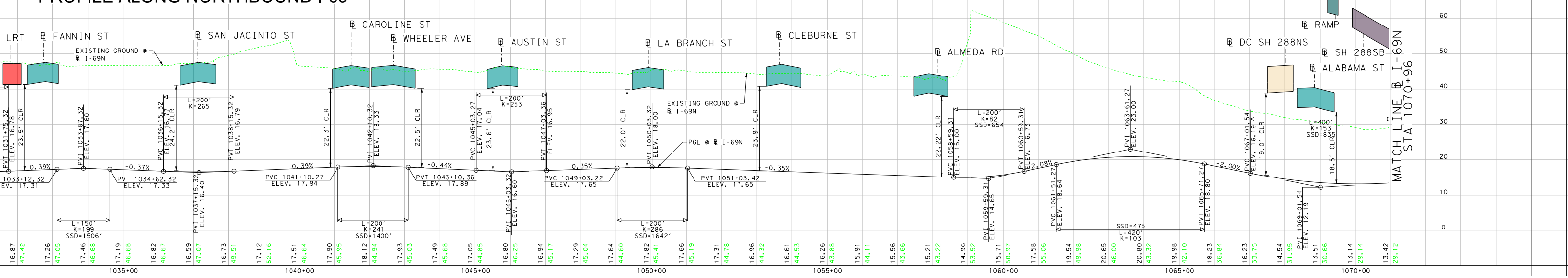

60
50
40
30
20
10
0
PVI 1011+60.32 ELEV. 43.04
PVI 1012+60.30 ELEV. 47.04
PVC 1013+09.32 ELEV. 48.85
4.00%
3.70%
EXISTING GROUND @ ℄ I-69N
PVI 1016+24.32 ELEV. 60.51
PGL @ ℄ I-69N
PVT 1019+39.32 ELEV. 50.13
L=630'
K=90
SSD=441'
-3.29%
℄ MAIN ST
L=400'
K=109
PVC 1027+75.32 ELEV. 22.59
18.7' CLR
PGL @ ℄ I-69N
PVI 1029+75.32 ELEV. 16.00
PVC
EL
36.59
40.49
44.63
44.66
48.51
48.64
51.75
52.67
53.89
56.57
54.92
48.36
54.84
48.48
53.65
48.64
51.34
48.88
48.13
48.85
44.84
48.49
41.54
49.15
38.25
49.60
34.95
49.35
31.66
50.23
28.37
52.81
25.07
48.99
21.80
46.65
19.20
47.07
17.51
45.86
16.75
47.34
1000+00
1005+00
1010+00
1015+00
1020+00
1025+00
1030+00

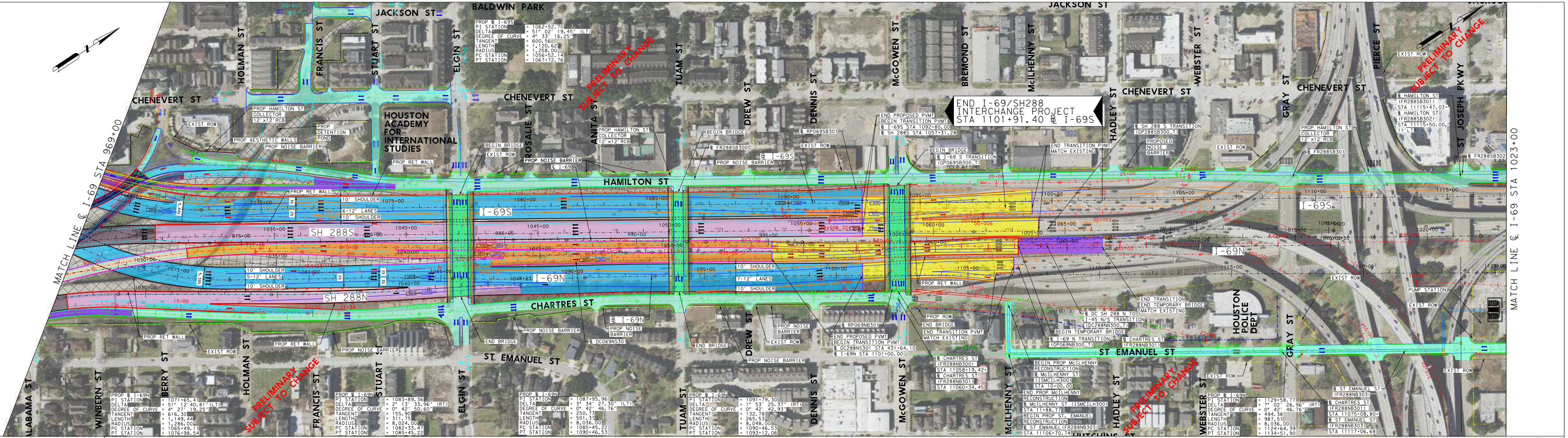

BEG I-69/SH288
INTERCHANGE PROJECT
STA 1055+21.67 ℄ I-69S
MATCH LINE ℄ I-69 STA 969+00
MAIN STREET
MAIN ST
FANNIN ST
WHEELER AVE
SAN JACINTO ST
EAGLE ST
CAROLINE ST
AUSTIN ST
CLEBURNE ST
LA BRANCH ST
ISABELLA ST
TRUXILLO ST
ALMEDA RD
WINBERN ST
ALABAMA ST
S.H.A.P.E. COMMUNITY CENTER
CONSULATE GENERAL OF MEXICO
US POST OFFICE
CHENEVERT ST
HAMILTON ST
SH 288S
SH 288N
P.C. 1031+79.46
P.T. 1034+24.72
P.T. 939+15.38
P.C. 936+53.61
P.T. 1040+73.86
P.C. 1038+28.60
EXIST ROW
℄ DC SH 288NS (DC288NS300)
PROP NOISE BARRIER
PROP RET WALL
℄ FR069SB300
℄ FR069SB301
℄ RP069SB300
BEGIN BRIDGE
END BRIDGE
10' SHOULDER
4-12' LANES
10' SHOULDER
10' SHOULDER
5-12' LANES
10' SHOULDER
PROP RET WALL
PROP ROW
PROP PUMP STATION BY OTHERS (I-69 CSJ 0027-13-201)
BEGIN PROP DIRECT CONNECTOR
℄ DC I-69NS
STA 112+20.00
℄ DC I-69NS (DC069NS300)
PROP NOISE BARRIER
EXIST ROW
PROP NOISE BARRIER

PROFILE ALONG SOUTHBOUND I-69

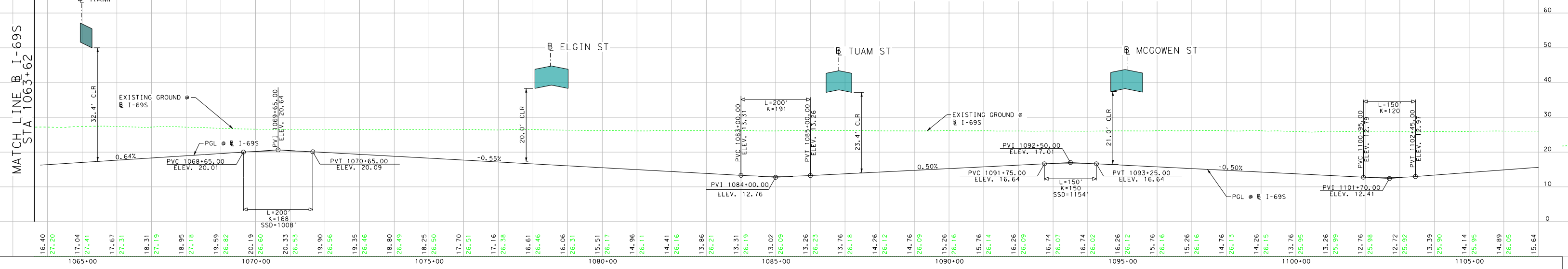

LRT
℄ FANNIN ST
℄ SAN JACINTO ST
℄ WHEELER AVE
℄ CAROLINE ST
℄ AUSTIN ST
℄ LA BRANCH ST
℄ CLEBURNE ST
℄ ALMEDA RD
℄ DC SH 288NS
℄ ALABAMA ST
EXISTING GROUND @ ℄ I-69S
PGL @ ℄ I-69S
MATCH LINE ℄ I-69S STA 1063+62
PVC 1026+61.90 ELEV. 17.31
PVT 1028+11.90 ELEV. 17.33
PVC 1034+59.90 ELEV. 17.92
PVT 1036+59.90 ELEV. 17.87
PVC 1042+52.90 ELEV. 17.65
PVT 1044+52.90 ELEV. 17.65
L=150' K=199 SSD=1506'
L=200' K=267
L=200' K=245 SSD=1422'
L=200' K=256
L=200' K=285 SSD=1640'
L=218' K=97 SSD=889
SSD=514' L=230' K=85
L=250' K=173
0.39%
-0.37%
0.38%
-0.43%
0.35%
-0.35%
1.90%
-0.81%
23.5' CLR
23.8' CLR
23.9' CLR
22.4' CLR
22.1' CLR
23.2' CLR
21.9' CLR
23.4' CLR
21.96' CLR
20.7' CLR
23.7' CLR
1025+00
1030+00
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
0
10
20
30
40
50
60

PROFILE ALONG NORTHBOUND I-69

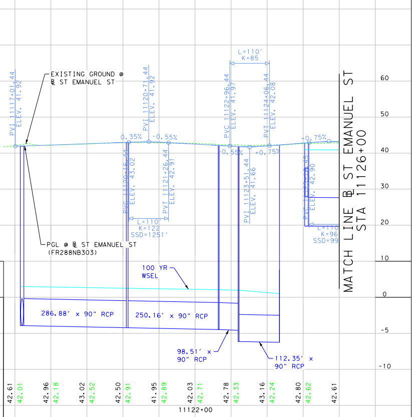

LRT
℄ FANNIN ST
℄ SAN JACINTO ST
℄ CAROLINE ST
℄ WHEELER AVE
℄ AUSTIN ST
℄ LA BRANCH ST
℄ CLEBURNE ST
℄ ALMEDA RD
℄ RAMP
℄ DC SH 288NS
℄ SH 288SB
℄ ALABAMA ST
EXISTING GROUND @ ℄ I-69N
PGL @ ℄ I-69N
MATCH LINE ℄ I-69N STA 1070+96
PVT 1034+62.32 ELEV. 17.33
PVC 1041+10.27 ELEV. 17.94
PVT 1043+10.36 ELEV. 17.89
PVC 1049+03.22 ELEV. 17.65
PVT 1051+03.42 ELEV. 17.65
L=150' K=199 SSD=1506'
L=200' K=265
L=200' K=241 SSD=1400'
L=200' K=253
L=200' K=286 SSD=1642'
L=200' K=82 SSD=654
SSD=475 L=420' K=103
L=400' K=153 SSD=835
0.39%
-0.37%
0.39%
-0.44%
0.35%
-0.35%
2.08%
-2.00%
23.5' CLR
22.3' CLR
22.5' CLR
23.6' CLR
22.0' CLR
23.9' CLR
22.22' CLR
19.0' CLR
18.5' CLR
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
1065+00
1070+00
0
10
20
30
40
50
60


MATCH LINE ℄ I-69 STA 969+00
MATCH LINE ℄ I-69 STA 1023+00
JACKSON ST
BALDWIN PARK
HOLMAN ST
FRANCIS ST
STUART ST
ELGIN ST
TUAM ST
DREW ST
DENNIS ST
McGOWEN ST
BREMOND ST
McILHENNY ST
HADLEY ST
WEBSTER ST
GRAY ST
PIERCE ST
ST JOSEPH PKWY
CHENEVERT ST
HOUSTON ACADEMY FOR INTERNATIONAL STUDIES
HAMILTON ST
CHARTRES ST
ST EMANUEL ST
HOUSTON POLICE DEPT
ALABAMA ST
WINBERN ST
BERRY ST
ROSALIE ST
ANITA ST
I-69S
I-69N
SH 288S
SH 288N
10' SHOULDER
6-12' LANES
5-12' LANES
7-12' LANES
PROP HAMILTON ST COLLECTOR 12'x12' RCB
PROP AESTHETIC WALLS
PROP NOISE BARRIER
PROP DETENTION POND
PROP RET WALL
EXIST ROW
PROP ROW
BEGIN BRIDGE
END BRIDGE
PUMP STATION
PRELIMINARY SUBJECT TO CHANGE
PROP ℄ I-69S
PI STATION = 1062+52.70
DELTA = 51° 02′ 19.45" (LT)
DEGREE OF CURVE = 4° 33′ 16.25"
TANGENT = 600.56
LENGTH = 1,120.62
RADIUS = 1,258.00
PC STATION = 1056+52.14
PT STATION = 1067+72.76
END I-69/SH288 INTERCHANGE PROJECT STA 1101+91.40 ℄ I-69S
END PROPOSED PVMT
BEGIN TRANSITION PVMT
℄ I-69S STA 1092+80.00
℄ SH 288S STA 1057+31.28
℄ I-69 S TRANSITION (GP069SB300_T)
END TRANSITION PVMT MATCH EXISTING
℄ SH 288 S TRANSITION (GP288SB300_T)
PROPOSED NOISE BARRIER
℄ FR288SB301
℄ FR288SB302
℄ HAMILTON ST (FR288SB301) STA 11115+47.03= ℄ HAMILTON ST (FR288SB302) STA 11115+50.00, 11'LT
℄ CHARTRES ST (FR288NB300) STA 11058+19.42= ℄ CHARTRES ST (FR288NB301) STA 11060+34.45
END PROPOSED PVMT BEGIN TRANSITION PVMT ℄ DC288NS301 STA 431+64.10 ℄ I-69N STA 1101+00.00
℄ DC SH 288 N TO I-45 N/S TRANSITION (DC288NN300_T)
BEGIN TEMPORARY BRIDGE
℄ I-69 N TRANSITION (GP069NB300_T)
℄ CHARTRES ST (FR288NB301)
END TRANSITION END TEMPORARY BRIDGE MATCH EXISTING
BEGIN PROP McILHENNY RECONSTRUCTION ℄ McILHENNY ST (ISMCILH300) STA 10+00.00
END PROP McILHENNY RECONSTRUCTION ℄ McILHENNY ST (ISMCILH300) STA 11+88.77
BEGIN PROP ST. EMANUEL RECONSTRUCTION ℄ ST EMANUEL (FR288NB303) STA 11106+70.74
℄ ST EMANUEL ST (FR288NB303)
℄ CHARTRES ST (FR288NB301) STA 11075+08.80= ℄ ST EMANUEL ST (FR288NB303) STA 11117+06.68
PROP ℄ I-69N
PI STATION = 1071+65.41
DELTA = 51° 12′40.81"(LT)
DEGREE OF CURVE = 4° 27′ 19.25"
TANGENT = 616.30
LENGTH = 1,149.44
RADIUS = 1,286.00
PC STATION = 1065+49.11
PT STATION = 1076+98.54
PROP ℄ I-69N
PI STATION = 1083+89.36
DELTA = 2° 13′ 33.96" (RT)
DEGREE OF CURVE = 0° 42′ 50.60"
TANGENT = 155.90
LENGTH = 311.75
RADIUS = 8,024.00
PC STATION = 1082+33.47
PT STATION = 1085+45.22
PROP ℄ I-69N
PI STATION = 1087+95.96
DELTA = 3° 34′ 27.30" (LT)
DEGREE OF CURVE = 0° 42′ 46.76"
TANGENT = 250.73
LENGTH = 501.31
RADIUS = 8,036.00
PC STATION = 1085+45.22
PT STATION = 1090+46.53
PROP ℄ I-69N
PI STATION = 1091+79.30
DELTA = 1° 53′ 25.37" (RT)
DEGREE OF CURVE = 0° 42′ 42.93"
TANGENT = 132.78
LENGTH = 265.53
RADIUS = 8,048.00
PC STATION = 1090+46.53
PT STATION = 1093+12.06
PROP ℄ I-69N
PI STATION = 1129+58.77
DELTA = 7° 02′ 26.96" (RT)
DEGREE OF CURVE = 0° 42′ 46.76"
TANGENT = 494.38
LENGTH = 987.51
RADIUS = 8,036.00
PC STATION = 1124+64.39
PT STATION = 1134+51.90

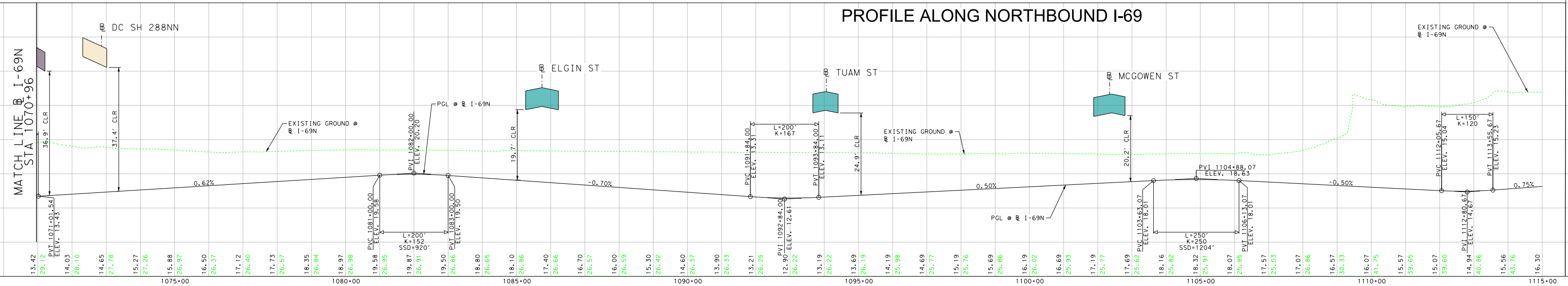
PROFILE ALONG SOUTHBOUND I-69


MATCH LINE ℄ I-69S STA 1063+62
℄ RAMP
℄ ELGIN ST
℄ TUAM ST
℄ MCGOWEN ST
EXISTING GROUND @ ℄ I-69S
PGL @ ℄ I-69S
0.64%
-0.55%
0.50%
-0.50%
PVC 1068+65.00 ELEV. 20.01
PVI 1069+65.00 ELEV. 20.64
PVT 1070+65.00 ELEV. 20.09
L=200' K=168 SSD=1008'
PVI 1084+00.00 ELEV. 12.76
L=200' K=191
PVI 1092+50.00 ELEV. 17.01
PVC 1091+75.00 ELEV. 16.64
PVT 1093+25.00 ELEV. 16.64
L=150' K=150 SSD=1154'
PVI 1101+70.00 ELEV. 12.41
L=150' K=120
32.4' CLR
20.0' CLR
23.4' CLR
21.0' CLR
1065+00
1070+00
1075+00
1080+00
1085+00
1090+00
1095+00
1100+00
1105+00
0
10
20
30
40
50
60

ST EMANUEL ST


EXISTING GROUND @ ℄ ST EMANUEL ST
PGL @ ℄ ST EMANUEL ST (FR288NB303)
MATCH LINE ℄ ST EMANUEL ST STA 11126+00
0.35%
-0.55%
0.75%
L=110' K=85
L=110' K=122 SSD=1251'
100 YR WSEL
286.88' x 90" RCP
250.16' x 90" RCP
98.51' x 90" RCP
112.35' x 90" RCP
11122+00
-10
-5
0
10
20
30
40
50
60

PROFILE ALONG NORTHBOUND I-69


MATCH LINE ℄ I-69N STA 1070+96
℄ DC SH 288NN
℄ ELGIN ST
℄ TUAM ST
℄ MCGOWEN ST
EXISTING GROUND @ ℄ I-69N
PGL @ ℄ I-69N
0.62%
-0.70%
0.50%
-0.50%
0.75%
36.9' CLR
37.4' CLR
19.7' CLR
24.9' CLR
20.2' CLR
L=200' K=152 SSD=920'
L=200' K=167
PVI 1104+88.07 ELEV. 18.63
L=250' K=250 SSD=1204'
L=150' K=120
1075+00
1080+00
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00
1115+00
0
10
20
30
40
50
60

HOUSTON DISTRICT
PROJECT DEVELOPMENT

SCHEMATIC DESIGN - SH 288

SCALE: 100.0000 ft / in.   PEN TABLE: PEN

TIME: 1:04:56 PM

PRELIMINARY
SUBJECT TO CHANGE

DATE: 7/26/2023

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

FILE LOCATION: DGN

PREPARED BY: shartshorn

2/8

PEN TABLE: \\hoxw00\jobs\59004\TECHPROD\NHHIP\Plots\59004_NHHIP_IH45.pen
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TIME: 13:45
DATE: 28-JUL-2023
FILE LOCATION: G:\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\20230417 - IDCUS Final Revised Schematic\DGN_HNTB Modified\NHHIP_I69_SH288 Interchange_PE_PP03_I69.dgn
PREPARED BY: ynevie

HOUSTON DISTRICT
PROJECT DEVELOPMENT

PUMP STATION OUTFALL

PRELIMINARY
SUBJECT TO CHANGE

SCHEMATIC DESIGN

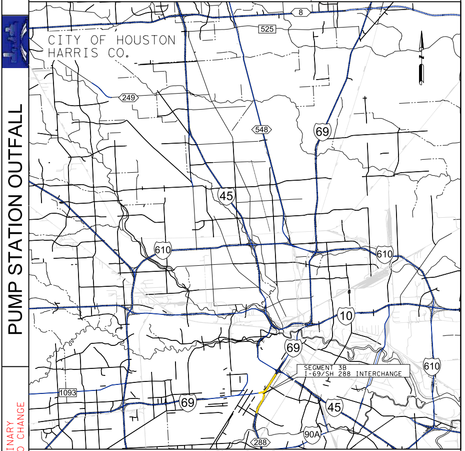
NHHIP
I-69/SH 288 INTERCHANGE
(I-69)

COUNTY: HARRIS
LIMITS FROM: ALMEDA RD
LIMITS TO: MCGOWEN ST
DATE: 28-JUL-2023
CONSTRUCTION CSJ: 0027-13-200, 0027-13-221, 0598-01-109

PUMP STATION OUTFALL

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200
VERT SCALE: 1"=20'
0 5 10 20



8
525
CITY OF HOUSTON
HARRIS CO.
249
548
69
45
610
610
10
69
610
SEGMENT 3B
I-69/SH 288 INTERCHANGE
1093
69
45
90A
288

LOCATION MAP : N.T.S.
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

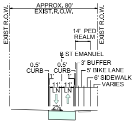
PLAN LEGEND

SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR CODE	
CENTERLINE			— · — · —	2	BLACK	0
I-45 MAINLANES	🟨	🟥	—	2	BLACK	0
I-69/US 59 MAINLANES	🟦	🟦	—	2	BLACK	0
I-10 MAINLANES	🟩	🟪	—	2	BLACK	0
SH 288 MAINLANES	🟪	🟫	—	2	BLACK	0
I-610 MAINLANES	🟩	🟩	—	2	BLACK	0
I-10 EXPRESS LANES	🟦	🟪	—	2	PINK	10
MAX LANES	🟪	🟪	—	2	PINK	28
LOCAL STREETS	🟩	🟦	—	2	BLUE	1
RAMPS	🟦	🟦	—	2	RED	3
DIRECT CONNECTOR	🟧	🟦	—	2	MAGENTA	5
PEDESTRIAN REALM	🟫	🟨	—	1	GREEN	155
EXISTING RDWY TO REMAIN	⬜	⬜	—	2		
HIGHWAY CAP/POTENTIAL OPEN SPACE			▨	7		
EXISTING RDWY TO BE REMOVED			▨	1		
SURPLUS ROW			▨	3	RED	3
CONVENTION CENTER STORAGE			▭	5	PURPLE	62
PROPOSED CONTROL OF ACCESS			—‖—	0	RED	3
PROPOSED FEIS ROW			— — —	6	BLUE	126
EXISTING ROW			- - -	1	YELLOW	4
ACCESS ROAD			······	1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)			┼┼┼┼	1	RED	3
METRO RAIL(EAST END LINE)			┼┼┼┼	1	GREEN	156
METRO RAIL(SOUTHEAST LINE)			┼┼┼┼	1	PURPLE	203
RAILROAD			┼┼┼┼	1	BLACK	0
LIMITS OF FLOODWAY			—	1	BLUE	171
PLANIMETRIC				2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			0000	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES			⇨	0	BLACK	0
TURNAROUNDS			⇨	0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES			➡	1	BLACK	0
TURNAROUNDS			➡	1	BLUE	168
RAMPS			➡	1	RED	3
DIRECT CONNECTOR			➡	1	RED	139
MAX LANES			➡	1	MAGENTA	5
DEPRESSED			—^—^—	3	RED	3
BY OTHERS			- - - -	3	BLUE	1
RETAINING WALL			—	6	RED	3
PROPOSED AESTHETIC WALL			—	6	PURPLE	203
PROPOSED NOISE BARRIER			—	6	LT GREEN	196

STEPHEN A. HRNCIR
67245
LICENSED PROFESSIONAL ENGINEER
28-JUL-2023

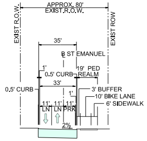
TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED



APPROX. 80'
EXIST.R.O.W.
EXIST R.O.W.
EXIST R.O.W.
14' PED
REALM
℄ ST EMANUEL
0.5'
CURB
0.5'
CURB
3' BUFFER
5' BIKE LANE
6' SIDEWALK
VARIES
1'
1'
11'
11'
LN
LN
2%

PROP. TYPICAL SECTION A-A
NTS



APPROX. 80'
EXIST.R.O.W.
EXIST R.O.W.
EXIST ROW
35'
℄ ST EMANUEL
1'
0.5' CURB
19' PED
REALM
33'
0.5' CURB
3' BUFFER
1'
10' BIKE LANE
6' SIDEWALK
11'
11'
11'
LN
LN
PRK
2%

PROP. TYPICAL SECTION B-B
NTS

FR288NB303

PI STATION = 11151+24.36
DELTA = 4°26′33.50"(LT)
DEGREE OF CURVE = 5°36′02.74"
TANGENT = 39.68′
LENGTH = 79.32′
RADIUS = 1023.00′
PC STATION = 11150+84.68
PT STATION = 11151+64.00

PI STATION = 11152+66.33
DELTA = 4°26′33.50"(RT)
DEGREE OF CURVE = 5°51′52.06"
TANGENT = 37.90′
LENGTH = 75.76′
RADIUS = 977.00′
PC STATION = 11152+28.43
PT STATION = 11153+04.19

PI STATION = 11171+06.78
DELTA = 2°04′02.40"(RT)
DEGREE OF CURVE = 2°53′53.22"
TANGENT = 35.67′
LENGTH = 71.33′
RADIUS = 1977.00′
PC STATION = 11170+71.11
PT STATION = 11171+42.45

PI STATION = 11172+50.92
DELTA = 2°04′02.40"(LT)
DEGREE OF CURVE = 2°49′55.99"
TANGENT = 36.50′
LENGTH = 72.99′
RADIUS = 2023.00′
PC STATION = 11172+14.42
PT STATION = 11172+87.42

PI STATION = 11194+33.65
DELTA = 8°48′51.63"(LT)
DEGREE OF CURVE = 4°57′11.41"
TANGENT = 89.15′
LENGTH = 177.95′
RADIUS = 1,156.75′
PC STATION = 11193+44.50
PT STATION = 11195+22.46

RP069NB302

PI STATION = 13+46.11
DELTA = 7° 26′ 01.92" (RT)
DEGREE OF CURVE = 1° 28′ 08.84"
TANGENT = 253.36
LENGTH = 506.01
RADIUS = 3,900.00
PC STATION = 10+92.75
PT STATION = 15+98.76

PI STATION = 31+56.74
DELTA = 7° 43′ 24.17" (LT)
DEGREE OF CURVE = 0° 52′ 58.19"
TANGENT = 438.08
LENGTH = 874.84
RADIUS = 6,490.00
PC STATION = 27+18.66
PT STATION = 35+93.50

RP069NB303

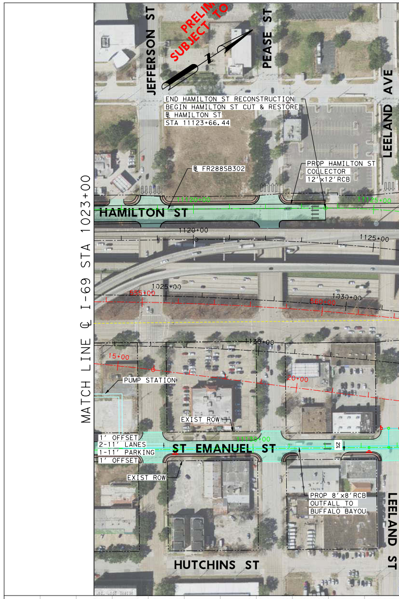
PI STATION = 10+61.23
DELTA = 6° 14′ 11.06" (LT)
DEGREE OF CURVE = 5° 05′ 50.96"
TANGENT = 61.23
LENGTH = 122.34
RADIUS = 1,124.00
PC STATION = 10+00.00
PT STATION = 11+22.34

PI STATION = 12+95.47
DELTA = 9° 20′ 55.05" (RT)
DEGREE OF CURVE = 5° 43′ 46.48"
TANGENT = 81.76
LENGTH = 163.16
RADIUS = 1,000.00
PC STATION = 12+13.70
PT STATION = 13+76.87

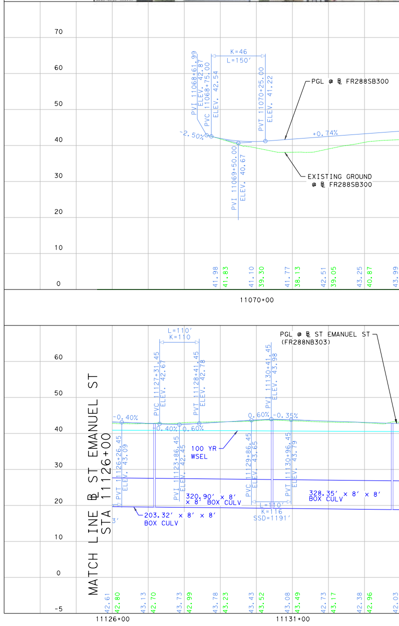
PI STATION = 15+40.03
DELTA = 2° 53′ 15.62" (LT)
DEGREE OF CURVE = 3° 47′ 03.83"
TANGENT = 38.16
LENGTH = 76.30
RADIUS = 1,514.00
PC STATION = 15+01.87
PT STATION = 15+78.17

PI STATION = 24+46.25
DELTA = 4° 45′ 32.14" (LT)
DEGREE OF CURVE = 0° 52′ 56.24"
TANGENT = 269.85
LENGTH = 539.38
RADIUS = 6,494.00
PC STATION = 21+76.40
PT STATION = 27+15.79

PI STATION = 33+82.41
DELTA = 1° 48′ 55.50" (RT)
DEGREE OF CURVE = 0° 53′ 03.10"
TANGENT = 102.67
LENGTH = 205.32
RADIUS = 6,480.00
PC STATION = 32+79.74
PT STATION = 34+85.06

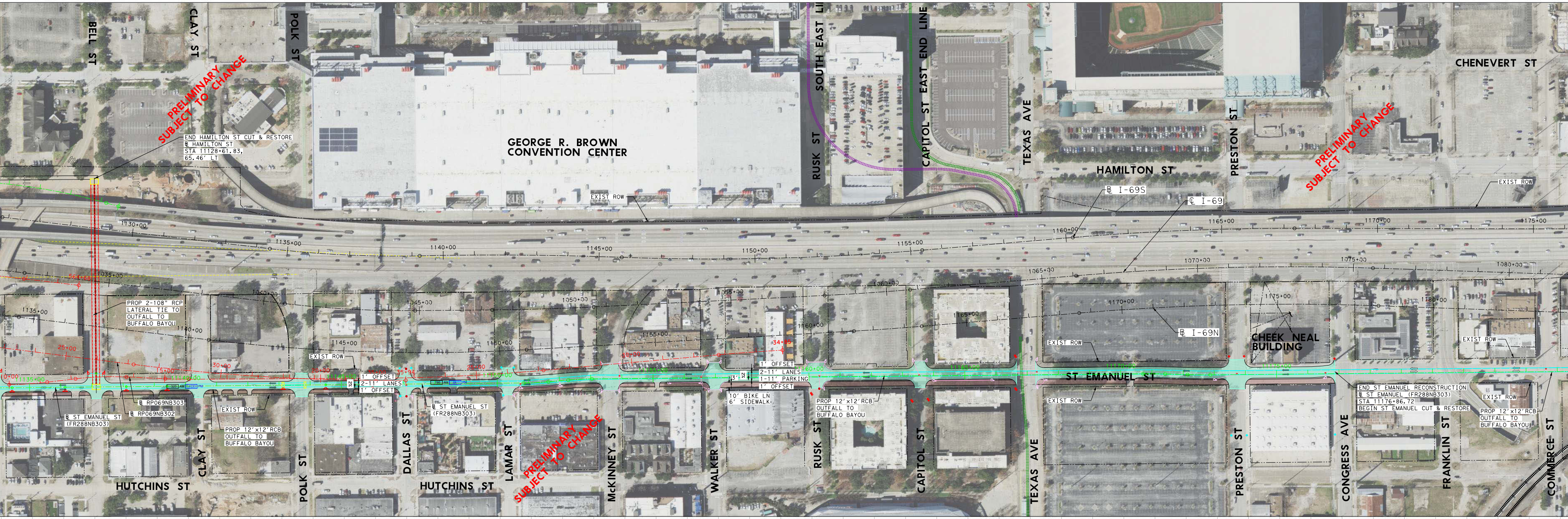


MATCH LINE ℄ I-69 STA 1023+00
JEFFERSON ST
PEASE ST
LEELAND AVE
PRELIMINARY
SUBJECT TO
END HAMILTON ST RECONSTRUCTION
BEGIN HAMILTON ST CUT & RESTORE
℄ HAMILTON ST
STA 11123+66.44
℄ FR288SB302
PROP HAMILTON ST
COLLECTOR
12′x12′RCB
HAMILTON ST
11120+00
11125+00
1120+00
1125+00
1025+00
1030+00
555+00
560+00
1130+00
15+00
20+00
PUMP STATION
EXIST ROW
1′ OFFSET
2-11′ LANES
1-11′ PARKING
1′ OFFSET
ST EMANUEL ST
11130+00
2%
EXIST ROW
PROP 8′x8′RCB
OUTFALL TO
BUFFALO BAYOU
HUTCHINS ST
LEELAND ST



PROFILE LEGEND

PROP. PGL @ CL/NB/EB MAINLANE	—
PROP. PGL @ SB/WB MAINLANE	— — —
PROP. PGL @ MAX LANES	—
EXISTING GROUND @ PGL	— · — ·
100 YR. W.S.E.	∇
PROP. PGL @ NB/EB RAMP	—
PROP. PGL @ SB/WB RAMP	— — —
PROP. PGL @ NB/EB DC	—
PROP. PGL @ SB/WB DC	— — —
PROP. PGL @ NB/EB FRONTAGE	—
PROP. PGL @ SB/WB FRONTAGE	— — —
PROP. PGL @ LOCAL ST	—
EXIST. GRND. @ NB/EB ROW	- - - -
EXIST. GRND. @ SB/WB ROW	- - - -

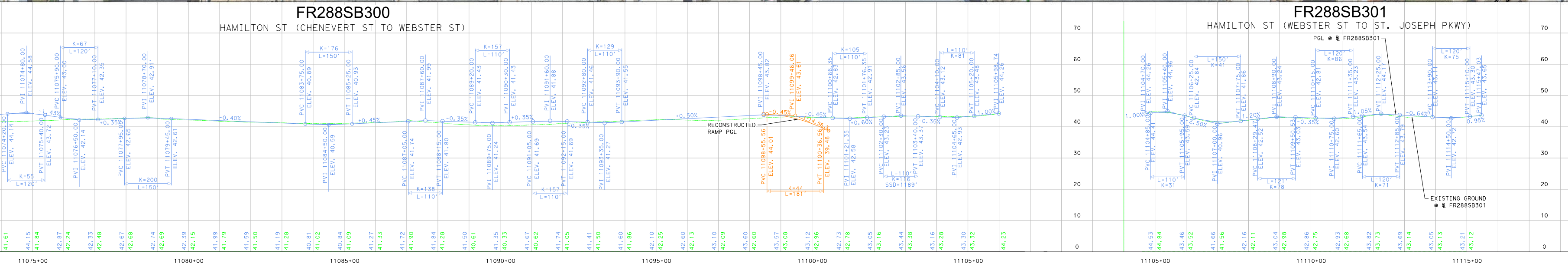

BELL ST
CLAY ST
POLK ST
PRELIMINARY SUBJECT TO CHANGE
END HAMILTON ST CUT & RESTORE
℄ HAMILTON ST
STA 11128+61.83, 65.46' LT
GEORGE R. BROWN CONVENTION CENTER
EXIST ROW
SOUTH EAST LINE
RUSK ST
CAPITOL ST EAST END LINE
TEXAS AVE
PRESTON ST
HAMILTON ST
℄ I-69S
℄ I-69
CHENEVERT ST
PRELIMINARY SUBJECT TO CHANGE
EXIST ROW
PROP 2-108" RCP LATERAL TIE TO OUTFALL TO BUFFALO BAYOU
EXIST ROW
1' OFFSET
2-11' LANES
1' OFFSET
1' OFFSET
2-11' LANES
1-11' PARKING
1' OFFSET
10' BIKE LN
6' SIDEWALK
℄ I-69N
CHEEK NEAL BUILDING
EXIST ROW
ST EMANUEL ST
EXIST ROW
END ST EMANUEL RECONSTRUCTION
℄ ST EMANUEL (FR288NB303)
STA 11176+86.72
BEGIN ST EMANUEL CUT & RESTORE
EXIST ROW
PROP 12'x12' RCB OUTFALL TO BUFFALO BAYOU
℄ RP069NB303
℄ RP069NB302
℄ ST EMANUEL ST (FR288NB303)
EXIST ROW
PROP 12'x12' RCB OUTFALL TO BUFFALO BAYOU
℄ ST EMANUEL ST (FR288NB303)
PROP 12'x12' RCB OUTFALL TO BUFFALO BAYOU
HUTCHINS ST
CLAY ST
POLK ST
DALLAS ST
HUTCHINS ST
LAMAR ST
PRELIMINARY SUBJECT TO CHANGE
McKINNEY ST
WALKER ST
RUSK ST
CAPITOL ST
TEXAS AVE
PRESTON ST
CONGRESS AVE
FRANKLIN ST
COMMERCE ST

FR288SB300

HAMILTON ST (CHENEVERT ST TO WEBSTER ST)

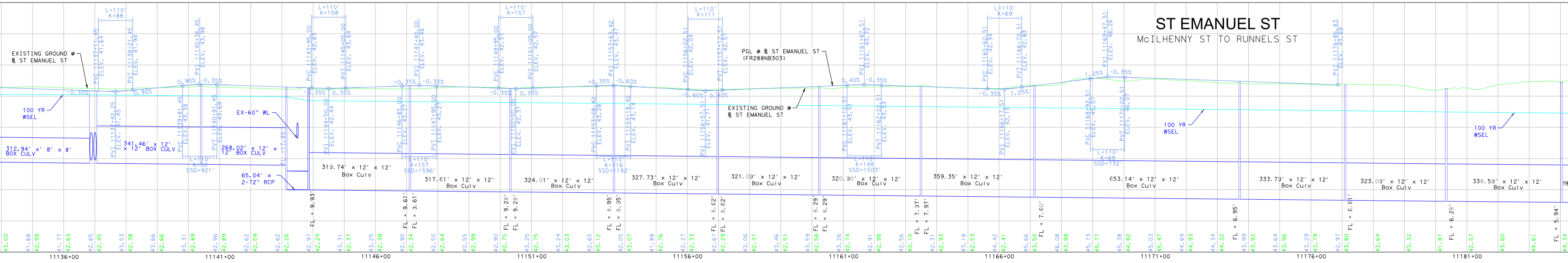
FR288SB301

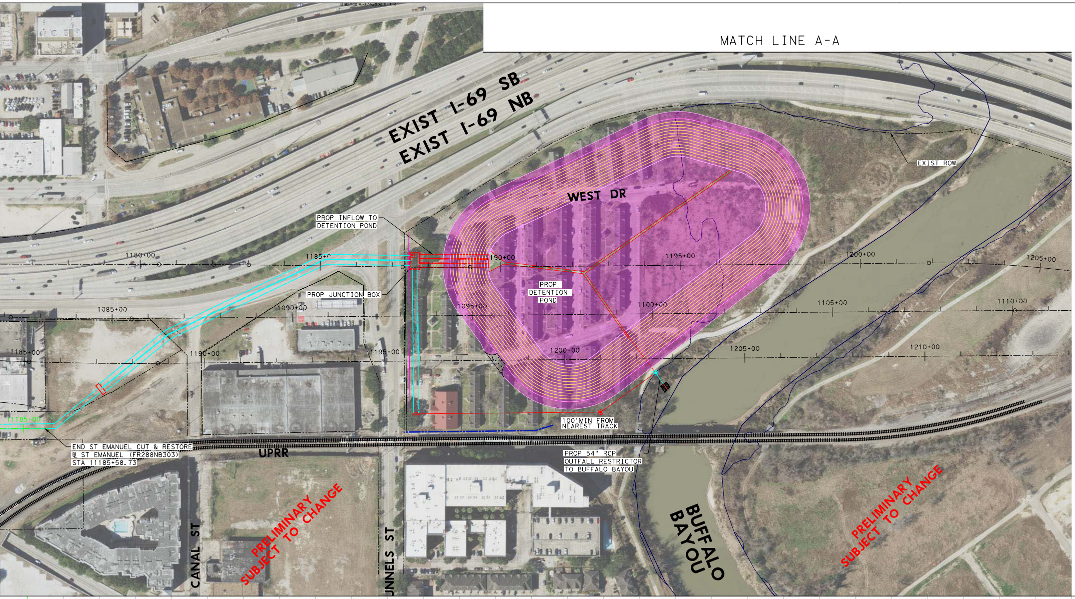
HAMILTON ST (WEBSTER ST TO ST. JOSEPH PKWY)

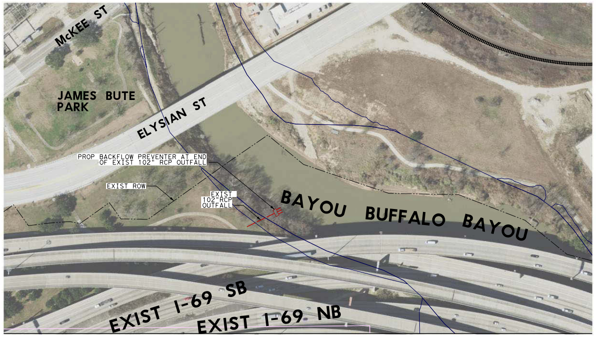

RECONSTRUCTED RAMP PGL
PGL @ ℄ FR288SB301
EXISTING GROUND @ ℄ FR288SB301
70
60
50
40
30
20
10
0
11075+00
11080+00
11085+00
11090+00
11095+00
11100+00
11105+00
11110+00
11115+00

ST EMANUEL ST

McILHENNY ST TO RUNNELS ST


EXISTING GROUND @ ℄ ST EMANUEL ST
100 YR WSEL
312.94' x 8' x 8' BOX CULV
341.46' x 12' x 12' BOX CULV
EX-60" WL
268.02' x 12' x 12' BOX CULV
65.04' x 2-72" RCP
319.74' x 12' x 12' Box Culv
317.61' x 12' x 12' Box Culv
324.01' x 12' x 12' Box Culv
327.73' x 12' x 12' Box Culv
321.09' x 12' x 12' Box Culv
320.90' x 12' x 12' Box Culv
359.35' x 12' x 12' Box Culv
653.14' x 12' x 12' Box Culv
333.79' x 12' x 12' Box Culv
323.09' x 12' x 12' Box Culv
338.59' x 12' x 12' Box Culv
PGL @ ℄ ST EMANUEL ST (FR288NB303)
EXISTING GROUND @ ℄ ST EMANUEL ST
100 YR WSEL
100 YR WSEL
FL = 9.93'
FL = 9.61'
FL = 9.28'
FL = 8.95'
FL = 8.62'
FL = 8.29'
FL = 7.97'
FL = 7.60'
FL = 6.95'
FL = 6.61'
FL = 6.28'
FL = 5.94'
11136+00
11141+00
11146+00
11151+00
11156+00
11161+00
11166+00
11171+00
11176+00
11181+00

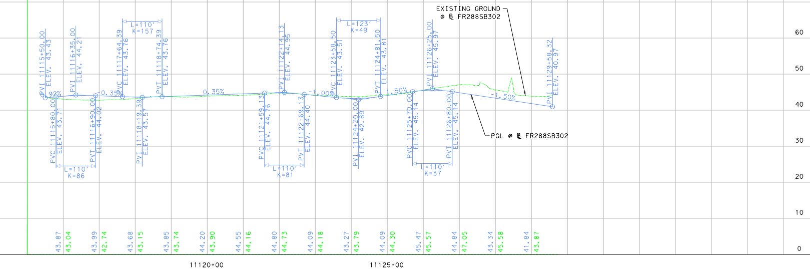

MATCH LINE A-A
EXIST I-69 SB
EXIST I-69 NB
WEST DR
EXIST ROW
PROP INFLOW TO DETENTION POND
PROP JUNCTION BOX
PROP DETENTION POND
1180+00
1185+0
1190+00
1195+00
1200+00
1205+00
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00
1185+00
1190+00
1195+00
1200+00
1205+00
1210+00
100' MIN FROM NEAREST TRACK
END ST EMANUEL CUT & RESTORE
℄ ST EMANUEL (FR288NB303)
STA 11185+58.73
UPRR
PROP 54" RCP OUTFALL RESTRICTOR TO BUFFALO BAYOU
BUFFALO BAYOU
CANAL ST
NNELS ST
PRELIMINARY SUBJECT TO CHANGE
PRELIMINARY SUBJECT TO CHANGE

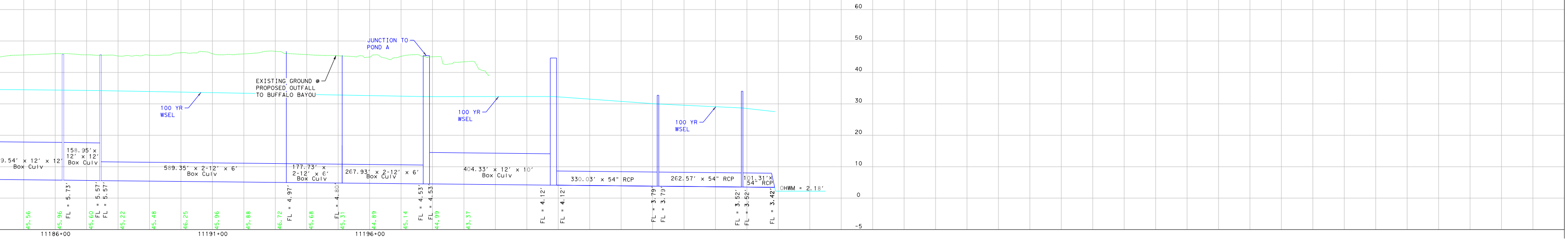

McKEE ST
JAMES BUTE PARK
ELYSIAN ST
PROP BACKFLOW PREVENTER AT END OF EXIST 102" RCP OUTFALL
EXIST ROW
EXIST 102" RCP OUTFALL
BAYOU
BUFFALO BAYOU
EXIST I-69 SB
EXIST I-69 NB

MATCH LINE A-A

FR288SB302

HAMILTON (ST. JOSEPH PKWY TO BELL ST)




JUNCTION TO POND A
EXISTING GROUND @ PROPOSED OUTFALL TO BUFFALO BAYOU
100 YR WSEL
100 YR WSEL
100 YR WSEL
9.54' x 12' x 12' Box Culv
158.95' x 12' x 12' Box Culv
589.35' x 2-12' x 6' Box Culv
177.73' x 2-12' x 6' Box Culv
267.93' x 2-12' x 6' Box Culv
404.33' x 12' x 10' Box Culv
330.03' x 54" RCP
262.57' x 54" RCP
101.31' x 54" RCP
OHWM = 2.18'
FL = 5.73'
FL = 5.57'
FL = 5.57'
FL = 4.97'
FL = 4.80'
FL = 4.53'
FL = 4.53'
FL = 4.12'
FL = 4.12'
FL = 3.79'
FL = 3.79'
FL = 3.52'
FL = 3.52'
FL = 3.42'
45.56
45.96
45.60
45.22
45.48
46.25
45.96
45.88
46.72
45.68
45.31
44.89
45.14
44.99
43.37
11186+00
11191+00
11196+00
60
50
40
30
20
10
0
-5

HOUSTON DISTRICT
PROJECT DEVELOPMENT

PUMP STATION OUTFALL

PRELIMINARY
SUBJECT TO CHANGE

3
8

PREPARED BY: ynevle

FILE LOCATION: G:\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\20230417 - IDCUS Final Revised Schematic\DGN_HNTB MODEL\NHHIP_2009_SH288 IH45_RE_PP03_I69.dgn

SCALE: 1:100

PEN TABLE: \\hoxw00\jobs\59004\TECHPROD\NHHIP\Plots\59004_NHHIP_IH45.pen

HOUSTON DISTRICT
PROJECT DEVELOPMENT

NHHIP - SEGMENT 3 - SH 288

PRELIMINARY
SUBJECT TO CHANGE

DATE: 7/27/2023 TIME: 11:04:31 AM SCALE: 100.0000 ft / in. PEN TABLE: PEN

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

FILE LOCATION: DGN

PREPARED BY: shartshorn

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(SH 288)

COUNTY: HARRIS
LIMITS FROM: BLODGETT ST
LIMITS TO: MCGOWEN ST
DATE: 7/27/2023

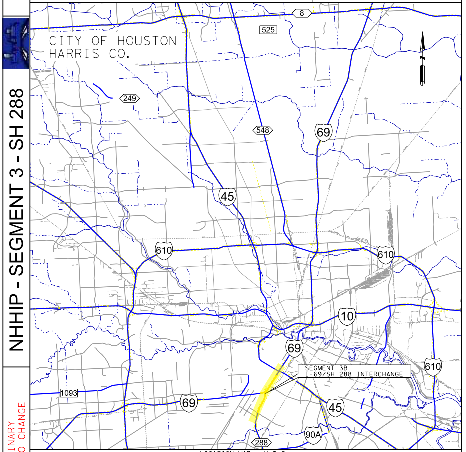
CONSTRUCTION CSJ: 0027-13-201, 0027-13-221

SCHEMATIC DESIGN - PROFILES

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

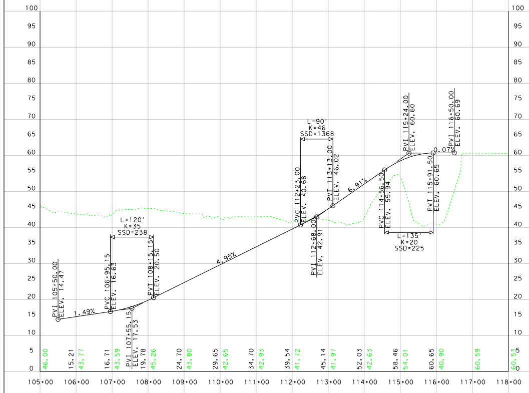
HORZ SCALE: 1"=200'
0 50 100 200

VERT SCALE: 1"=20'
0 5 10 20


CITY OF HOUSTON
HARRIS CO.
8
525
249
548
69
45
610
10
69
SEGMENT 3B
I-69/SH 288 INTERCHANGE
610
1093
69
45
90A
288

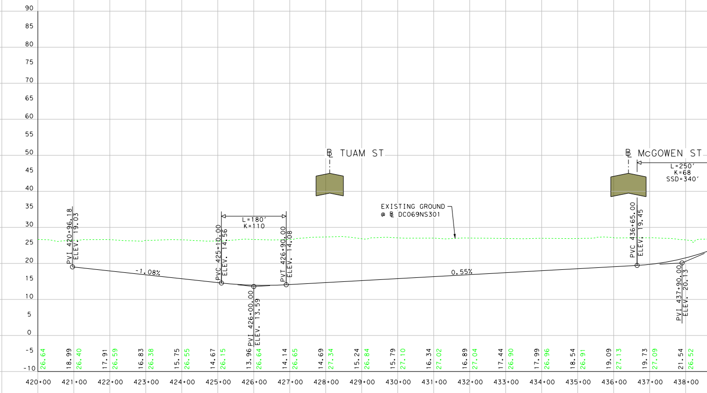
LOCATION MAP : N.T.S.

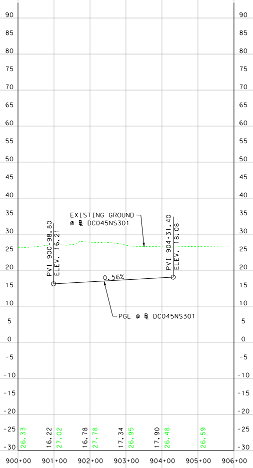
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013


PVI 105+50.00
ELEV. 14.47
1.49%
PVC 106+95.15
ELEV. 16.63
L=120'
K=35
SSD=238
PVI 107+55.15
ELEV. 17.53
PVT 108+15.15
ELEV. 20.50
4.95%
PVC 112+23.00
ELEV. 40.68
L=90'
K=46
SSD=1368
PVI 112+68.00
ELEV. 42.91
PVT 113+13.00
ELEV. 46.02
6.91%
PVC 114+56.50
ELEV. 55.94
PVI 115+24.00
ELEV. 60.60
L=135'
K=20
SSD=225
PVT 115+91.50
ELEV. 60.65
0.07%
PVI 116+50.00
ELEV. 60.69
46.00 15.21 43.77 16.71 43.59 19.78 45.26 24.70 43.80 29.65 42.65 34.70 42.93 39.54 41.72 45.14 41.97 52.03 42.63 58.46 54.01 60.65 40.90 60.59 60.53
105+00 106+00 107+00 108+00 109+00 110+00 111+00 112+00 113+00 114+00 115+00 116+00 117+00 118+00

DC069NS300

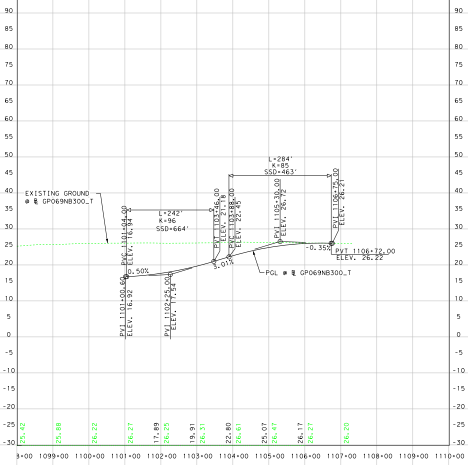
DC I69N-SH288S


℄ TUAM ST
℄ McGOWEN ST
L=250'
K=68
SSD=340'
EXISTING GROUND
@ ℄ DC069NS301
PVI 420+96.18
ELEV. 19.03
-1.08%
PVC 425+10.00
ELEV. 14.56
L=180'
K=110
PVI 426+00.00
ELEV. 13.59
PVT 426+90.00
ELEV. 14.08
0.55%
PVC 436+65.00
ELEV. 19.45
PVI 437+90.00
ELEV. 20.13
26.64 18.99 26.40 17.91 26.59 16.83 26.38 15.75 26.55 14.67 26.15 13.96 26.64 14.14 26.65 14.69 27.34 15.24 26.84 15.79 27.10 16.34 27.02 16.89 27.04 17.44 26.90 17.99 26.96 18.54 26.91 19.09 27.13 19.73 27.09 21.54 26.52
420+00 421+00 422+00 423+00 424+00 425+00 426+00 427+00 428+00 429+00 430+00 431+00 432+00 433+00 434+00 435+00 436+00 437+00 438+00


EXISTING GROUND
@ ℄ DC045NS301
PVI 900+98.80
ELEV. 16.21
0.56%
PVI 904+31.40
ELEV. 18.08
PGL @ ℄ DC045NS301
26.33 16.22 27.02 16.78 27.78 17.34 26.95 17.90 26.48 26.59
900+00 901+00 902+00 903+00 904+00 905+00 906+00

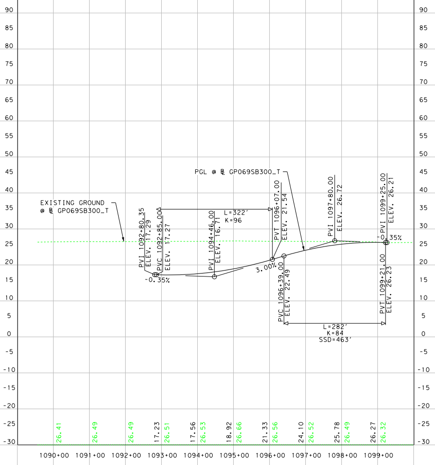
DC045NS301

DC I45N-SH288S


EXISTING GROUND
@ ℄ GP069NB300_T
PVC 1101+04.00
ELEV. 16.94
L=242'
K=96
SSD=664'
0.50%
PVI 1101+00.60
ELEV. 16.92
PVI 1102+25.00
ELEV. 17.54
PVT 1103+46.00
ELEV. 21.18
PVC 1103+88.00
ELEV. 22.45
3.01%
L=284'
K=85
SSD=463'
PVI 1105+30.00
ELEV. 26.72
PVI 1106+75.00
ELEV. 26.21
-0.35%
PVT 1106+72.00
ELEV. 26.22
PGL @ ℄ GP069NB300_T
25.42 25.88 26.22 26.27 17.89 26.25 19.91 26.31 22.80 26.61 25.07 26.47 26.17 26.27 26.20
1099+00 1100+00 1101+00 1102+00 1103+00 1104+00 1105+00 1106+00 1107+00 1108+00 1109+00 1110+00

GP69NB300_T

TRANSITION GP PROP I69N TO EXIST I69N


EXISTING GROUND
@ ℄ GP069SB300_T
PGL @ ℄ GP069SB300_T
PVI 1092+80.35
ELEV. 17.29
PVC 1092+85.00
ELEV. 17.27
-0.35%
L=322'
K=96
PVI 1094+46.00
ELEV. 16.71
PVT 1096+07.00
ELEV. 21.54
3.00%
PVC 1096+39.00
ELEV. 22.49
PVI 1097+80.00
ELEV. 26.72
PVI 1099+25.00
ELEV. 26.21
-0.35%
PVT 1099+21.00
ELEV. 26.23
L=282'
K=84
SSD=463'
26.41 26.49 26.49 17.23 26.51 17.56 26.53 18.92 26.66 21.33 26.56 24.10 26.52 25.78 26.49 26.27 26.32
1090+00 1091+00 1092+00 1093+00 1094+00 1095+00 1096+00 1097+00 1098+00 1099+00

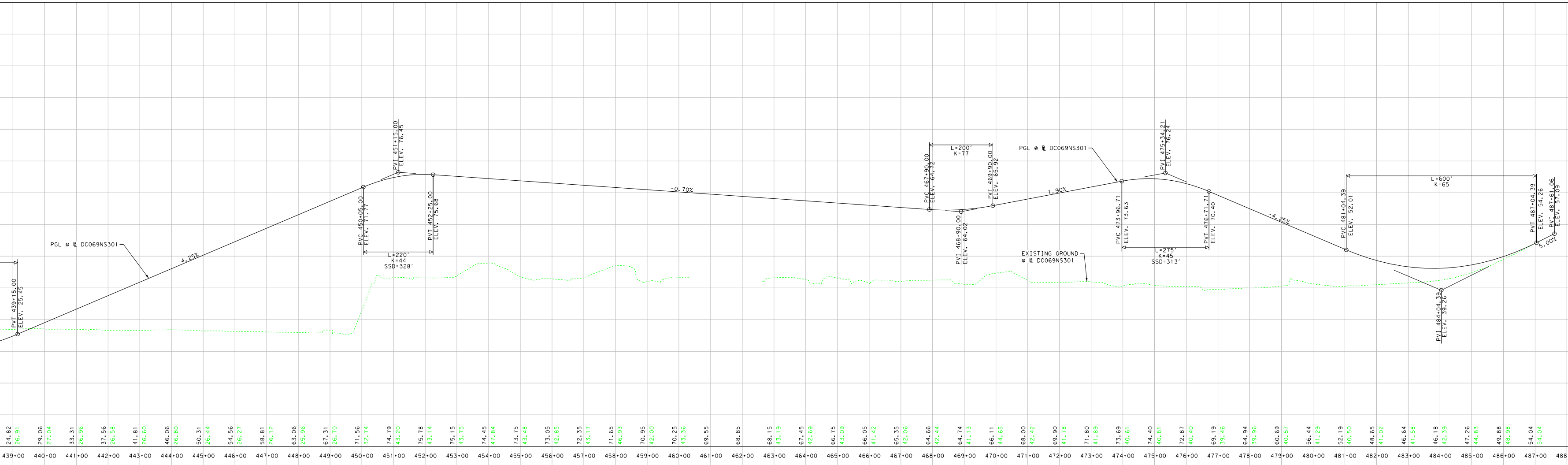
GP69SB300_T

TRANSITION PROP I69S TO EXIST I69S

STEPHEN A. HRNCIR
67245
7/27/2023

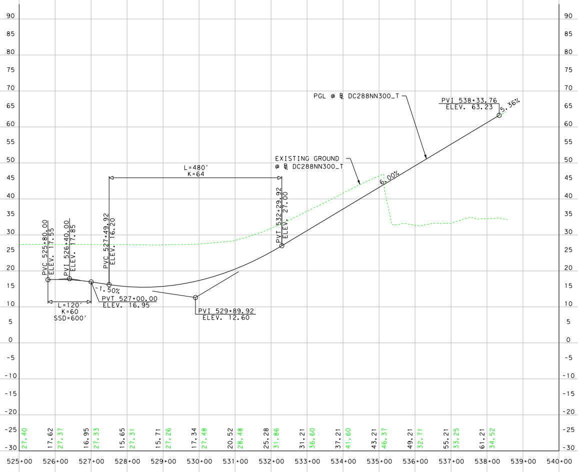
TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED


PVT 439+15.00
ELEV. 25.45
PGL @ ℄ DC069NS301
4.25%
PVC 450+05.00
ELEV. 71.77
PVI 451+15.00
ELEV. 76.45
PVT 452+25.00
ELEV. 75.68
L=220'
K=44
SSD=328'
-0.70%
L=200'
K=77
PVC 467+90.00
ELEV. 64.72
PVI 468+90.00
ELEV. 64.02
PVT 469+90.00
ELEV. 65.92
1.90%
PGL @ ℄ DC069NS301
PVI 475+34.21
ELEV. 76.24
PVC 473+96.71
ELEV. 73.63
PVT 476+71.71
ELEV. 70.40
L=275'
K=45
SSD=313'
EXISTING GROUND
@ ℄ DC069NS301
-4.25%
PVC 481+04.39
ELEV. 52.01
L=600'
K=65
PVI 484+04.39
ELEV. 39.26
PVT 487+04.39
ELEV. 54.26
PVI 487+61.06
ELEV. 57.09
5.00%
24.82 26.91
29.06 27.04
33.31 26.96
37.56 26.58
41.81 26.60
46.06 26.80
50.31 26.44
54.56 26.27
58.81 26.12
63.06 25.96
67.31 26.70
71.56 32.74
74.79 43.20
75.78 43.14
75.15 43.75
74.45 47.84
73.75 43.48
73.05 42.85
72.35 43.17
71.65 46.93
70.95 42.00
70.25 43.36
69.55
68.85
68.15 43.19
67.45 42.69
66.75 43.09
66.05 41.42
65.35 42.06
64.66 42.44
64.74 41.13
66.11 44.65
68.00 42.42
69.90 41.78
71.80 41.89
73.69 40.61
74.40 40.81
72.87 40.40
69.19 39.46
64.94 39.96
60.69 40.57
56.44 41.29
52.19 40.50
48.65 41.02
46.64 41.58
46.18 42.39
47.26 44.83
49.88 48.98
54.04 54.04
439+00 440+00 441+00 442+00 443+00 444+00 445+00 446+00 447+00 448+00 449+00 450+00 451+00 452+00 453+00 454+00 455+00 456+00 457+00 458+00 459+00 460+00 461+00 462+00 463+00 464+00 465+00 466+00 467+00 468+00 469+00 470+00 471+00 472+00 473+00 474+00 475+00 476+00 477+00 478+00 479+00 480+00 481+00 482+00 483+00 484+00 485+00 486+00 487+00 488

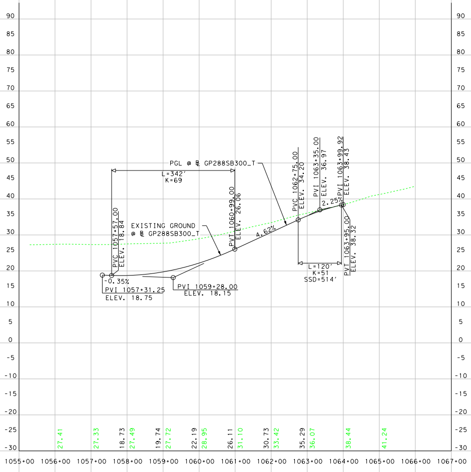
DC069NS301

DC I69N-I45S


90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 -5 -10 -15 -20 -25 -30
PGL @ ℄ DC288NN300_T
PVI 538+33.76
ELEV. 63.23
5.36%
L=480'
K=64
EXISTING GROUND
@ ℄ DC288NN300_T
6.00%
PVC 525+80.00
ELEV. 17.55
PVI 526+40.00
ELEV. 17.85
PVC 527+49.92
ELEV. 16.20
PVT 532+29.92
ELEV. 27.00
-1.50%
PVT 527+00.00
ELEV. 16.95
L=120'
K=60
SSD=600'
PVI 529+89.92
ELEV. 12.60
27.40
17.62 27.37
16.95 27.33
15.65 27.31
15.71 27.26
17.34 27.48
20.52 28.48
25.28 31.86
31.21 36.60
37.21 41.60
43.21 46.37
49.21 32.71
55.21 33.25
61.21 34.52
525+00 526+00 527+00 528+00 529+00 530+00 531+00 532+00 533+00 534+00 535+00 536+00 537+00 538+00 539+00 540+00

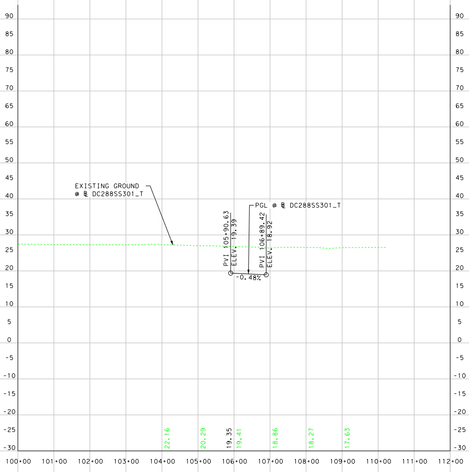
DC288NN300_T

TRANSITION DC PROP SH288N TO EXIST I45N/S


90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 -5 -10 -15 -20 -25 -30
PGL @ ℄ GP288SB300_T
L=342'
K=69
EXISTING GROUND
@ ℄ GP288SB300_T
PVC 1057+57.00
ELEV. 18.84
PVT 1060+99.00
ELEV. 26.06
PVC 1062+75.00
ELEV. 34.20
PVI 1063+35.00
ELEV. 36.97
PVI 1063+99.92
ELEV. 38.43
PVT 1063+95.00
ELEV. 38.32
4.62%
2.25%
-0.35%
PVI 1057+31.25
ELEV. 18.75
PVI 1059+28.00
ELEV. 18.15
L=120'
K=51
SSD=514'
27.41
27.33
18.73 27.49
19.74 27.72
22.19 28.95
26.11 31.10
30.73 33.42
35.29 36.07
38.44
41.24
1055+00 1056+00 1057+00 1058+00 1059+00 1060+00 1061+00 1062+00 1063+00 1064+00 1065+00 1066+00 1067+00

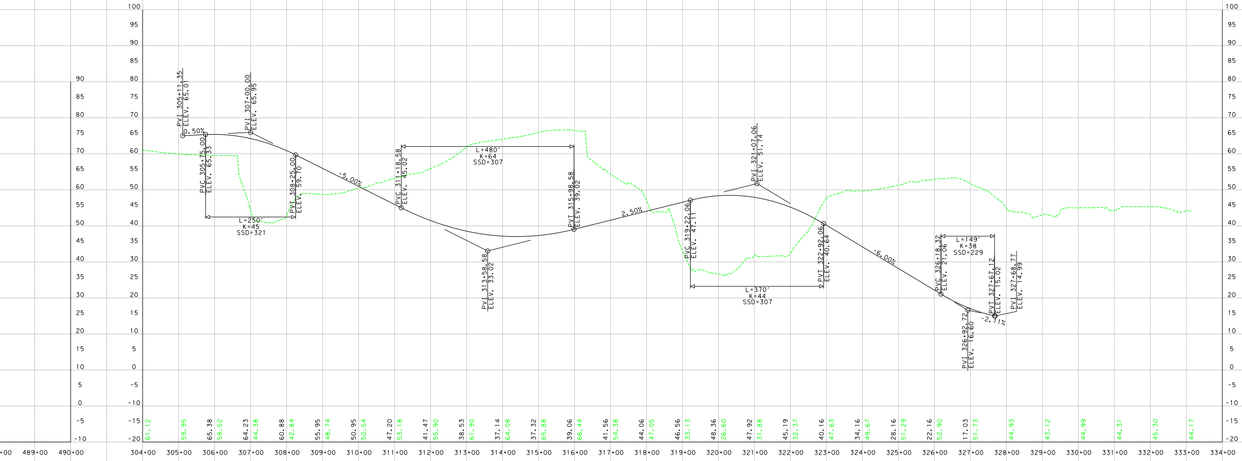
GP288SB300_T

TRANSITION GP EXIST SH288S TO PROP SH288S


90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 -5 -10 -15 -20 -25 -30
EXISTING GROUND
@ ℄ DC288SS301_T
PGL @ ℄ DC288SS301_T
PVI 105+90.63
ELEV. 19.39
PVI 106+89.42
ELEV. 18.92
-0.48%
22.16
20.29
19.35 19.41
18.86
18.27
17.63
100+00 101+00 102+00 103+00 104+00 105+00 106+00 107+00 108+00 109+00 110+00 111+00 112+00

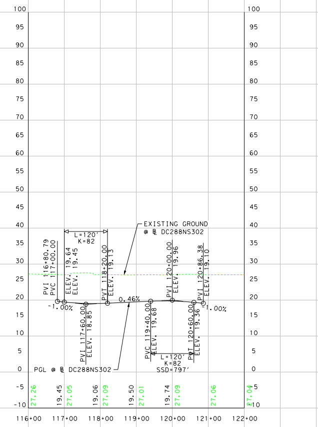
DC288SS301_T

TRANSITION DC PROP SH288S TO PROP I69S


PVI 305+11.35 ELEV. 65.01
0.50%
PVC 305+75.00 ELEV. 65.33
PVI 307+00.00 ELEV. 65.95
L=250'
K=45
SSD=321
PVI 308+25.00 ELEV. 59.70
-5.00%
PVC 311+18.58 ELEV. 45.02
L=480'
K=64
SSD=307
PVI 313+58.58 ELEV. 33.02
PVT 315+98.58 ELEV. 39.02
2.50%
PVC 319+22.06 ELEV. 47.11
PVI 321+07.06 ELEV. 51.74
L=370'
K=44
SSD=307
PVT 322+92.06 ELEV. 40.64
-6.00%
PVC 326+18.32 ELEV. 21.06
L=149'
K=38
SSD=229
PVI 326+92.72 ELEV. 16.60
PVT 327+67.12 ELEV. 15.02
PVI 327+68.77 ELEV. 14.99
-2.11%
61.12
59.95
65.38
59.92
64.23
44.38
60.88
42.84
55.95
48.74
50.95
50.54
47.20
53.18
41.47
55.90
38.53
61.90
37.14
64.08
37.32
65.88
39.06
66.44
41.56
54.38
44.06
47.05
46.56
33.13
48.36
26.60
47.92
31.88
45.19
32.37
40.16
47.63
34.16
49.67
28.16
51.29
22.16
52.90
17.03
51.73
44.93
43.12
44.99
44.31
45.30
44.17
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
+00
489+00
490+00
304+00
305+00
306+00
307+00
308+00
309+00
310+00
311+00
312+00
313+00
314+00
315+00
316+00
317+00
318+00
319+00
320+00
321+00
322+00
323+00
324+00
325+00
326+00
327+00
328+00
329+00
330+00
331+00
332+00
333+00
334+00

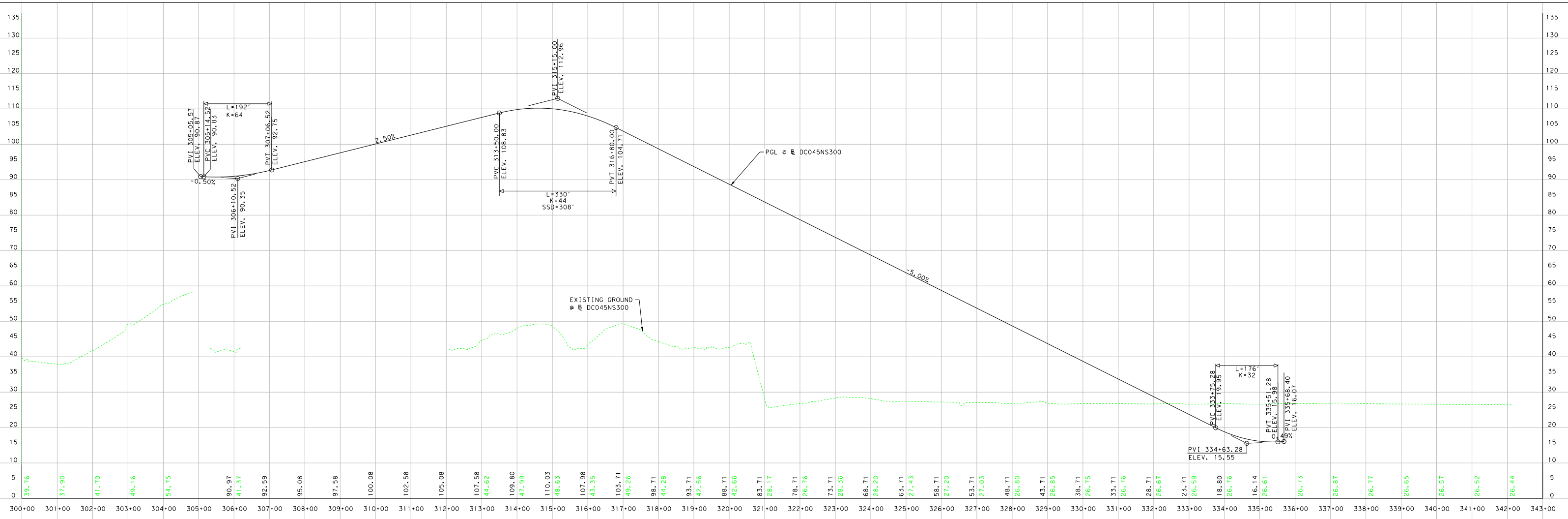
DC288NS300

DC SH288N-I69S


EXISTING GROUND
@ ℄ DC288NS302
L=120'
K=82
PVI 116+80.79 ELEV. 19.64
PVC 117+00.00 ELEV. 19.45
-1.00%
PVI 117+60.00 ELEV. 18.85
PVT 118+20.00 ELEV. 19.13
0.46%
PVC 119+40.00 ELEV. 19.68
PVI 120+00.00 ELEV. 19.96
PVT 120+60.00 ELEV. 19.36
PVI 120+86.38 ELEV. 19.10
1.00%
L=120'
K=82
SSD=797'
PGL @ ℄ DC288NS302
27.26
19.45
27.05
19.06
27.09
19.50
27.01
19.74
27.09
27.06
27.04
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
116+00
117+00
118+00
119+00
120+00
121+00
122+00

DC288NS302

DC SH288NN300-I45S


PVI 305+05.57
ELEV. 90.87
PVC 305+14.52
ELEV. 90.83
L=192'
K=64
PVT 307+06.52
ELEV. 92.75
-0.50%
PVI 306+10.52
ELEV. 90.35
2.50%
PVI 315+15.00
ELEV. 112.96
PVC 313+50.00
ELEV. 108.83
PVT 316+80.00
ELEV. 104.71
L=330'
K=44
SSD=308'
PGL @ ℄ DC045NS300
-5.00%
EXISTING GROUND
@ ℄ DC045NS300
L=176'
K=32
PVC 333+75.28
ELEV. 19.95
PVT 335+51.28
ELEV. 15.98
PVI 335+68.40
ELEV. 16.07
.49%
PVI 334+63.28
ELEV. 15.55
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
39.76
37.90
41.70
49.16
54.75
90.97
41.37
92.59
95.08
97.58
100.08
102.58
105.08
107.58
44.62
109.80
47.99
110.03
48.63
107.98
43.35
103.71
49.26
98.71
44.28
93.71
42.56
88.71
42.66
83.71
28.17
78.71
26.76
73.71
28.36
68.71
28.20
63.71
27.43
58.71
27.20
53.71
27.03
48.71
26.80
43.71
26.85
38.71
26.75
33.71
26.76
28.71
26.67
23.71
26.59
18.80
26.76
16.14
26.61
26.73
26.87
26.77
26.65
26.57
26.52
26.44
300+00
301+00
302+00
303+00
304+00
305+00
306+00
307+00
308+00
309+00
310+00
311+00
312+00
313+00
314+00
315+00
316+00
317+00
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319+00
320+00
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322+00
323+00
324+00
325+00
326+00
327+00
328+00
329+00
330+00
331+00
332+00
333+00
334+00
335+00
336+00
337+00
338+00
339+00
340+00
341+00
342+00
343+00

DC045NS300

DC I45N-I69S

HOUSTON DISTRICT
PROJECT DEVELOPMENT

NHHIP - SEGMENT 3 - SH 288

PRELIMINARY
SUBJECT TO CHANGE

HNTB

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

DATE: 7/27/2023 TIME: 11:04:31 AM SCALE: 100.0000 ft / in. PEN TABLE: PEN

PREPARED BY: shartshorn FILE LOCATION: DGN

HOUSTON DISTRICT
PROJECT DEVELOPMENT

NHHIP - SEGMENT 3 - SH 288

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(SH 288)

COUNTY: HARRIS
LIMITS FROM: BLODGETT ST
LIMITS TO: MCGOWEN ST
DATE: 5/16/2023

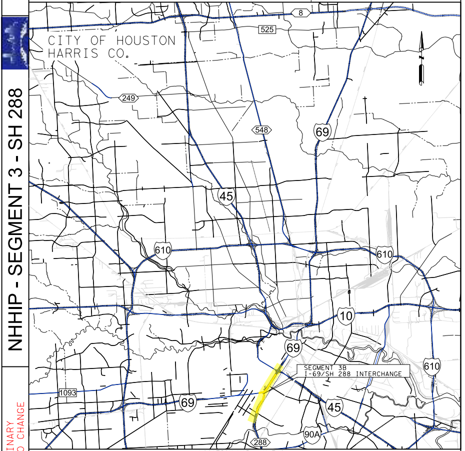
CONSTRUCTION CSJ: 0027-13-201, 0027-13-221

SCHEMATIC DESIGN - PROFILES

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

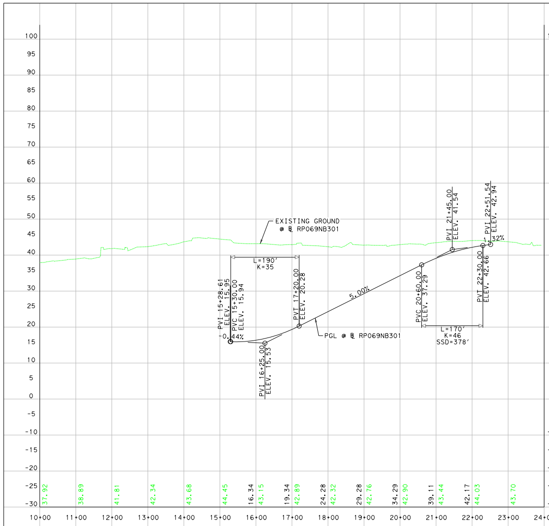
HORZ SCALE: 1"=200'
0 50 100 200

VERT SCALE: 1"=20'
0 5 10 20


CITY OF HOUSTON
HARRIS CO.
8
525
249
548
69
45
610
10
SEGMENT 3B
I-69/SH 288 INTERCHANGE
1093
90A
288

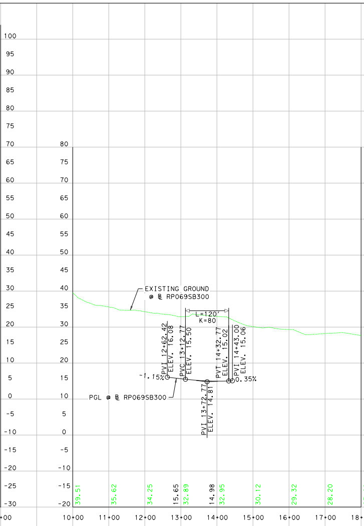
LOCATION MAP : N.T.S.

SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013


EXISTING GROUND
@ ℄ RP069NB301
L=190'
K=35
PVI 15+28.61
ELEV. 15.95
PVC 15+30.00
ELEV. 15.94
-0.44%
PVI 16+25.00
ELEV. 15.53
PVT 17+20.00
ELEV. 20.28
5.00%
PGL @ ℄ RP069NB301
PVC 20+60.00
ELEV. 37.29
PVI 21+45.00
ELEV. 41.54
PVT 22+30.00
ELEV. 42.66
PVI 22+51.54
ELEV. 42.94
1.32%
L=170'
K=46
SSD=378'
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00

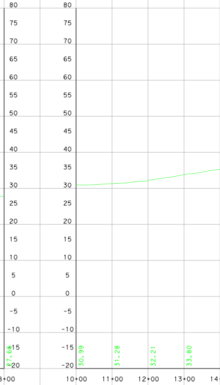
RP069NB301

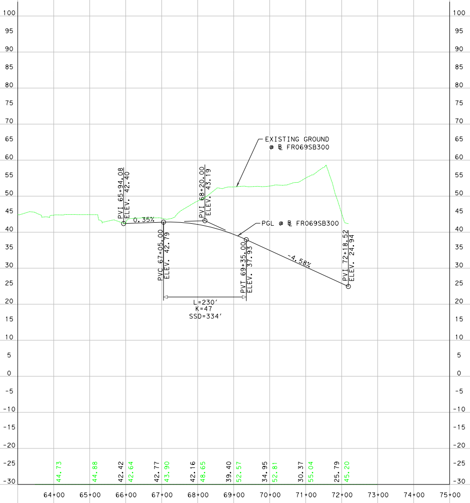
RAMP I69N EXIT TO GRAY ST


EXISTING GROUND
@ ℄ RP069SB300
L=120'
K=80
PVI 12+62.42
ELEV. 16.08
PVC 13+12.77
ELEV. 15.50
-1.15%
PVI 13+72.77
ELEV. 14.81
PVT 14+32.77
ELEV. 15.02
PVI 14+43.00
ELEV. 15.06
0.35%
PGL @ ℄ RP069SB300
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00

RP069SB300

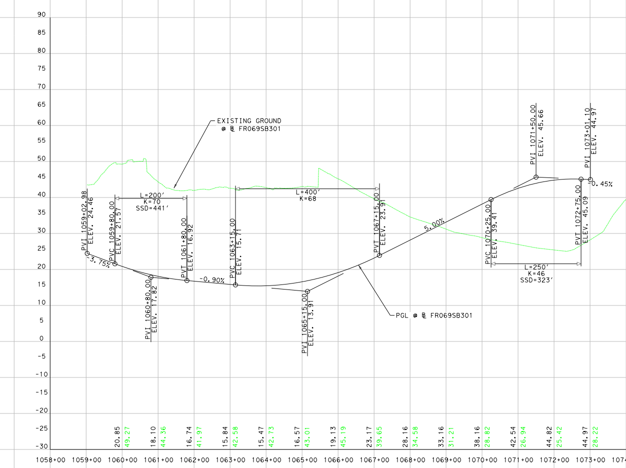
RAMP I69S EXIT TO ALMEDA RD




EXISTING GROUND
@ ℄ FR069SB300
PVI 65+94.08
ELEV. 42.40
0.35%
PVC 67+05.00
ELEV. 42.79
PVI 68+20.00
ELEV. 43.19
PGL @ ℄ FR069SB300
PVT 69+35.00
ELEV. 37.93
-4.58%
PVI 72+18.52
ELEV. 24.94
L=230'
K=47
SSD=334'
64+00
65+00
66+00
67+00
68+00
69+00
70+00
71+00
72+00
73+00
74+00
75+00

FR069SB300

I69SB FRTG (ALMEDA RD TO ALABAMA ST)


EXISTING GROUND
@ ℄ FR069SB301
PVI 1059+02.98
ELEV. 24.46
-3.75%
PVC 1059+80.00
ELEV. 21.57
L=200'
K=70
SSD=441'
PVI 1060+80.00
ELEV. 17.82
PVT 1061+80.00
ELEV. 16.92
-0.90%
PVC 1063+15.00
ELEV. 15.71
L=400'
K=68
PVI 1065+15.00
ELEV. 13.91
PVT 1067+15.00
ELEV. 23.91
5.00%
PGL @ ℄ FR069SB301
PVC 1070+25.00
ELEV. 39.41
PVI 1071+50.00
ELEV. 45.66
PVT 1072+75.00
ELEV. 45.09
PVI 1073+01.10
ELEV. 44.97
-0.45%
L=250'
K=46
SSD=323'
1058+00
1059+00
1060+00
1061+00
1062+00
1063+00
1064+00
1065+00
1066+00
1067+00
1068+00
1069+00
1070+00
1071+00
1072+00
1073+00

FR069SB301

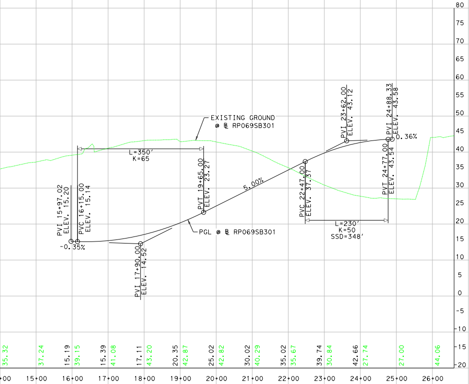
I69SB FRTG (ALABAMA ST TO STUART ST)

STEPHEN A. HRNCIR
67245
06/19/2023

TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

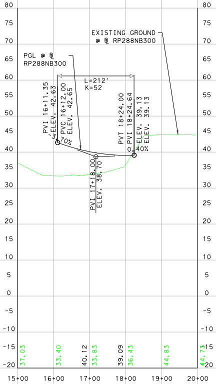
FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED

SHEET 5 OF 8


EXISTING GROUND @ ℄ RP069SB301
PGL @ ℄ RP069SB301
PVI 15+97.02 ELEV. 15.20
PVC 16+15.00 ELEV. 15.14
PVI 17+90.00 ELEV. 14.52
PVT 19+65.00 ELEV. 23.27
L=350′ K=65
-0.35%
5.00%
PVC 22+47.00 ELEV. 37.37
PVI 23+62.00 ELEV. 43.12
PVT 24+77.00 ELEV. 43.54
PVI 24+88.33 ELEV. 43.58
0.36%
L=230′ K=50 SSD=348′
15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00

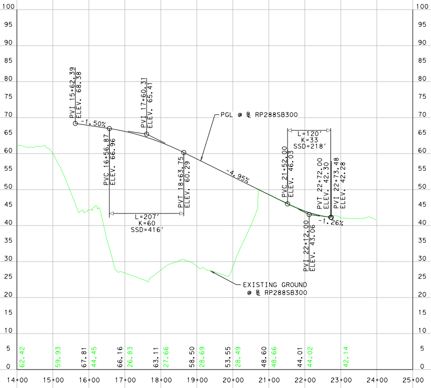
RP069SB301

RAMP I69S ENTRANCE FROM WEBSTER ST


PGL @ ℄ RP288NB300
EXISTING GROUND @ ℄ RP288NB300
L=212′ K=52
PVI 16+11.35 ELEV. 42.63
PVC 16+12.00 ELEV. 42.65
PVI 17+18.00 ELEV. 38.70
PVT 18+24.00 ELEV. 39.13
PVI 18+24.64 ELEV. 39.13
0.40%
15+00 16+00 17+00 18+00 19+00 20+00

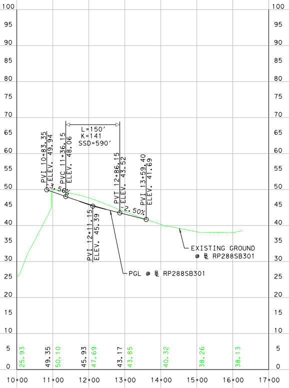
RP288NB300

RAMP SH288N EXIT TO ELGIN


PVI 15+62.39 ELEV. 68.38
-1.50%
PVC 16+56.87 ELEV. 66.96
PVI 17+60.31 ELEV. 65.41
PVT 18+63.75 ELEV. 60.29
PGL @ ℄ RP288SB300
-4.95%
L=207′ K=60 SSD=416′
L=120′ K=33 SSD=218′
PVC 21+52.00 ELEV. 46.03
PVI 22+12.00 ELEV. 43.06
PVT 22+72.00 ELEV. 42.30
PVI 22+73.48 ELEV. 42.28
-1.26%
EXISTING GROUND @ ℄ RP288SB300
14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00

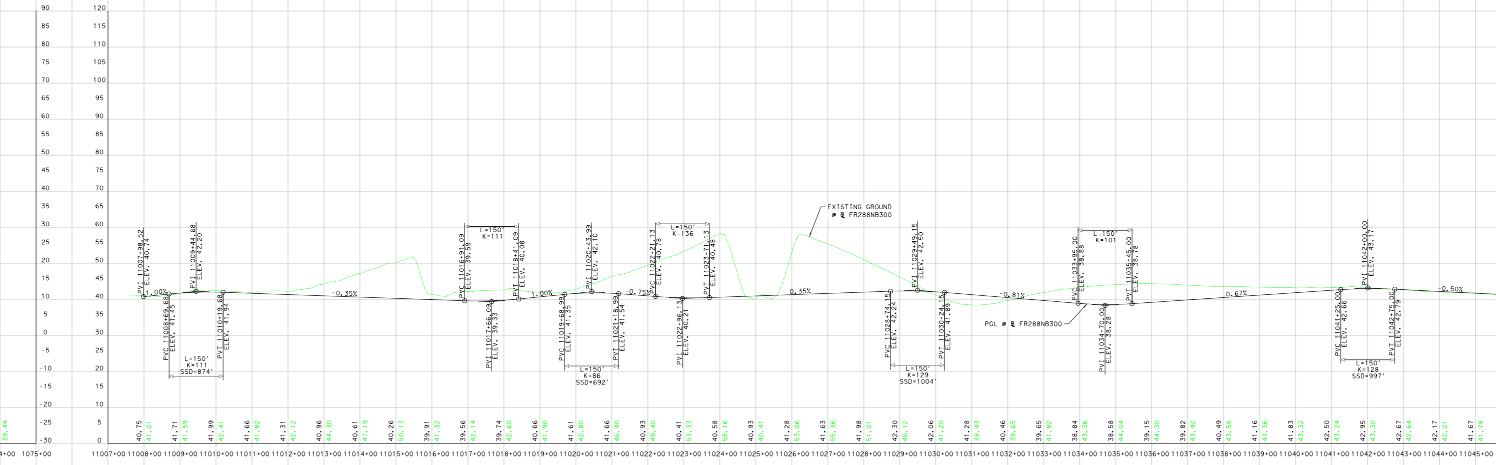
RP288SB300

RAMP SH288S ENTRANCE FROM CHENEVERT ST


PVI 10+83.35 ELEV. 49.94
PVC 11+36.15 ELEV. 48.06
L=150′ K=141 SSD=590′
PVI 12+11.15 ELEV. 45.39
PVT 12+86.15 ELEV. 43.52
PVI 13+59.40 ELEV. 41.69
-2.50%
EXISTING GROUND @ ℄ RP288SB301
PGL @ ℄ RP288SB301
10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

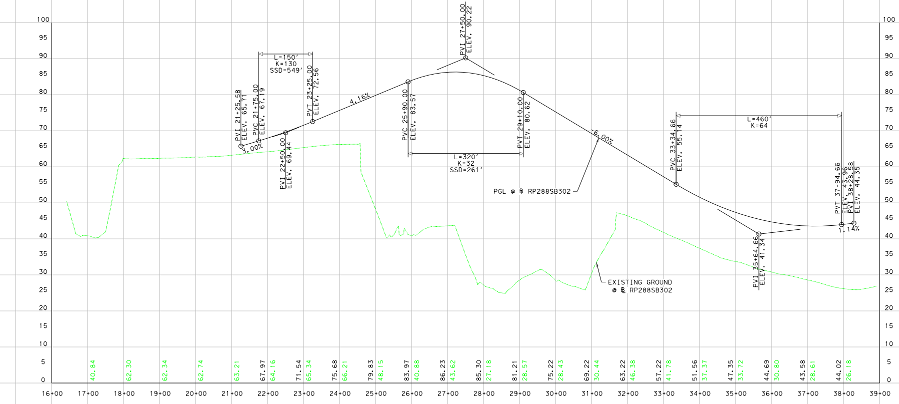
RP288SB301

RAMP SH288S ENTRANCE FROM HAMILTON ST


PVI 11007+98.52 ELEV. 40.74
1.00%
PVC 11008+69.68 ELEV. 41.45
PVI 11009+44.68 ELEV. 42.20
PVT 11010+19.68 ELEV. 41.94
L=150′ K=111 SSD=874′
-0.35%
PVC 11016+91.09 ELEV. 39.59
PVI 11017+66.09 ELEV. 39.33
PVT 11018+41.09 ELEV. 40.08
L=150′ K=111
1.00%
PVC 11019+68.99 ELEV. 41.35
PVI 11020+43.99 ELEV. 42.10
PVT 11021+18.99 ELEV. 41.54
L=150′ K=86 SSD=692′
-0.75%
PVC 11022+21.13 ELEV. 40.78
PVI 11022+96.13 ELEV. 40.21
PVT 11023+71.13 ELEV. 40.48
L=150′ K=136
0.35%
EXISTING GROUND @ ℄ FR288NB300
PVC 11028+74.15 ELEV. 42.24
PVI 11029+49.15 ELEV. 42.50
PVT 11030+24.15 ELEV. 41.89
L=150′ K=129 SSD=1004′
-0.81%
PGL @ ℄ FR288NB300
PVC 11033+95.00 ELEV. 38.88
PVI 11034+70.00 ELEV. 38.28
PVT 11035+45.00 ELEV. 38.78
L=150′ K=101
0.67%
PVC 11041+25.00 ELEV. 42.66
PVI 11042+00.00 ELEV. 43.17
PVT 11042+75.00 ELEV. 42.79
L=150′ K=128 SSD=997′
-0.50%
11007+00 11008+00 11009+00 11010+00 11011+00 11012+00 11013+00 11014+00 11015+00 11016+00 11017+00 11018+00 11019+00 11020+00 11021+00 11022+00 11023+00 11024+00 11025+00 11026+00 11027+00 11028+00 11029+00 11030+00 11031+00 11032+00 11033+00 11034+00 11035+00 11036+00 11037+00 11038+00 11039+00 11040+00 11041+00 11042+00 11043+00 11044+00 11045+00

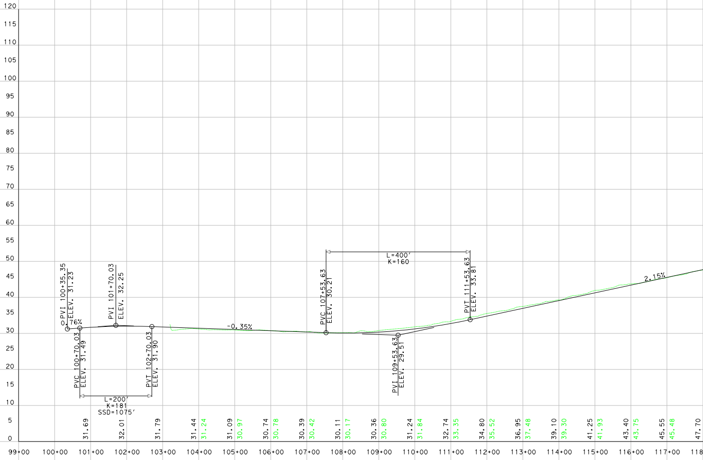
FR288NB300

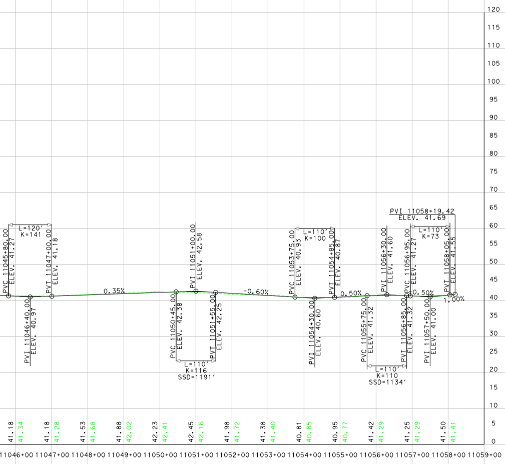
SH288NB FRTG (WHEELER AVE TO ALABAMA ST)
AND CHARTRES ST (ALABAMA ST TO MCGOWEN ST)

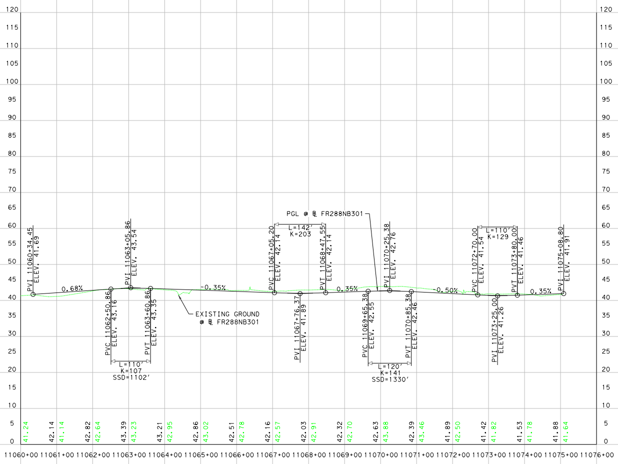

PVI 21+25.58
ELEV. 65.71
PVC 21+75.00
ELEV. 67.19
L=150'
K=130
SSD=549'
PVT 23+25.00
ELEV. 72.56
PVI 22+50.00
ELEV. 69.44
3.00%
4.16%
PVC 25+90.00
ELEV. 83.57
PVI 27+50.00
ELEV. 90.22
PVT 29+10.00
ELEV. 80.62
L=320'
K=32
SSD=261'
-6.00%
PGL @ ℄ RP288SB302
PVC 33+34.66
ELEV. 55.74
L=460'
K=64
PVI 35+64.66
ELEV. 41.94
PVT 37+94.66
ELEV. 43.96
1.14%
EXISTING GROUND
@ ℄ RP288SB302
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
35+00
36+00
37+00
38+00
39+00

RP288SB302

RAMP SH288S MANAGED LANES ENTRANCE FROM HAMILTON ST

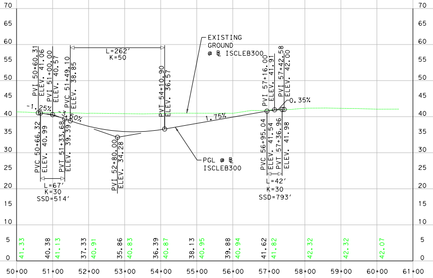

PVI 100+35.35
ELEV. 31.23
PVC 100+70.03
ELEV. 31.49
PVI 101+70.03
ELEV. 32.25
PVT 102+70.03
ELEV. 31.90
L=200'
K=181
SSD=1075'
-0.35%
PVC 107+53.63
ELEV. 30.21
L=400'
K=160
PVI 109+53.63
ELEV. 29.51
PVT 111+53.63
ELEV. 33.81
2.15%
99+00
100+00
101+00
102+00
103+00
104+00
105+00
106+00
107+00
108+00
109+00
110+00
111+00
112+00
113+00
114+00
115+00
116+00
117+00


PVC 11045+80.00
ELEV. 41.27
L=120'
K=141
PVI 11046+40.00
ELEV. 40.97
PVT 11047+00.00
ELEV. 41.18
0.35%
PVC 11050+45.00
ELEV. 42.38
PVI 11051+00.00
ELEV. 42.59
PVT 11051+55.00
ELEV. 42.25
L=110'
K=116
SSD=1191'
-0.60%
PVC 11053+75.00
ELEV. 40.93
L=110'
K=100
PVI 11054+30.00
ELEV. 40.60
PVT 11054+85.00
ELEV. 40.87
0.50%
PVC 11055+75.00
ELEV. 41.32
PVI 11056+30.00
ELEV. 41.60
PVT 11056+85.00
ELEV. 41.32
L=110'
K=110
SSD=1134'
PVC 11056+95.00
ELEV. 41.27
L=110'
K=73
-0.50%
PVI 11057+50.00
ELEV. 41.00
PVI 11058+19.42
ELEV. 41.69
PVT 11058+05.00
ELEV. 41.55
1.00%


PVT 11060+34.45
ELEV. 41.69
0.68%
PVC 11062+50.86
ELEV. 43.16
PVI 11063+05.86
ELEV. 43.54
PVT 11063+60.86
ELEV. 43.35
L=110'
K=107
SSD=1102'
-0.35%
EXISTING GROUND
@ ℄ FR288NB301
PGL @ ℄ FR288NB301
PVC 11067+05.20
ELEV. 42.14
L=142'
K=203
PVI 11067+76.37
ELEV. 41.89
PVT 11068+47.55
ELEV. 42.14
0.35%
PVC 11069+65.38
ELEV. 42.55
PVI 11070+25.38
ELEV. 42.76
PVT 11070+85.38
ELEV. 42.46
L=120'
K=141
SSD=1330'
-0.50%
PVC 11072+70.00
ELEV. 41.54
L=110'
K=129
PVI 11073+25.00
ELEV. 41.26
PVT 11073+80.00
ELEV. 41.46
0.35%
PVT 11075+08.80
ELEV. 41.91

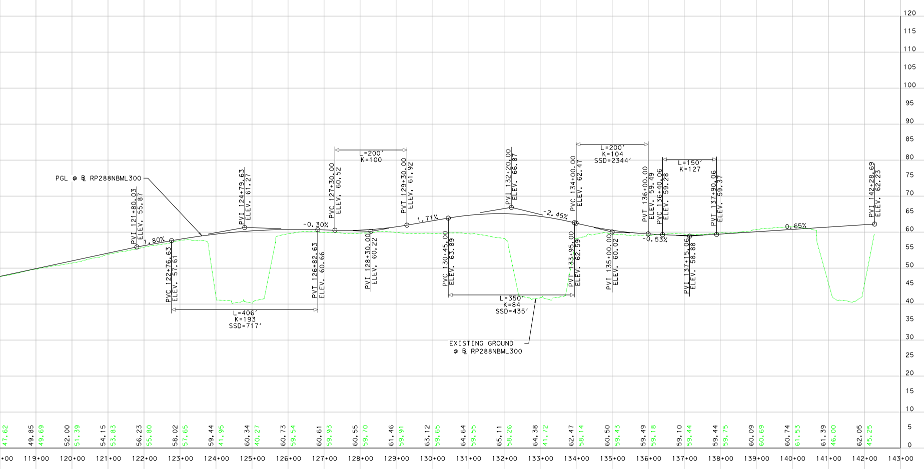
FR288NB301

CHARTRES ST (MCGOWEN ST TO GRAY ST)


PVI 50+60.31
ELEV. 41.06
PVC 50+66.32
ELEV. 40.99
PVI 51+00.00
ELEV. 40.97
PVT 51+33.68
ELEV. 39.39
PVC 51+49.10
ELEV. 38.85
L=67'
K=30
SSD=514'
L=262'
K=50
PVI 52+80.00
ELEV. 34.28
PVT 54+10.90
ELEV. 36.57
EXISTING
GROUND
@ ℄ ISCLEB300
PGL @ ℄
ISCLEB300
1.75%
PVC 56+95.04
ELEV. 41.54
PVI 57+16.00
ELEV. 41.91
PVT 57+36.96
ELEV. 41.98
PVI 57+42.58
ELEV. 42.00
L=42'
K=30
SSD=793'
0.35%
50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
59+00
60+00
61+00

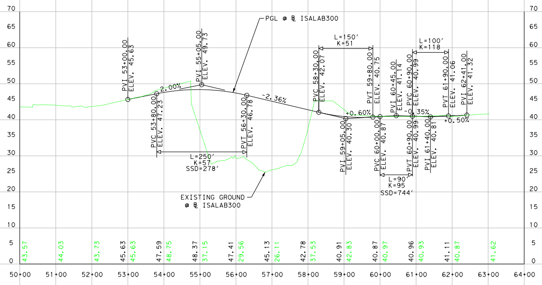
ISCLEB300

CLEBURNE ST


PGL @ ℄ RP288NBML300
EXISTING GROUND @ ℄ RP288NBML300
1.80%
-0.30%
1.71%
-2.45%
-0.53%
0.65%
L=406' K=193 SSD=717'
L=200' K=100
L=350' K=84 SSD=435'
L=200' K=104 SSD=2344'
L=150' K=127

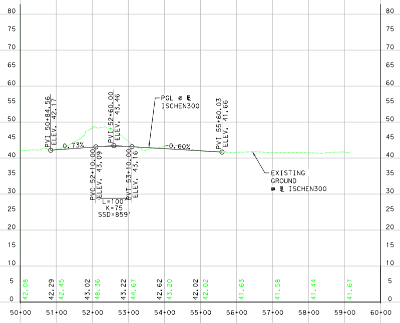
RP288NBML300

RAMP FROM SH288N MANAGED LANES TO SH288 NB DC


PGL @ ℄ ISALAB300
EXISTING GROUND @ ℄ ISALAB300
2.00%
-2.36%
+0.60%
-0.35%
+0.50%
L=250' K=57 SSD=278'
L=150' K=51
L=100' K=118
L=90' K=95 SSD=744'

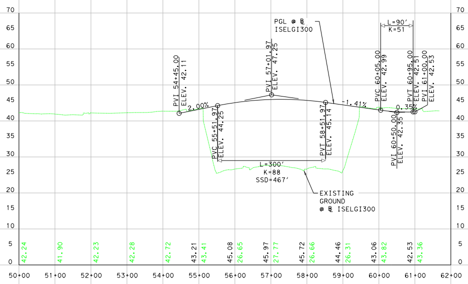
ISALAB300

ALABAMA ST


PGL @ ℄ ISCHEN300
EXISTING GROUND @ ℄ ISCHEN300
0.73%
-0.60%
L=100' K=75 SSD=859'

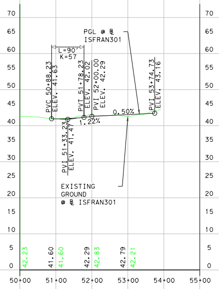
ISCHEN300

CHENEVERT ST


PGL @ ℄ ISELGI300
EXISTING GROUND @ ℄ ISELGI300
2.00%
-1.41%
L=300' K=88 SSD=467'
L=90' K=51

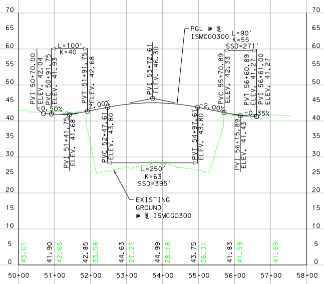
ISELGI300

ELGIN ST


PGL @ ℄ ISFRAN301
EXISTING GROUND @ ℄ ISFRAN301
1.22%
0.50%
L=90' K=57

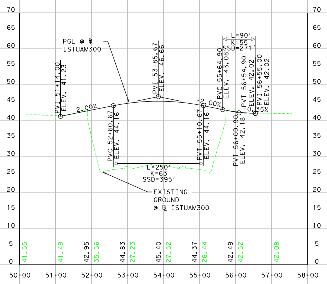
ISFRAN301

FRANCIS ST


PGL @ ℄ ISMCGO300
EXISTING GROUND @ ℄ ISMCGO300
2.00%
-2.00%
L=100' K=40
L=250' K=63 SSD=395'
L=90' K=55 SSD=271'

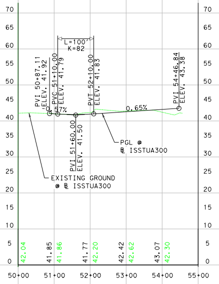
ISMCGO300

MCGOWEN ST


PGL @ ℄ ISTUAM300
EXISTING GROUND @ ℄ ISTUAM300
2.00%
L=250' K=63 SSD=395'
L=90' K=55 SSD=271'

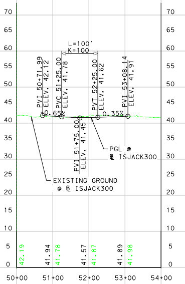
ISTUAM300

TUAM ST


PGL @ ℄ ISSTUA300
EXISTING GROUND @ ℄ ISSTUA300
0.65%
L=100' K=82

ISSTUA300

STUART ST


PGL @ ℄ ISJACK300
EXISTING GROUND @ ℄ ISJACK300
0.35%
L=100' K=100

ISJACK300

JACKSON ST

HOUSTON DISTRICT
PROJECT DEVELOPMENT

NHHIP - SEGMENT 3 - SH 288

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

SCALE: 100.0000 ft / in.

HOUSTON DISTRICT
PROJECT DEVELOPMENT

SCALE: 100.0000 ft / in.   PEN TABLE: PEN TIME: 2:01:35 PM   DATE: 7/27/2023

I-69 ULTIMATE

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

FILE LOCATION: DGN PREPARED BY: shartshorn

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(I-69)

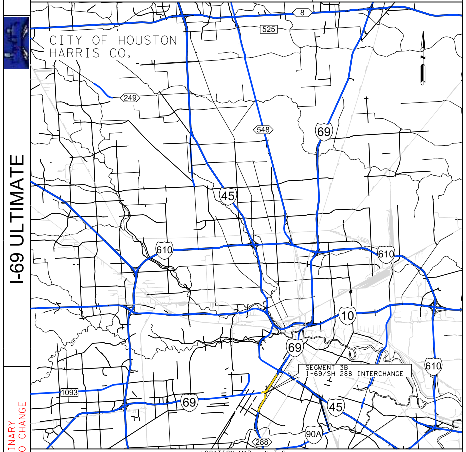
COUNTY: HARRIS
LIMITS FROM: ALMEDA RD
LIMITS TO: MCGOWEN ST
DATE: 7/27/2023
CONSTRUCTION CSJ: 0027-13-200, 0027-13-221, 0598-01-109

I-69 ULTIMATE

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200

VERT SCALE: 1"=20'
0 5 10 20


8
525
CITY OF HOUSTON
HARRIS CO.
249
548
69
45
610
610
10
69
SEGMENT 3B
I-69/SH 288 INTERCHANGE
610
1093
69
45
90A
288

LOCATION MAP : N.T.S.
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

PLAN LEGEND

SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR CODE	
CENTERLINE			—·—·—	2	BLACK	0
I-45 MAINLANES	🟨	🟥	——	2	BLACK	0
I-69/US 59 MAINLANES	🟦	🟦	——	2	BLACK	0
I-10 MAINLANES	🟩	🟪	——	2	BLACK	0
SH 288 MAINLANES	🟪	🟪	——	2	BLACK	0
I-610 MAINLANES	🟩	🟩	——	2	BLACK	0
I-10 EXPRESS LANES	🟦	🟪	——	2	PINK	10
MAX LANES	🟪	🟪	——	2	PINK	28
LOCAL STREETS	🟩	🟦	——	2	BLUE	1
RAMPS	🟦	🟦	——	2	RED	3
DIRECT CONNECTOR	🟧	⬛	——	2	MAGENTA	5
PEDESTRIAN REALM	🟫	🟨	——	1	GREEN	155
EXISTING RDWY TO REMAIN	⬛	⬛	——	2		
HIGHWAY CAP/POTENTIAL OPEN SPACE			▨	7		
EXISTING RDWY TO BE REMOVED			▩	1		
SURPLUS ROW			▩	3	RED	3
CONVENTION CENTER STORAGE			☐	5	PURPLE	62
PROPOSED CONTROL OF ACCESS			—ıı—	0	RED	3
PROPOSED FEIS ROW			— - —	6	BLUE	126
EXISTING ROW			- - -	1	YELLOW	4
ACCESS ROAD			········	1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)			╫╫╫	1	RED	3
METRO RAIL(EAST END LINE)			╫╫╫	1	GREEN	156
METRO RAIL(SOUTHEAST LINE)			╫╫╫	1	PURPLE	203
RAILROAD			╫╫╫	1	BLACK	0
LIMITS OF FLOODWAY			——	1	BLUE	171
PLANIMETRIC			⬠	2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			0000	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES			⇨	0	BLACK	0
TURNAROUNDS			⇨	0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES			➡	1	BLACK	0
TURNAROUNDS			➡	1	BLUE	168
RAMPS			➡	1	RED	3
DIRECT CONNECTOR			➡	1	RED	139
MAX LANES			➡	1	MAGENTA	5
DEPRESSED			—ʌ—ʌ—	3	RED	3
BY OTHERS			- - - -	3	BLUE	1
RETAINING WALL			——	6	RED	3
PROPOSED AESTHETIC WALL			——	6	PURPLE	203
PROPOSED NOISE BARRIER			——	6	LT GREEN	196

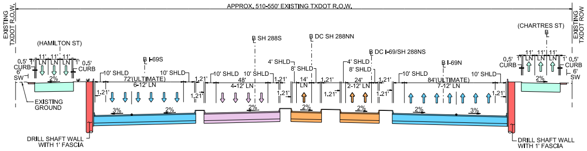
STEPHEN A. HRNCIR
67245
8/1/2023

TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED

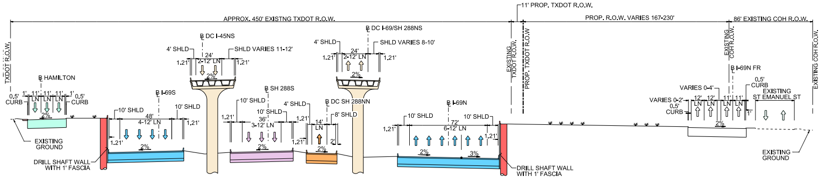
SHEET 6 OF 8

6/8


APPROX. 510-550' EXISTING TXDOT R.O.W.
EXISTING TXDOT R.O.W.
EXISTING TXDOT ROW
(HAMILTON ST)
(CHARTRES ST)
℄ SH 288S
℄ DC SH 288NN
℄ DC I-69/SH 288NS
℄ I-69S
℄ I-69N
0.5' CURB
1'
11' LN
11' LN
11' LN
6' SW
10' SHLD
72'(ULTIMATE)
6-12' LN
48'
4-12' LN
4' SHLD
8' SHLD
14' LN
24'
2-12' LN
84'(ULTIMATE)
7-12' LN
1.21'
2%
3%
EXISTING GROUND
DRILL SHAFT WALL WITH 1' FASCIA

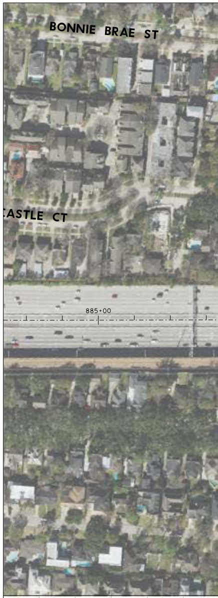
PROP. TYPICAL SECTION A-A

NTS


APPROX. 450' EXISTNG TXDOT R.O.W.
11' PROP. TXDOT R.O.W.
PROP. R.O.W. VARIES 167-230'
86' EXISTING COH R.O.W.
TXDOT R.O.W.
EXISTING TXDOT R.O.W.
PROP. TXDOT R.O.W
EXISTING COH R.O.W.
EXISTING COH R.O.W.
℄ HAMILTON
℄ DC I-45NS
℄ DC I-69/SH 288NS
℄ I-69S
℄ SH 288S
℄ DC SH 288NN
℄ I-69N
℄ I-69N FR
0.5' CURB
1'
11' LN
4' SHLD
SHLD VARIES 11-12'
SHLD VARIES 8-10'
24'
2-12' LN
10' SHLD
48'
4-12' LN
36'
3-12' LN
8' SHLD
14' LN
2'
72'
6-12' LN
VARIES 0-4'
VARIES 0-2'
12' LN
EXISTING ST EMANUEL ST
1.21'
2%
3%
EXISTING GROUND
DRILL SHAFT WALL WITH 1' FASCIA

PROP. TYPICAL SECTION B-B

NTS

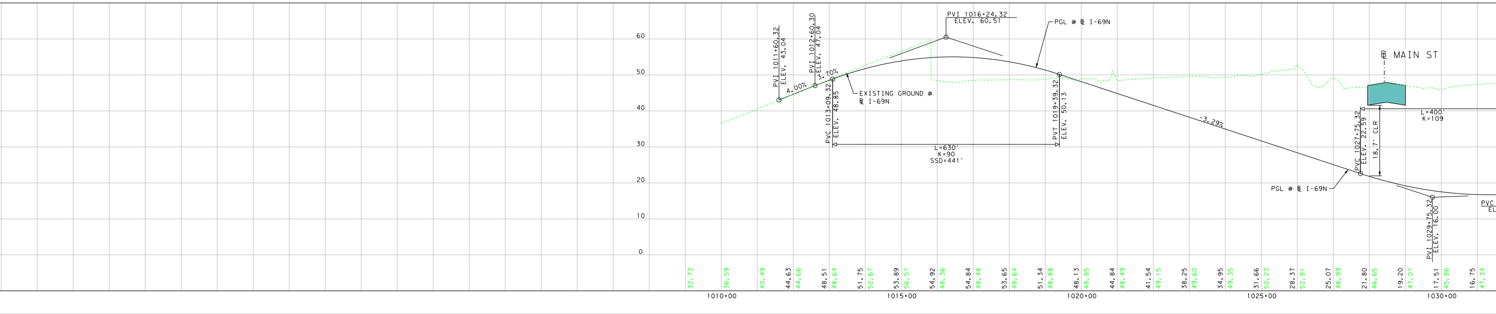

BONNIE BRAE ST
ASTLE CT
885+00

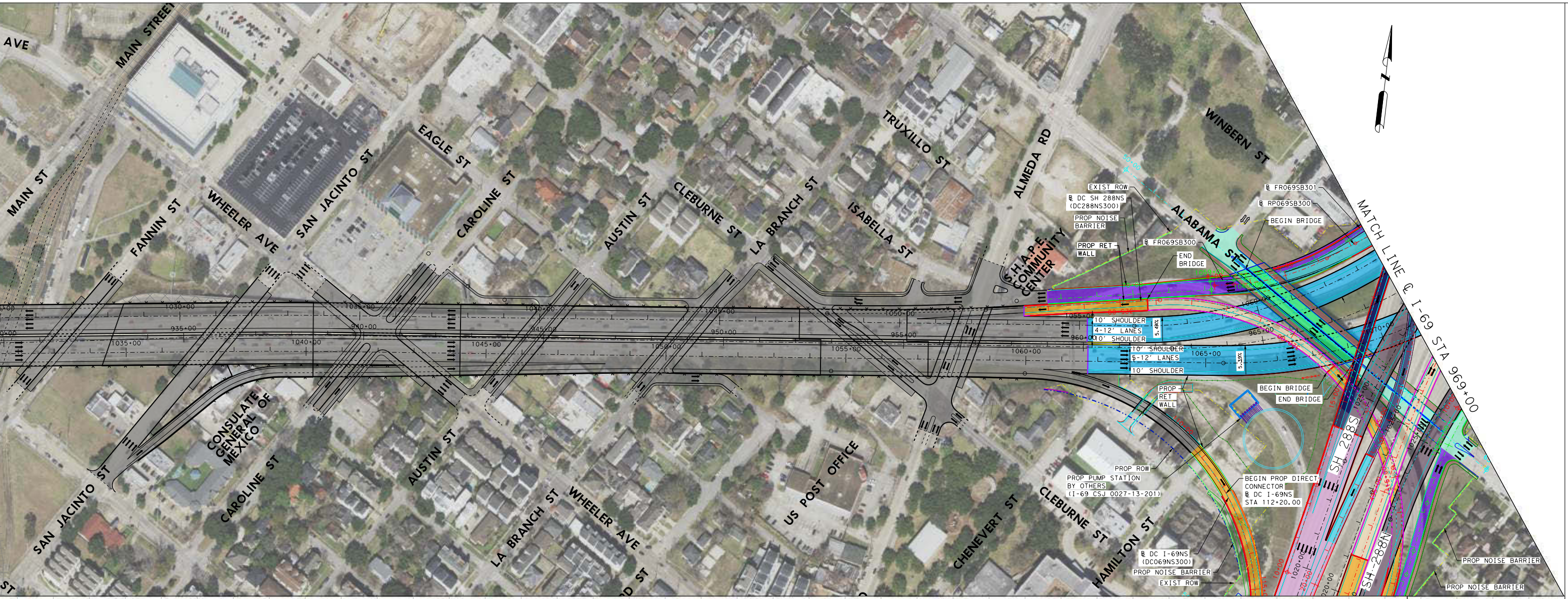
PROFILE LEGEND

PROP. PGL @ CL/NB/EB MAINLANE	——
PROP. PGL @ SB/WB MAINLANE	- - -
PROP. PGL @ MAX LANES	——
EXISTING GROUND @ PGL	-·-·-
100 YR. W.S.E.	▽
PROP. PGL @ NB/EB RAMP	——
PROP. PGL @ SB/WB RAMP	- - -
PROP. PGL @ NB/EB DC	——
PROP. PGL @ SB/WB DC	- - -
PROP. PGL @ NB/EB FRONTAGE	——
PROP. PGL @ SB/WB FRONTAGE	- - -
PROP. PGL @ LOCAL ST	——
EXIST. GRND. @ NB/EB ROW	- - -
EXIST. GRND. @ SB/WB ROW	- - -

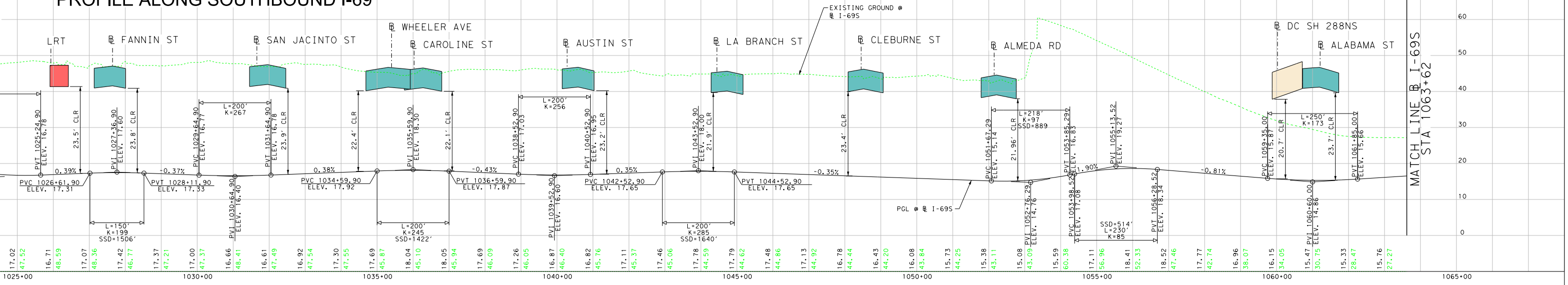
N
BONNIE BRAE ST
CASTLE CT
MIRAMAR ST
MOUNT VERNON ST
YOAKUM BLVD
MONTROSE BLVD
KYLE ST
ROSELAND ST
STANFORD ST
GREELEY ST
JACK ST
OAKLEY ST
WOODROW ST
GARROTT ST
RICHMOND
GRAUSTARK ST
VERNON ST
UM BLVD
SE BLVD
MAIN ST
FANNIN ST
WENTWORTH
990+11
995+00
1000+00
1005+00
1010+00
890+00
895+00
900+00
905+00
910+00
915+00
920+00
925+00
996+61
1000+00
1005+00
1010+00
1015+00
1020+00
1025+00
1030+00

60
50
40
30
20
10
0
EXISTING GROUND @ ℄ I-69S
PVI 1005+19.45 ELEV. 27.76
1.43%
PGL @ ℄ I-69S
PVI 1008+09.90 ELEV. 31.90
PVC 1008+68.90 ELEV. 32.74
1.42%
L=150′ K=153 SSD=633′
PVI 1009+43.90 ELEV. 33.81
PVT 1010+18.90 ELEV. 35.61
2.40%
PVC 1011+12.90 ELEV. 37.86
22.4′ CLR
℄ I-69HOV
PVI 1014+37.90 ELEV. 45.67
L=650′ K=113 SSD=494′
PGL @ ℄ I-69S
PVT 1017+62.90 ELEV. 34.80
-3.34%
EXISTING GROUND @ ℄ I-69S
℄ BLODGETT ST
℄ MAIN ST
PVC 1021+24.90 ELEV. 22.69
18.6′ CLR
21.3′ CLR
L=400′ K=107
PVI 1023+24.90 ELEV. 16.00
31.93
30.55
32.46
33.19
33.14
28.91 34.05
30.34 34.92
31.76 36.70
33.21 42.43
35.17 48.14
37.56 47.31
39.62 47.87
40.81 48.55
41.12 49.16
40.54 49.73
39.07 52.11
36.73 53.99
33.56 55.59
30.21 58.15
26.87 51.33
23.52 46.12
20.44 46.54
18.26 47.17
1005+00
1010+00
1015+00
1020+00

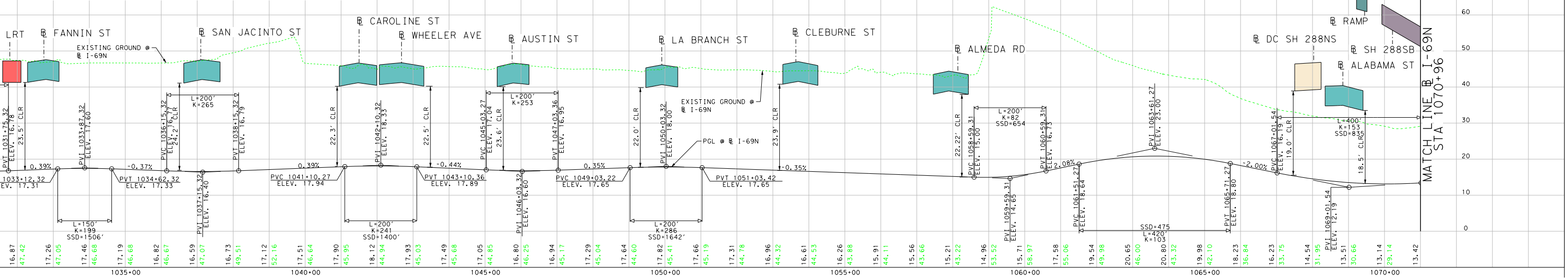

60
50
40
30
20
10
0
PVI 1011+60.32 ELEV. 43.04
4.00%
PVI 1012+60.30 ELEV. 47.04
3.70%
PVC 1013+09.32 ELEV. 48.85
EXISTING GROUND @ ℄ I-69N
PVI 1016+24.32 ELEV. 60.51
PGL @ ℄ I-69N
L=630′ K=90 SSD=441′
PVT 1019+39.32 ELEV. 50.13
-3.29%
℄ MAIN ST
L=400′ K=109
PVC 1027+75.32 ELEV. 22.59
18.7′ CLR
PGL @ ℄ I-69N
PVI 1029+75.32 ELEV. 16.00
PVC
EL
32.73
36.59
40.49
44.63 44.66
48.51 48.64
51.75 52.67
53.89 56.57
54.92 48.36
54.84 48.48
53.65 48.64
51.34 48.88
48.13 48.85
44.84 48.49
41.54 49.15
38.25 49.60
34.95 49.35
31.66 50.23
28.37 52.81
25.07 48.99
21.80 46.65
19.20 47.07
17.51 45.86
16.75 47.34
1010+00
1015+00
1020+00
1025+00
1030+00

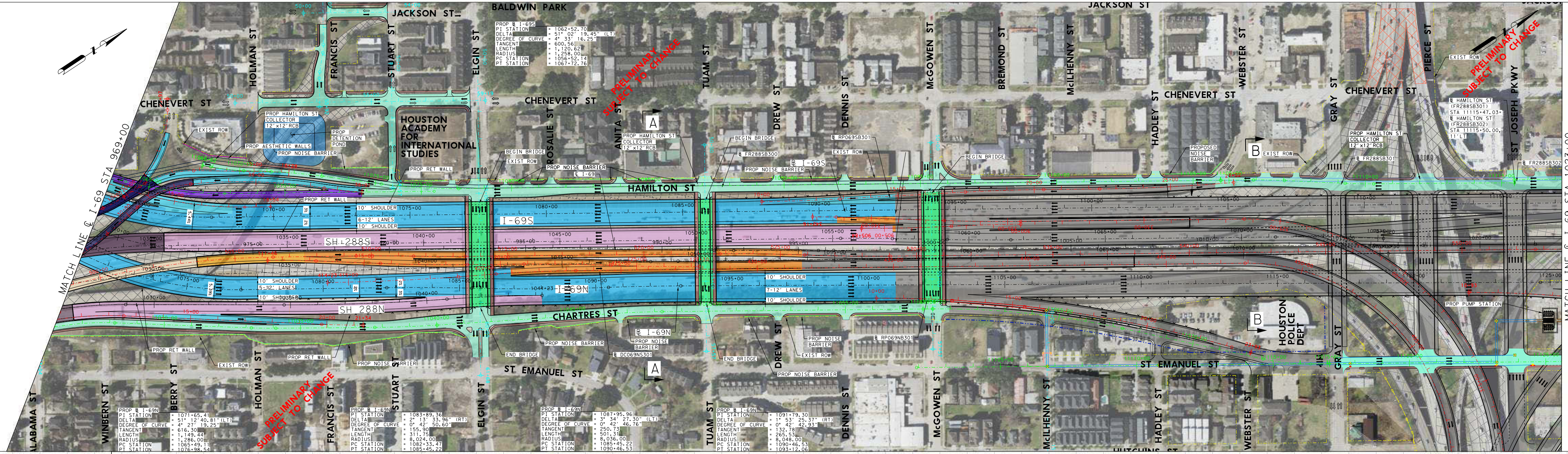

MAIN STREET
MAIN ST
FANNIN ST
WHEELER AVE
SAN JACINTO ST
EAGLE ST
CAROLINE ST
AUSTIN ST
CLEBURNE ST
LA BRANCH ST
ISABELLA ST
TRUXILLO ST
ALMEDA RD
WINBERN ST
ALABAMA ST
S.H.A.P.E. COMMUNITY CENTER
CONSULATE GENERAL OF MEXICO
US POST OFFICE
CHENEVERT ST
HAMILTON ST
EXIST ROW
℄ DC SH 288NS (DC288NS300)
PROP NOISE BARRIER
PROP RET WALL
℄ FR069SB300
END BRIDGE
℄ FR069SB301
℄ RP069SB300
BEGIN BRIDGE
10' SHOULDER
4-12' LANES
10' SHOULDER
10' SHOULDER
5-12' LANES
10' SHOULDER
PROP RET WALL
BEGIN BRIDGE
END BRIDGE
PROP ROW
PROP PUMP STATION BY OTHERS (I-69 CSJ 0027-13-201)
BEGIN PROP DIRECT CONNECTOR ℄ DC I-69NS STA 112+20.00
℄ DC I-69NS (DC069NS300)
PROP NOISE BARRIER
EXIST ROW
PROP NOISE BARRIER
PROP NOISE BARRIER
SH 288S
SH 288N
MATCH LINE ℄ I-69 STA 969+00
1030+00
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
1065+00
935+00
940+00
945+00
950+00
955+00
960+00
965+00
970+00

PROFILE ALONG SOUTHBOUND I-69

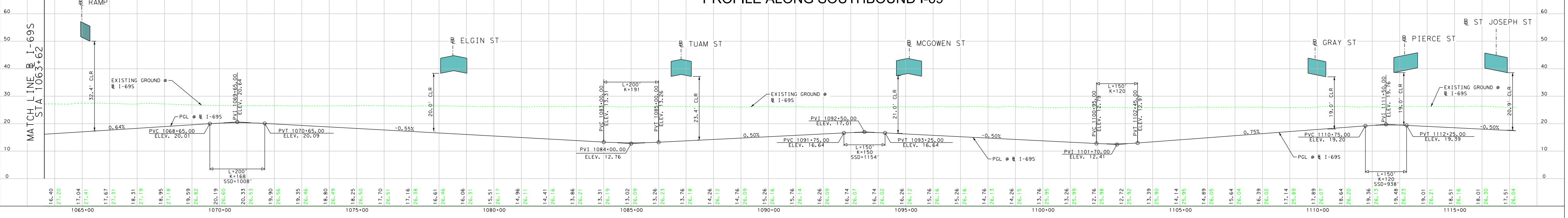

LRT
℄ FANNIN ST
℄ SAN JACINTO ST
℄ WHEELER AVE
℄ CAROLINE ST
℄ AUSTIN ST
℄ LA BRANCH ST
℄ CLEBURNE ST
℄ ALMEDA RD
℄ DC SH 288NS
℄ ALABAMA ST
EXISTING GROUND @ ℄ I-69S
PGL @ ℄ I-69S
PVT 1025+24.90 ELEV. 16.78
PVC 1026+61.90 ELEV. 17.31
PVT 1027+36.90 ELEV. 17.60
L=150' K=199 SSD=1506'
PVT 1028+11.90 ELEV. 17.33
PVC 1029+64.90 ELEV. 16.77
L=200' K=267
PVI 1030+64.90 ELEV. 16.40
PVT 1031+64.90 ELEV. 16.78
PVC 1034+59.90 ELEV. 17.92
PVI 1035+59.90 ELEV. 18.30
L=200' K=245 SSD=1422'
PVT 1036+59.90 ELEV. 17.87
PVC 1038+52.90 ELEV. 17.03
L=200' K=256
PVI 1039+52.90 ELEV. 16.60
PVT 1040+52.90 ELEV. 16.98
PVC 1042+52.90 ELEV. 17.65
PVI 1043+52.90 ELEV. 18.00
L=200' K=285 SSD=1640'
PVT 1044+52.90 ELEV. 17.65
PVC 1051+67.29 ELEV. 15.14
L=218' K=97 SSD=889
PVI 1052+76.29 ELEV. 14.76
PVT 1053+85.29 ELEV. 16.83
PVC 1053+98.52 ELEV. 17.08
PVI 1055+13.52 ELEV. 19.27
SSD=514' L=230' K=85
PVT 1056+28.52 ELEV. 18.34
PVC 1059+35.00 ELEV. 15.87
L=250' K=173
PVI 1060+60.00 ELEV. 14.86
PVT 1061+85.00 ELEV. 15.66
23.5' CLR
23.8' CLR
23.9' CLR
22.4' CLR
22.1' CLR
23.2' CLR
21.9' CLR
23.4' CLR
21.96' CLR
20.7' CLR
23.7' CLR
0.39%
-0.37%
0.38%
-0.43%
0.35%
-0.35%
1.90%
-0.81%
MATCH LINE ℄ I-69S STA 1063+62
60
50
40
30
20
10
0
1025+00
1030+00
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
1065+00

PROFILE ALONG NORTHBOUND I-69

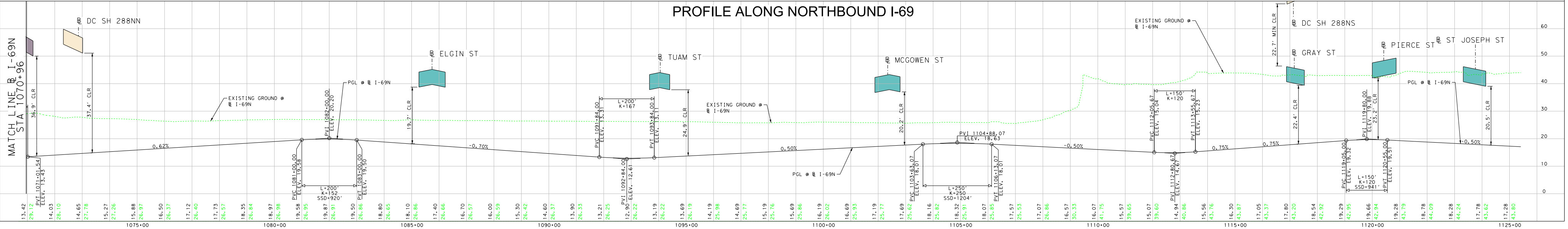

LRT
℄ FANNIN ST
EXISTING GROUND @ ℄ I-69N
℄ SAN JACINTO ST
℄ CAROLINE ST
℄ WHEELER AVE
℄ AUSTIN ST
℄ LA BRANCH ST
℄ CLEBURNE ST
℄ ALMEDA RD
℄ RAMP
℄ DC SH 288NS
℄ SH 288SB
℄ ALABAMA ST
EXISTING GROUND @ ℄ I-69N
PGL @ ℄ I-69N
PVT 1031+74.32 ELEV. 16.78
PVC 1033+12.32 ELEV. 17.31
PVI 1033+87.32 ELEV. 17.60
L=150' K=199 SSD=1506'
PVT 1034+62.32 ELEV. 17.33
PVC 1036+15.32 ELEV. 16.77
L=200' K=265
PVI 1037+15.32 ELEV. 16.40
PVT 1038+15.32 ELEV. 16.79
PVC 1041+10.27 ELEV. 17.94
PVI 1042+10.32 ELEV. 18.33
L=200' K=241 SSD=1400'
PVT 1043+10.36 ELEV. 17.89
PVC 1045+03.27 ELEV. 17.03
L=200' K=253
PVI 1046+03.32 ELEV. 16.60
PVT 1047+03.36 ELEV. 16.95
PVC 1049+03.22 ELEV. 17.65
PVI 1050+03.32 ELEV. 18.00
L=200' K=286 SSD=1642'
PVT 1051+03.42 ELEV. 17.65
PVC 1058+59.31 ELEV. 15.00
L=200' K=82 SSD=654
PVI 1059+59.31 ELEV. 14.65
PVT 1060+59.31 ELEV. 16.73
PVC 1061+51.27 ELEV. 18.64
PVI 1063+61.27 ELEV. 22.00
SSD=475 L=420' K=103
PVT 1065+71.27 ELEV. 18.80
PVC 1067+01.54 ELEV. 16.19
L=400' K=153 SSD=835
PVI 1069+01.54 ELEV. 12.19
23.5' CLR
24.2' CLR
22.3' CLR
22.5' CLR
23.6' CLR
22.0' CLR
23.9' CLR
22.22' CLR
19.0' CLR
18.5' CLR
0.39%
-0.37%
0.39%
-0.44%
0.35%
-0.35%
2.08%
-2.00%
MATCH LINE ℄ I-69N STA 1070+96
60
50
40
30
20
10
0
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
1065+00
1070+00


JACKSON ST
BALDWIN PARK
JACKSON ST
HOLMAN ST
FRANCIS ST
STUART ST
ELGIN ST
CHENEVERT ST
CHENEVERT ST
CHENEVERT ST
CHENEVERT ST
HOUSTON ACADEMY FOR INTERNATIONAL STUDIES
ROSALIE ST
ANITA ST
TUAM ST
DREW ST
DENNIS ST
McGOWEN ST
BREMOND ST
McILHENNY ST
HADLEY ST
WEBSTER ST
GRAY ST
PIERCE ST
ST JOSEPH PKWY
HAMILTON ST
CHARTRES ST
ST EMANUEL ST
ST EMANUEL ST
HOUSTON POLICE DEPT
ALABAMA ST
WINBERN ST
BERRY ST
HOLMAN ST
FRANCIS ST
STUART ST
ELGIN ST
TUAM ST
DREW ST
DENNIS ST
McGOWEN ST
McILHENNY ST
HADLEY ST
WEBSTER ST
GRAY ST
HUTCHINS ST
MATCH LINE ℄ I-69 STA 969+00
MATCH LINE ℄ I-69 STA 1023+00
I-69S
SH 288S
I-69N
SH 288N
10' SHOULDER
6-12' LANES
10' SHOULDER
10' SHOULDER
5-12' LANES
10' SHOULDER
10' SHOULDER
7-12' LANES
10' SHOULDER
PROP HAMILTON ST COLLECTOR 12'x12' RCB
PROP DETENTION POND
PROP AESTHETIC WALLS
PROP NOISE BARRIER
PROP RET WALL
EXIST ROW
BEGIN BRIDGE
END BRIDGE
PROPOSED NOISE BARRIER
PROP PUMP STATION
℄ HAMILTON ST (FR288SB301) STA 11115+47.03= ℄ HAMILTON ST (FR288SB302) STA 11115+50.00, 11'LT
℄ FR288SB301
℄ FR288SB302
℄ FR288SB300
℄ RP069SB301
℄ RP069NB301
℄ DC069NS301
℄ I-69N
℄ I-69S
A
B
PRELIMINARY SUBJECT TO CHANGE
PROP ℄ I-69S
PI STATION = 1062+52.70
DELTA = 51° 02′ 19.45" (LT)
DEGREE OF CURVE = 4° 33′ 16.25"
TANGENT = 600.56
LENGTH = 1,120.62
RADIUS = 1,258.00
PC STATION = 1056+52.14
PT STATION = 1067+72.76
PROP ℄ I-69N
PI STATION = 1071+65.41
DELTA = 51° 12′ 40.81" (LT)
DEGREE OF CURVE = 4° 27′ 19.25"
TANGENT = 616.30
LENGTH = 1,149.44
RADIUS = 1,286.00
PC STATION = 1065+49.11
PT STATION = 1076+98.54
PROP ℄ I-69N
PI STATION = 1083+89.36
DELTA = 2° 13′ 33.96" (RT)
DEGREE OF CURVE = 0° 42′ 50.60"
TANGENT = 155.90
LENGTH = 311.75
RADIUS = 8,024.00
PC STATION = 1082+33.47
PT STATION = 1085+45.22
PROP ℄ I-69N
PI STATION = 1087+95.96
DELTA = 3° 34′ 27.30" (LT)
DEGREE OF CURVE = 0° 42′ 46.76"
TANGENT = 250.73
LENGTH = 501.31
RADIUS = 8,036.00
PC STATION = 1085+45.22
PT STATION = 1090+46.53
PROP ℄ I-69N
PI STATION = 1091+79.30
DELTA = 1° 53′ 25.37" (RT)
DEGREE OF CURVE = 0° 42′ 42.93"
TANGENT = 132.78
LENGTH = 265.53
RADIUS = 8,048.00
PC STATION = 1090+46.53
PT STATION = 1093+12.06

PROFILE ALONG SOUTHBOUND I-69


MATCH LINE ℄ I-69S STA 1063+62
℄ RAMP
℄ ELGIN ST
℄ TUAM ST
℄ MCGOWEN ST
℄ GRAY ST
℄ PIERCE ST
℄ ST JOSEPH ST
EXISTING GROUND @ ℄ I-69S
PGL @ ℄ I-69S
32.4' CLR
20.0' CLR
23.4' CLR
21.0' CLR
19.0' CLR
19.0' CLR
20.9' CLR
0.64%
-0.55%
0.50%
-0.50%
0.75%
-0.50%
PVC 1068+65.00 ELEV. 20.01
PVI 1069+65.00 ELEV. 20.64
PVT 1070+65.00 ELEV. 20.09
L=200' K=168 SSD=1008'
PVI 1084+00.00 ELEV. 12.76
L=200' K=191
PVI 1092+50.00 ELEV. 17.01
PVC 1091+75.00 ELEV. 16.64
PVT 1093+25.00 ELEV. 16.64
L=150' K=150 SSD=1154'
PVI 1101+70.00 ELEV. 12.41
L=150' K=120
PVC 1110+75.00 ELEV. 19.20
PVT 1112+25.00 ELEV. 19.39
PVI 1111+50.00
L=150' K=120 SSD=938'
0
10
20
30
40
50
60
1065+00
1070+00
1075+00
1080+00
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00
1115+00

PROFILE ALONG NORTHBOUND I-69


MATCH LINE ℄ I-69N STA 1070+96
℄ DC SH 288NN
℄ ELGIN ST
℄ TUAM ST
℄ MCGOWEN ST
℄ DC SH 288NS
℄ GRAY ST
℄ PIERCE ST
℄ ST JOSEPH ST
EXISTING GROUND @ ℄ I-69N
PGL @ ℄ I-69N
36.9' CLR
37.4' CLR
19.7' CLR
24.9' CLR
20.2' CLR
22.7' MIN CLR
22.4' CLR
23.3' CLR
20.5' CLR
0.62%
-0.70%
0.50%
-0.50%
0.75%
0.75%
-0.50%
PVT 1071+01.54 ELEV. 13.43
PVC 1081+00.00 ELEV. 19.58
PVI 1082+00.00 ELEV. 20.20
PVT 1083+00.00 ELEV. 19.50
L=200' K=152 SSD=920'
PVI 1092+84.00 ELEV. 12.61
L=200' K=167
PVI 1104+88.07 ELEV. 18.63
L=250' K=250 SSD=1204'
L=150' K=120
L=150' K=120 SSD=941'
0
10
20
30
40
50
60
1075+00
1080+00
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00
1115+00
1120+00
1125+00

HOUSTON DISTRICT
PROJECT DEVELOPMENT

I-69 ULTIMATE

SCALE: 100.0000 ft / in. PEN TABLE: PEN

PRELIMINARY
SUBJECT TO CHANGE

DATE: 7/27/2023 TIME: 2:01:35 PM

HNTB

HNTB Corporation
1301 Fannin St, Suite 2100
Houston, TX 77002
TBPE Firm Registration No. 420

FILE LOCATION: DGN

PREPARED BY: shortshorn

HOUSTON DISTRICT
PROJECT DEVELOPMENT

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(I-69)

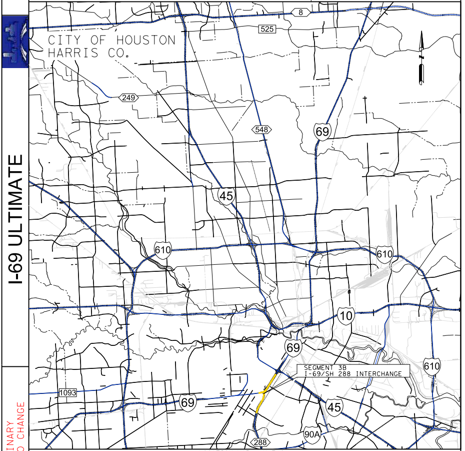
COUNTY: HARRIS
LIMITS FROM: ALMEDA RD
LIMITS TO: MCGOWEN ST
DATE: 28-JUL-2023

CONSTRUCTION CSJ: 0027-13-200, 0027-13-221, 0598-01-109

I-69 ULTIMATE

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200
VERT SCALE: 1"=20'
0 5 10 20


CITY OF HOUSTON
HARRIS CO.
8
525
249
548
69
45
610
10
SEGMENT 3B
I-69/SH 288 INTERCHANGE
1093
288
90A

LOCATION MAP : N.T.S.
SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

PLAN LEGEND

SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR CODE	
CENTERLINE			— · —	2	BLACK	0
I-45 MAINLANES	🟨	🟥	—	2	BLACK	0
I-69/US 59 MAINLANES	🟦	🟦	—	2	BLACK	0
I-10 MAINLANES	🟩	🟪	—	2	BLACK	0
SH 288 MAINLANES	🟪	▬	—	2	BLACK	0
I-610 MAINLANES	🟩	🟩	—	2	BLACK	0
I-10 EXPRESS LANES	🟦	🟪	—	2	PINK	10
MAX LANES	🟪	🟪	—	2	PINK	28
LOCAL STREETS	▭	🟦	—	2	BLUE	1
RAMPS	🟦	🟦	—	2	RED	3
DIRECT CONNECTOR	🟧	🟦	—	2	MAGENTA	5
PEDESTRIAN REALM	🟫	▭	—	1	GREEN	155
EXISTING RDWY TO REMAIN	▬	▬	—	2		
HIGHWAY CAP/POTENTIAL OPEN SPACE			▨	7		
EXISTING RDWY TO BE REMOVED			▨	1		
SURPLUS ROW			▨	3	RED	3
CONVENTION CENTER STORAGE			▨	5	PURPLE	62
PROPOSED CONTROL OF ACCESS			—II—	0	RED	3
PROPOSED FEIS ROW			— - —	6	BLUE	126
EXISTING ROW			- - -	1	YELLOW	4
ACCESS ROAD			······	1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)			┼┼┼┼	1	RED	3
METRO RAIL(EAST END LINE)			┼┼┼┼	1	GREEN	156
METRO RAIL(SOUTHEAST LINE)			┼┼┼┼	1	PURPLE	203
RAILROAD			┼┼┼┼	1	BLACK	0
LIMITS OF FLOODWAY			—	1	BLUE	171
PLANIMETRIC				2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			0000	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES			⇨	0	BLACK	0
TURNAROUNDS			⇨	0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES			➡	1	BLACK	0
TURNAROUNDS			➡	1	BLUE	168
RAMPS			➡	1	RED	3
DIRECT CONNECTOR			➡	1	RED	139
MAX LANES			➡	1	MAGENTA	5
DEPRESSED			—^—^—	3	RED	3
BY OTHERS			- - -	3	BLUE	1
RETAINING WALL			—	6	RED	3
PROPOSED AESTHETIC WALL			—	6	PURPLE	203
PROPOSED NOISE BARRIER			—	6	LT GREEN	196

STEPHEN A. HRNCIR
67245
28-JUL-2023

TxDOT (DISTRICT-"APPROVED BY")
LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY")
LETTER DATED

SHEET 7 OF 8

7
8

I-69 ULTIMATE

PRELIMINARY
SUBJECT TO CHANGE

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DATE: 28-JUL-2023
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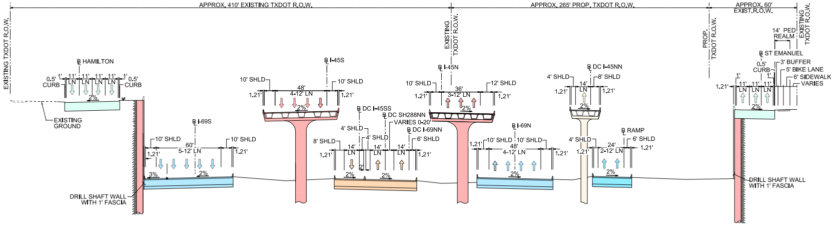
PREPARED BY: ynevie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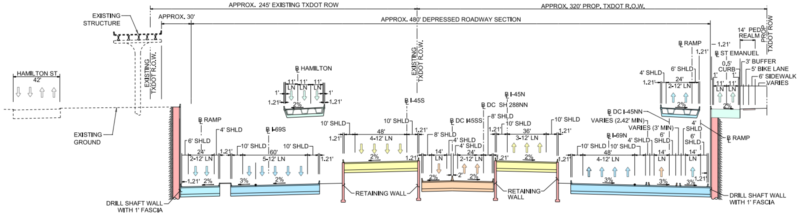
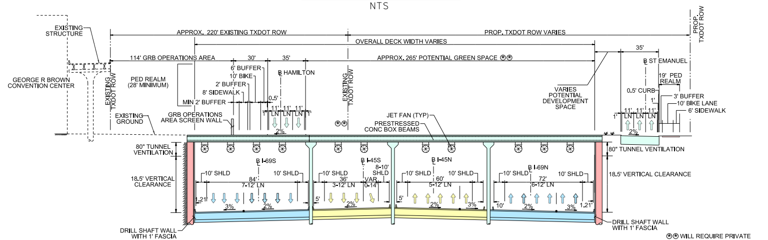
APPROX. 265' PROP. TXDOT R.O.W.
APPROX. 60' EXIST.R.O.W.
EXISTING TXDOT R.O.W.
PROP. TXDOT R.O.W.
℄ HAMILTON
℄ I-45S
℄ I-45N
℄ DC I-45NN
℄ DC I-45SS
℄ DC SH288NN
℄ DC I-69NN
℄ I-69S
℄ I-69N
℄ RAMP
℄ ST EMANUEL
14' PED REALM
3' BUFFER
5' BIKE LANE
6' SIDEWALK
VARIES
EXISTING GROUND
DRILL SHAFT WALL WITH 1' FASCIA
10' SHLD
4' SHLD
8' SHLD
6' SHLD
12' SHLD
48' 4-12' LN
36' 3-12' LN
60' 5-12' LN
24' 2-12' LN
VARIES 0-20'

PROP. TYPICAL SECTION A-A
NTS

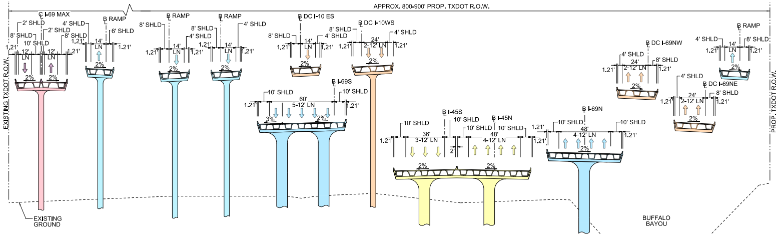

APPROX. 245' EXISTING TXDOT ROW
APPROX. 30'
APPROX. 320' PROP. TXDOT R.O.W.
APPROX. 480' DEPRESSED ROADWAY SECTION
EXISTING STRUCTURE
HAMILTON ST. 42'
EXISTING GROUND
℄ HAMILTON
℄ I-45S
℄ I-45N
℄ DC SH 288NN
℄ DC I-45SS
℄ DC I-45NN
℄ I-69S
℄ I-69N
℄ RAMP
℄ ST EMANUEL
14' PED REALM
3' BUFFER
5' BIKE LANE
6' SIDEWALK
VARIES
VARIES (2.42' MIN)
VARIES (3' MIN)
RETAINING WALL
DRILL SHAFT WALL WITH 1' FASCIA

PROP. TYPICAL SECTION B-B
NTS

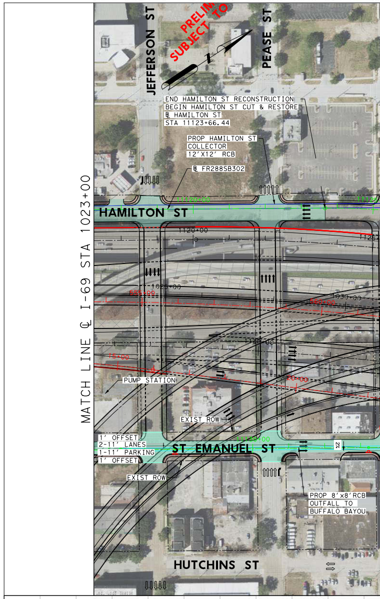

EXISTING STRUCTURE
APPROX. 220' EXISTING TXDOT ROW
PROP. TXDOT ROW VARIES
OVERALL DECK WIDTH VARIES
114' GRB OPERATIONS AREA
APPROX. 265' POTENTIAL GREEN SPACE
GEORGE R BROWN CONVENTION CENTER
PED REALM (28' MINIMUM)
6' BUFFER
10' BIKE
2' BUFFER
8' SIDEWALK
MIN 2' BUFFER
GRB OPERATIONS AREA SCREEN WALL
JET FAN (TYP)
PRESTRESSED CONC BOX BEAMS
VARIES POTENTIAL DEVELOPMENT SPACE
℄ HAMILTON
℄ ST EMANUEL
19' PED REALM
3' BUFFER
10' BIKE LANE
6' SIDEWALK
80" TUNNEL VENTILATION
18.5' VERTICAL CLEARANCE
℄ I-69S
℄ I-45S
℄ I-45N
℄ I-69N
84' 7-12' LN
36' 3-12' LN
60' 5-12' LN
72' 6-12' LN
DRILL SHAFT WALL WITH 1' FASCIA

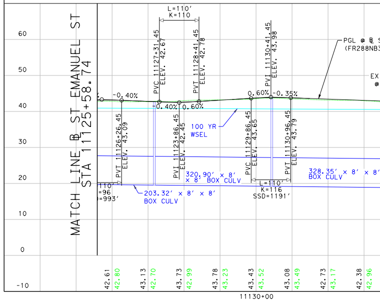
PROP. TYPICAL SECTION C-C
NTS

Ⓡ Ⓡ WILL REQUIRE PRIVATE DEVELOPMENT AND FUNDING


APPROX. 800-900' PROP. TXDOT R.O.W.
EXISTING TXDOT R.O.W.
PROP. TXDOT R.O.W.
℄ I-69 MAX
℄ RAMP
℄ DC I-10 ES
℄ DC I-10WS
℄ I-69S
℄ I-45S
℄ I-45N
℄ I-69N
℄ DC I-69NW
℄ DC I-69NE
EXISTING GROUND
BUFFALO BAYOU

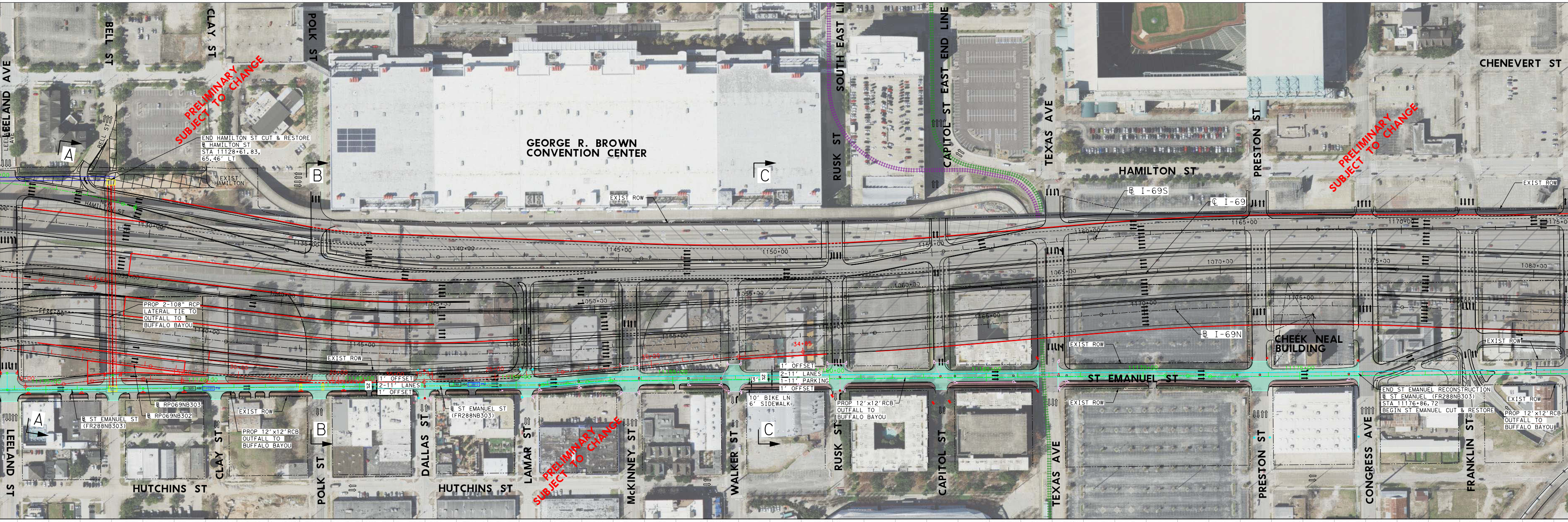
PROP. TYPICAL SECTION D-D
NTS


JEFFERSON ST
PEASE ST
PRELIMINARY SUBJECT TO
END HAMILTON ST RECONSTRUCTION
BEGIN HAMILTON ST CUT & RESTORE
℄ HAMILTON ST
STA 11123+66.44
PROP HAMILTON ST COLLECTOR
12'X12' RCB
℄ FR288SB302
MATCH LINE ℄ I-69 STA 1023+00
HAMILTON ST
PUMP STATION
EXIST ROW
1' OFFSET
2-11' LANES
1-11' PARKING
1' OFFSET
ST EMANUEL ST
PROP 8'x8' RCB OUTFALL TO BUFFALO BAYOU
HUTCHINS ST

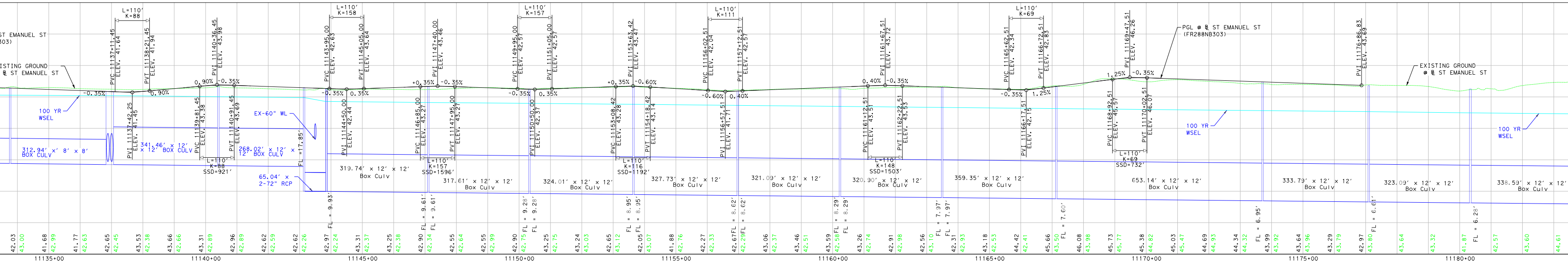


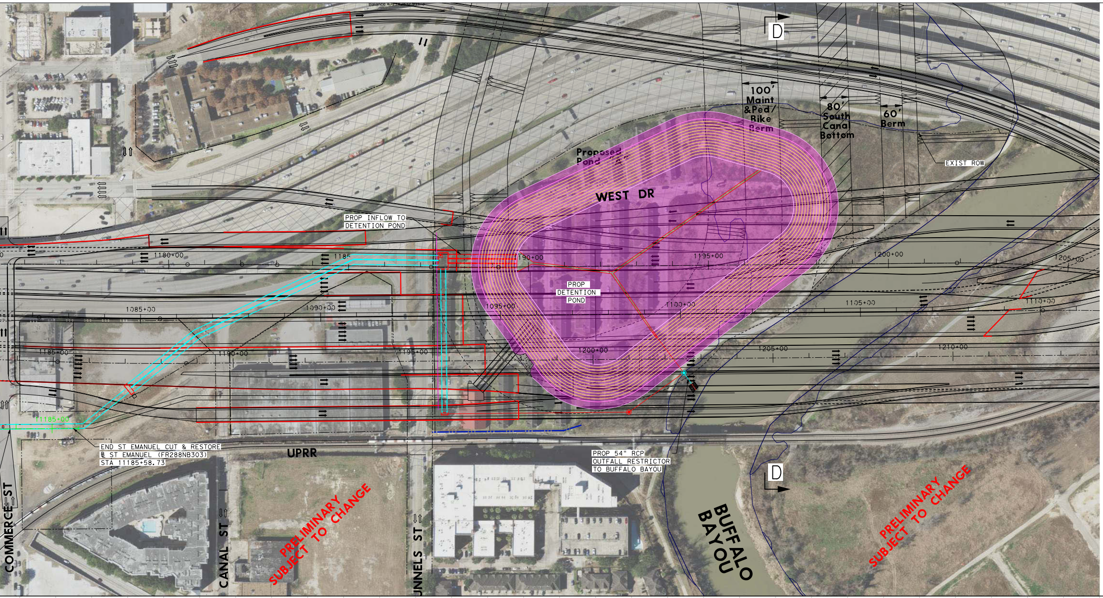
PROFILE LEGEND

PROP. PGL @ CL/NB/EB MAINLANE	—
PROP. PGL @ SB/WB MAINLANE	— —
PROP. PGL @ MAX LANES	—
EXISTING GROUND @ PGL	— · —
100 YR. W.S.E.	∇
PROP. PGL @ NB/EB RAMP	—
PROP. PGL @ SB/WB RAMP	— —
PROP. PGL @ NB/EB DC	—
PROP. PGL @ SB/WB DC	— —
PROP. PGL @ NB/EB FRONTAGE	—
PROP. PGL @ SB/WB FRONTAGE	— —
PROP. PGL @ LOCAL ST	—
EXIST. GRND. @ NB/EB ROW	- - -
EXIST. GRND. @ SB/WB ROW	- - -

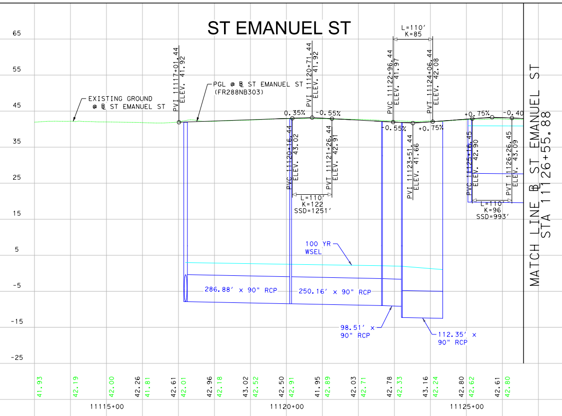

LEELAND AVE
BELL ST
CLAY ST
POLK ST
SOUTH EAST LINE
EAST END LINE
CAPITOL ST
RUSK ST
TEXAS AVE
PRESTON ST
CHENEVERT ST
HAMILTON ST
GEORGE R. BROWN CONVENTION CENTER
PRELIMINARY SUBJECT TO CHANGE
END HAMILTON ST CUT & RESTORE
℄ HAMILTON ST
STA 11128+61.83,
65.46' LT
EXIST HAMILTON
EXIST ROW
℄ I-69S
℄ I-69
℄ I-69N
PROP 2-108" RCP
LATERAL TIE TO
OUTFALL TO
BUFFALO BAYOU
1' OFFSET
2-11' LANES
1' OFFSET
1-11' PARKING
10' BIKE LN
6' SIDEWALK
ST EMANUEL ST
CHEEK NEAL BUILDING
℄ ST EMANUEL ST
(FR288NB303)
℄ RP069NB303
℄ RP069NB302
PROP 12'x12' RCB
OUTFALL TO
BUFFALO BAYOU
END ST EMANUEL RECONSTRUCTION
℄ ST EMANUEL (FR288NB303)
STA 11176+86.72
BEGIN ST EMANUEL CUT & RESTORE
HUTCHINS ST
DALLAS ST
LAMAR ST
McKINNEY ST
WALKER ST
CONGRESS AVE
FRANKLIN ST
A
B
C

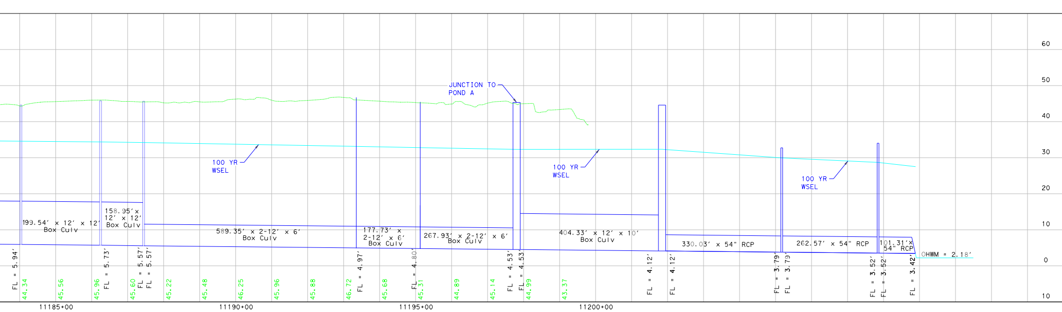
ST EMANUEL ST


PGL @ ℄ ST EMANUEL ST
(FR288NB303)
EXISTING GROUND
@ ℄ ST EMANUEL ST
100 YR WSEL
EX-60" WL
312.94' x' 8' x 8' BOX CULV
341.46' x 12' x 12' BOX CULV
268.02' x 12' x 12' BOX CULV
65.04' x 2-72" RCP
313.74' x 12' x 12' Box Culv
317.61' x 12' x 12' Box Culv
324.01' x 12' x 12' Box Culv
327.73' x 12' x 12' Box Culv
321.09' x 12' x 12' Box Culv
320.90' x 12' x 12' Box Culv
359.35' x 12' x 12' Box Culv
653.14' x 12' x 12' Box Culv
333.79' x 12' x 12' Box Culv
323.09' x 12' x 12' Box Culv
338.59' x 12' x 12' Box Culv
L=110' K=88
L=110' K=158
L=110' K=157
L=110' K=111
L=110' K=69
L=110' K=88 SSD=921'
L=110' K=157 SSD=1596'
L=110' K=116 SSD=1192'
L=110' K=148 SSD=1503'
L=110' K=69 SSD=732'
-0.35%
0.90%
0.35%
-0.60%
0.40%
1.25%
11135+00
11140+00
11145+00
11150+00
11155+00
11160+00
11165+00
11170+00
11175+00
11180+00


D
100' Maint &Ped/ Bike Berm
80' South Canal Bottom
60' Berm
EXIST ROW
Proposed Pond
WEST DR
PROP INFLOW TO DETENTION POND
1180+00
1185
1190+00
1195+00
1200+00
1205+00
PROP DETENTION POND
1085+00
1090+00
1095+00
1100+00
1105+00
1110+00
1185+00
1190+00
1195+00
1200+00
1205+00
1210+00
11185+00
END ST EMANUEL CUT & RESTORE
℄ ST EMANUEL (FR288NB303)
STA 11185+58.73
UPRR
PROP 54" RCP OUTFALL RESTRICTOR TO BUFFALO BAYOU
D
BUFFALO BAYOU
COMMERCE ST
CANAL ST
NNELS ST
PRELIMINARY SUBJECT TO CHANGE
PRELIMINARY SUBJECT TO CHANGE

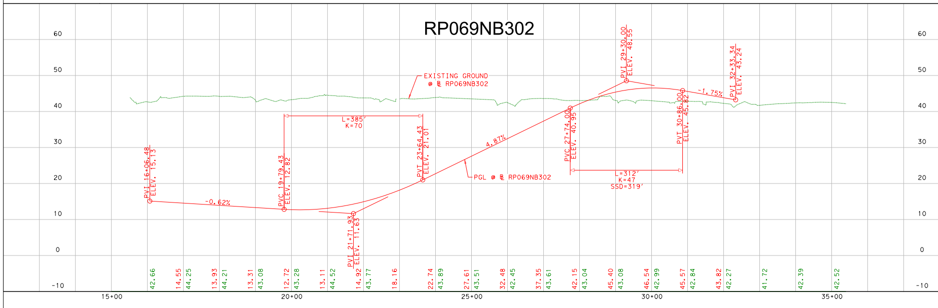
ST EMANUEL ST


65
55
45
35
25
15
5
-5
-15
-25
EXISTING GROUND @ ℄ ST EMANUEL ST
PVI 11117+01.44 ELEV. 41.92
PGL @ ℄ ST EMANUEL ST (FR288NB303)
PVI 11120+71.44 ELEV. 41.92
0.35%
-0.55%
PVC 11120+16.44 ELEV. 43.02
PVT 11121+26.44 ELEV. 42.91
L=110' K=122 SSD=1251'
L=110' K=85
PVC 11122+96.44 ELEV. 41.97
PVT 11124+06.44 ELEV. 42.08
-0.55%
+0.75%
PVI 11123+51.44 ELEV. 41.66
+0.75%
-0.40
PVC 11125+16.45 ELEV. 42.90
PVT 11126+26.45 ELEV. 43.09
L=110' K=96 SSD=993'
100 YR WSEL
286.88' x 90" RCP
250.16' x 90" RCP
98.51' x 90" RCP
112.35' x 90" RCP
MATCH LINE ℄ ST EMANUEL ST
STA 11126+55.88
41.93
42.19
42.00
42.26
41.81
42.61
42.01
42.96
42.18
43.02
42.52
42.50
42.91
41.95
42.89
42.03
42.71
42.78
42.33
43.16
42.24
42.80
42.62
42.61
42.80
11115+00
11120+00
11125+00

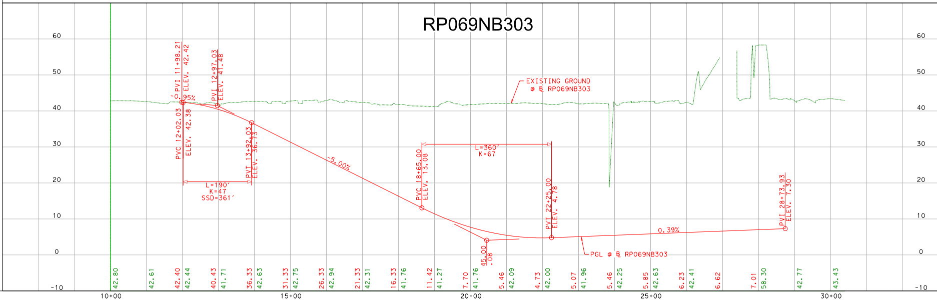

60
50
40
30
20
10
0
10
JUNCTION TO POND A
100 YR WSEL
100 YR WSEL
100 YR WSEL
199.54' x 12' x 12' Box Culv
158.95'x 12' x 12' Box Culv
589.35' x 2-12' x 6' Box Culv
177.73' x 2-12' x 6' Box Culv
267.93' x 2-12' x 6' Box Culv
404.33' x 12' x 10' Box Culv
330.03' x 54" RCP
262.57' x 54" RCP
101.31'x 54" RCP
OHWM = 2.18'
FL = 5.94'
44.34
45.56
45.96
FL = 5.73'
45.60
FL = 5.57'
FL = 5.57'
45.22
45.48
46.25
45.96
45.88
46.72
FL = 4.97'
45.68
FL = 4.80'
45.31
44.89
45.14
FL = 4.53'
FL = 4.53'
44.99
43.37
FL = 4.12'
FL = 4.12'
FL = 3.79'
FL = 3.79'
FL = 3.52'
FL = 3.52'
FL = 3.42'
11185+00
11190+00
11195+00
11200+00

65
55
45
35
25
15
5
-5
-15
-25

RP069NB302


60
50
40
30
20
10
0
-10
EXISTING GROUND @ ℄ RP069NB302
PGL @ ℄ RP069NB302
PVI 16+06.48 ELEV. 15.13
-0.62%
PVC 19+79.43 ELEV. 12.82
L=385' K=70
PVI 21+71.93 ELEV. 11.63
PVT 23+64.43 ELEV. 21.01
4.87%
PVC 27+74.00 ELEV. 40.95
L=312' K=47 SSD=319'
PVI 29+30.00 ELEV. 48.55
PVT 30+86.00 ELEV. 45.82
-1.75%
PVI 32+33.34 ELEV. 43.24
42.66
14.55
44.25
13.93
44.21
13.31
43.08
12.72
43.28
13.11
44.52
14.92
43.77
18.16
22.74
43.89
27.61
43.51
32.48
42.45
37.35
43.61
42.15
43.04
45.40
43.08
46.54
42.99
45.57
42.84
43.82
42.27
41.72
42.39
42.52
15+00
20+00
25+00
30+00
35+00

RP069NB303


60
50
40
30
20
10
0
-10
EXISTING GROUND @ ℄ RP069NB303
PGL @ ℄ RP069NB303
PVI 11+98.21 ELEV. 42.42
-0.95%
PVC 12+02.03 ELEV. 42.38
PVI 12+97.03 ELEV. 41.48
PVT 13+92.03 ELEV. 36.73
L=190' K=47 SSD=361'
-5.00%
PVC 18+65.00 ELEV. 13.08
L=360' K=67
45.00 .08
PVT 22+25.00 ELEV. 4.78
0.39%
PVI 28+73.93 ELEV. 7.30
42.80
42.61
42.40
42.44
40.43
41.71
36.33
42.63
31.33
42.75
26.33
42.94
21.33
42.31
16.33
41.76
11.42
41.27
7.70
41.76
5.46
42.09
4.73
42.00
5.07
41.96
5.46
42.25
5.85
42.63
6.23
42.41
6.62
7.01
58.30
42.77
43.43
10+00
15+00
20+00
25+00
30+00

HOUSTON DISTRICT
PROJECT DEVELOPMENT

I-69 ULTIMATE

PRELIMINARY
SUBJECT TO CHANGE

7
8

PREPARED BY: ynevle

FILE LOCATION: G:\59004\TECHPROD\NHHIP\Doc\From IDC\2023-04-17 Seg 3B Schem Cadd\20230417 - IDCUS Final Revised Schematic\DGN_HNTB MODIFIED\ULT_NHHIP_I69_SH288 Interchange_RE_PP02_I69_grade

SCALE: 1:100

PEN TABLE: \\hoxw00\jobs\59004\TECHPROD\NHHIP\Plots\59004_NHHIP_IH45.pen

SCHEMATIC DESIGN

NHHIP
I-69/SH 288 INTERCHANGE
(SH 288)

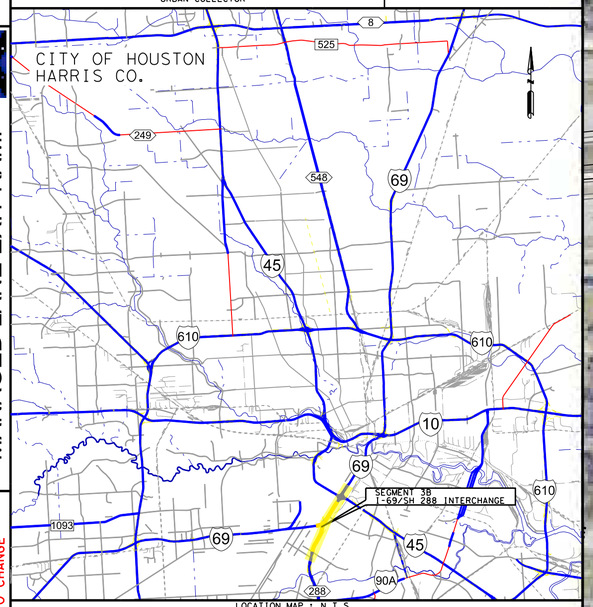
COUNTY: HARRIS

DATE: 5/16/2023

MANAGED LANE EXIT RAMP
CSJ 0598-01-109

ROADWAY	FUNCTIONAL CLASSIFICATION	DESIGN SPEED
GENERAL PURPOSE LANES	URBAN FREEWAY	50 MPH
DIRECT CONNECTORS	DIRECT CONNECTOR	40 MPH
RAMPS	RAMP	40 MPH
SH 288 MANAGED LANES RAMP	RAMP	45 MPH
HAMILTON/CHENEVERT RAMPS TO SH 288 SB	RAMP	35 MPH
FRONTAGE ROAD	URBAN COLLECTOR	40 MPH
CROSS STREETS/LOCAL ROADS	URBAN MINOR ARTERIAL/ URBAN COLLECTOR	30 MPH

HORZ SCALE: 1"=200'
0 50 100 200



LOCATION MAP : N.T.S.

SURVEY DATA: TEXAS SOUTH CENTRAL ZONE #4204 (HARRIS COUNTY)
ADJUSTED TO SURFACE USING COMBINED SCALE FACTOR 1.00013

PLAN LEGEND

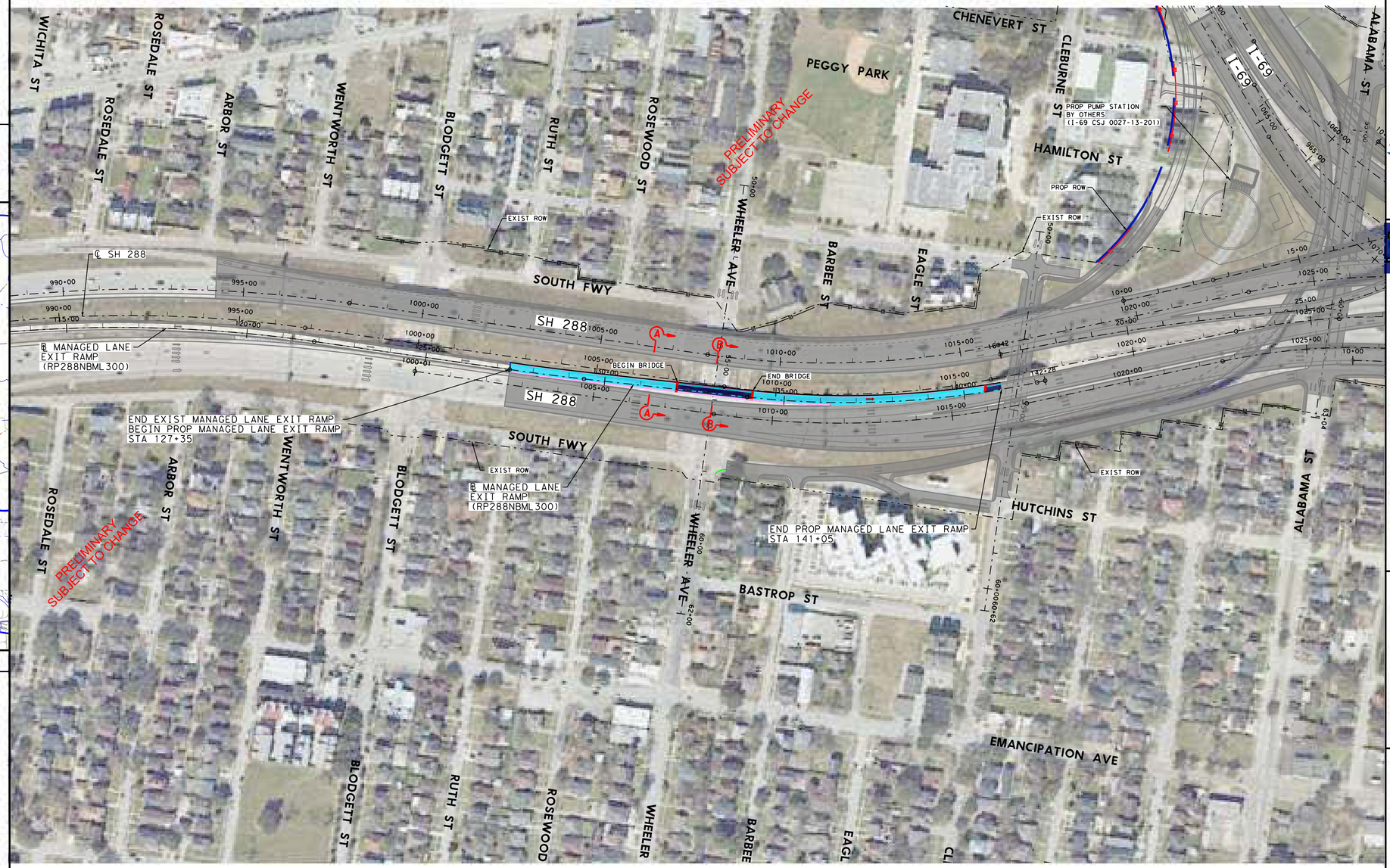
SYMBOLOGY	ROADWAY	BRIDGE	STYLE	LINE WT	COLOR	CODE
CENTERLINE				2	BLACK	0
I-45 MAINLANES				2	BLACK	0
I-69/US 59 MAINLANES				2	BLACK	0
I-10 MAINLANES				2	BLACK	0
SH 288 MAINLANES				2	BLACK	0
I-610 MAINLANES				2	BLACK	0
I-10 EXPRESS LANES				2	PINK	10
MAX LANES				2	PINK	28
LOCAL STREETS				2	BLUE	1
RAMPS				2	RED	3
DIRECT CONNECTOR				2	MAGENTA	5
PEDESTRIAN REALM				1	GREEN	155
EXISTING RDWY TO REMAIN				2		
HIGHWAY CAP/POTENTIAL OPEN SPACE				7		
EXISTING RDWY TO BE REMOVED				1		
SURPLUS ROW				3	RED	3
CONVENTION CENTER STORAGE				5	PURPLE	62
PROPOSED CONTROL OF ACCESS				0	RED	3
PROPOSED FEIS ROW				6	BLUE	126
EXISTING ROW				1	YELLOW	4
ACCESS ROAD				1	BLUE	1
METRO RAIL RED (MAIN STREET LINE)				1	RED	3
METRO RAIL(EAST END LINE)				1	GREEN	156
METRO RAIL(SOUTHEAST LINE)				1	PURPLE	203
RAILROAD				1	BLACK	0
LIMITS OF FLOODWAY				1	BLUE	171
PLANIMETRIC				2	GREEN	2
TRAFFIC COUNT YEAR (2040) DHV			0000	0	BLACK	0
AM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 AM	0	BLACK	0
PM MAX LANE TRAFFIC COUNT YEAR (2040) DHV			0000 PM	0	BLUE	168
EXISTING LANE DIRECTIONAL INDICATOR:						
MAIN LANES				0	BLACK	0
TURNAROUNDS				0	BLUE	168
PROPOSED LANE DIRECTIONAL INDICATOR:						
MAIN LANES				1	BLACK	0
TURNAROUNDS				1	BLUE	168
RAMPS				1	RED	3
DIRECT CONNECTOR				1	RED	139
MAX LANES				1	MAGENTA	5
DEPRESSED				3	RED	3
BY OTHERS				3	BLUE	1
RETAINING WALL				6	RED	3
PROPOSED AESTHETIC WALL				6	PURPLE	203
PROPOSED NOISE BARRIER				6	LT GREEN	196

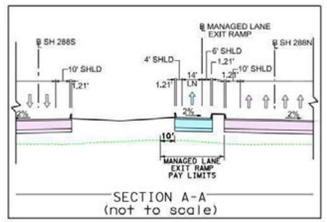
STEPHEN A. HINCIR 67245 LICENSED PROFESSIONAL ENGINEER
06/19/2023

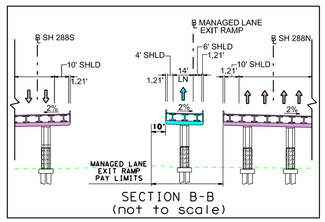
TxDOT (DISTRICT-"APPROVED BY") LETTER DATED

FHWA REPRESENTATIVES ("APPROVED BY") LETTER DATED

SHEET 8 OF 8







HOUSTON DISTRICT
PROJECT DEVELOPMENT

MANAGED LANE EXIT RAMP

SCALE: 200.0000 FT / IN. PEN TABLE: #PEN#
TIME: 2:30:59 PM
DATE: 5/16/2023

PRELIMINARY
SUBJECT TO CHANGE

HNTB Corporation
1301 Fannin St, Suite 2160
Houston, TX 77002
TBPE Firm Registration No. 637

FILE LOCATION: #DGN#

PREPARED BY: #SHT NBR#

8
8

APPENDIX B

NHHIP 3B Drainage Design Criteria

Memorandum/White Paper

Date:	Monday, July 03, 2023
Project:	NHHIP Segment 3B
To:	Elie Alkhoury
Cc:	Michael Meroney
From:	Eric Friedrich
Subject:	Drainage Design Criteria
Priority:	Normal

DRAINAGE CRITERIA

General Requirements

Efficient performance of the drainage system is an integral part of the performance of the Project. Section Designer shall account for all sources of runoff that may reach the Project, whether originating within or outside the Project ROW, in the design of the drainage facilities.

If existing drainage patterns are revised during the Project design, then the Section Designer shall coordinate those revisions with Teague Nall and Perkins, Inc. (TNP), drainage task lead for the General Engineering Consultant (GEC), and shall design a solution that does not have adverse impact to property owners outside the ROW.

Project Specific Requirements

Section Designer shall incorporate the following requirements into the Project drainage design:

- No increase to existing water surface elevations at stream crossings outside the Project ROW and at any cross section along the streams. At its sole discretion, TxDOT may approve increases in existing water surface elevations if contained within drainage channels or storm drain systems and if no adverse impacts result to adjacent properties.
- Recommendations from the report entitled "North Houston Highway Improvement Project Segment 3B-DB-1 Addendum Alabama Street to McGowen Street" dated August 2021 by TNP (Seg 3B Addendum Report), including updates to that report developed by TNP as part of the GEC work for this project.

Analysis and Design Requirements

Section Designer shall analyze and design all Elements of the drainage facilities in accordance with criteria in this document, the TxDOT Hydraulic Design Manual (September 2019), and applicable criteria in the Harris County

Flood Control District Policy Criteria & Procedure Manual (July 2019). Any changes/deviations from TxDOT criteria need coordination with and approval by TxDOT Houston District.

Abbreviations used in this document including tables herein are defined as follows:

AEP	Annual Exceedance Probability	HGL	Hydraulic Grade Line
AHW	Allowable High Water	HOU	Houston District Practice
COH	City of Houston	JB	Junction Box
EOP	Edge of Pavement	L.P.	Low Point
FB	Freeboard	MH	Manhole
FEMA	Federal Emergency Management Agency	ML	Main Lanes
FHWA	Federal Highway Administration	P.I.	Point of Intersection
FIS	Flood Insurance Study	Q	Runoff, Discharge, Flowrate
FR	Frontage Road	RCB	Reinforced Concrete Box
HCFCD	Harris County Flood Control District	RCP	Reinforced Concrete Pipe
HDM	Hydraulic Design Manual (TxDOT)	ROW	Right of Way
HEC	Hydrologic Engineering Center (USACE) or Hydraulic Engineering Circular (FHWA)	SWMM	Storm Water Management Model (XP-, PC-, or EPA-SWMM)
HEC-HMS	USACE HEC Hydrologic Modeling System	USACE	U.S. Army Corps of Engineers
HEC-RAS	USACE HEC River Analysis System	WSEL	Water Surface Elevation

Design Frequencies

Section Designer and GEC shall use the design frequencies listed in **Table 1** below for hydrologic and hydraulic analysis and design of project drainage features and systems. Frequency flows should be based on Atlas 14 precipitation. The pre-Atlas 14 500-year flow on FEMA studied streams may be used for outfall tailwater determination in lieu of the Atlas 14 100-year flow, with TxDOT approval.

Table 1: Drainage Design Frequencies

(Any deviation requires TxDOT approval)

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
DEPRESSED ROADWAYS						
Storm Drain Inlets and Pavement Drainage	100-yr	100-yr	100-yr	10-yr	Match Exist. or better	Applies to ponded widths in gutter and inlet capacity. Local Streets acting as TxDOT frontage road should be designed per frontage road criteria. Approval from TxDOT required to lower frequency due to capacity of City System.
Storm Drain Conduits	100-yr	100-yr	100-yr	10-yr	Match Exist. or better	Size conduit for non-pressure full flow; i.e. Design Q<= Full Flow Capacity Q. See HGL requirements below. Local Streets acting as TxDOT frontage road should be designed per frontage road criteria. Approval from TxDOT required to lower frequency due to capacity of City System.
Storm Drain HGL	100-yr	100-yr	100-yr	10-yr: max 1-lane ponding	10-yr: max 1-lane ponding	Ponding on the shoulder is allowable. Starting HGL at outfall: 100-yr, base the starting HGL on hydrograph timing at the outfall considering existing and proposed channel conditions. Determine and report maximum frequency flood contained in ROW.
Depressed Roadway Storm Drain, Inlets and Pavement Drainage	100-yr	100-yr	100-yr	100-yr	100-yr	Depressed roadway occurs if water has nowhere to drain overland when curb height is exceeded. Size conduit for non-pressure full flow.
Storm Water Pumping Stations	100-yr	100-yr	100-yr	100-yr	100-yr	
Separation Ditches	100-yr	100-yr	100-yr	N/A	N/A	Separation Ditches are those in medians between adjacent roadways.
NON - DEPRESSED ROADWAYS (AT OR ABOVE GRADE)						
Storm Drain Inlets and Pavement Drainage	10-yr	10-yr	10-yr	10-yr	Match Exist. or better	Applies to ponded widths in gutter and inlet capacity. Local Streets acting as TxDOT frontage road should be designed per frontage road criteria. Approval from TxDOT required to lower frequency due to capacity of City System.

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
Storm Drain Conduits	10-yr	10-yr	10-yr	10-yr	Match Exist. or better	Size conduit for non-pressure full flow; i.e. Design Q<= Full Flow Capacity Q. See HGL requirements below. Local Streets acting as TxDOT frontage road should be designed per frontage road criteria. Approval from TxDOT required to lower frequency due to capacity of City System.
Storm Drain HGL	100-yr	10-yr	100-yr	10-yr: max 1-lane ponding	10-yr: max 1-lane ponding	Ponding on the shoulder is allowable. Starting HGL at outfall: 100-yr, base the starting HGL on hydrograph timing at the outfall considering existing and proposed channel conditions. Determine and report maximum frequency flood contained in ROW.
Separation Ditches	10-yr	10-yr	10-yr	N/A	N/A	Separation Ditches are those in medians between adjacent roadways.
DETENTION PONDS						
Detention Ponds	100-year + 2' FB. Provide Detention Summary with Area Serviced, Detention Storage Volume Required, Detention Storage Volume Provided, Maximum Design WSEL, Maximum Outflow Rate Allowed, Maximum Outflow Rate Provided, and Restrictor Size.					Approval from TxDOT required for freeboard less than 2'. Sample plans available from TxDOT upon request.

Hydrologic Analysis

Section Designer and GEC shall analyze and design drainage structure capacities for the frequencies and hydrologic conditions as described in **Table 1**. GEC shall analyze drainage impacts and evaluate mitigation effectiveness using 100-yr and 10-yr frequencies. The National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11 Version 2.0: Texas (Perica et al. 2018) shall be used as the rainfall depth-duration-frequency source in hydrologic studies.

Using a minimum Time of Concentration (Tc) of 10 minutes, the following Atlas 14 partial duration e, b, and d values shown in **Table 2** shall be utilized for Rainfall Intensity calculations in the Rational Method, per the HDM and as presented in TxDOT's spreadsheet release, EBDLKUP-2019-vC6.2.10.

Table 2: Atlas 14 Rainfall Intensity Coefficients e, b, and d values

	50% (2-year)	20% (5-year)	10% (10-year)	4% (25-year)	2% (50-year)	1% (100-year)	0.2% (500-year)
e	0.7854	0.7623	0.7445	0.7243	0.7088	0.6963	0.6878

	50% (2-year)	20% (5-year)	10% (10-year)	4% (25-year)	2% (50-year)	1% (100-year)	0.2% (500-year)
b	66.7210	76.7585	84.7764	96.1543	103.9212	113.6760	156.5886
d	12.7018	12.3866	12.3576	12.5173	12.6202	13.1642	17.3069

Section Designer shall design the drainage system to accommodate increased runoff due to the roadway improvements within the Project ROW. Flood damage potential for the completed Project shall not exceed pre-Project conditions.

When determining flow for conduits from outside the right of way the flow shall be the greater of (a) the contributing drainage area at existing development conditions, or (b) the 150' semi-development strip adjacent to the right of way using a runoff coefficient of 0.65. Peak flows from existing development with compensatory onsite stormwater detention should consider the flow reduction benefits of the stormwater detention. See also 'Inlet Drainage Area' and 'Conduit Drainage Area' provisions in **Table 3**.

Storm Sewer Systems

Where precluded from handling runoff with open channels by physical site constraints, or as directed in this document, Section Designer shall design enclosed storm sewer systems to collect and convey runoff to appropriate discharge points.

Section Designer shall design all storm sewer systems such that the hydraulic grade line for the design frequency event is no higher than:

a. the level for 'Storm Drain HGL' in **Table 1**; and

b. one foot below the top of manhole cover (for standalone MH).

Section Designer shall apply the design criteria listed in **Table 3** for design of drainage systems and related appurtenances.

Table 3: Drainage Design Criteria

(Any deviation requires TxDOT approval)

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
Pavement Drainage						

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
Allowable Ponding Width/AHW	Shldr Width	Shldr Width + 2'	Shldr Width + 2'	Curb offset + 1 Lane	Curb offset + 1 Lane	
Maximum Low Point Ponding Depth	Function of Allowable Ponding Width and Cross Slope					Provide flanking inlets to reduce hydroplaning potential.
Storm Drain Inlets						
Pavement Inlet Types	AZ, AZ2G, AZR, AZR2G, Trench Drains	AZ, AZ2G, AZR, AZR2G, C or C1	AZ, AZ2G, AZR, AZR2G	C1 (typical)	C, C1	Use Trench Drains in ramp gores. Provide resultant slope of Trench Drain invert >/= 1%.
Ditch Inlet Types	ML Separation Ditches: AD, AAD, SET Side Road Ditches: A, AD, AAD, SET					Provide detail to add concrete riprap apron around inlet perimeter, with minimum 2' width, preferable 5' width.
Inlet Drainage Area	In general, contributing drainage area to the inlet from within and outside the right of way, with following clarifications: 1. For Frontage Road inlets Adjacent to **Undeveloped Areas Outside Right Of Way:** Contributing area within the right of way, plus 150' strip outside right of way at an assumed runoff coefficient 'C' = 0.65 2. For Frontage Road inlets Adjacent to **Developed Areas (with internal drainage system) Outside Right of Way:** Contributing areas within and outside right of way. 3. Drainage area for storm drain conduits may differ (see 'Conduit Drainage Area' below).					
Inlet Locations	1. On-grade: Place inlets to keep gutter ponding within allowable ponding widths in this table. Carryover acceptable up to 1 cfs. TxDOT approval for carryover of more than 1 cfs. 2. Low points: Verify inlet location is at sag of vertical curve, not at P.I. Place flanking inlets both sides of low point at a 25' - 100' spacing from L.P. 3. Redundant inlets: End of curb returns at intersection, and in separation ditches. 4. 100% flow interception: On pavement at end of retaining wall, at ramp gores, at intersections. 5. Provide detail for equalizer pipes to connect multiple boxes in trunkline at inlets.					
Bridge Deck Drainage	1. Drain free-fall through slots in rail, where falling water would not affect adjacent roadway/bridge or other features below. 2. Use Bridge Drain Inlets per Houston District Bridge Section details, where drainage through slots in rail would adversely affect adjacent roadway/bridge or other features below, including any traffic thereon. 3. Use slotted rail w/water blocks in sag locations. Limit height of water stop to 2" in sags. 4. Outfall deck drain pipe system directly into nearby storm drain inlet or manhole below grade, if available. Otherwise, outfall pipe from base of column into adjacent ditch collection system in a manner that prevents erosion. 5. Minimize exposed length of PVC drain pipe from inlet to bent cap. Hide PVC drain pipe inside cap and column.					
Storm Drain Conduits – General						

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
Conduit Drainage Area	In general, contributing drainage area to the conduit from within and outside the right of way, with following clarifications: 1. Flows to the conduit from areas outside the right of way are based on the higher of (1) contributing area at existing development conditions or (2) 150' strip adjacent to right of way at runoff coefficient 'C' = 0.65 2. 'Existing development conditions' in #1 should consider effect of any existing stormwater detention. 3. Drainage area for storm drain inlets may differ (see 'Inlet Drainage Area' above).					
Conduit Material/Type	Reinforced Concrete Pipe – RCP, or Reinforced Concrete Box - RCB					Polyvinyl Chloride Pipe – PVC is recommended for bridge deck drain system conduits.
Design Conduit Size	Full flow pipe capacity >= design Q					
Conduit Size Changes	Match soffits at conduit size changes, if possible. Matching flowlines is acceptable if grade is limited.					
Manholes/Junctions	Hou District Ty A or Ty B Manholes. Statewide Bridge Division Manhole PB, PJB, PDD, & PSL.. Manhole TY M signed and seal. All other JB's require special design.					No MH access on mainlanes, except on shoulders. Provide MH spacing per TxDOT HDM. Top section of manhole shall be cast in place and flush with pavement surface.
Conduit Connections	1. Lateral stub-in boxes require 2' minimum size differential 2. Pipe to pipe stub-in requires 3' minimum size differential 3. Other connections require M/H, JB, or JB w/out riser or approved collar detail 4. Provide detail for accommodating multiple (parallel) conduits at junctions – use equalizer openings at every other inlet 5. Bends acceptable up to 30° angle.					
Minimum Conduit Clearance (Cover)	1. Graded areas: 1 ft 2. Paved areas: the lower of (a) 2 ft below pavement surface, or (b) 0.5' below treated subgrade.					
Location near Retaining Wall	1. Where possible, avoid placement of conduit parallel to MSE wall if located within wall backfill. 2. Preferred lateral placement is under wall, normal to wall alignment (see AZR and AZR2G inlet standards). 3. If conduits are outside of and parallel to a fill wall, offset conduit 15 ft minimum from face of wall, if possible.					
Storm Drain Conduits – Laterals						
Minimum Pipe Size	24"	24"	24"	24"	24"	18" allowed with TxDOT approval
Minimum Slope	0.2 % preferable, 0.1 % minimum					
Maximum Slope	3%					Deviations allowed with TxDOT approval
Minimum Velocity	2 ft/sec at full flow					
Maximum Velocity	12 ft/sec					
Storm Drain Conduits – Trunk Lines						

Design Element	Mainlanes	Ramp	Direct Connect.	Frontage Road	Arterial / Cross Street	Application Notes
Minimum Pipe Size	24"	24"	24"	24"	24"	18" allowed with TxDOT approval
Minimum RCB Depth	3'	3'	3'	3'	3'	Deviations allowed with TxDOT approval
Minimum Slope	0.2 % preferable, 0.1 % minimum					
Maximum Slope	3%					Deviations allowed with TxDOT approval
Minimum Velocity	2 ft/sec at full flow					Deviations allowed with TxDOT approval
Maximum Velocity	12 ft/sec					Deviations allowed with TxDOT approval
Separation Ditches						
Minimum Depth	Variable					
Maximum Depth	3'					
Minimum Slope	0.2 % preferable, 0.1 % minimum					
Side Slopes/Shape	Based on roadway design criteria and typical section max 4:1 front & back slope					Deviations allowed with TxDOT approval

Overland Flow Design

Section Designer should follow recommendations from the Seg 3B Addendum report to restrict overland flow from entering the proposed depressed section.

Hamilton Street Collector System

The Hamilton Street Collector System has been sized to capture and convey the overland sheet flow to Buffalo Bayou; eliminating overland flow from entering the proposed depressed section. Inlets along the Hamilton Street System must be designed to provide capacity to accommodate conventional street or pavement drainage, plus additional capacity to fully intercept the overland sheet flow into the Hamilton Street Collector System, as shown in the Seg 3B Addendum Report.

Ramps\Frontage Road Profiles

The Hamilton Street profile near Holeman was raised to eliminate the overland flow from entering the proposed depressed section. Much of the existing overland flow enters the existing depressed section at this location. Ramps and frontage road profiles need to be designed with high points above the 100-year HGL to keep overland flow from draining into the proposed depressed section. Barrier walls should be used along the frontage road when the profile is below the 100-year HGL to keep overland flow from spilling over into the depressed section.

Siphons

Section Designer shall analyze existing and proposed siphons and drainage-ways impacted, replaced, or created by the Project design, for any localized flooding problems. See Seg 3B Addendum report for proposed siphon size, location, and hydraulic operation and data.

Bridges

Bridge Deck Drainage

Runoff from bridge decks shall be carried off the bridge and into the adjacent roadway drainage system using bridge deck drains, slots in the rail, and/or captured in bridge approach drains to intercept gutter flow at each end of the bridge according to Bridge Deck Drainage criteria in Storm Drain Inlets section of **Table 3**.

Pump Stations

See Seg 3B Addendum report for pump station sizing, location, and operation criteria and requirements. Section Designer shall follow pump station design guidelines in chapter 11 of the HDM, in coordination with the FHWA HEC-24 manual. GEC will provide a draft Pump Station construction specification for the Section Designer to finalize and complete consistent with final pump station design. TxDOT and GEC will assist in review and coordination of final pump station plans and specification.

DRAINAGE DOCUMENTATION

Section Designer and GEC shall provide drainage analysis and design documentation per the requirements of their respective TxDOT contract scopes and shall deliver that documentation per their contract schedules and/or other requirements coordinated with TxDOT. This section highlights the major components of that documentation. Section Designer shall coordinate with GEC on design changes.

Drainage Impact Analysis Report

GEC shall prepare a Drainage Report as an update to the Seg 3B Addendum report to include drainage design of major drainage system components that will be included in the Section Designer's plans. At a minimum, the Drainage Report shall include:

a) Drainage computations, both hydrologic and hydraulic, and all supporting data.
b) Hydrologic and hydraulic notes, models, and tabulations (where computer software is used, both pdf copies and electronic input and output files)
c) Profile exhibits of roadway with WSEL plots at outfalls
d) SWMM link-node network exhibits
e) Drainage designs for Mitigation & Detention Ponds
f) Floodplain cut and fill calculations
g) Drainage system data (location, type, material, size, and other pertinent information) in a suitable electronic format
h) Recommendations for storm sewer trunkline sizes and system layout

i) Recommendations for pump station capacity, pump sizes and configuration, on-off elevations, minimum wet well size, backup power considerations, and pump outfall size and configuration.

NOAA Atlas 14, Volume 11, Version 2 HOUSTON WB CITY
Station ID: 79-0056
Location name: Houston, Texas, USA*
Latitude: 29.7622°, Longitude: -95.3593°
Elevation:
Elevation (station metadata): 52 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.497** (0.376-0.657)	**0.585** (0.446-0.763)	**0.727** (0.553-0.954)	**0.846** (0.635-1.13)	**1.01** (0.735-1.39)	**1.14** (0.807-1.61)	**1.27** (0.878-1.85)	**1.42** (0.953-2.11)	**1.62** (1.05-2.49)	**1.78** (1.12-2.81)
10-min	**0.787** (0.596-1.04)	**0.928** (0.707-1.21)	**1.16** (0.879-1.52)	**1.35** (1.01-1.79)	**1.61** (1.18-2.22)	**1.82** (1.29-2.58)	**2.04** (1.40-2.95)	**2.25** (1.51-3.35)	**2.54** (1.65-3.92)	**2.76** (1.75-4.37)
15-min	**1.00** (0.760-1.33)	**1.18** (0.898-1.54)	**1.46** (1.11-1.91)	**1.69** (1.27-2.26)	**2.02** (1.47-2.77)	**2.27** (1.61-3.20)	**2.53** (1.75-3.67)	**2.81** (1.89-4.18)	**3.20** (2.08-4.93)	**3.51** (2.22-5.54)
30-min	**1.44** (1.09-1.91)	**1.68** (1.28-2.20)	**2.07** (1.58-2.72)	**2.40** (1.80-3.19)	**2.84** (2.06-3.89)	**3.18** (2.25-4.48)	**3.54** (2.44-5.13)	**3.95** (2.66-5.88)	**4.54** (2.95-7.00)	**5.03** (3.18-7.94)
60-min	**1.90** (1.44-2.51)	**2.23** (1.70-2.91)	**2.77** (2.11-3.64)	**3.23** (2.42-4.30)	**3.86** (2.79-5.28)	**4.34** (3.06-6.11)	**4.86** (3.35-7.05)	**5.47** (3.68-8.16)	**6.39** (4.16-9.88)	**7.17** (4.54-11.3)
2-hr	**2.29** (1.74-3.00)	**2.80** (2.12-3.56)	**3.57** (2.72-4.63)	**4.26** (3.21-5.63)	**5.27** (3.84-7.16)	**6.08** (4.32-8.52)	**7.00** (4.85-10.1)	**8.10** (5.47-12.0)	**9.78** (6.37-15.0)	**11.2** (7.12-17.6)
3-hr	**2.50** (1.91-3.25)	**3.14** (2.36-3.93)	**4.07** (3.11-5.24)	**4.94** (3.74-6.50)	**6.24** (4.59-8.48)	**7.34** (5.25-10.3)	**8.61** (5.98-12.3)	**10.1** (6.84-14.9)	**12.4** (8.11-19.0)	**14.4** (9.16-22.5)
6-hr	**2.88** (2.21-3.72)	**3.75** (2.81-4.59)	**4.97** (3.82-6.34)	**6.15** (4.69-8.04)	**7.98** (5.91-10.8)	**9.57** (6.89-13.3)	**11.4** (7.98-16.3)	**13.6** (9.24-19.9)	**17.0** (11.1-25.8)	**19.9** (12.7-30.9)
12-hr	**3.31** (2.57-4.25)	**4.40** (3.31-5.31)	**5.91** (4.58-7.47)	**7.40** (5.68-9.58)	**9.70** (7.24-13.0)	**11.7** (8.51-16.2)	**14.1** (9.91-20.0)	**16.9** (11.5-24.5)	**21.2** (14.0-32.0)	**25.0** (16.0-38.5)
24-hr	**3.80** (2.97-4.84)	**5.13** (3.87-6.10)	**6.95** (5.41-8.70)	**8.76** (6.77-11.2)	**11.6** (8.70-15.5)	**14.1** (10.3-19.4)	**17.0** (12.0-23.9)	**20.4** (14.0-29.3)	**25.5** (16.8-38.2)	**29.8** (19.2-45.8)
2-day	**4.34** (3.41-5.48)	**5.96** (4.50-6.99)	**8.16** (6.40-10.1)	**10.4** (8.07-13.2)	**13.8** (10.5-18.4)	**17.0** (12.5-23.3)	**20.6** (14.6-28.7)	**24.5** (16.8-34.9)	**30.0** (19.8-44.4)	**34.4** (22.2-52.5)
3-day	**4.74** (3.74-5.96)	**6.51** (4.95-7.61)	**8.92** (7.02-11.0)	**11.3** (8.84-14.4)	**15.1** (11.5-20.0)	**18.5** (13.7-25.3)	**22.4** (15.9-31.0)	**26.4** (18.2-37.5)	**32.0** (21.2-47.2)	**36.5** (23.6-55.4)
4-day	**5.07** (4.01-6.35)	**6.90** (5.28-8.07)	**9.42** (7.44-11.6)	**11.9** (9.32-15.1)	**15.8** (12.1-20.9)	**19.3** (14.3-26.2)	**23.2** (16.5-32.1)	**27.3** (18.8-38.6)	**32.9** (21.9-48.4)	**37.4** (24.3-56.6)
7-day	**5.83** (4.64-7.26)	**7.73** (5.99-9.07)	**10.4** (8.26-12.7)	**13.0** (10.2-16.3)	**17.0** (13.0-22.2)	**20.5** (15.2-27.7)	**24.5** (17.5-33.6)	**28.6** (19.8-40.2)	**34.3** (22.9-50.2)	**38.8** (25.2-58.4)
10-day	**6.49** (5.17-8.03)	**8.43** (6.59-9.92)	**11.2** (8.95-13.7)	**13.9** (10.9-17.3)	**17.9** (13.8-23.3)	**21.5** (16.0-28.8)	**25.4** (18.2-34.7)	**29.5** (20.5-41.4)	**35.1** (23.5-51.3)	**39.7** (25.8-59.5)
20-day	**8.59** (6.90-10.6)	**10.6** (8.49-12.7)	**13.7** (11.0-16.7)	**16.5** (13.1-20.4)	**20.5** (15.8-26.4)	**23.9** (17.8-31.7)	**27.5** (19.9-37.4)	**31.4** (22.0-43.9)	**36.8** (24.8-53.5)	**41.2** (26.9-61.4)
30-day	**10.4** (8.38-12.7)	**12.5** (10.1-15.0)	**15.8** (12.8-19.2)	**18.7** (14.9-23.1)	**22.8** (17.5-29.1)	**26.0** (19.4-34.2)	**29.4** (21.3-39.8)	**33.1** (23.2-46.1)	**38.3** (25.8-55.3)	**42.4** (27.8-63.0)
45-day	**13.0** (10.5-15.8)	**15.3** (12.5-18.4)	**19.1** (15.6-23.1)	**22.2** (17.8-27.3)	**26.5** (20.4-33.6)	**29.7** (22.2-38.8)	**33.0** (23.9-44.4)	**36.5** (25.7-50.6)	**41.2** (27.9-59.3)	**44.9** (29.5-66.4)
60-day	**15.4** (12.5-18.7)	**17.9** (14.8-21.6)	**22.1** (18.1-26.6)	**25.5** (20.5-31.1)	**29.9** (23.1-37.8)	**33.3** (24.9-43.3)	**36.5** (26.5-49.0)	**39.8** (28.1-55.0)	**44.1** (29.9-63.3)	**47.3** (31.1-69.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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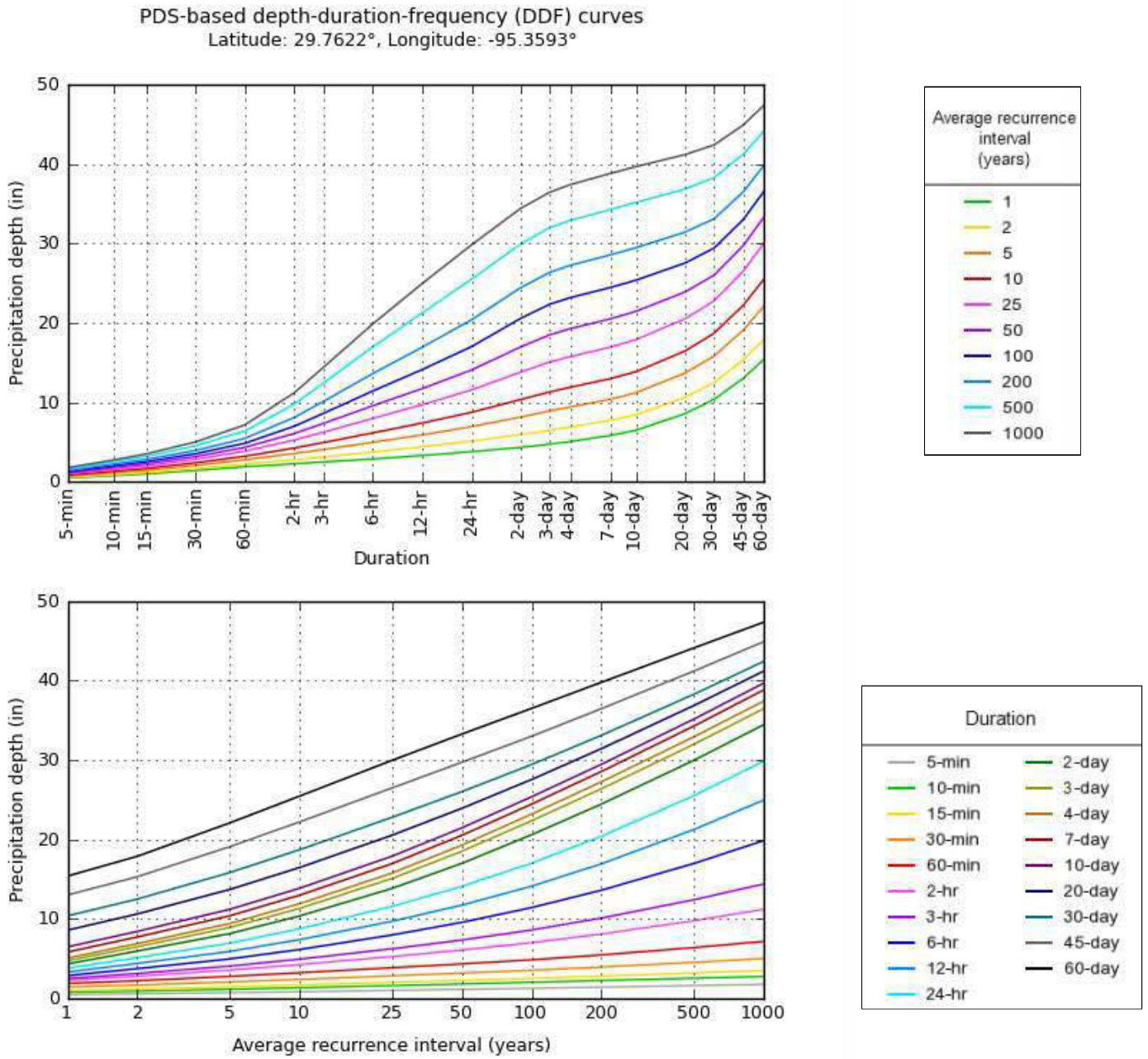
PF graphical



NOAA Atlas 14, Volume 11, Version 2

Created (GMT): Mon Jul 25 20:40:46 2022

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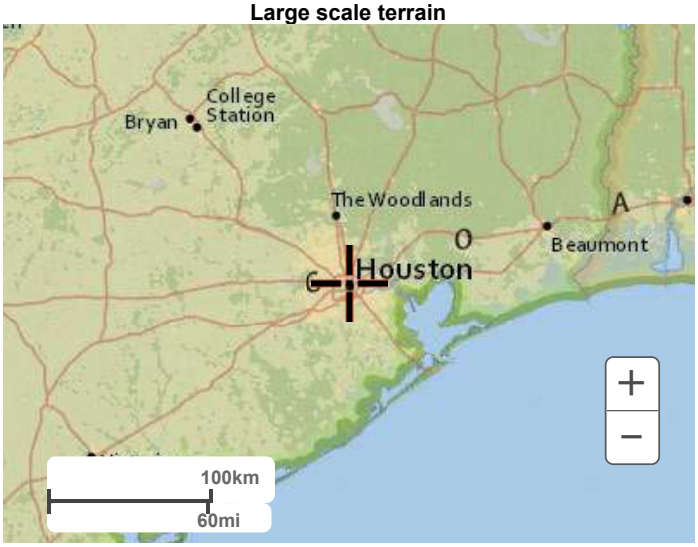
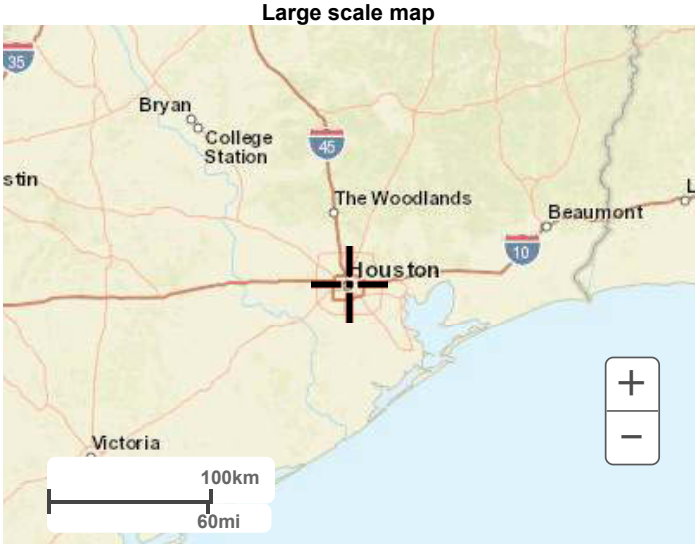
Maps & aerials

Small scale terrain

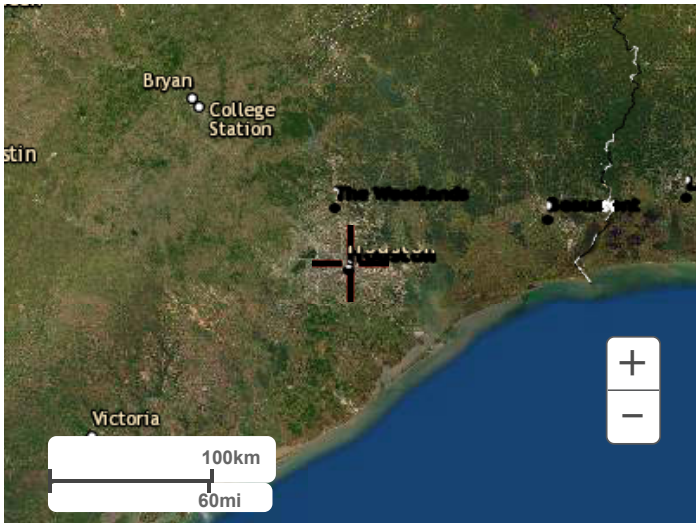
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX C

As-built Plans

H-686-C

2
992

FINAL

12	HARRIS	999	3		US 59

STATE OF TEXAS
STATE HIGHWAY DEPARTMENT

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT

I-45-1(71)046 — STATE CONTROL 500-3-106
U514 (43) — STATE CONTROL 177-11-24

NET LENGTH OF PROJECT

PROJECT	ROADWAY	BRIDGES	TOTAL
I-45-1(71)046	0.00 FT. = 0.000 MI.	0.00 FT. = 0.000 MI.	0.00 FT. = 0.000 MI.
U514 (43)	0.00 FT. = 0.000 MI.	0.00 FT. = 0.000 MI.	0.00 FT. = 0.000 MI.

HOUSTON URBAN EXPRESSWAYS

EASTEX FREEWAY

STORM SEWER FROM BELL ST. TO BUFFALO BAYOU

U.S. 59 HARRIS COUNTY

STORM SEWER & EMBANKMENT

FINAL PLANS

FIELD CHANGES & SUPPLEMENTAL AGREEMENT

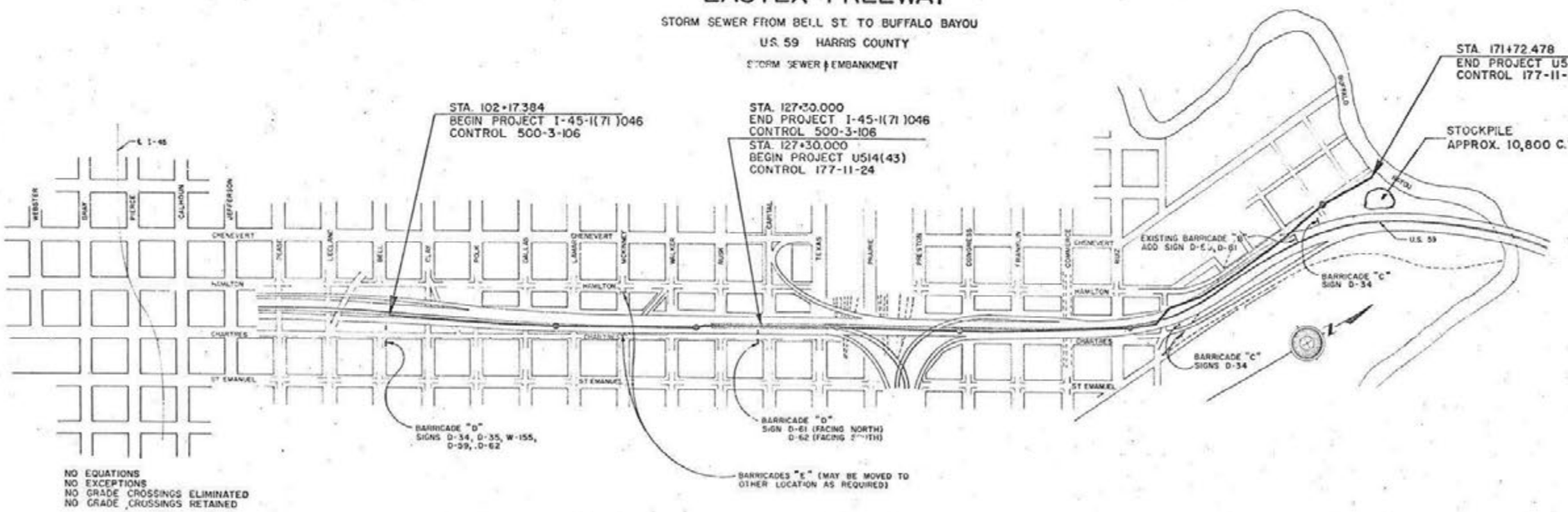
FIELD CHANGE NO. 1 Provided for a change of alignment of the 102 inch storm sewer.

FIELD CHANGE NO. 2 Provided for the use of I beam Ribs with timber lagging under railroads in lieu of corrugated metal liner plates, permitted the splicing of elliptical ring reinforcing bars used in the 102" monolithic pipe sewer, changed the fifth paragraph of Standard Specification Item 476.3 (3), and revised alignment of 102" pipe sewer and minor addition of 18" pipe sewer stub.

LIMITS ON 104(6)5 NEEDS ESTIMATE MAP
BEGIN A 12+0.3 MI
END A 12+0.3 MI

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	TYPICAL CROSS SECTIONS & ROADWAY DETAILS
3	SPECIFICATION DATA SHEET
4-5	ESTIMATE & QUANTITY
6	SUMMARY OF SEWER QUANTITIES
7	PLAN & PROFILE
8	LAYOUT OF DRAINAGE AREA & VICINITY WITH RUNOFF COMPUTATIONS
9-15	STORM SEWER PLAN & PROFILE
16-21	STORM SEWER DETAILS
22-23	OUTFALL STRUCTURE DETAILS
24-25	B.W. 61 (1)(3033) & (2)
26	C.I.S.-61



NO EQUATIONS
NO EXCEPTIONS
NO GRADE CROSSINGS ELIMINATED
NO GRADE CROSSINGS RETAINED

NOTES:
SEE SPECIAL PROVISION REGARDING DESCRIPTION OF PROJECT, SCOPE OF CONTRACT, AND SEQUENCE OF WORK, ETC.
SPECIFICATIONS ADOPTED BY THE STATE HIGHWAY DEPARTMENT OF TEXAS JANUARY 2, 1962, AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT REQUIRED CONTRACT PROVISIONS FOR FEDERAL AID PROJECTS APPROVED SEPTEMBER 6, 1963.
SEE PROJECT LAYOUT SHEET FOR BARRICADES AND WARNING SIGNS.

LAYOUT SCALE: 1 IN. = 400 FT.

CITY OF HOUSTON

RECOMMENDED FOR APPROVAL 9/10/62
Eugene Maier
DIRECTOR OF PUBLIC WORKS

APPROVED 9-12-62
Louis Welch
MAYOR

TEXAS HIGHWAY DEPARTMENT

CORRECT 9-6-62
ASST. ENGINEER MANAGER

APPROVED 9-6-62
ENGINEER MANAGER

APPROVED 10-9-62
Clyde J. Gross
BRIDGE ENGINEER

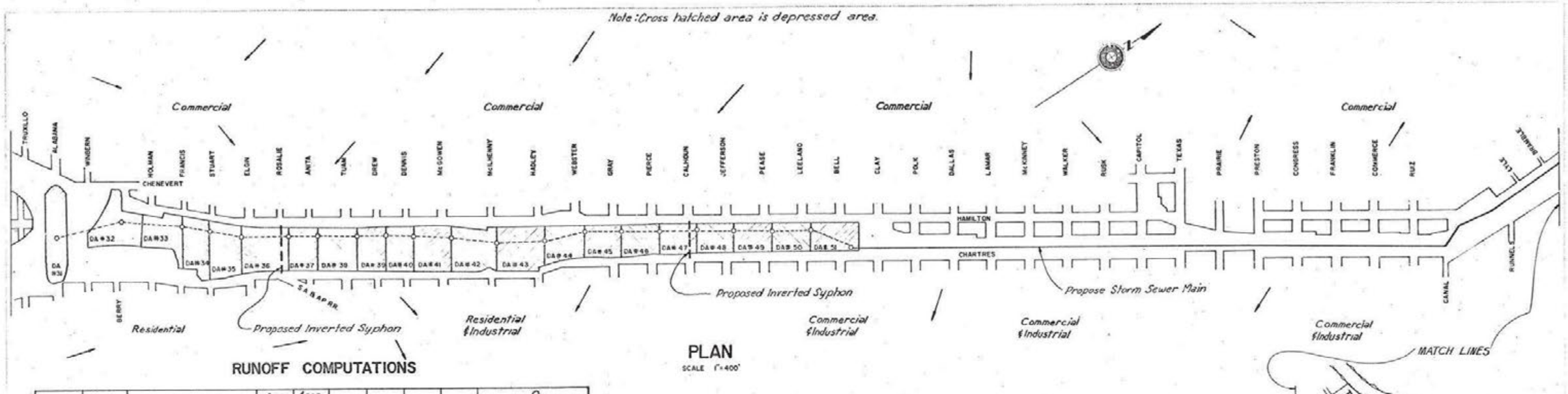
BUREAU OF PUBLIC ROADS
DEPT. OF COMMERCE

APPROVED
DIVISION ENGINEER

I P E 6 8 3 0 — I-45-1(71)046
COUNTY HARRIS — PROJ. NO. U514(43)
HWY. NO. U.S. 59 LETTING DATE
DATE ACCEPTED

DATE FILED 9-26-62

Note: Cross hatched area is depressed area.



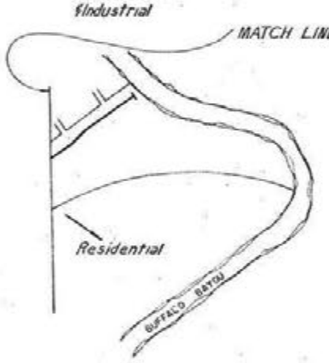
PLAN

SCALE 1"=400'

RUNOFF COMPUTATIONS

From	To	Drainage Area No.	Area	Area Sub-total	Freq	t	I	C	Q Σ Area	Q *Other	Q Total
Alabama	Berry	# 31	331 Ac	3224 Acres Primary	50yr.	15min	8.00	0.8	21	0	21
Berry	Francis	# 31 Thru # 32	5.91		"	16.3	7.70	"	37	0	37
Francis	Stuart	# 31 " # 33	7.72		"	17.6	7.50	"	47	0	47
Stuart	Elgin	# 31 " # 34	10.59		"	18.2	7.40	"	63	0	63
Elgin	Rosalie	# 31 " # 35	14.39		"	18.8	7.30	"	84	0	84
Rosalie	Anita	# 31 " # 36	16.87		"	19.8	7.20	"	97	5	102
Anita	Tuam	# 31 " # 37	19.11		"	20.7	7.10	"	108	5	113
Tuam	Drew	# 31 " # 38	21.98		"	21.8	7.00	"	124	5	129
Drew	Dennis	# 31 " # 39	24.31		"	23.0	6.80	"	133	5	138
Dennis	Mc Gowen	# 31 " # 40	26.55		"	23.9	6.70	"	143	5	148
Mc Gowen	McIlhenny	# 31 " # 41	29.33		"	25.1	6.60	"	155	5	160
McIlhenny	Hadley	# 31 " # 42	33.19		"	26.6	6.40	"	170	5	175
Hadley	Webster	# 31 " # 43	37.24		"	28.2	6.25	"	186	5	191
Webster	Gray	# 31 " # 44	39.81	12.20 Acres Interstate	"	29.3	6.20	"	198	5	203
Gray	Pierce	# 31 " # 45	42.08		"	30.9	6.05	"	204	5	209
Pierce	Calhoun	# 31 " # 46	44.13		"	32.6	5.90	"	208	5	213
Calhoun	Jefferson	# 31 " # 47	46.02		"	33.7	5.80	"	214	10	224
Jefferson	Pease	# 31 " # 48	47.91		"	34.8	5.75	"	220	10	230
Pease	Leeland	# 31 " # 49	49.80		"	35.9	5.70	"	228	10	238
Leeland	Bayou	# 31 " # 51	54.44		"	37.1	5.60	"	244	10	254

* Quantity Limited By Pipe or Orifice Size



Basis of Design

In the vicinity of the proposed depressed freeway, the existing city storm sewers are designed on basis of a 2 year frequency.

Those areas from Holman to Hadley along the proposed depressed freeway are subject to ponding in streets and yards. The depression will be isolated from the potential pond by physical barriers.

The existing city storm sewers which now cross the area to be depressed will be replaced by inverted syphons of adequate capacity in the same vicinity. For the purpose of keeping the syphon clean, an orifice with gate mechanism will allow a limited quantity of water from the inverted syphons into the depressed freeway storm sewer only when the hydraulic gradient of the sewer is below grade in the depression.

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

LAYOUT OF DRAINAGE AREAS & VICINITY WITH RUNOFF COMPUTATION

FWG		ORIGINAL	AUG. 1962
RCO			
FWG			

I-45 (F.M. 1046) US 75 (S.H. 3)

HARRIS 500 3 106 US 59

ROW

HAMILTON ST.

ROW

HAMILTON ST.

ROW

R.O.W.

BELL AVE.

CLAY AVE

POLK AVE.

Pl "5 U.S. 59 S. Bound { 713,903.4283 / 3,154,805.3177
Sta. 98+05.427
Δ = 3°15'19" Rt.
D = 0°30'00"
T = 325.615'
L = 651.056'

Begin Project I-45-1 (?1) 046
Control 500-3-106

℄ U.S. 59 (South Bound)

Sta. 100+00

Match Line Sta 110+00

129' to 22' offset

BLOCK 325

Limits of Prep. R.O.W.

Test Hole "9

P.T. 101+30.868

254'

59.175'

BLOCK 308

Begin Storm Sewer
Sta. 102+17.384

Limits of Prep. R.O.W.

Test Hole "30

Test Hole "31

105

N36°33'19"E

P.C. 107+22.303

BLOCK 286

1100' (part) - 102"

Limits of Prep. R.O.W.

Test Hole "32

BLOCK 281

Limits of Prep. R.O.W.

Test Hole "33

CHARTRES ST.

CHARTRES ST.

ROW

ROW

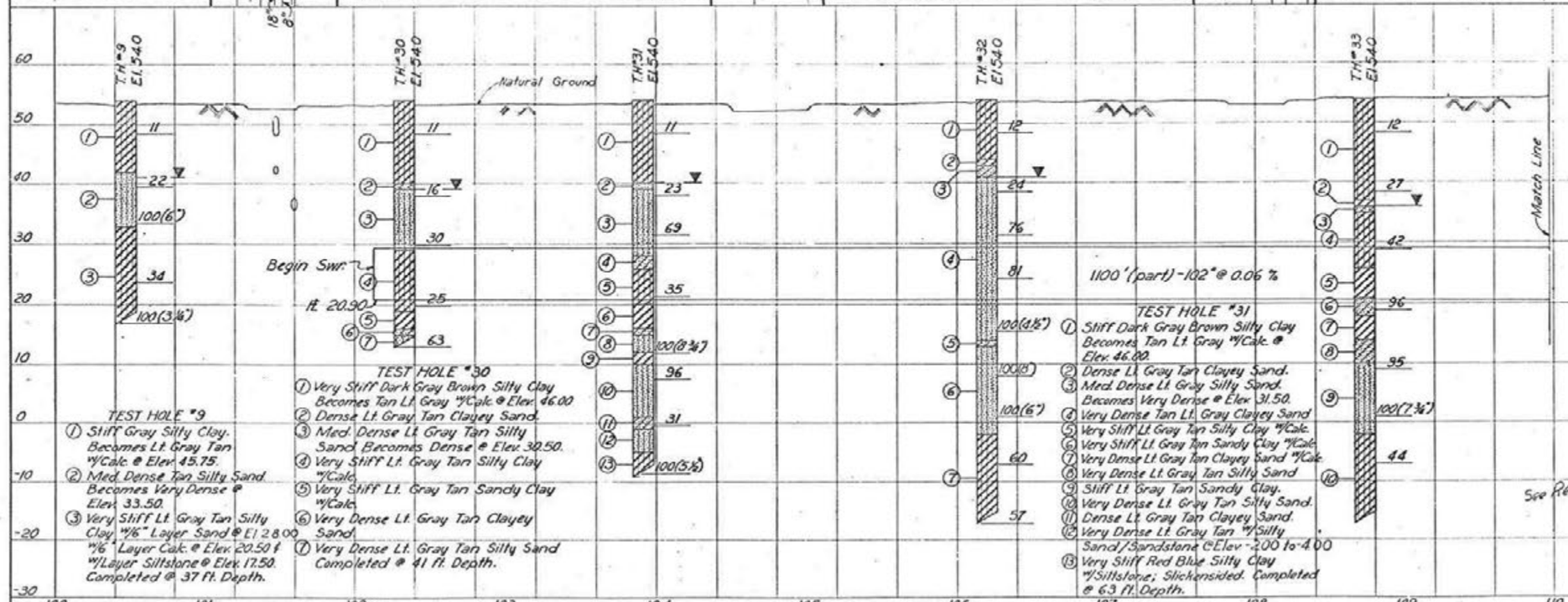
ROW

ROW

LEGEND

Water Line	
Gas Line	
Sanitary Sewer	
Storm Sewer (Exist.)	
Storm Sewer (New)	
Misc. (As Shown)	

GENERAL NOTES:
The symbol (▼) indicates elevation of water in the test holes.
The location of all ulilities are approximate only.
See Sheet No. 7 Plan & Profile Sheet for tabulation of Prep. R.O.W. areas.



TEST HOLE "9
① Stiff Gray Silty Clay. Becomes Lt. Gray Tan W/Calc. @ Elev. 45.75.
② Med. Dense Tan Silty Sand Becomes Very Dense @ Elev. 33.50.
③ Very Stiff Lt. Gray Tan Silty Clay W/6" Layer Sand @ El 28.00 W/6" Layer Calc. @ Elev. 20.50 & W/Layer Siltstone @ Elev. 17.50. Completed @ 37 ft. Depth.

TEST HOLE "30
① Very Stiff Dark Gray Brown Silty Clay Becomes Tan Lt. Gray W/Calc. @ Elev. 46.00
② Dense Lt. Gray Tan Clayey Sand.
③ Med. Dense Lt. Gray Tan Silty Sand Becomes Dense @ Elev. 30.50.
④ Very Stiff Lt. Gray Tan Silty Clay W/Calc.
⑤ Very Stiff Lt. Gray Tan Sandy Clay W/Calc.
⑥ Very Dense Lt. Gray Tan Clayey Sand.
⑦ Very Dense Lt. Gray Tan Silty Sand Completed @ 41 ft. Depth.

TEST HOLE "31
① Stiff Dark Gray Brown Silty Clay Becomes Tan Lt. Gray W/Calc. @ Elev. 46.00.
② Dense Lt. Gray Tan Clayey Sand.
③ Med. Dense Lt. Gray Silty Sand. Becomes Very Dense @ Elev. 31.50.
④ Very Dense Tan Lt. Gray Clayey Sand
⑤ Very Stiff Lt. Gray Tan Silty Clay W/Calc.
⑥ Very Stiff Lt. Gray Tan Sandy Clay W/Calc.
⑦ Very Dense Lt. Gray Tan Clayey Sand W/Calc.
⑧ Very Dense Lt. Gray Tan Silty Sand
⑨ Stiff Lt. Gray Tan Sandy Clay.
⑩ Very Dense Lt. Gray Tan Silty Sand.
⑪ Dense Lt. Gray Tan Clayey Sand.
⑫ Very Dense Lt. Gray Tan W/Silty Sand/Sandstone @ Elev -2.00 to -4.00
⑬ Very Stiff Red Blue Silty Clay W/Siltstone; Slickensided. Completed @ 6.3 ft. Depth.

TEST HOLE "32
① Stiff Dark Gray Brown Silty Clay Becomes Lt. Gray Tan W/Calc. @ Elev. 46.00.
② Stiff Lt. Gray Tan Sandy Clay.
③ Med. Dense Lt. Gray Tan Clayey Sand.
④ Med. Dense Lt. Gray Tan Silty Sand Becomes Very Dense W/Thin Layers Sandstone @ Elev. 31.50.
⑤ Very Dense Lt. Gray Tan Clayey Sand.
⑥ Very Dense Lt. Gray Tan Silty Sand W/Thin Layers Sandstone @ Elev. 8.00 Thru Elev -1.00
⑦ Very Stiff Red Blue Silty Clay W/Siltstone W/6" Layer Silt @ Elev -8.00 Slickensided. Complete @ 63 ft. Depth.

TEST HOLE "33
① Stiff Dark Gray Brown Silty Clay Becomes Lt. Gray Tan W/Calc. @ Elev. 46.00 & Becomes Tan Lt. Gray W/Calc. Slickensided @ Elev. 41.75.
② Stiff Tan Lt. Gray Sandy Clay.
③ Med. Dense Tan Lt. Gray Clayey Sand.
④ Very Stiff Tan Lt. Gray Silty Clay W/Calc. Becomes Lt. Gray Tan @ 27' Slickensided.
⑤ Stiff Lt. Gray Tan Sandy Clay.
⑥ Very Dense Lt. Gray Tan Clayey Sand.
⑦ Stiff Lt. Gray Tan Sandy Clay.
⑧ Very Dense Lt. Gray Tan Clayey Sand.
⑨ Very Dense Lt. Gray Tan Silty Sand.
⑩ Very Stiff Red Blue Silty Clay W/Siltstone Slickensided Completed @ 71 ft. Depth.

See Revised Sep'd

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER PLAN & PROFILE

Ck.	Drawing	Date				SHEET 1 OF 7 SHEETS		
Ck. Ck.	Original	June 1962	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
Ck. C.H.			6	TEXAS	I-45-1 (?) 066 U.S.59 (?) 3			U.S.59
Ck. P.E.			STATE DIST. NO.	COUNTY	SECTION NO.	JOB NO.		SHEET NO.
Ck.			12	Harris	500	3	106	9

P.I. #4 U.S. 59 S. Bound { 714,357.3040 / 3,155,596.2636
Sta. 111+23.066
Δ = 4°00'00" Lt.
D = 0°30'00"
T = 400.163'
L = 800.000'

ROW
H.L. & Pwr. U/G
DALLAS AVE.
LAMAR AVE.
MC KINNEY AVE.
12" H.G.E.
Match Line Sta 110+00
Match Line Sta 121+00

BLOCK 281
Limits of Prep. R.O.W.
N 36°53'19" E
P.I. #4
TEST HOLE #34
BLOCK 246
Limits of Prep. R.O.W.
℄ U.S. 59 (South Bound)
192.946'
1100' (part) -102"
52.138'
M.H. #1
BLOCK 178
TEST HOLE #35
N 32°53'19" E
115'
Limits of Prep. R.O.W.
965' (part) -102"
PT 115 + 2.903
BLOCK 177
120'
Limits of Prep. R.O.W.
TEST HOLE #36

CHARTRES ST.

Natural Ground

T.H. #34 El 540
T.H. #35 El 540
M.H. #1 Top 540
T.H. #36 El 540
Match Line
Inv. 20.24
1100' (part) -102" @ 0.06%
965' (part) -102" @ 0.06%

TEST HOLE #34
① Very Stiff Dark Gray Brown Silty Clay, Becomes Lt. Gray Tan W/Cal. @ Elev. 46.00, Becomes Tan Lt. Gray W/Cal. @ Elev. 41.75 & Becomes Lt. Gray Tan @ Elev. 30.00.
② Very Stiff Lt Gray Tan Sandy Clay.
③ Dense Lt. Gray Tan Clayey Sand.
④ Very Stiff Lt. Gray Tan Sandy Clay.
⑤ Very Dense Lt. Gray Tan Silty Sand.
⑥ Very Dense Lt. Gray Tan Silty Sand.
⑦ Very Stiff Red Blue Silty Clay W/Siltstone Slickensided, Completed @ 71 Ft. Depth.

TEST HOLE #35
① Stiff Dark Gray Brown Silty Clay, Becomes Very Stiff Lt Gray Tan W/Calc. @ Elev. 46, Becomes Tan Lt Gray W/Calc. @ Elev. 41.75 Slickensided
② Very Stiff Lt Gray Tan Sandy Clay W/Calc.
③ Dense Lt Gray Tan Clayey Sand W/Calc.
④ Very Stiff Lt Gray Tan Sandy Clay W/Calc.
⑤ Very Dense Lt Gray Tan Silty Sand
⑥ Very Stiff Red Blue Silty Clay W/Siltstone Slickensided Completed @ 60 Ft. Depth

TEST HOLE #36
① Stiff Dark Gray Brown Silty Clay Becomes Lt Gray Tan W/Calc. @ Elev. 45.75 & Becomes Tan Lt Gray W/Calc. @ Elev. 43.75 Slickensided
② Med. Dense Tan Lt Gray Clayey Sand
③ Very Stiff Red Blue Silty Clay
④ Very Stiff Lt Gray Tan Sandy Clay W/Calc.
⑤ Very Stiff Tan Lt. Gray Silty Clay W/Thin Layers Siltstone @ Elev. 18.00 Thru 14.00 Slickensided
⑥ Very Dense Red Silty Sand
⑦ Very Stiff Red Blue Silty Clay W/Siltstone Slickensided
⑧ Very Dense Red Silty Sand
⑨ Very Stiff Red Blue Silty Clay W/Siltstone Completed @ 68 ft Depth

See Revised Sepia

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS
STORM SEWER
PLAN & PROFILE

Dn.	Drawing	Date	Sheet ___ of ___ Sheets	
Ck. Dn.	ORIGINAL	MAY 1962		
Dn. A.C.B.				
Ck. Dn. W.E.B.				
Tk.				
Ck. Tk.				

District	State	Federal Aid Project No.	Highway No.
12	Texas	I-45-1 (9) 1044 (9) Stp L 991	U.S. 59

State Dist. No.	County	Sheet No.
12	Harris	10

BLOCK 281

BLOCK 246

BLOCK 178

BLOCK 177

ROW

Limits of Prep. R.O.W.

From P.I.② to P.I.③ =128.183'

From P.I.③ P.I.④ =187.086'

From P.I.④ to P.I.② =287.803'

From P.I.② to P.I.② =826.107'

P.T. 114+08.932

N 35°35'44"E

N 34°59'31"E

N 33°53'16"E

N 32°53'9"E

D=6°30'

235.34' Along Tan.

107.84' Along Tan.

2,484.040' (Part)-102"

TEST HOLE #34

TEST HOLE #35

TEST HOLE #36

DALLAS AVE

LAMAR AVE.

MC KINNEY AVE.

HL & P w/ U.G.

12" HG & F

OCHARTRES ST.

Match Line Sta 10+00

Match Line Sta 121+00

Natural Ground

2,484.040' (part) - 102" @ 0.06 %

TEST HOLE #34

① Very Stiff Dark Gray Brown Silty Clay, Becomes Lt. Gray Tan w/Cal. @ Elev. 46.00, Becomes Tan Lt. Gray w/Cal. @ Elev. 41.75 & Becomes Lt. Gray Tan @ Elev. 30.00.
② Very Stiff Lt Gray Tan Sandy Clay.
③ Dense Lt. Gray Tan Clayey Sand.
④ Very Stiff Lt. Gray Tan Sandy Clay.
⑤ Very Dense Lt. Gray Tan Clayey Sand.
⑥ Very Dense Lt. Gray Tan Silty Sand.
⑦ Very Stiff Red Blue Silty Clay w/Siltstone Slickensided, Completed @ 71 Ft. Depth.

TEST HOLE #35

① Stiff Dark Gray Brown Silty Clay, Becomes Very Stiff Lt Gray Tan w/Calc. @Elev 46, Becomes Tan Lt Gray w/Calc. @Elev 41.75 Slickensided
② Very Stiff Lt Gray Tan Sandy Clay w/Calc.
③ Dense Lt Gray Tan Clayey Sand w/Calc.
④ Very Stiff Lt Gray Tan Sandy Clay w/Calc.
⑤ Very Dense Lt Gray Tan Silty Sand
⑥ Very Stiff Red Blue Silty Clay w/Siltstone Slickensided Completed @ 60 Ft Depth

TEST HOLE #36

① Stiff Dark Gray Brown Silty Clay Becomes Lt Gray Tan w/Calc @ Elev 45.75 Becomes Tan Lt Gray w/Calc @ Elev 43.75 Slickensided
② Med Dense Tan Lt Gray Clayey Sand
③ Very Stiff Red Blue Silty Clay
④ Very Stiff Lt Gray Tan Sandy Clay w/Calc
⑤ Very Stiff Tan Lt Gray Silty Clay w/Thin Layers Siltstone @ Elev (Thru)
Slickensided
⑥ Very Dense Red Silty Sand
⑦ Very Stiff Red Blue Silty Clay w/Siltstone Slickensided
⑧ Very Dense Red Silty Sand
⑨ Very Stiff Red Blue Silty Clay w/Siltstone Completed @ 68 ft Depth

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER
PLAN & PROFILE

10A

	ORIGINAL	MAY 1962			STATE				
ACG	Rev. FMG	Nov 21, 1962	3		TEXAS	1.25 (71)	0.46	U.S.59	
WEB	Rev. FJG	Jan. 23, 1963				U.S. 4 (99)			
	Rev. FJG	June 21, 1963	12		COUNTY				
					Harris	109	3	106	10

8-29". Full c

End Project 1-45-1 (71) 046
Control 500-3-106
Sta. 127+30.000
Begin Project U 514 (43)
Control 177-11-24
Sta. 127+30.000

MATCH LINE STA. 121+00

WALKER AVE.

H.G.&F.

Foundation to be removed by the Contractor.

BLOCK 176

Limits of Prep. R.O.W.

℄ U.S. 59 (Southbound)

Test Hole #37

122+84.739
55.180' Rt.

123+58.000
27.000' Rt.

965'(part) -102"

M.H. #2

Lt. 19.6

RUSK AVE.

R.O.W.

BLOCK 175

Limits of Prep. R.O.W.

N 32°53'19"E

125

Test Hole #38

931'(part) -102"

CAPITAL AVE.

R.O.W.

BLOCK 174

Test Hole #39

130

27.000 Rt.

Limits of Prep. R.O.W.

Test Hole #40

TEXAS AVE.

SWBT 14 MTD

R.O.W.

MATCH LINE STA. 132+00

Building to be cleared by others by approximately Jan. 15, 1963. Foundation to be removed by the Contractor.

Limits of Prep. R.O.W.

CHARTRES ST.

CHARTRES ST.

33" 30" 30" 3" 18" 8" 4" 6" 10" 12"

T.H. #37 El. 54.0

M.H. #2 Top 54.0

T.H. #38 El. 54.0

T.H. #39 El. 53.0

T.H. #40 El. 53.0

Natural Ground

MATCH LINE

965'(part) -102" @ 0.06%

931'(part) -102" @ 0.06%

Inv. 19.66

100 (7½")

100 (4½")

100 (4")

TEST HOLE #37

① Very Stiff Dark Gray Brown Silty Clay. Becomes Tan Lt. Gray w/Calc. @ Elev. 46.00 Slickensided.
② Med. Dense Tan Lt. Gray Clayey Sand.
③ Very Stiff Tan Lt. Gray Silty Clay Slickensided.
④ Very Stiff Lt. Gray Tan Sandy Clay w/Calc. Becomes Tan Lt. Gray @ Elev. 12.35.
⑤ Very Stiff Red Blue Silty Clay w/Siltstone Slickensided. Completed @ 47 ft. Depth.

TEST HOLE #38

① Stiff Dark Gray Brown Silty Clay. Becomes Tan Lt. Gray w/Calc. @ Elev. 46.00
② Stiff Tan Lt. Gray Sandy Clay w/Calc.
③ Med. Dense Tan Lt. Gray Clayey Sand w/Calc.
④ Stiff Tan Lt. Gray Sandy Clay w/Calc.
⑤ Very Stiff Tan Lt. Gray Silty Clay w/Calc. Slickensided.
⑥ Very Stiff Lt. Gray Tan Sandy Clay w/Calc.
⑦ Very Stiff Tan Lt. Gray Silty Clay w/Calc. Becomes Red Blue w/Siltstone @ Elev. 11.25 Slickensided. Completed @ 47 ft. Depth.

TEST HOLE #39

① Very Stiff Dark Gray Brown Silty Clay. Becomes Lt. Gray Tan w/Calc. @ Elev. 44.75 & Becomes Tan Lt. Gray w/Calc. @ Elev. 42.90.
② Very Stiff Tan Lt. Gray Sandy Clay.
③ Med. Dense Tan Lt. Gray Clayey Sand.
④ Very Stiff Tan Lt. Gray Silty Clay.
⑤ Very Stiff Lt. Gray Tan Sandy Clay w/Calc. Becomes Tan Lt. Gray w/Calc. @ Elev. 18.50.
⑥ Very Stiff Tan Lt. Gray Silty Clay w/Siltstone. Becomes Red Blue w/Siltstone @ Elev. 10.25 Slickensided. Completed @ 55 ft. Depth.

TEST HOLE #40

① Very Stiff Dark Gray Brown Silty Clay. Becomes Lt. Gray Tan w/Calc. @ Elev. 45.00 & Becomes Tan Lt. Gray w/Calc. @ Elev. 43.00.
② Dense Tan Lt. Gray Clayey Sand.
③ Very Stiff Tan Lt. Gray Silty Clay w/Calc.
④ Very Stiff Lt. Gray Tan Sandy Clay w/Calc. Becomes Tan Lt. Gray w/Calc. @ Elev. 17.50.
⑤ Very Stiff Tan Lt. Gray Silty Clay w/Siltstone. Becomes Red Blue w/Siltstone @ Elev. 11.50 Slickensided.
⑥ Very Dense Red Silty Sand.
⑦ Very Stiff Red Blue Silty Clay w/Siltstone Slickensided. Completed @ 61 ft. Depth.

See Revised Sepia

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER PLAN & PROFILE

SHEET 3 OF 7 SHEETS

Dn.	Drawing	Date	Fed. Aid Project No.	State	Federal Aid Project No.	Highway No.
Ck. Dn.	ORIGINAL	MAY 1962			(SWBT) M 1046	
Dn. C.J.M.	Rev. Oct. 15, 1962 SS		6	TEXAS	U514(43)	U.S. 59
Ck. Dn. W.E.G.			State Dist. No.	County	Control No. / Section No. / Job No.	Sheet No.
Tr.			12	Harris	500 / 3 / 102	11 / 24
Ck. Tr.					177 / 11 / 24	

MATCH LINE STA. 121+00

WALKER AVE.

H6 I/F

2"

6"

2"

12"

Pipe Curve Data
P.I. ℄ to P.I. Ⓑ
Δ = 3°00'01"
D = 12°30'
T = 12.004'
L = 24.002'

Foundation to be removed by the Contractor

BLOCK 176

Limits of Prep. R.O.W.

From P.I. ℄ to P.I. Ⓑ
=114.643'

P.I. ℄

P.I. Ⓑ

N 32°53'19"E

N 35°53'20"E

Test Hole #37

Sta 123+14.257

Sta 124+28.714.2

P.C.

P.T.

200'

125

RUSK AVE.

4"

End Project I-45-1 (71)046
Control 500-3-106
Sta. 127+30.000
Begin Project U 514(43)
Control 177-11-24
Sta. 127+30.000

R.O.W.

BLOCK 175

Limits of Prep. R.O.W.

N 32°53'19"E

Test Hole #38

2,484.040'(Part)-102"

4"

8"

3"

CAPITAL AVE.

R.O.W.

BLOCK 174

Test Hole #39

From P.I. Ⓑ to MH #2
=658.257'

130

MH #2
Rim 63 Cover
Top 54.23

Sta 130+87.00

18" Stub ℄ 45.30'

906.157'(Part)-102"

Limits of Prep. R.O.W.

MH #2A
Top 52.95
No Pay

200'

From MH #2 To P.I. Ⓑ
=153.499'

Test Hole #40

18"

6"

SWBT 14WTD

TEXAS AVE.

10"

4"

12"

R.O.W.

MATCH LINE STA. 132+00

5 Building to be cleared by others by approximately Jan 15, 1963. Foundation to be removed by the Contractor.

2 Limits of Prep. R.O.W.

35"

30"

CHARTRES ST.

8"

6"

4"

18"

R.O.W.

TEST HOLE #40

1. Very Stiff Dark Gray Brown Silty Clay. Becomes Lt Gray Tan W/Calc @ Elev 45.00 & Becomes Tan Lt Gray W/Calc. @ Elev 43.00
2. Dense Tan Lt Gray Clayey Sand.
3. Very Stiff Tan Lt Gray Silty Clay W/Calc.
4. Very Stiff Lt Gray Tan Sandy Clay W/Calc. Becomes Tan Lt Gray W/Calc @ Elev. 17.50
5. Very Stiff Tan Lt Gray Silty Clay W/Siltstone Becomes Red Blue W/Siltstone @ Elev. 11.50 Slickensided
6. Very Dense Red Silty Sand
7. Very Stiff Red Blue Silty Clay W/Siltstone Slickensided Completed @ 61 ft. Depth

TH #37 El 59.0

TH #38 El 59.0

Natural Ground

TH #39 El 59.0

TH #40 El 59.0

MH #2 Top 54.23

MATCH LINE

MATCH LINE

2,484.040'(part)-102" @ 0.06%

906.157'(Part)-102" @ 0.06%

Inv. 18.84

100(7⅛")

100(4¾")

100(4")

60
50
40
30
20
10
0
-10
-20
-30

121 122 123 124 125 126 127 128 129 130 131

TEST HOLE #37

1. Very Stiff Dark Gray Brown Silty Clay. Becomes Tan Lt Gray W/Calc. @ Elev. 46.00 Slickensided.
2. Most Dense Tan Lt. Gray Clayey Sand.
3. Very Stiff Tan Lt Gray Silty Clay Slickensided
4. Very Stiff Lt. Gray Tan Sandy Clay W/Calc. Becomes Tan Lt. Gray @ Elev. 12.35.
5. Very Stiff Red Blue Silty Clay W/Siltstone Slickensided. Completed @ 47 ft. Depth.

TEST HOLE #38

1. Stiff Dark Gray Brown Silty Clay. Becomes Tan Lt Gray W/Calc. @ Elev 46.00
2. Stiff Tan Lt Gray Sandy Clay W/Calc.
3. Med. Dense Tan Lt. Gray Clayey Sand W/Calc.
4. Stiff Tan Lt Gray Sandy Clay W/Calc.
5. Very Stiff Tan Lt Gray Silty Clay W/Calc. Slickensided.
6. Very Stiff Lt. Gray Tan Sandy Clay W/Calc.
7. Very Stiff Tan Lt. Gray Silty Clay W/Calc. Becomes Red Blue W/Siltstone @ Elev. 11.25 Slickensided. Completed @ 47 ft. Depth.

TEST HOLE #39

1. Very Stiff Dark Gray Brown Silty Clay. Becomes Lt. Gray Tan W/Calc. @ Elev 44.75 & Becomes Tan Lt. Gray W/Calc. @ Elev. 42.90
2. Very Stiff Tan Lt. Gray Sandy Clay
3. Med. Dense Tan Lt. Gray Clayey Sand.
4. Very Stiff Tan Lt. Gray Silty Clay.
5. Very Stiff Lt. Gray Tan Sandy Clay W/Calc. Becomes Tan Lt. Gray W/Calc. @ Elev. 18.50.
6. Very Stiff Tan Lt Gray Silty Clay W/Siltstone. Becomes Red Blue W/Siltstone @ Elev. 10.25 Slickensided. Completed @ 55 ft. Depth.

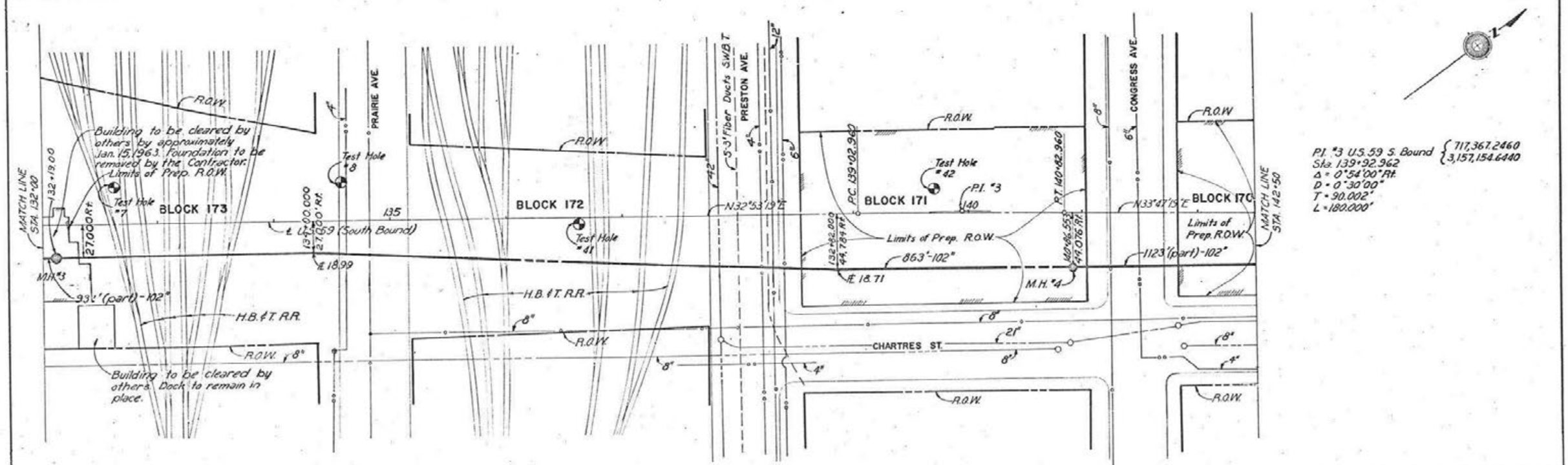
TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

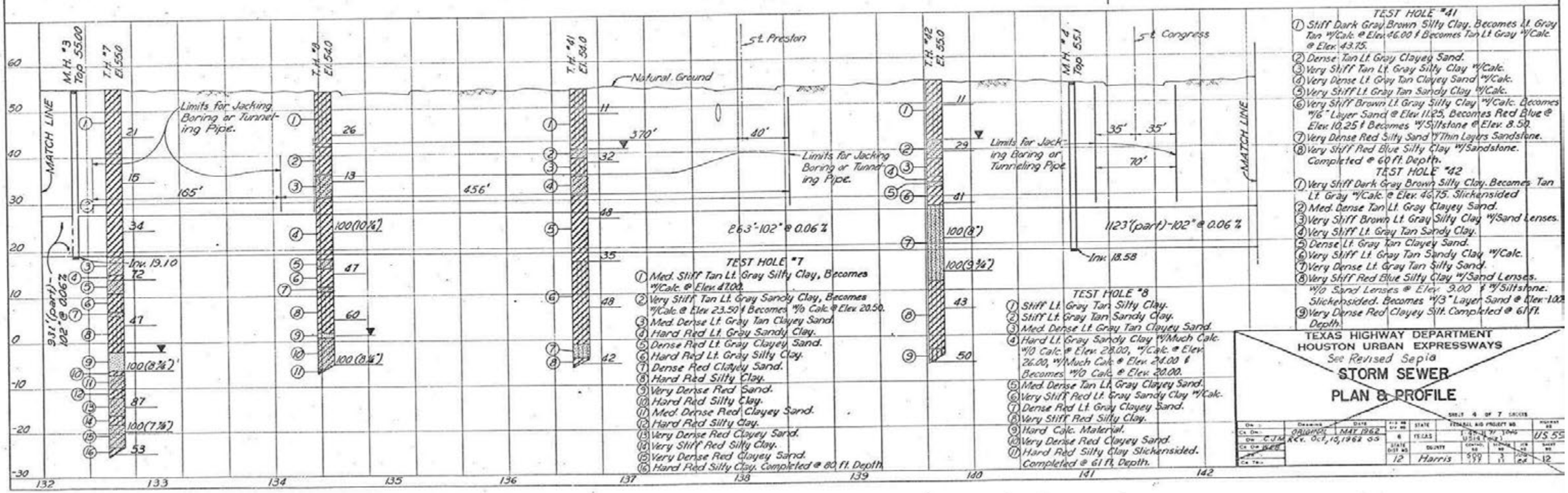
STORM SEWER PLAN & PROFILE

11A

DRAWN	DATE	SHEET	OF	SHEETS
C.J.M.	ORIGINAL MAY 1962			
W.E.B.	Rev. FWS Nov 21, 1962			
	Rev. FWS Jan 23, 1963			
	Rev. FWS June 21, 1963			

DIST	COUNTY	FEDERAL AID PROJECTS					
12	Harris						





TEST HOLE #41

(1) Stiff Dark Gray Brown Silty Clay. Becomes Lt. Gray Tan w/Calc. @ Elev. 46.00 & Becomes Tan Lt. Gray w/Calc. @ Elev. 43.75.
(2) Dense Tan Lt. Gray Clayey Sand.
(3) Very Stiff Tan Lt. Gray Silty Clay w/Calc.
(4) Very Dense Lt. Gray Tan Clayey Sand w/Calc.
(5) Very Stiff Lt. Gray Tan Sandy Clay w/Calc.
(6) Very Stiff Brown Lt. Gray Silty Clay w/Calc. Becomes w/6" Layer Sand @ Elev. 11.25, Becomes Red Blue @ Elev. 10.25 & Becomes w/Siltstone @ Elev. 8.50.
(7) Very Dense Red Silty Sand w/Thin Layers Sandstone.
(8) Very Stiff Red Blue Silty Clay w/Sandstone. Completed @ 60 ft. Depth.

TEST HOLE #42

(1) Very Stiff Dark Gray Brown Silty Clay. Becomes Tan Lt. Gray w/Calc. @ Elev. 46.75. Slickensided
(2) Med. Dense Tan Lt. Gray Clayey Sand.
(3) Very Stiff Brown Lt. Gray Silty Clay w/Sand Lenses.
(4) Very Stiff Lt. Gray Tan Sandy Clay.
(5) Dense Lt. Gray Tan Clayey Sand.
(6) Very Stiff Lt. Gray Tan Sandy Clay w/Calc.
(7) Very Dense Lt. Gray Tan Silty Sand.
(8) Very Stiff Red Blue Silty Clay w/Sand Lenses. w/o Sand Lenses @ Elev. 9.00 & w/Siltstone. Slickensided. Becomes w/3" Layer Sand @ Elev. 1.00
(9) Very Dense Red Clayey Silt. Completed @ 61 ft. Depth.

TEST HOLE #7

(1) Med. Stiff Tan Lt. Gray Silty Clay, Becomes w/Calc. @ Elev. 47.00.
(2) Very Stiff Tan Lt. Gray Sandy Clay, Becomes w/Calc. @ Elev. 23.50 & Becomes w/o Calc. @ Elev. 20.50.
(3) Med. Dense Lt. Gray Tan Clayey Sand.
(4) Hard Red Lt. Gray Sandy Clay.
(5) Dense Red Lt. Gray Clayey Sand.
(6) Hard Red Lt. Gray Silty Clay.
(7) Dense Red Clayey Sand.
(8) Hard Red Silty Clay.
(9) Very Dense Red Sand.
(10) Hard Red Silty Clay.
(11) Med. Dense Red Clayey Sand.
(12) Hard Red Silty Clay.
(13) Very Dense Red Clayey Sand.
(14) Very Stiff Red Silty Clay.
(15) Very Dense Red Clayey Sand.
(16) Hard Red Silty Clay. Completed @ 80 ft. Depth.

TEST HOLE #8

(1) Stiff Lt. Gray Tan Silty Clay.
(2) Stiff Lt. Gray Tan Sandy Clay.
(3) Med. Dense Lt. Gray Tan Clayey Sand.
(4) Hard Lt. Gray Sandy Clay w/Much Calc. w/o Calc. @ Elev. 28.00, w/Calc. @ Elev. 26.00, w/Much Calc. @ Elev. 24.00 & Becomes w/o Calc. @ Elev. 20.00.
(5) Med. Dense Tan Lt. Gray Clayey Sand.
(6) Very Stiff Red Lt. Gray Sandy Clay w/Calc.
(7) Dense Red Lt. Gray Clayey Sand.
(8) Very Stiff Red Silty Clay.
(9) Hard Calc. Material.
(10) Very Dense Red Clayey Sand.
(11) Hard Red Silty Clay Slickensided. Completed @ 61 ft. Depth.

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS
See Revised Sepia
STORM SEWER
PLAN & PROFILE

Drawn	Date	Job No.	State	Federal Aid Project No.	Highway No.
BALLINGER	MAY 1962		TEXAS	1 SEWER (TOG)	US 59
Rev. Oct. 10, 1962 GS				SHEET 4 OF 7 SHEETS	
		State Dist. No.	County	Control No. / Section No. / Job No. / Sheet No.	
		12	Harris	500 / 179 / 1 / 66	12

MATCH LINE STA. 142+50

BLOCK 170

R.O.W.

Limits of Prep. R.O.W.

Test Hole #43

FRANKLIN AVE. 24" Comb.

BLOCK 169

Building to be removed by Contractor

R.O.W.

Limits of Prep. R.O.W.

℄ U.S. 59 (South Bound)

H.B.&T. RR.

1123' (part) - 102"

COMMERCE AVE.

BLOCK 162

R.O.W.

Equation: Sta. 149+82.916 ℄ U.S. 59-SB = P.C. 149+82.916 ℄ U.S. 59

N33°47'19"E

Limits of Prep. R.O.W.

Test Hole #45

230.859'

P.C.C. 151+07.916

Limits of Prep. R.O.W.

Test Hole #46

RUIZ AVE.

BLOCK 111

R.O.W.

Limits of Prep. R.O.W.

N33°47'19"E 16.289' Rt. ℄ U.S. 59

M.H. #5

1581' (part) - 102"

MATCH LINE STA. 152+50

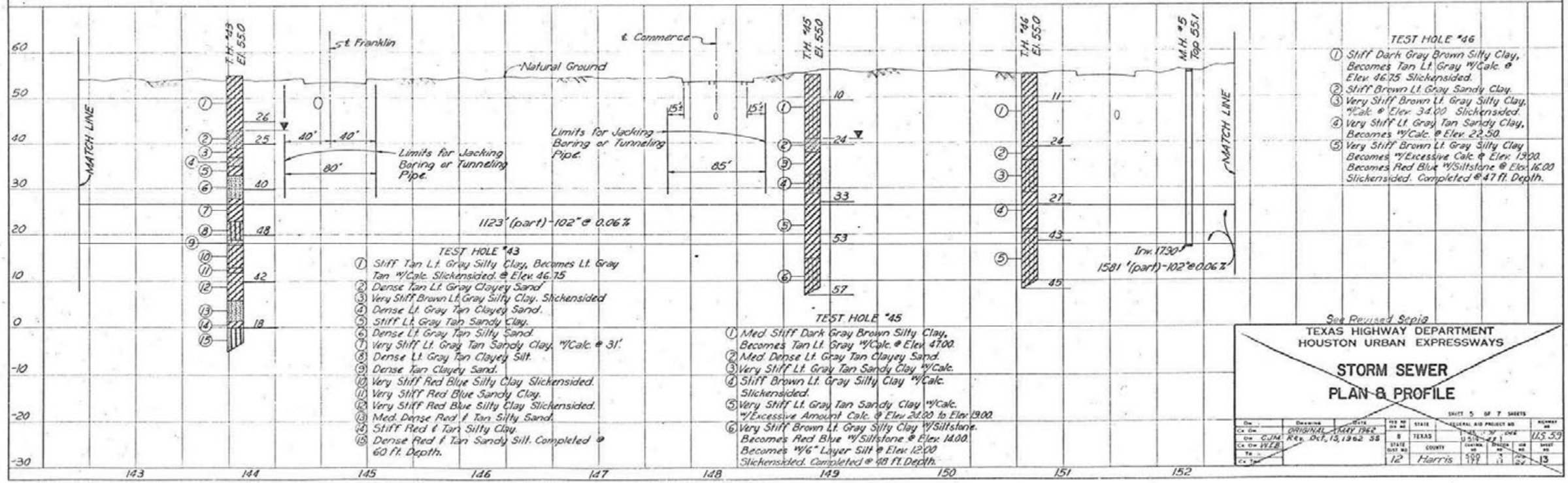
CHARTRES ST.

CHARTRES ST.

R.O.W.

R.O.W.

R.O.W.



TEST HOLE #43

① Stiff Tan Lt. Gray Silty Clay, Becomes Lt. Gray Tan w/Calc. Slickensided. @ Elev. 46.75
② Dense Tan Lt. Gray Clayey Sand
③ Very Stiff Brown Lt. Gray Silty Clay. Slickensided
④ Dense Lt. Gray Tan Clayey Sand.
⑤ Stiff Lt. Gray Tan Sandy Clay.
⑥ Dense Lt. Gray Tan Silty Sand.
⑦ Very Stiff Lt. Gray Tan Sandy Clay, w/Calc. @ 31'
⑧ Dense Lt. Gray Tan Clayey Silt.
⑨ Dense Tan Clayey Sand.
⑩ Very Stiff Red Blue Silty Clay Slickensided.
⑪ Very Stiff Red Blue Sandy Clay.
⑫ Very Stiff Red Blue Silty Clay Slickensided.
⑬ Med. Dense Red & Tan Silty Sand.
⑭ Stiff Red & Tan Silty Clay.
⑮ Dense Red & Tan Sandy Silt. Completed @ 60 ft. Depth.

TEST HOLE #45

① Med Stiff Dark Gray Brown Silty Clay, Becomes Tan Lt. Gray w/Calc. @ Elev. 47.00.
② Med. Dense Lt. Gray Tan Clayey Sand.
③ Very Stiff Lt. Gray Tan Sandy Clay w/Calc.
④ Stiff Brown Lt. Gray Silty Clay w/Calc. Slickensided.
⑤ Very Stiff Lt. Gray Tan Sandy Clay w/Calc. w/Excessive Amount Calc. @ Elev 20.00 to Elev 19.00.
⑥ Very Stiff Brown Lt. Gray Silty Clay w/Siltstone. Becomes Red Blue w/Siltstone @ Elev. 14.00. Becomes w/6" Layer Silt @ Elev. 12.00 Slickensided. Completed @ 48 ft. Depth.

TEST HOLE #46

① Stiff Dark Gray Brown Silty Clay, Becomes Tan Lt. Gray w/Calc. @ Elev. 46.75 Slickensided.
② Stiff Brown Lt. Gray Sandy Clay.
③ Very Stiff Brown Lt. Gray Silty Clay, w/Calc. @ Elev. 34.00 Slickensided.
④ Very Stiff Lt. Gray Tan Sandy Clay, Becomes w/Calc. @ Elev. 22.50
⑤ Very Stiff Brown Lt. Gray Silty Clay Becomes w/Excessive Calc. @ Elev. 19.00 Becomes Red Blue w/Siltstone @ Elev. 16.00 Slickensided. Completed @ 47 ft. Depth.

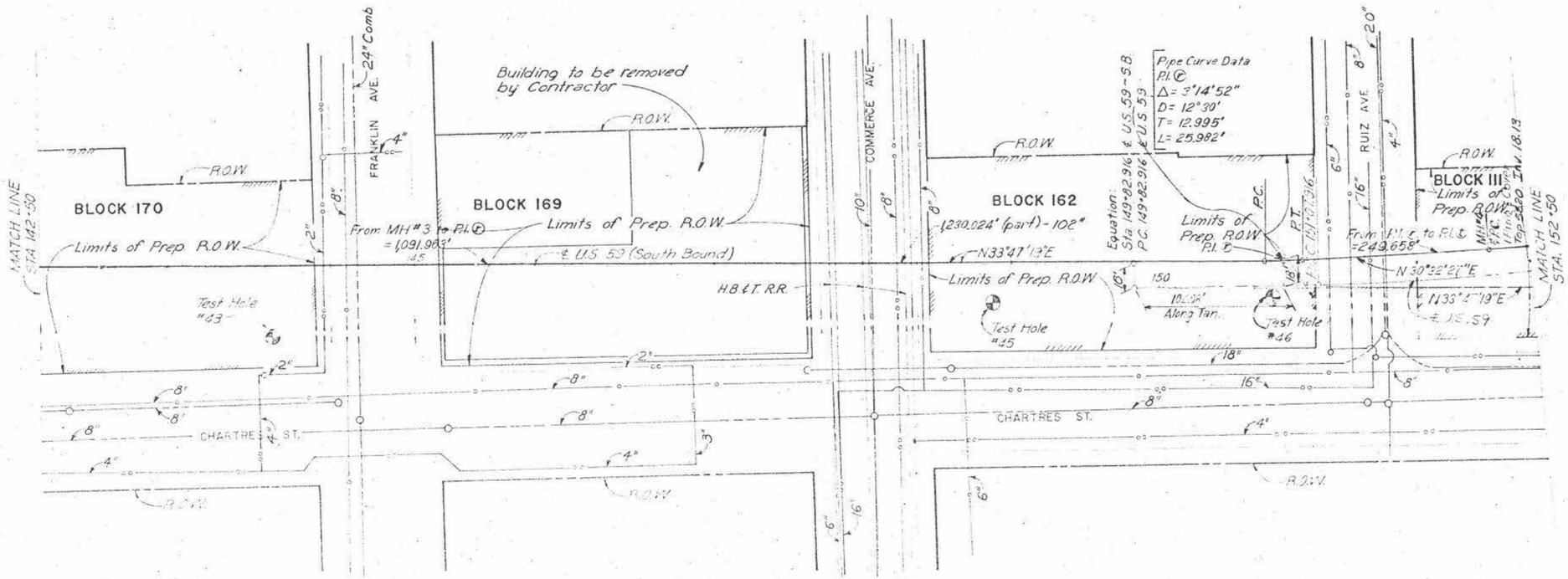
See Revised Sepia

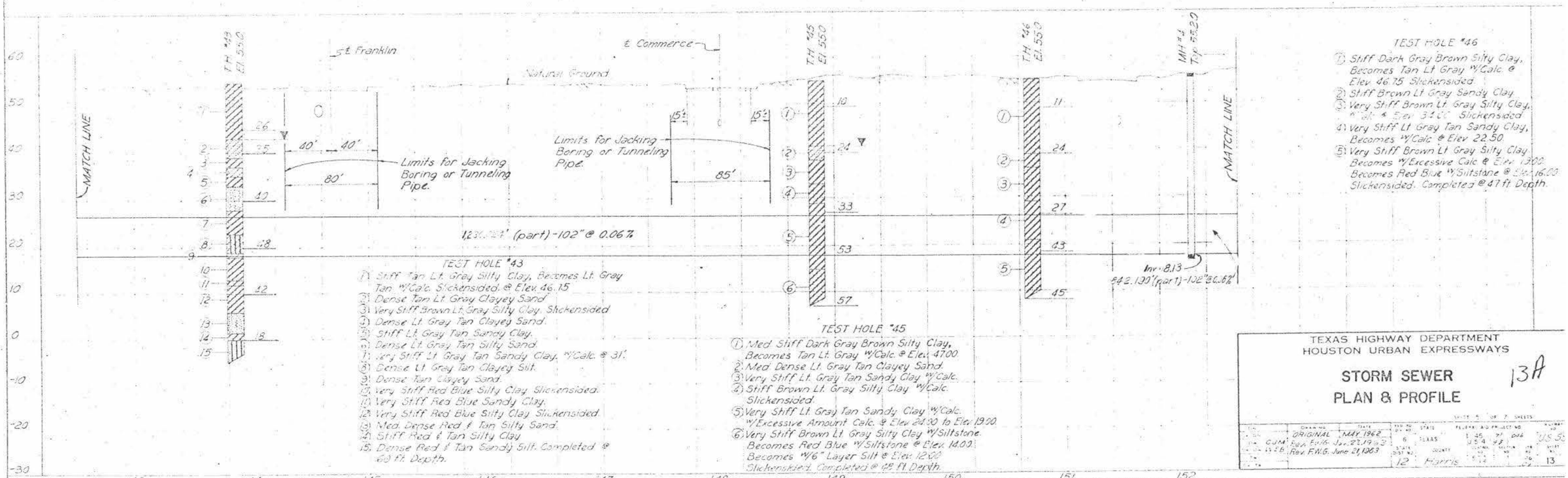
TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER PLAN & PROFILE

SHEET 5 OF 7 SHEETS

Drawing	Date	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.
ORIGINAL	MAY 1962	6	TEXAS	U.S. 59-4 (1) 046	U.S. 59
C.J.M. Rev. Oct. 15, 1962 SS		STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
C.J.M. W.E.B.		12	Harris	500	1	24	13



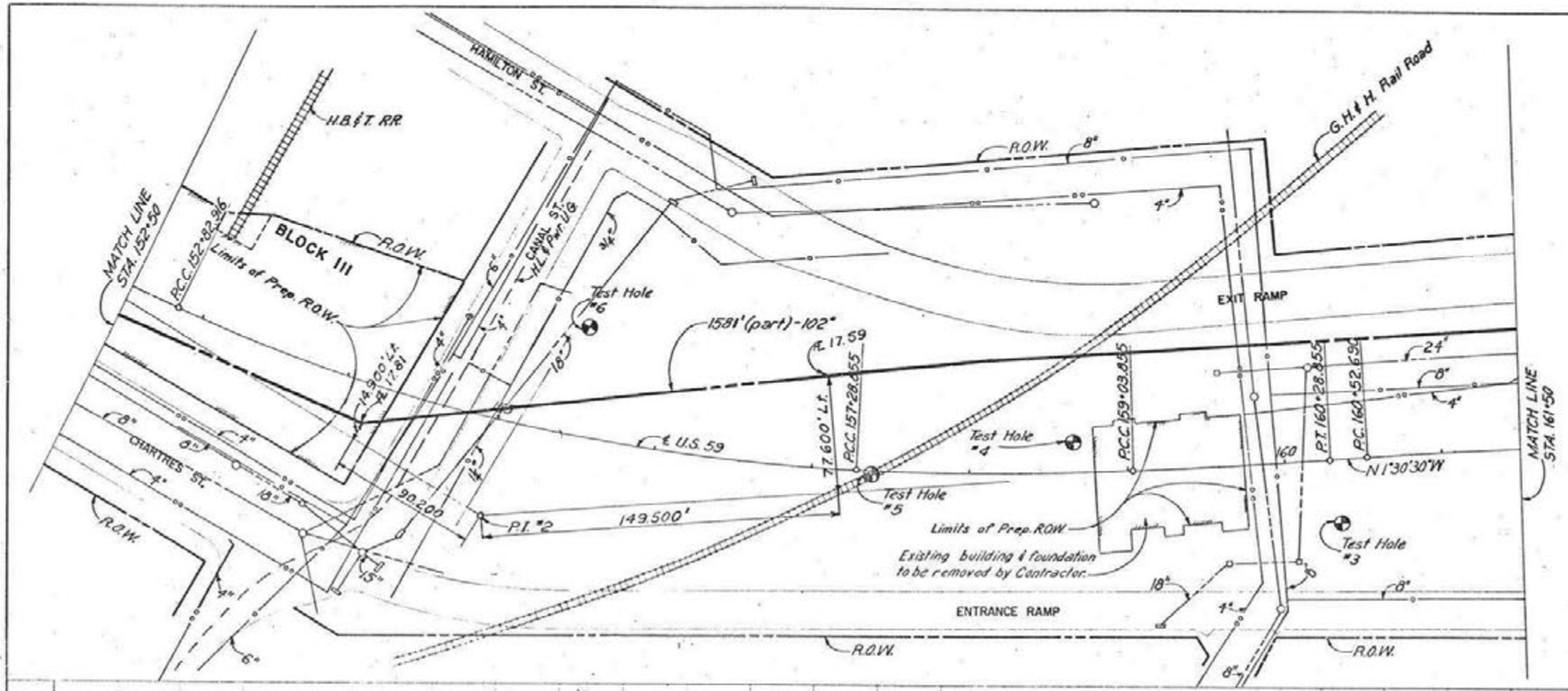


TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

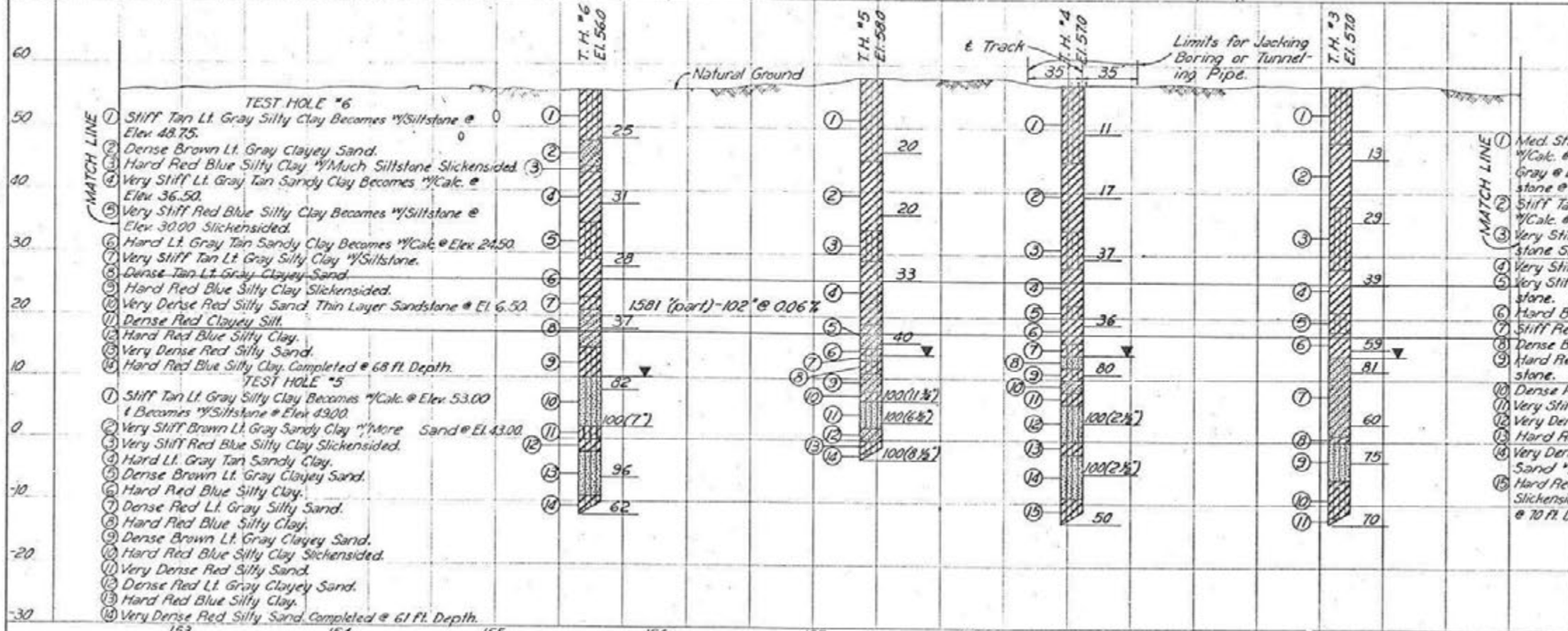
STORM SEWER PLAN & PROFILE

13A

DESIGNED	DATE	SHEET NO.	STATE	FEDERAL AID PROJECT NO.	
C.J.M.	ORIGINAL MAY 1962	6	TEXAS	I-45 71 D(4)	US 59
J.S.B.	Rev. F.H.G. Jan. 23, 1963	DIST. NO.	COUNTY		
	Rev. F.H.G. June 21, 1963	12	Harris		13



P.I. #2 U.S. 59 { 718,626.619
Sta. 155+19.148 { 3,158,016.608
Δ1 = 1°15'00" Rt. D1 = 1°00'00"
Δ2 = 5°15'00" Rt. D2 = 3°00'00"
Δ3 = 22°17'49" Rt. D3 = 5°00'00"
ΔT = 35°17'49" Rt.
T = 536.232'
L1 = 125.000'
L2 = 175.000'
L3 = 445.939'



TEST HOLE #6
1. Stiff Tan Lt. Gray Silty Clay Becomes W/Siltstone @ Elev. 48.75.
2. Dense Brown Lt. Gray Clayey Sand.
3. Hard Red Blue Silty Clay W/Much Siltstone Slickensided.
4. Very Stiff Lt. Gray Tan Sandy Clay Becomes W/Calc. @ Elev. 36.50.
5. Very Stiff Red Blue Silty Clay Becomes W/Siltstone @ Elev. 30.00 Slickensided.
6. Hard Lt. Gray Tan Sandy Clay Becomes W/Calc. @ Elev. 24.50.
7. Very Stiff Tan Lt. Gray Silty Clay W/Siltstone.
8. Dense Tan Lt. Gray Clayey Sand.
9. Hard Red Blue Silty Clay Slickensided.
10. Very Dense Red Silty Sand Thin Layer Sandstone @ El. 6.50.
11. Dense Red Clayey Silt.
12. Hard Red Blue Silty Clay.
13. Very Dense Red Silty Sand.
14. Hard Red Blue Silty Clay. Completed @ 68 ft. Depth.

TEST HOLE #5
1. Stiff Tan Lt. Gray Silty Clay Becomes W/Calc. @ Elev. 53.00 & Becomes W/Siltstone @ Elev. 49.00.
2. Very Stiff Brown Lt. Gray Sandy Clay W/More Sand @ El. 43.00.
3. Very Stiff Red Blue Silty Clay Slickensided.
4. Hard Lt. Gray Tan Sandy Clay.
5. Dense Brown Lt. Gray Clayey Sand.
6. Hard Red Blue Silty Clay.
7. Dense Red Lt. Gray Silty Sand.
8. Hard Red Blue Silty Clay.
9. Dense Brown Lt. Gray Clayey Sand.
10. Hard Red Blue Silty Clay Slickensided.
11. Very Dense Red Silty Sand.
12. Dense Red Lt. Gray Clayey Sand.
13. Hard Red Blue Silty Clay.
14. Very Dense Red Silty Sand Completed @ 61 ft. Depth.

TEST HOLE #4
1. Med. Stiff Gray Silty Clay Becomes W/Calc. @ Elev. 51.75, Becomes Tan Lt. Gray @ Elev. 49.75 & Becomes W/Siltstone @ Elev. 47.00.
2. Stiff Tan Lt. Gray Sandy Clay Becomes W/Calc. @ Elev. 37.50.
3. Very Stiff Red Blue Silty Clay W/Siltstone Slickensided.
4. Very Stiff Lt. Gray Tan Sandy Clay
5. Very Stiff Tan Lt. Gray Silty Clay W/Siltstone.
6. Hard Brown Lt. Gray Sandy Clay.
7. Stiff Red Blue Silty Clay W/Siltstone.
8. Dense Brown Lt. Gray Silty Sand.
9. Hard Red Blue Silty Clay W/Much Siltstone.
10. Dense Red Lt. Gray Clayey Sand.
11. Very Stiff Red Blue Silty Clay Slickensided.
12. Very Dense Red Silty Sand.
13. Hard Red Silty Clay.
14. Very Dense Red Silty Sand W/Sandstone.
15. Hard Red Silty Clay Slickensided. Completed @ 70 ft. Depth.

TEST HOLE #3
1. Stiff Gray Silty Clay Becomes Tan Lt. Gray @ Elev. 50.50 & Becomes W/Siltstone @ Elev. 50.00.
2. Med. Stiff Tan Lt. Gray Sandy Clay Becomes Lt. Gray Tan @ Elev. 44.00 & Becomes W/Calc. @ Elev. 40.00.
3. Stiff Red Blue Silty Clay W/Siltstone Slickensided.
4. Very Stiff Lt. Gray Tan Sandy Clay Becomes W/Calc. @ Elev. 23.50.
5. Very Stiff Red Blue Silty Clay.
6. Very Stiff Brown Lt. Gray Sandy Clay.
7. Very Dense Brown Lt. Gray Clayey Sand.
8. Hard Red Silty Clay Slickensided.
9. Very Dense Red Silty Sand.
10. Hard Red Silty Clay Slickensided.
11. Very Dense Red Silty Sand. Completed @ 70 ft. Depth.

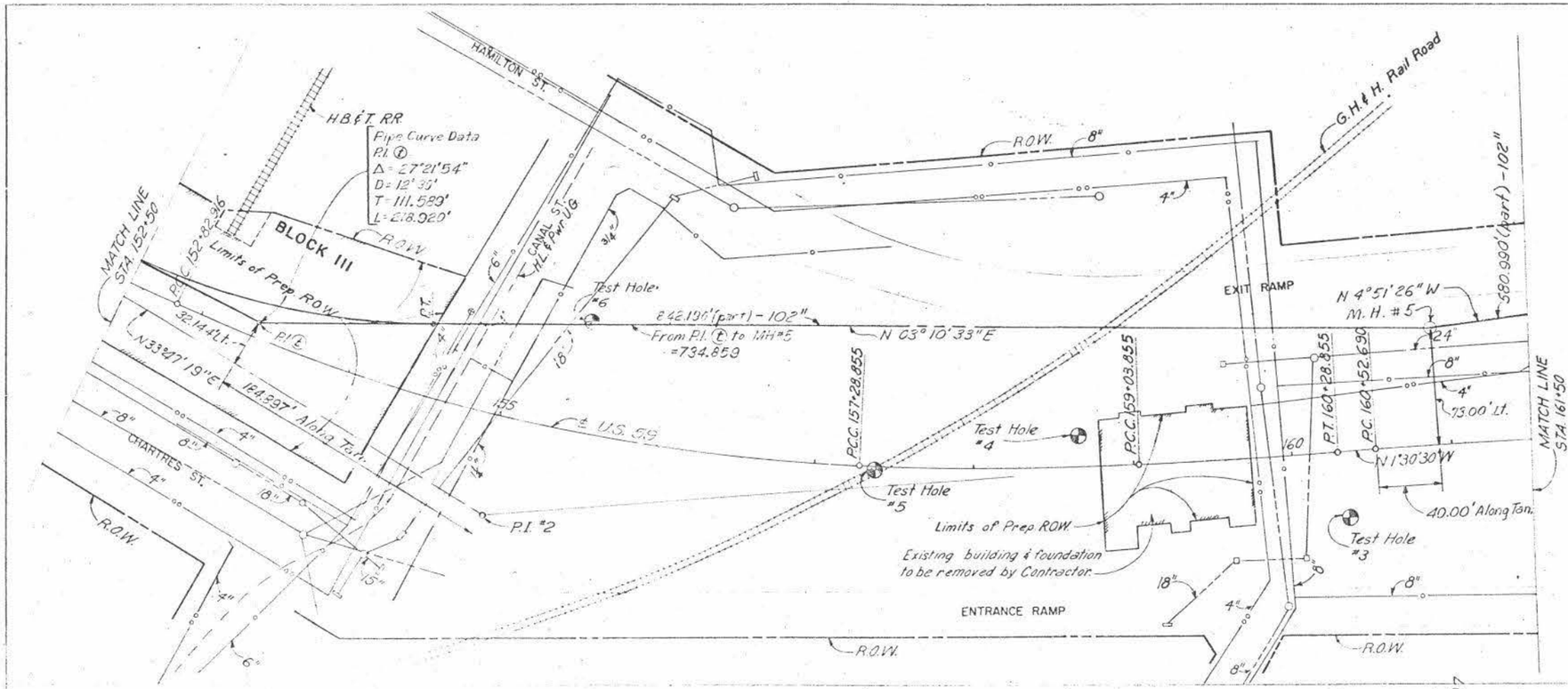
See Revised Sht. #9

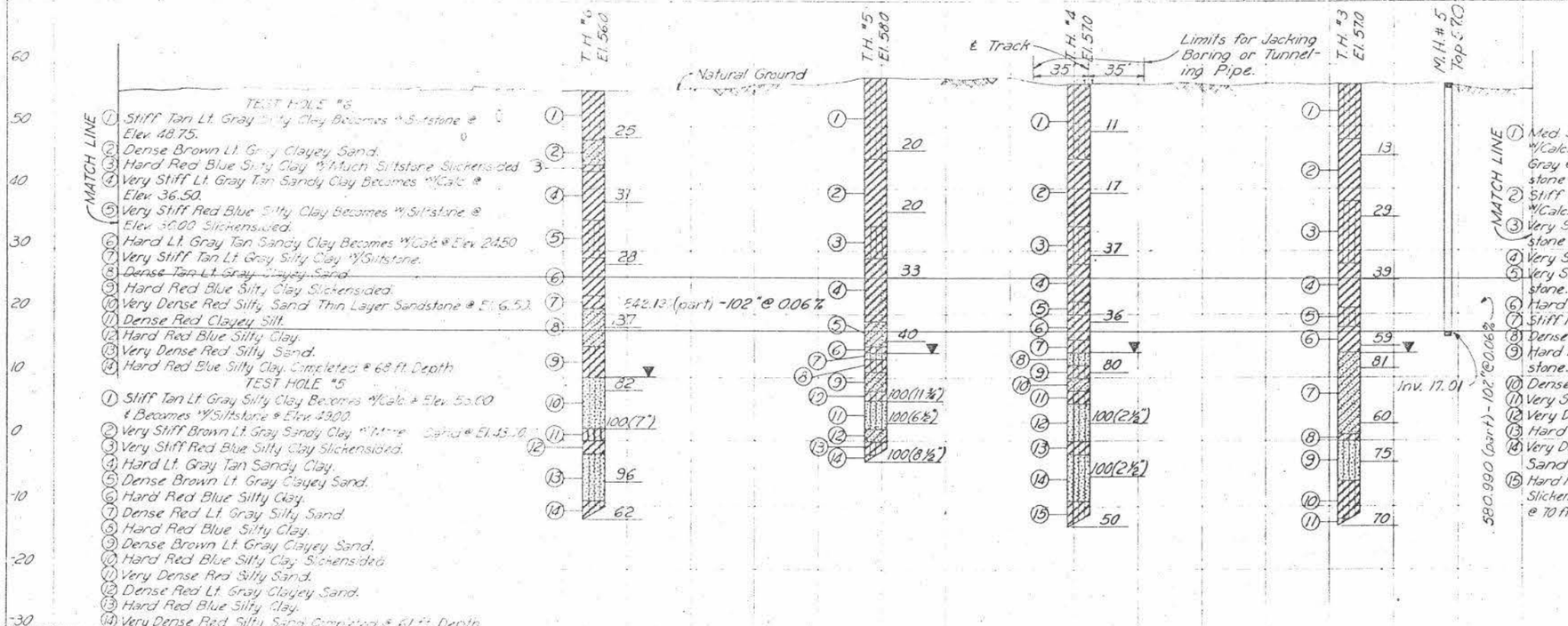
TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER PLAN & PROFILE

Drawing	Date	Fed. No. Div. No.	State	Federal Aid Project No.	Highway No.
Original	June 1962	6	Texas	I-45-4(7)106 U-5(9)3	US 59
Rev.	Oct. 15, 1959	State Dist. No.	County	Control No.	Section No.	Job No.	Sheet No.
		12	Harris	500 172	3 11		14

Sheet 6 of 7 Sheets





TEST HOLE #6
1. Stiff Tan Lt. Gray Silty Clay Becomes W/Siltstone @ Elev. 48.75.
2. Dense Brown Lt. Gray Clayey Sand.
3. Hard Red Blue Silty Clay W/Much Siltstone Slickensided
4. Very Stiff Lt. Gray Tan Sandy Clay Becomes W/Calc. @ Elev. 36.50.
5. Very Stiff Red Blue Silty Clay Becomes W/Siltstone @ Elev. 30.00 Slickensided.
6. Hard Lt. Gray Tan Sandy Clay Becomes W/Calc @ Elev. 24.50
7. Very Stiff Tan Lt. Gray Silty Clay W/Siltstone.
8. Dense Tan Lt. Gray Clayey Sand.
9. Hard Red Blue Silty Clay Slickensided.
10. Very Dense Red Silty Sand Thin Layer Sandstone @ El. 6.50.
11. Dense Red Clayey Silt.
12. Hard Red Blue Silty Clay.
13. Very Dense Red Silty Sand.
14. Hard Red Blue Silty Clay. Completed @ 68 ft. Depth.

TEST HOLE #5
1. Stiff Tan Lt. Gray Silty Clay Becomes W/Calc. @ Elev. 50.00 & Becomes W/Siltstone @ Elev. 43.00.
2. Very Stiff Brown Lt. Gray Sandy Clay W/Mine... Sand @ El. 43.00.
3. Very Stiff Red Blue Silty Clay Slickensided.
4. Hard Lt. Gray Tan Sandy Clay.
5. Dense Brown Lt. Gray Clayey Sand.
6. Hard Red Blue Silty Clay.
7. Dense Red Lt. Gray Silty Sand.
8. Hard Red Blue Silty Clay.
9. Dense Brown Lt. Gray Clayey Sand.
10. Hard Red Blue Silty Clay Slickensided.
11. Very Dense Red Silty Sand.
12. Dense Red Lt. Gray Clayey Sand.
13. Hard Red Blue Silty Clay.
14. Very Dense Red Silty Sand. Completed @ 61 ft. Depth.

TEST HOLE #4
1. Med. Stiff Gray Silty Clay Becomes W/Calc. @ Elev. 51.75, Becomes Tan Lt. Gray @ Elev. 49.75 & Becomes W/Siltstone @ Elev. 47.00.
2. Stiff Tan Lt. Gray Sandy Clay Becomes W/Calc. @ Elev. 37.50.
3. Very Stiff Red Blue Silty Clay W/Siltstone Slickensided.
4. Very Stiff Lt. Gray Tan Sandy Clay
5. Very Stiff Tan Lt. Gray Silty Clay W/Siltstone.
6. Hard Brown Lt. Gray Sandy Clay.
7. Stiff Red Blue Silty Clay W/Siltstone.
8. Dense Brown Lt. Gray Silty Sand.
9. Hard Red Blue Silty Clay W/Much Siltstone.
10. Dense Red Lt. Gray Clayey Sand.
11. Very Stiff Red Blue Silty Clay Slickensided.
12. Very Dense Red Silty Sand.
13. Hard Red Silty Clay.
14. Very Dense Red Silty Sand W/Sandstone.
15. Hard Red Silty Clay Slickensided. Completed @ 70 ft. Depth.

TEST HOLE #3
1. Stiff Gray Silty Clay Becomes Tan Lt. Gray @ Elev. 50.50 & Becomes W/Siltstone @ Elev. 50.00.
2. Med. Stiff Tan Lt. Gray Sandy Clay Becomes Lt. Gray Tan @ Elev. 44.00 & Becomes W/Calc. @ Elev. 40.00.
3. Stiff Red Blue Silty Clay W/Siltstone Slickensided
4. Very Stiff Lt. Gray Tan Sandy Clay Becomes W/Calc @ Elev 23.50.
5. Very Stiff Red Blue Silty Clay.
6. Very Stiff Brown Lt. Gray Sandy Clay.
7. Very Dense Brown Lt. Gray Clayey Sand
8. Hard Red Silty Clay Slickensided.
9. Very Dense Red Silty Sand.
10. Hard Red Silty Clay Slickensided.
11. Very Dense Red Silty Sand. Completed @ 70 ft. Depth.

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS

STORM SEWER PLAN & PROFILE

14A

SHEET 6 OF 7 SHEETS

Des.	Drawing	Date	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
Ck. DN	ORIGINAL	JUNE 1962		[45-11 (7)] C46	
Dr. CJM	Rev. FWS	Jan. 22, 1963	TEXAS	U 514 (33)	U5.59
Ck. WEB	Rev. FWS	June 21, 1963			
Tr.			STATE DIST. NO. 12	COUNTY Harris	CONTROL NO. 500-179
Ck. Tr.					JOB NO. 3-11
					SHEET NO. 166-82
					14

ROW
LYLE ST.
4"
ROW
BRAMBLE ST.
ROW
R.O.W.
RACE ST.
ROW
ARCH ST.
R.O.W.
End Project U 514(43)
Control 177-11-24
18" EXIT RAMP
4"
8"
RAINS ST.
6"
M.H. #6
18"
1581 '(part)-102"
384'-102"
Cap existing Inlet
24"
Pt. A
R 17.16
Inlet 1A
36"
Cap existing Inlet
TEST HOLE #2
MATCH LINE STA. 161+50
PCC 163+52.630
71.969 Lt.
125.237' Lt.
N 1°30'30"W
384.809 to P.C.
165'
734.911' to P.C.
Sta. 162+65
78' Rt.
Inlet 2 A
188'-18"
TEST HOLE #1
Cap existing Inlet
8"
ENTRANCE RAMP
ROW
6"
8"
2:1
2:1
2:1
End Storm Sewer
Sta. 171+72.478
(Measured along tangent)
99.941' Lt.
1119.788' to P.C.
BAYOU
BUFFALO
N
* Note: Slope ground to intersect back of walls of the outfall structure at point 1 foot below top. Excavation outside the limits of structural excavation will not be paid for directly but shall be considered subsidiary to the Item "Compacted Embankment."

TH #2 EL 56.0
TH #1 EL 54.0
MATCH LINE
Pt. A
Limits for Jacking Boring or Tunneling Pipe.
1581 '(part)-102" @ 0.06 %
M.H. #6 Top 41.0
Natural Ground
Inv. 16.95
384'-102" @ 3.81 %
100'-102" @ 0.06 %
2:1 Slope
For details of outfall structure, see sheet Nos. 22 & 23.
Elev 6.00
See Revised Sepia
Inlet 2A, Tp. A Top 53.0
188'-18" @ 0.20 %
Existing Inlet (To be Capped)
Exist. Inlet (To be Capped)
Inlet 1A, Tp. A Top 48.80
Exist. Inlet
Exist. 18" SWR
45.40
45.02
44.52
45.22
45.38
ft. 6.06
ft. 6.00

TEST HOLE #2
① Stiff Gray Silty Clay. Becomes Tan Lt Gray @ Elev 50.15 & Becomes "/Siltstone @ Elev 46.75
② Very Stiff Lt Gray Tan Sandy Clay
③ Very Stiff Red Blue Silty Clay "/Layers Siltstone Slickensided
④ Hard Lt Gray Tan Sandy Clay
⑤ Hard Red Blue Silty Clay "/Siltstone
⑥ Hard Brown Lt Gray Sandy Clay. Slickensided
⑦ Very Dense Brown Lt Gray Clayey Sand "/Sandstone
⑧ Very Stiff Red Silty Clay "/Siltstone
⑨ Very Dense Red Silty Sand. Completed @ 58ft. Depth

TEST HOLE #1
① Stiff Brown Silty Clay "/Siltstone @ Elev 48.75.
② Very Stiff Tan Lt Gray Sandy Clay.
③ Stiff Red Blue Silty Clay "/Layers Siltstone Slickensided.
④ Very Stiff Lt Gray Tan Sandy Clay Becomes "/Calc. @ Elev 27.00.
⑤ Very Stiff Red Blue Silty Clay "/Much Siltstone Slickensided.
⑥ Very Stiff Brown Lt Gray Sandy Clay.
⑦ Dense Red Silty Sand.
⑧ Very Stiff Red Blue Silty Clay.
⑨ Very Dense Red Silty Sand.
⑩ Very Stiff Red Silty Clay. Slickensided.
⑪ Dense Red Clayey Sand.
⑫ Very Dense Red Silty Sand. Completed @ 74 ft. Depth.

60 50 40 30 20 10 0 -10 -20 -30
162 163 164 165 166 167 168

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS
STORM SEWER
PLAN & PROFILE

DES.	CHECKED	DATE	STATE	FED. AID PROJECT NO.	HIGHWAY NO.
C. Cox	ORIGINAL	JUNE 1966	TEXAS	U.S.59 (IH) 1046	U.S.59
DRN. R.G.D.				U.S.59 (IH)	
CK. W.E.H.					
TR.					
CK. TR.					

STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
12	HARRIS	500 77	3 11	106 24	15

SHEET 7 OF 9 SHEET

ROW
4"
LYLE ST.
ROW
18'
EXIT RAMP
4"
8"
BRAMBLE ST
ROW
ROW
RACE ST
ROW
ARCH ST.
End Project U514(3)
Control 177-11-24
ROW
RAINS ST
6"
18"
S80.930 (part)-102"
N 04°51'26"W
Cap existing Inlet
24"
Pt. A
Inlet 1A
M.H. #6
N 00°36'52"W
499.851'-102"
2:1
2:1
2:1
2:1
MATCH LINE STA. 161+50
TEST HOLE #2
PCC 163+52.690
382.13' Lt.
Cap existing Inlet
36"
107.00' Lt.
End Storm Sewer
Sta. 171+72.478
(Measured along tangent)
BUFFALO BAYOU
N 1°30'30"W
620.00' to P.C.
384.809 to P.C.
165'
36"
Sta 162+65
78' Rt.
99.41' Lt.
1119.788' to P.C.
Inlet 2A
188'-18"
TEST HOLE #1
8"
ENTRANCE RAMP
Cap existing Inlet
8"
8"

* Note: Slope ground to intersect back of walls of the outfall structure at point 1 foot below top. Excavation outside the limits of structural excavation will not be paid for directly but shall be considered subsidiary to the Item "Compacted Embankment."

TEST HOLE #1
1. Stiff Brown Silty Clay w/Siltstone @ Elev 43.75
2. Very Stiff Tan Lt Gray Sandy Clay.
3. Stiff Red Blue Silty Clay w/Layers Siltstone Slickensided.
4. Very Stiff Lt Gray Tan Sandy Clay Becomes w/Calc. @ Elev 2700.
5. Very Stiff Red Blue Silty Clay w/Much Siltstone Slickensided.
6. Very Stiff Brown Lt Gray Sandy Clay.
7. Dense Red Silty Sand.
8. Very Stiff Red Blue Silty Clay.
9. Very Dense Red Silty Sand.
10. Very Stiff Red Silty Clay. Slickensided.
11. Dense Red Clayey Sand.
12. Very Dense Red Silty Sand Completed @ 74 ft. Depth.

MATCH LINE
580.990 (part)-102" @ 0.06%
Pt. A
165'
Limits for Jacking Boring or Tunneling Pipe.
M.H. # 6
Top 43.81
Natural Ground
113.851'-102" @ 0.06%
TEST HOLE #2
Inv 16.96
ft. 16.96
256'-102" @ 3.81 %
100'-102" @ 0.06 %
2:1 Slope
ft. 6.06
ft. 6.00
Elev 6.00
For details of outfall structure, see sheet Nos. 22 & 23.

1. Stiff Gray Silty Clay Becomes Tan Lt Gray @ Elev 50.75 & Becomes w/Siltstone @ Elev 46.75
2. Very Stiff Lt Gray Tan Sandy Clay
3. Very Stiff Red Blue Silty Clay w/Layers Siltstone Slickensided
4. Very Stiff Lt Gray Tan Sandy Clay
5. Very Stiff Red Blue Silty Clay w/Siltstone
6. Very Stiff Brown Lt Gray Sandy Clay Slickensided
7. Very Dense Brown Lt Gray Clayey Sand w/Sandstone
8. Very Stiff Red Silty Clay w/Siltstone
9. Very Dense Red Silty Sand Completed @ 58ft. Depth

Inlet 2A, Ty A
Top 53.0
Sta. 1.7
152.5'
188'-18" @ 0.20 %
Existing Inlet (To Be Capped)
4540
4530
4502
44.52
Exist 18" Swr
Exist Inlet (To be capped)
51' ?
Inlet 1A, Ty A
Top 43.80 Sta. 1.7
Exist Inlet
4522
4538
44.87

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN EXPRESSWAYS
STORM SEWER
PLAN & PROFILE
15A

ORIGINAL 13 JUNE 1962
REVISED Rev. Fwg Jan. 23, 1963
C.C.D. W.E.B.
TEXAS
I. 45 (1) 71 1044
U.S. 59 (43)
U.S. 59
12
15

R.O.W.
Inlet 45A
Tc 52.21
IE 46.51
℄ Elgin
Exist 30"
538'-18"
Inlet 45B
Tc 52.02
IE 43.65
R.O.W.
90' -48"
223'-18"
Bulkhead end of pipe
50 MH467
Top 52.03
IE 42.55
Plug & Aband
239'-42"
Inlet 46S
Tc 51.67
IE 47.54
℄ Rosalie
R.O.W.
Tc 50.83
IE 46.28
Inlet 46Q
℄ Anita
Inlet 46P
Tc 50.87
IE 46.30
R.O.W.
℄ Hamilton
55
35.5'-18"
53.2'-18"
42.4'-18"
Begin 102" Pipe Sewer
Sta 50+75.42 (℄ 102" Pipe)
126'-6" Perf.
MH46R
Top 52.72
IE 42" 40.86
IE 18" 47.39
227'-42"
MH46Ø
Top 52.22
IE 42" 41.11
IE 18"N 45.09
IE 18"W 45.27
339.3'-42"
Perf
(99'-6" Perf.)
Tc 35.67 Inlet 1A
IE 30.48
Sta 51+85.50(℄ 288 S.B)
Offset 22'
119'-6" Perf.
Sta 52+89.00(℄ Hamilton)
Offset 26'
Inlet 3A
Sta 53+34.00(℄ US 59 SB)
Offset 34'
Sta 55+19.00(℄ Hamilton)
Offset 26'
Inlet 5A
Sta 55+42.50(℄ US 59 SB)
Offset 34'
#201
168'-6" Perf.
50
(6'-6")
100'-6" Perf.
Top 35.75
IE 31.19
99'-6" Perf.
100'-6" Perf.
99'-6" Perf.
2049'-6" Perf.
30.5'-18"
225'-6" Perf
6'-6"
203.6'-6" Perf
6'-6"
Top 35.75
IE 31.23
55
288'-18"
℄ 288 S.B.
℄ US 59 S.B.
28.2'-18"
℄ 102" Pipe
℄ 102" Pipe
Sta 468+18(℄ US 59 SB)
121.8'-66"
16'
470 ℄ US 59 S.B.
N 32°52'00"E
40.6'-18"
40'-18"
Bulkhead end of pipe
40'-18"
Inlet 2C
Sta 51+27.50(℄ 288 Express)
Offset 68'
Top 35.76
Tc 36.48
IE 31.10
Inlet 4C
Sta 53+35.00(℄ 288 Express)
Offset 68'
Tc 36.50
Top 35.56
IE 30.45
Inlet 6C
Sta 55+43.00(℄ 288 Express)
Offset 68'
Tc 36.44
Top 35.68
IE 30.52
465
℄ Conn A
MH 1X
See Siphon
Details
135.6'-18"
131.7'-18"
50
℄ 288 Express
55
#200
437'-18"
Top 35.20
Tc 36.09
IE 31.10
Top 35.22
Tc 36.07
IE 31.48
Adjust inlets to new
Alignment
Adjust inlet to new
Alignment
470
Inlet 2B
Sta. 471+03.50 (℄ Conn B)
Offset 22'
Inlet 4B
Sta. 473+25.50 (℄ Conn B)
Offset 22'
Tc 36.18
Top 35.37
IE 31.20
Inlet 6B
Sta. 475+45.00 (℄ Conn B)
Offset 22'
MATCH LINE STA 57+00
Exist 66"
Plug & Aband
℄ US 59 N.B.
475
℄ US 59 N.B.
℄ 288 N.B.
181'-8"
82'-18"
50
#178
987'-18"
Tc 35.70
IE 31.74
213.5'-6" Perf
204.5'-6" Perf
204.5'-6" Perf
194.8'-6" Perf
Top 35.69
IE 31.70
Top 35.71
IE 31.85
Inlet 2A
Sta 50+66.00(℄ 288 N.B.)
Offset 34'
Inlet 4A
Sta 52+82.50(℄ 288 N.B.)
Offset 34'
Inlet 6A
Sta 475+57.50(℄ US 59 N.B.)
Offset 34'
Top 53.78
IE 39.03
MH43A
Sta 49+36.00(℄ Chartres)
Offset 28'
117'-48"
C6M Pipe
6'X3.5'
Box Siphon
MH44T Sta 51+50.00(℄ Chartres)
Offset 26'
Top 52.61
IE 39.86
363'-42"
MH44R
Sta 55+20 (℄ Chartres)
Offset 26'
336.5'-42"
Top 51.54
IE 42" 41.14
IE 18" 46.46
55
368'-18"
Tc 50.97
IE 47.68
Inlet 44S
825'-66"
Plug & Aband
50
975'-66"
127.5'-42"
IE 18" 47.35
84'-18"
℄ Chartres
37.5'-18"
Bulkhead end of pipe
Inlet 44S
Tc 50.92
IE 47.49
Tc 51.71
IE 47.80
R.O.W.
℄ Anita
R.O.W.
Inlet 44TT
Sta. 52+30.00(℄ Chartres)
Offset 11'
Inlet 42A
Tc 52.29
IE 44.84
Top 52.84
IE 42" 39.29
IE 18" 41.86
IE 66" 38.39
IE 90" 38.29
MH44U
Exist 90"
℄ Elgin

Note: Offsets for Curb Inlets are to Face of Curb.
Offsets for Area Inlets or Manholes are to Center.

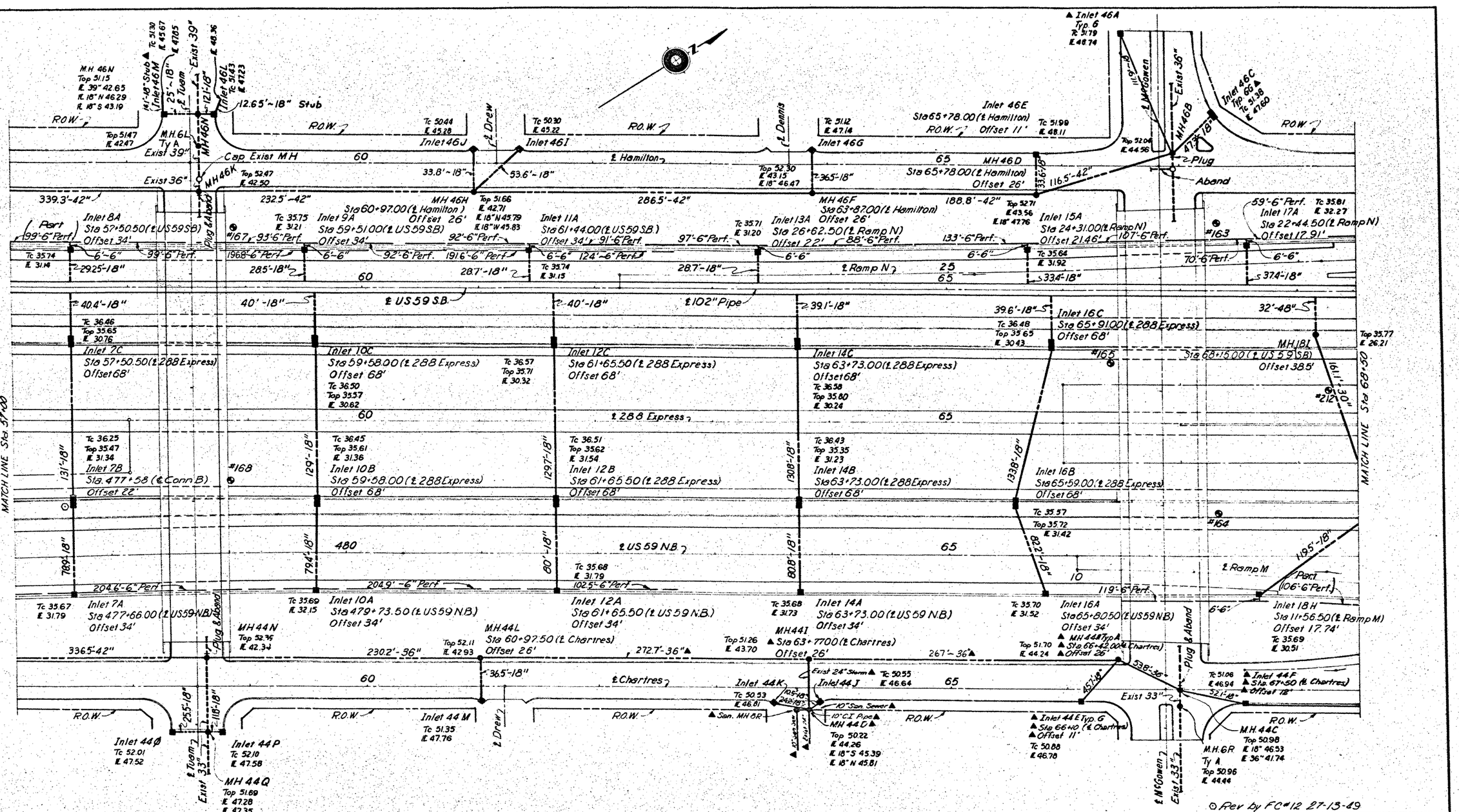
⊙ Rev by FC #12 27-13-49

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 129

SHEET 1 OF 6

Dn JAN	Drawing	Date	Fed Road Act. No.	State	Federal Aid Project No	Sheet No
Ck Dn NCK	ORIGINAL	MAY 1967	6	TEXAS	I-45-1(102)046 U 514(55)	129
Dn HWJ	▲ Rev Nov 68 GDD					
Ck Dn NCK	● Rev. Field Change No.5		State Dist. No.	County	Control No. / Section No. / Job No. / Highway No.	
Tr.	⊙ Rev Nov 75 JAN				500 27 / 5 13 / 151 49 / I.H. 45 U.S. 59	
Ck Tr.						



⊙ Rev by FC#12 27-13-49

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 130

SHEET 2 OF 6

Dn JAN	Drawing	Date	Fed Road Div. No.	State	Federal Aid Project No	Sheet No.
Ck Dn NCK	ORIGINAL	MAY 1967	6	TEXAS	F-45-(192)046	130
Dw HMJ	▲ Rev. Nov. 69 GCD				U 814(55)	
Ck Dw NCK	● Rev. Field Change No. 5		State Dist. No.	County	Control	Section	Job No.	Highway No.
Tr -	⊙ Rev. Nov 75 JAN				500	9	181	I.H. 45
Ck Tr -					27	13	49	U.S. 59

Adj Inlets

Inlet 48D
Sta 10+47.16 (℄ Ramp N)
Offset 24'
Tc 52.37
℄ 47.94

167'-18"

Top 52.23
℄ 48.46
Inlet 48E
Sta 78+41.00 (℄ Hamilton)
Offset 50'

MH 48C
Sta 78+11.00 (℄ Hamilton)
Offset 6'
Top 54.34
℄ 46.79

45'-18"

Inlet 48A
Sta 72+70.00 (℄ Hamilton)
Offset 12'

℄ McElhenny

℄ Hadley

Inlet 48B
Sta 76+53.00 (℄ Hamilton)
Offset 12'
Tc 53.07
℄ 47.15

R.O.W.

Tc 52.95
℄ 48.86

℄ Hamilton

377.9'-18"

152.9'-24"

#202

187.5'-24"

Inlet 25A
Sta 19+02.00 (℄ Ramp L)
Offset 9'
Tc 37.13
℄ 33.10

Inlet 27A
Sta 76+29.00 (℄ Ramp L)
Offset 9'

70.1'-18"

Inlet 25B
Sta 75+50.50 (℄ US 59 SB)
Offset 22'

#204

Tc 35.67
℄ 31.53

51.3'-18"

℄ Ramp L

℄ Ramp N

Tc 36.05
℄ 31.55

Exist 20'-9'X6' Box
See Transition Details

167'-18"

℄ 102" Pipe

Inlet 19A
Sta 21+40.00 (℄ Ramp N)
Offset 14.67'

#207

35'-6" Perf.

6'-6"

39'-18"

Tc 35.99
℄ 31.30

Inlet 21A
Sta 19+30.00 (℄ Ramp N)
Offset 12'

78'-6" Perf.

Tc 35.47
℄ 30.95

Inlet 23A
Sta 72+46.00 (℄ US 59 SB)
Offset 22' Adj Inlet

#203

453'-18"

Tc 35.72
℄ 31.61

161'-18"

℄ US 59 S.B.

Top 35.31
℄ 31.28

33'-18"

℄ 102" Pipe

32.8'-18"

32.1'-18"

Inlet 20A
Sta 70+01.00 (℄ US 59 N.B.)
Offset 38.5'
Top 35.78
℄ 31.10

#211

Inlet 22A
Sta 72+46.00 (℄ US 59
Offset 38.5'
Top 35.31
℄ 31.29

#206

Inlet 24A
Sta 75+10.00 (℄ US 59 S.B.)
Offset 38.5'

#205

Inlet 26C
Sta 78+06.00 (℄ US 59 S.B.)
Offset 33'

Top 35.68
℄ 31.18

27.8'-18"

MATCH LINE Sta 69+50

MATCH LINE Sta 78+50 (℄ U.S. 59 S.B.)

℄ 288 S.B.

℄ 288 N.B.

Inlet 18A
Sta 74+74.00 (℄ US 59 NB)
Offset 33'
Top 35.31
℄ 31.80

Exist S.W.B. Telephone Conduit to remain in place

Inlet 26B
Sta 77+56.00 (℄ US 59 NB)
Offset 33'

Top 35.81
℄ 31.30

604'-18"

#103.9

#213

Inlet 18G
Sta 68+65.00 (℄ US 59 NB)
Offset 38.5'

#210

Inlet 18D
Sta 71+76.50 (℄ US 59 NB)
Offset 38.5'
Top 35.33
℄ 30.29

#199

#209

Adj Inlet
Inlet 18B
Sta 74+74.00 (℄ US 59 NB)
Offset 22'

518'-18"

Tc 36.03
℄ 31.41

Top 36.01
℄ 31.15

Inlet 26A
Sta 77+88.00 (℄ US 59 NB)
Offset 22'
Adj Inlet

Inlet 18C
Sta 71+60.00 (℄ US 59 N.B.)
Offset 22'

Tc 36.00
℄ 29.78

Inlet 18E
Sta 14+97.00 (℄ Ramp M)
Offset 12'

Tc 35.61
℄ 29.13

Top 35.37
℄ 30° 28.52
℄ 18" 30.37

119.5'-18"

172.5'-30"

58'-18½"

59.2'-30"

86.7'-30"

311.3'-18"

℄ Ramp K

℄ Ramp M

(350'-6" Perf. Part)

MH 47C
Sta 19+28.00 (℄ Ramp M)
Offset 15'

Top 53.13
℄ 24" 45.72
℄ 18" 47.81

208.5'-24"

420.8'-24"

82.5'-18"

Inlet 15F
Sta 14+10.00 (℄ Ramp M)
Offset 12'

Tc 35.71
℄ 29.08

(Part 139'-6" Perf. 106'-6" Perf.)

#198

388'-6" Perf.

Tc 52.18
℄ 46.61

59.3'-18"

Tc 52.20
℄ 48.46

Inlet 47E
Sta 77+45.00 (℄ Chartres)
Offset 12'
Tc 53.13
℄ 45.23
℄ 18" 49.83

6'-0"-18" Stub

Inlet 47B

Inlet 47D

℄ Chartres

325.0'-18"

38.2'-18"

Tc 53.00
℄ 48.97

Inlet 47R.

130.6'-18"

21'-18"

Plug & Abend

Dunbar School

R.O.W.

Hadley

MH 47A
Top 51.80
℄ 46.34

Exist 18"

Inlet 44B
Tc 52.88
℄ 48.84

Inlet 44A

Tc 52.00
℄ 46.80

℄ McElhenny

R.O.W.

● Rev by FC#11 27-13-49 W.E.B.

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 131

SHEET 3 OF 6

Dr. JAN	Drawing	Date	FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
Ck. Dr. NCK	ORIGINAL	MAY 1967	6	TEXAS	F-45-1(92)046 U 514(105)	131
Dr. HWJ	▲ Rev. Nov. 69 GOD					
Ck. Dr. NCK			STATE DIST. NO.	COUNTY	CONTROL SECTION / JOB NO.	HIGHWAY NO.
Tr. -					500 3 151	U.S. 59
Ck. Tr.					67 13 43	

Inlet 27C
Sta 78+55.00 (℄ US 59 SB)
Offset 22'

Inlet 27B
Sta 75+35.00 (℄ Ramp L)
Offset 9'

Inlet 48G
Sta 80+00.00 (℄ Hamilton)
Offset 12'

ROW

Inlet 48I

Inlet 48J

49'-18"

Inlet 48L
Sta 83+71.00 (℄ Hamilton)
Offset 22'

MH 48H
Sta 82+15.50 (℄ Hamilton)
Offset 26'

72'-18"

Inlet 48F
Sta 80+00.00 (℄ Hamilton)
Offset 24'

33'-18"

185'-24"

213'-30"

154'-30"

41'-18"

℄ Hamilton

Inlet 48K
Sta 83+71.00 (℄ Hamilton)
Offset 22'

85

360'-30"

Inlet 48M
Sta 87+30.50 (℄ Hamilton)
Offset 22'

90'-30"

Inlet 57A

25'-18"

Exist 60"

24'-18"

Inlet 57B

ROW

125'-18"

MH 58E

Plug & Abond

6'X3.5' Box Siphon

Inlet 29A
Sta 13+45.00 (℄ Ramp L)
Offset 9'

#208

30'-6" Perf.

38'-18"

℄ Ramp L

186'-6" Perf.

Inlet 31A
Sta 10+50.00 (℄ Ramp L)
Offset 15.18'

99'-6" Perf.

127'-6" Perf.

160'-6" Perf.

Inlet 33A
Sta 86+56.00 (℄ US 59 SB)
Offset 22'

160'-6" Perf.

#175

160'-6" Perf. Part

17'-18"

6'-6"

℄ 102" Pipe

℄ US 59 SB

28'-18"

MH 2X See Siphon Details

Inlet 28D
Sta 80+21.00 (℄ US 59 SB)
Offset 33'

104'-18"

Inlet 30C
Sta 83+28.00 (℄ US 59 SB)
Offset 33'

76'-18"

Inlet 30B
Sta 83+30.00 (℄ US 59 NB)
Offset 33'

#14

℄ Gray

Utility Underpass @ Pierce

℄ Pierce

Inlet 32C
Sta 86+47.50 (℄ US 59 SB)
Offset 33'

30'-18"

Inlet 32B
Sta 86+50.50 (℄ US 59 NB)
Offset 33'

53'-18"

#179

Part 161'-6" Perf.

Inlet 32A
Sta 29+07.00 (℄ Ramp K)
Offset 19'

171'-6" Perf.

151'-6" Perf.

℄ US 59 NB

25 ℄ Ramp K

25'-18"

200'-6" Perf.

Inlet 30A
Sta 25+46.00 (℄ Ramp K)
Offset 19'

6'-6"

124'-6" Perf.

Inlet 28C
Sta 80+05.00 (℄ US 59 NB)
Offset 33'

98'-18"

83'-18"

106'-6" Perf.

Inlet 28B
Sta 23+07.00 (℄ Ramp K)
Offset 14.23'

Part 135'-6" Perf.

Inlet 28A
Sta 22+04.81 (℄ Ramp K)
Offset 9.06'

40'-6" Perf.

52'-6" Perf.

MH 47F

Aband exist pipe
Replace 41'-18"

Plug & Abond

℄ Chartres

271'-30"

114'-36"

268'-36"

Inlet 47N
Sta 85+50.00 (℄ Chartres)
Offset 22'

Inlet 47J
Sta 84+32.00 (℄ Chartres)
Offset 22'

49'-18"

40'-18"

Inlet 47M

Inlet 47L

Inlet 49A

31'-18"

Inlet 49B

20'-18"

Exist 60"

Plug & Abond #174

Exist 54"

MH 47Q
Sta 88+80.00 (℄ Chartres)

MH 47P

57'-54"

Inlet 47G

23'-18"

MH 47I

28'-18"

Inlet 47H

Exist 18"

416'-24"

R.O.W.

MATCH LINE Sta 78+50 (℄ US 59 SB)

MATCH LINE Sta 89+00 (℄ US 59 SB)

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

THIS SHEET VOID AND REPLACED BY REVISED SHEET NO. 132A

STORM SEWER PLAN 132

SHEET 4 OF 6

Dn. JAN	Drawing ORIGINAL	Date MAY 1967	Fed Road Div. No. 6	State TEXAS	Federal Aid Project No. I-45-1(192)046 U 514(58)	Sheet No. 132
Ck Dn. NCK						
Dw. HWJ	▲ Rev. Nov 68 GDD					
Ck Dw. NCK	☆ Rev. Mar 69 GDD					
Tr.			State Dist. No.	County	Control No. 500 27	Section No. 3 13	Job No. 191 49	Highway No. F.M. 518 U.S. 59
Ck Tr.						

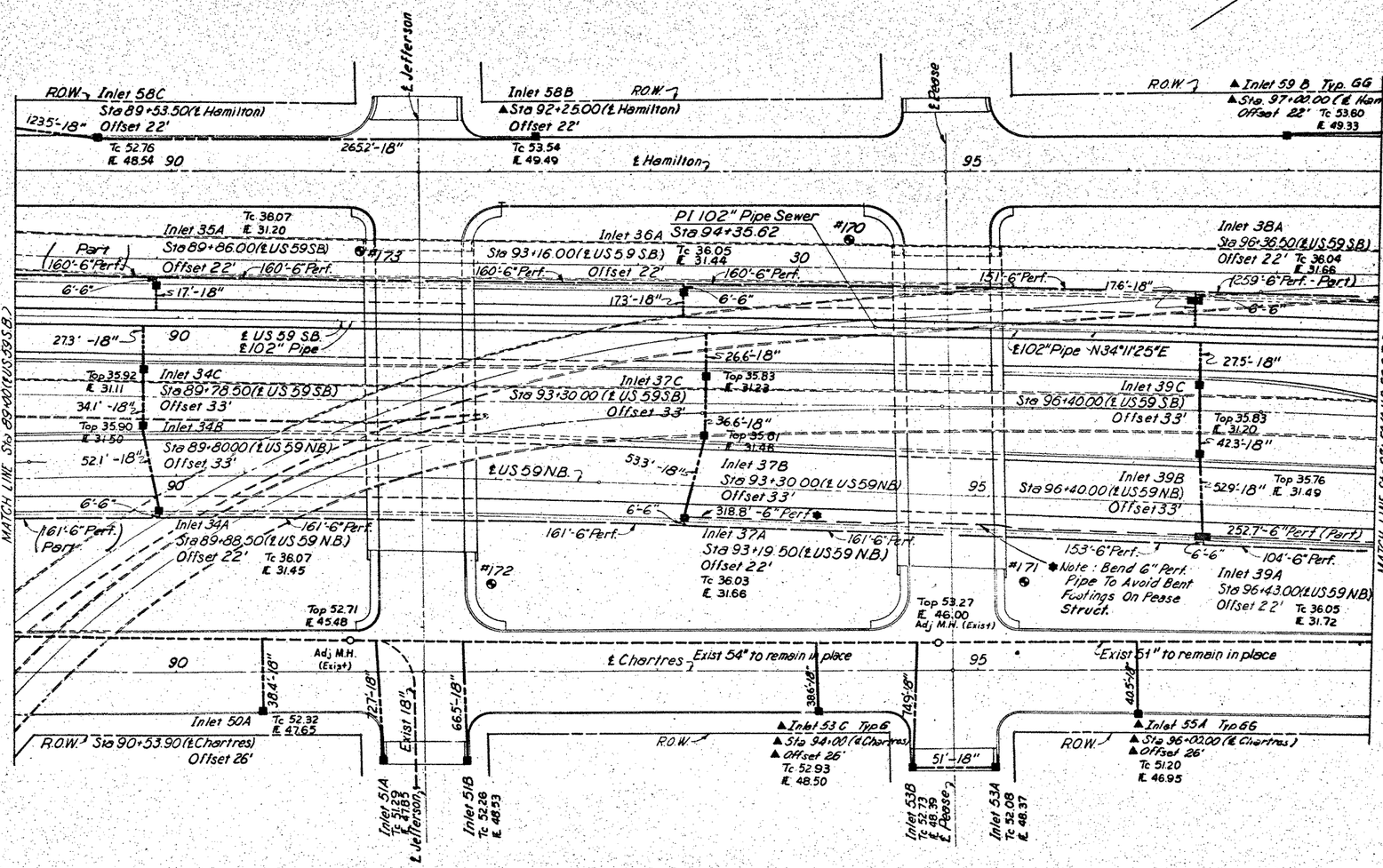
Inlet 27C
Sta 78+55.00 (℄US59SB)
Offset 22'
Tc 36.11
℄ 30.95
MATCH LINE Sta 79+50 (℄US59SB)
Inlet 27B
Sta 15+35.00 (℄ Ramp L)
Offset 9'
Tc 35.34
℄ 31.20
43.6'-18"
47'-18"
Inlet 486
Sta 80+00.00 (℄ Hamilton)
Offset 12'
Tc 51.36
℄ 48.84
ROW
Inlet 481
Tc 52.85
℄ 48.92
Inlet 48J
Tc 52.87
℄ 49.85
486'-18"
Inlet 48L
Sta 83+71.00 (℄ Hamilton)
Offset 22'
Tc 52.40
℄ 48.20
41'-18"
Inlet 48M
Sta 87+30.50 (℄ Hamilton)
Offset 22'
87.7'-30"
Inlet 57A
Tc 52.85
℄ 46.36
23.2'-18"
4 Exist 60"
23'-18"
Inlet 57B
Tc 53.01
℄ 48.58
ROW
123.5'-18"
MH 58F
Top 52.88
66" ℄ 39.94
30" S ℄ 42.44
18" N ℄ 46.14
Inlet 48F
Sta 80+00.00 (℄ Hamilton)
Offset 24'
187.5'-24"
332'-18"
MH 48H
Sta 82+15.50 (℄ Hamilton)
Offset 26'
135'-18"
Inlet 48K
Sta 83+71.00 (℄ Hamilton)
Offset 22'
211.1'-30"
153.4'-30"
℄ Hamilton
362.2'-30"
Tc 52.88
℄ 43.24
MH 58F
Plug & Aband
MH 58E
Top 53.58
℄ 39.74
6'X3.5'
Box Siphon
Tc 51.56
℄ 18" 48.28
℄ 45.80
#208
Inlet 29A
Sta 13+45.00 (℄ Ramp L)
Offset 9'
30.5' Perf
319'-18"
℄ Ramp L
Tc 35.62
℄ 31.58
6'-6"
186'-6" Perf.
Top 53.47
℄ 18" 48.25
℄ 30" 46.32
Inlet 31A
Sta 10+50.00 (℄ Ramp L)
Offset 15.18'
99'-6" Perf.
Tc 52.45
℄ 18" 47.95
℄ 30" 44.63
Tc 36.03
℄ 31.40
Inlet 33A
Sta 86+56.00 (℄ US 59 SB)
Offset 22'
160'-6" Perf.
#175
127'-6" Perf.
160'-6" Perf.
6'-6"
17'-18"
160'-6" Perf.
Part
℄ 102" Pipe
174'-18"
Tc 36.02
℄ 31.71
10
80
℄ US 59 SB
27.6'-18"
85
27'-18"
Top 35.83
℄ 31.19
MH 2X See
Siphon Details
26.6'-18"
Top 35.70
℄ 30.30
Inlet 28D
Sta 80+21.00 (℄ US 59 SB)
Offset 33'
Inlet 30C
Sta 83+28.00 (℄ US 59 SB)
Offset 33'
Top 35.83
℄ 31.10
Inlet 32C
Sta 86+47.50 (℄ US 59 SB)
Offset 33'
Inlet 32B
Sta 86+50.50 (℄ US 59 NB)
Offset 33'
Top 35.84
℄ 31.50
50.8'-18"
℄ Gray
℄ Pierce
Utility Underpass
℄ Pierce
MATCH LINE Sta 89+40 (℄ US 59 SB)
104.7'-18"
753'-18"
Inlet 28C
Sta 80+05.00 (℄ US 59 NB)
Offset 33'
Top 35.83
℄ 31.21
Inlet 30B
Sta 83+30.00 (℄ US 59 NB)
Offset 33'
Top 35.87
℄ 31.39
#114
#179
℄ US 59 N.B
25 ℄ Ramp K
73.6'-18"
85
511'-18"
6'-6"
Inlet 32A
Sta 29+07.00 (℄ Ramp K)
Offset 19'
171'-6" Perf.
Part
(161'-6" Perf.)
95.4'-18"
82'-18"
80
Tc 35.67
℄ 31.46
106'-6" Perf.
Inlet 28B
Sta 23+07.00 (℄ Ramp K)
Offset 14.23'
Tc 35.86
℄ 31.43
200'-6" Perf.
Inlet 30A
Sta 25+46.00 (℄ Ramp K)
Offset 19'
Tc 36.01
℄ 31.60
151'-6" Perf.
℄ Calhoun
Plug & Aband
#174
Plug & Aband
Part
(50'-6" Perf.)
6'-6"
40'-6" Perf.
52'-6" Perf.
Inlet 28A
Sta 22+04.81 (℄ Ramp K)
Offset 9.06'
Tc 35.50
℄ 31.51
MH47F
Aband exist pipe
Replace 41'-18"
Plug & Aband
℄ Chartres
262.0'-30"
112.9'-36"
267.5'-36"
MH47P
Top 53.32
℄ 40.06
55.3' 54"
Exist 54"
420.8'-24"
ROW
Inlet 47G
Tc 52.95
℄ 49.30
225'-18"
MH47I
213'-18"
Tc 52.98
℄ 49.47
Inlet 47H
Inlet 47J
Tc 52.52
℄ 42.32
▲Sta 84+32.00 (℄ Chartres)
Offset 22'
Exist 18"
M.H. 47I
Top 53.01
℄ 46.71
℄ 18" N 49.24
℄ 18" S 49.04
Inlet 47M
Tc 52.37
℄ 48.27
Inlet 47L
Tc 52.32
℄ 48.14
50.6'-18"
40.5'-18"
Inlet 47N
▲Sta 85+50.00 (℄ Chartres)
Offset 22'
Tc 52.54
℄ 18" 47.25
℄ 36" 41.60
Inlet 49A
Tc 53.17
℄ 48.30
28.6'-18"
209'-18"
Exist 60"
Inlet 49B
Tc 53.28
℄ 49.83
ROW
MATCH LINE Sta 89+40 (℄ US 59 SB)

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 132-A

SHEET 4 OF 6

Dr. JAN	Drawing	Date	FED ROAD DIV NO	STATE	FEDERAL AID PROJECT NO	SHEET NO
Ck. Dn. NCK	ORIGINAL	MAY 1967	6	TEXAS	I-45-1(102)046 U 514(55)	132
Dr. MMJ	▲ Rev Nov 68 GAD		STATE DIST NO	COUNTY	CONTROL NO / SECTION NO / JOB NO	HIGHWAY NO
Ck. Dn. NCK	△ Rev Nov 69 GAD				500 / 5 / 131	I.H. 45 U.S. 59
Tr.	Ⓐ Rev June 70 GHV					
Ck. Tr.						



TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 133

SHEET 5 OF 6

Dr. JAN	Drawn No.	Date	FED. AID Div. No.	STATE	FEDERAL AID PROJECT NO	SHEET NO.
Ck. Dr. NCK	ORIGINAL	MAY 1967	6	TEXAS	I-45-1(92)046	133
Dr. HMJ	▲ Rev Nov. 68 GCP				U 514(55)	
Ck. Dr. NCK	● Rev. Field Change No.4		STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO. / HIGHWAY NO.	
Tr.			Tr.		6.00 / 27 / 9 / 13 / 151 / 49	K.H. 45 / U.S. 59
Ck. Tr.						

▲ Inlet 59A (Typ.A)
▲ Sta. 13+00.00 (℄ Leeland)
▲ Offset 25.86

Inlet 59D
▲ Sta 12+95.00 (℄ Leeland)
Offset 25.86'
Tc 53.35
E. 49.72

Tc 52.98
E. 49.18

483'-18"

61'-18"

℄ Leeland

ROW

141'-25"

MH 59C
▲ Sta 33+45.00 (℄ Hamilton)
▲ Offset 28.00

188'-24"

Top 54.64
E. 49.08

Tc 55.11
E. 48.41

Inlet 59E
Sta 12+97.30 (℄ Leeland-Bell)
Offset 24'

℄ Leeland-Bell

119.0'-24"

MH 59F
Top 52.90
E. 43.29

8'-18"

Inlet 59G
Tc 53.38
E. 47.55

Tc 53.42
E. 48.82
Inlet 60A
Sta 11+12.00 (℄ Leeland-Bell)
Offset 24'

32'-18"

MH 60B

Top 53.31
E. 45.76

Exist 36" to remain in place

Bell

Inlet 61A
▲ Sta 102+50.00 (℄ Hamilton)
Offset 22'
Tc 53.25
E. 49.30

Clay

100

Exist MH - Adjust
Top to Elev 53.68
E 47.05
Exist MH

410'-18"

Inlet 61B
▲ Sta 102+55.00 (℄ Hamilton)
Offset 22'
Tc 53.31
E. 49.02

Exist storm sewer
to remain in place

Adjust
Inlet
Top 54.62
E. 46.64

Plug & Aband

46'-18"

Adjust
M.H.
Top 52.47
E 45.37

End 102" Pipe Sewer
Sta 102+18.95

18'-18" (Vertical)

Exist 102" Pipe

℄ 102" Pipe

Exist 15"

Inlet 62A

Exist. 18"

Exist. MH.

Exist 18"

Polk

#169

Inlet 40A
Sta 99+00.00 (℄ US 59 SB)
Offset 22'
Tc 38.34
E. 34.10

(Part. 259'-6" Perf.)

136'-18"

6'-6"

205'-6" Perf.

N34°11'25"E

100

℄ US 59 SB

Inlet 63A
Sta. 102+29 (℄ US 59 SB)
offset 22' Lt.
Tc 53.47
E. 44.81

41.1'-18"

Inlet 41C
Sta 99+44.00 (℄ US 59 SB)
Offset 33'
Top 39.54
E. 33.66

301'-18"

Inlet 41B
Sta 99+42.50 (℄ US 59 NB)
Offset 42'
Top 39.08
E. 33.84

#9

#10

744'-18"

℄ US 59 NB

100

252'-6" Perf. (Part)

6'-6"

30.0'-6" Perf

Inlet 41A
Sta 99+00.00 (℄ US 59 NB)
Offset 22'
Tc 38.09
E. 34.13

144'-6" Perf.

184'-6" Perf.

Inlet 64A
Sta. 102+73 (℄ US 59 NB)
offset 22' Rt.
Tc 54.54
E. 46.92

4.5'-18" (Vertical)

Exist storm sewer
to remain in place

MATCH LINE Sta 97+50 (℄ US 59 SB)

Exist MH
Adjust Top
to Elev 54.83
E. 43.93

E 46.91

42'-18"

100 ℄ Chartres

Exist 48" to remain in place

Exist 18"

Inlet 56A
▲ Sta 99+50.00 (℄ Chartres)
Tc 53.60
E. 48.14

ROW

℄ Leeland

℄ Leeland-Bell

*Note: Pipe to be located around existing bridge column. The adjustments to this existing system will be paid for as follows:
1. Adjusting Inlet - 1 ea
2. Type GC Inlet - 1 ea
3. 18" Pipe Sewer - 24'
All other work and materials required to complete the revisions to this system shall be considered incidental to the above mentioned items.

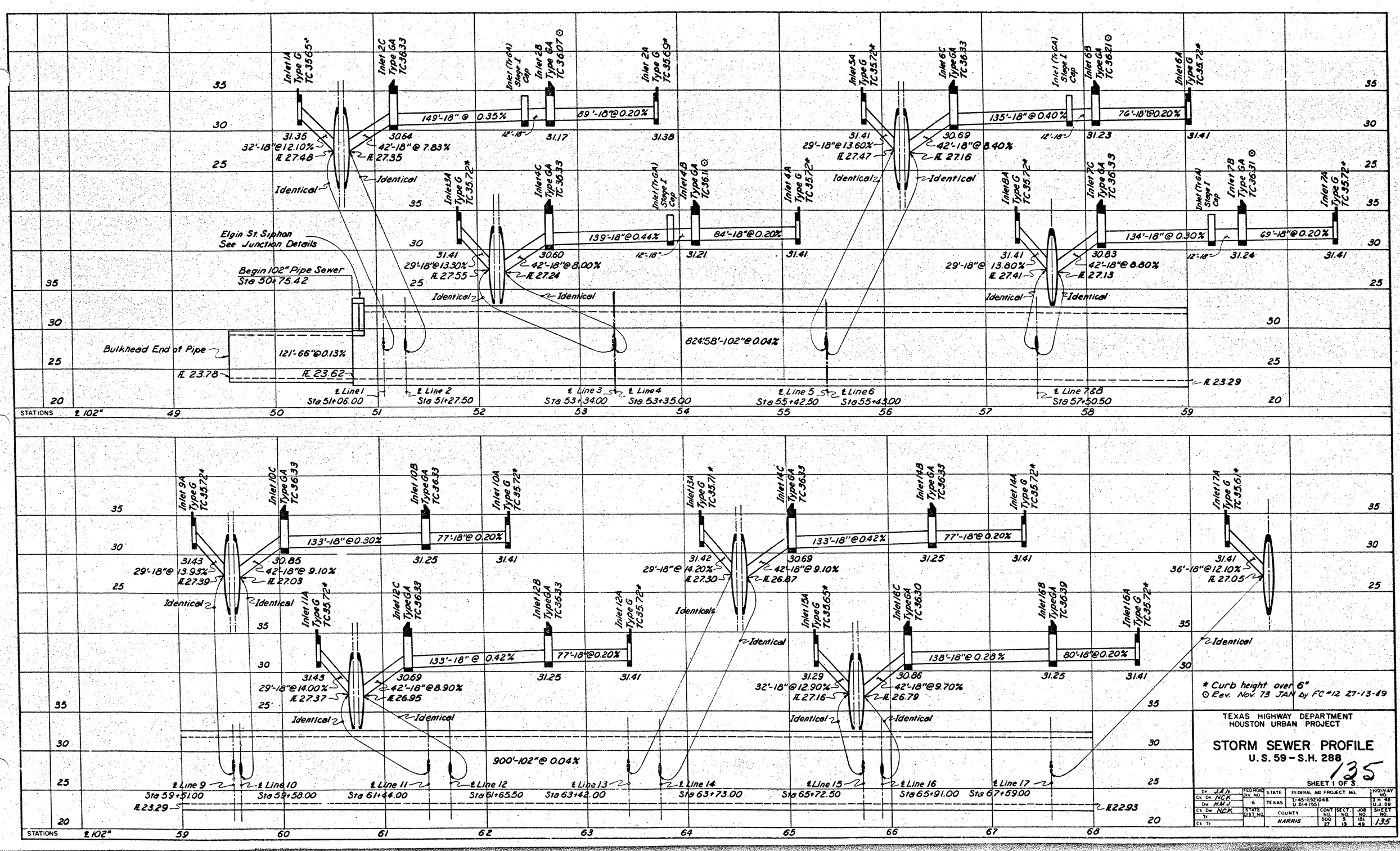
▲ Field Change #10 27-13-69

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PLAN 124

SHEET 6 OF 6

JAN	Drawn by	Date	FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
NCA	ORIGINAL	MAY 1967	6	TEXAS	I-45-1(92)046	134
HMJ	Rev. 5-21-68				U 514(5)51	
NCA	▲ Rev. Nov 68 CAD					
	* Rev. Field Change No. 4		STATE DIST. NO.	COUNTY	SHEET NO. / TOTAL SHEETS	HIGHWAY NO.
			12	Harris	52 / 73	IH 45 / US 59



* Curb height over 6"
⊙ Rev. Nov. 73 JAN by FC #12 27-13-49

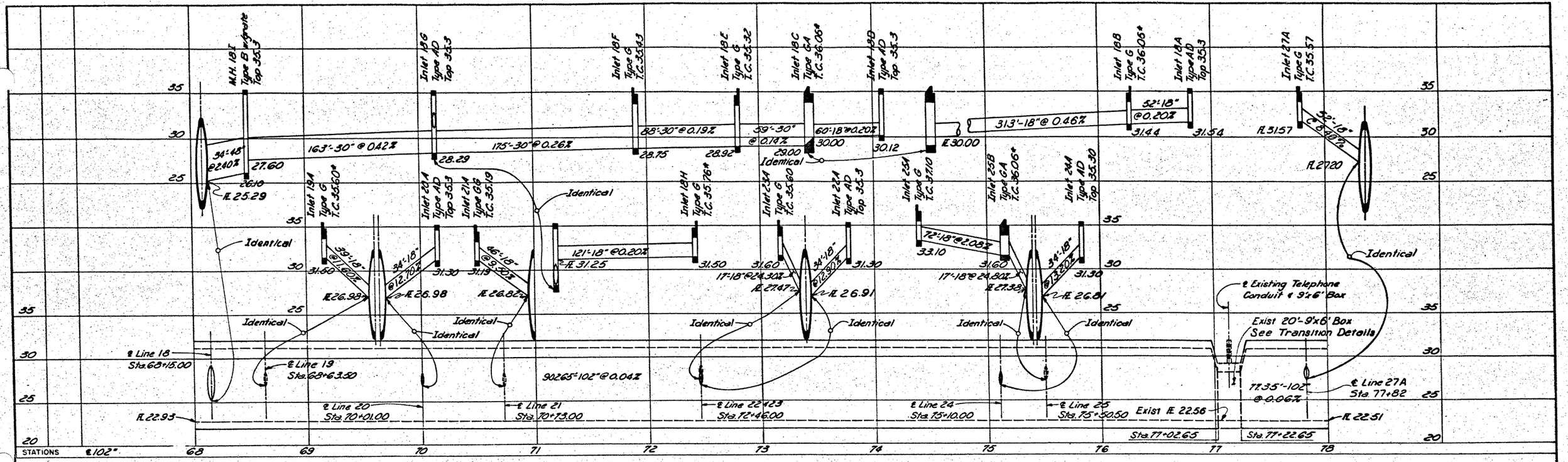
TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PROFILE
U.S. 59 – S.H. 288

135

SHEET 1 OF 3

Dr. J.A.N.	FEDERAL DIV. NO.	STATE	FEDERAL AID PROJECT NO.		HIGHWAY NO.
Ck. Dr. N.C.K.	6	TEXAS	U-45-1(192)046		I 10 59
Dw. H.M.V.			U 514 (150)		U.S. 59
Ck. Dw. N.C.K.	STATE DIST. NO.	COUNTY	CONT. NO.	SEC'T. NO.	JOB NO.	SHEET NO.
Tr.		HARRIS	500	5	151	135
Ck. Tr.			27	13	49	



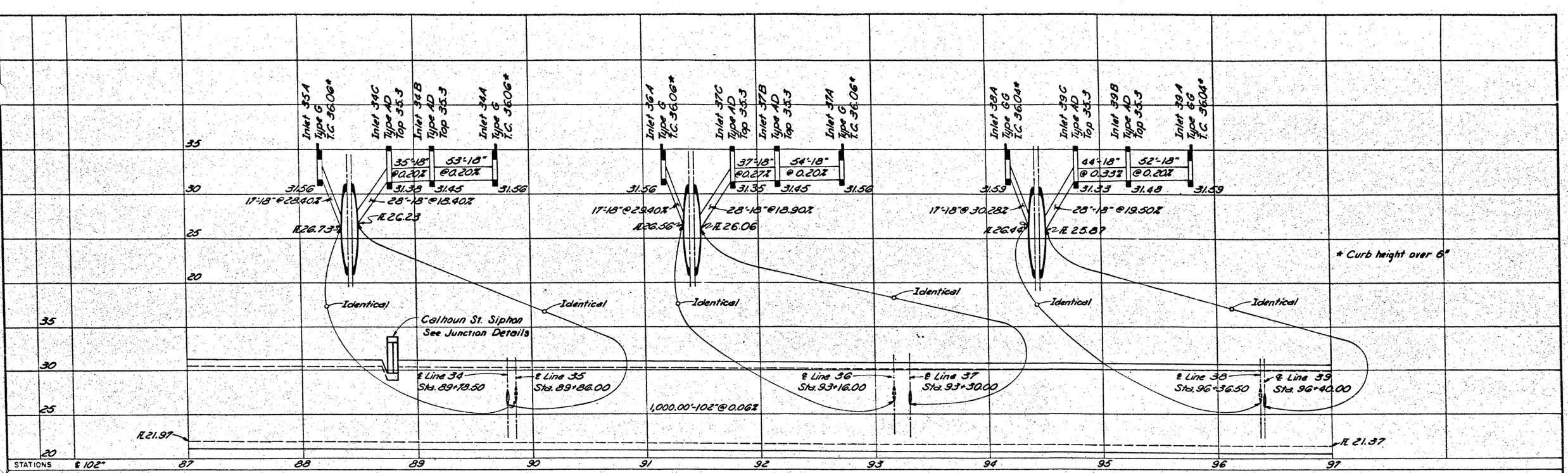
TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PROFILE
U.S. 59 - S.H. 288

SHEET 2 OF 3

136

Dr. J.A.N.	FED.ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.
Ck. Dr. N.C.K.	6	TEXAS	2-45-1(82)046	F.M. 45
Dr. M.G.A.			U.S.14(55)	U.S. 59
Ck. Dr. N.C.K.	STATE DIST. NO.	COUNTY	CONT. NO. / SEC'Y NO. / JOB NO.	SHEET NO.
Tr.		HARRIS	500 / 5 / 151	136
Ck. Tr.			27 / 13 / 48	



TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

STORM SEWER PROFILE
U.S. 59 - S.H. 288

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SHEET 3 OF 3

Dr. J.A.N.	FED.ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
Ck Dr. N.C.K.						T.H. 45 U.S. 59
Dw. M.G.A.	6	TEXAS	F-45-1(92)048 U 514 (55)			
Ck Dw. N.C.K.	STATE DIST. NO.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
Tr.		HARRIS	500 27	8 13	151 49	137
Ck Tr.						

℄ Chartres

66" pipe

30

S57°08'00"E

Exist. 90" pipe

M.H. 44U

42" pipe

Aband. Exist. 90" pipe

679'

Aband. Exist. 66" pipe

℄ 288 N.B.

℄ U.S. 59 N.B.

℄ Conn. B

℄ Elgin

℄ 288 Express

℄ Conn. A

℄ U.S. 59 S.B.

℄ 288 S.B.

Aband. Exist. 36" pipe

℄ 6'x3.5' Box Siphon
S57°08'00"E

Aband. Exist. 72" pipe

353.6'

M.H. IX

℄ 102" pipe
N 32°52'00" E

66" Pipe

Sta 50+80
℄ 102" Pipe

86.6'

9'R. Typ.

45° Typ.

℄ Hamilton St.

48" pipe

M.H. 46T

Exist. 30" pipe

18" pipe

42" pipe

℄ All Curved Sections
Δ=45°00'
R=9.00'
T=3.7279'
L=7.0686'

Exist. 90" pipe

M.H. 44U

Exist fl. 38.33

Natural Ground

℄ 288 N.B.

℄ U.S. 59 N.B.

Existing 72" to be abandoned

℄ 288 Express

M.H. IX, Top El. 36.7

℄ U.S. 59 S.B.

Identical

℄ 288 S.B.

M.H. 46T

Exist. 30" pipe

El. 40.00

fl. 29.95

fl. 29.79

fl. 29.84

℄ 102" pipe

112.8'@7.40%±

312'@0.05%

47'@0.10%

87.7'@11.58%

559.5'-6'x3.5' Box Siphon

50
45
40
35
30
25
20

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

SIPHON LAYOUT
ELGIN ST. 140

J.A.N.	F-AP-(19)(3)046		F.M. 59
M.C.K.	U 514(15)		U.S. 59
M.G.A.	500	151	140
	27	49	

℄ Chartres ℘

Abandon Exist. 39" Pipe Sewer

℄ US 59 N.B. ℘

℄ RAMP "G" ℘

P.C.C. 20+92.426

℄ US 59 S.B.

P.I. "G"

P.C. 87+04.988

℄ Ramp "H" ℘

P.C.C. 36+23.632

36" Pipe

M.H. 47 P

Exist. 60" Pipe

Abandon Exist. 60" Pipe ℘

M.H. 58 E

Exist. 60" Pipe

℄ Calhoun ℘
S 57° 07' 16" E

54" Pipe

Aband. Exist. 54" Pipe

860'

℄ RAMP "E" ℘

℄ RAMP "F" ℘

℄ 6'X3.5' Box Siphon
S 57° 07' 16" E

P.T. 88+38.321

℄ 102" Pipe Sewer
℄ US 59 S.B.

P.T. 21+92.426

45°

90°

53.0'

Δ = 45°00'
R = 9.00'
T = 3.7279'
L = 7.0686'

M.H. 2X
Sta. 88+77

35

149.0'

P.I. "C"

65.0'

N 53° 38' 00" E

Δ = 90°00'
R = 15.00'
T = 15.00'
L = 23.562'

℄ Hamilton ℘

28

50
45
40
35
30
25
20

M.H. 47 P

Natural Ground

M.H. 2X, Top El. 36.7

M.H. 58 E

Exist. 54" Storm Sewer to be Abandoned

Exist. 60" Pipe

Exist. El. 40.5 ±

℄ U.S. 59 N.B.

Identical

Exist. El. 39.9 ±

Exist. 60" Pipe

El. 29.93

El. 29.79

El. 29.82

El. 21.87

℄ U.S. 59 S.B.
℄ 102" Pipe

103.2' @ 10.24% ±

135' @ 0.10%

30' @ 0.10%

81.6' @ 13.25% ±

▲ 349.8' ± 6'X3.5' Box Siphon

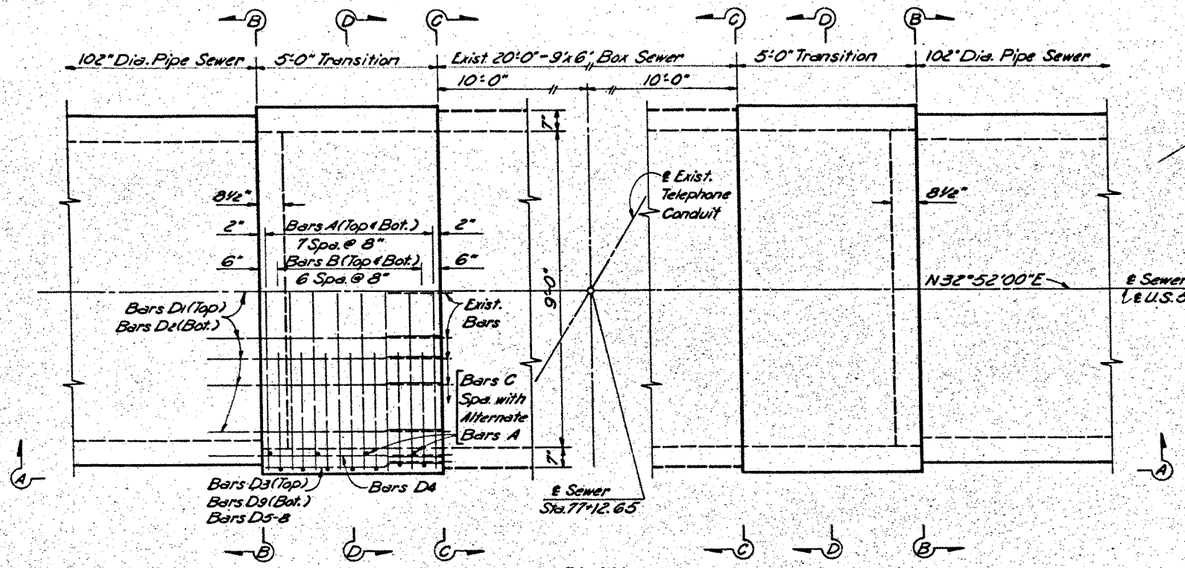
141-a

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

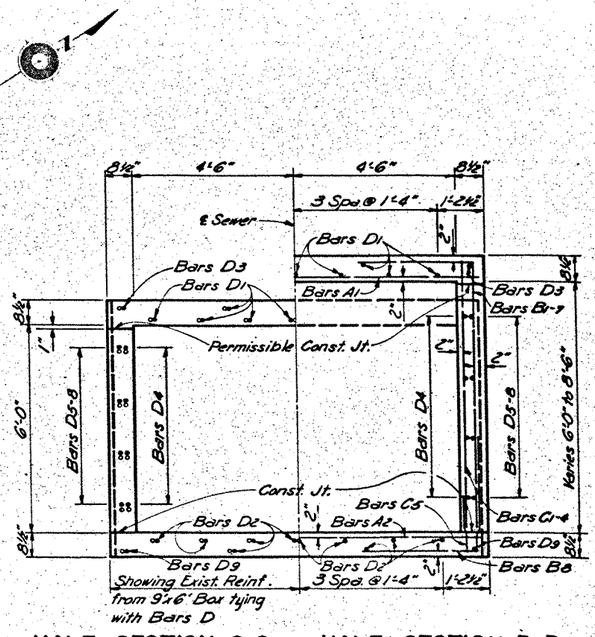
SIPHON LAYOUT
CALHOUN STREET

▲ Rev. June '70 GHV

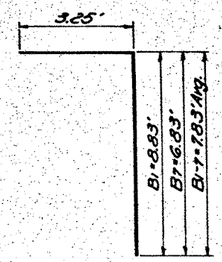
DRAWN J.A.N.	STATE	FEDERAL PROJECT NO.			HIGHWAY NO.
CHECKED N.C.K.		S-45-1(92)046			I.H. 45
TRACED D.M.F.		U 514(55)			U.S. 59
CHECKED 12	COUNTY HARRIS	CONT. NO. 500 27	SEC. NO. 13	JOB NO. 151 49	SHEET NO. 141



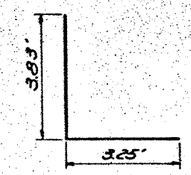
PLAN



HALF SECTION C-C HALF SECTION D-D



BARS B1-7

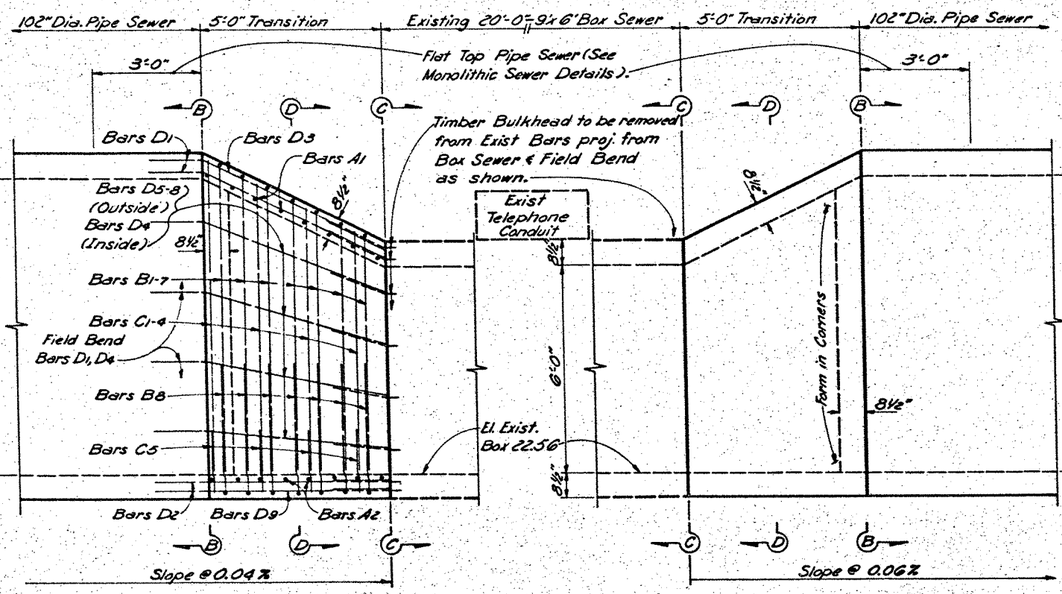


BARS B8

BILL OF REINF. STEEL

Bars	No.	Size	Length	Weight
A1	16	#7	10.17'	333
A2	16	#7	10.17'	333
B1-7	28	#6	Avg. 11.08'	466
B8	28	#6	7.08'	298
C1-4	16	#4	Avg. 8.08'	86
C5	16	#4	1.92'	21
D1	18	#5	7.08'	133
D2	18	#5	6.50'	122
D3	4	#5	5.47'	23
D4	16	#5	7.00'	117
D5-8	16	#5	Avg. 5.09'	85
D9	4	#5	4.88'	20
Total			* Lbs.	2,037

*For both Transitions



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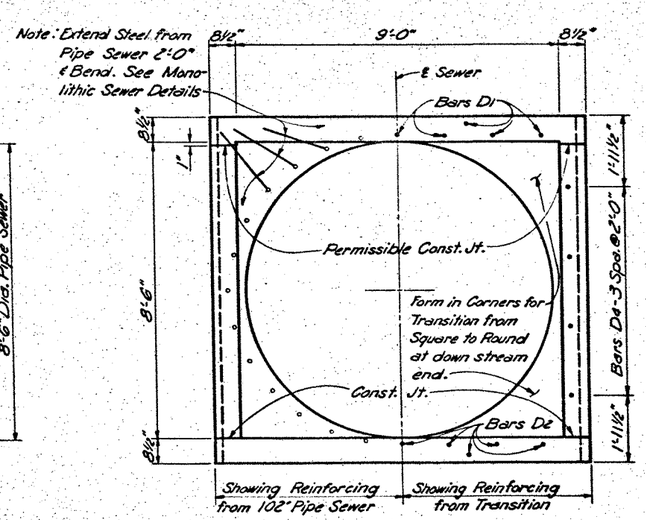
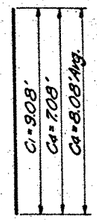
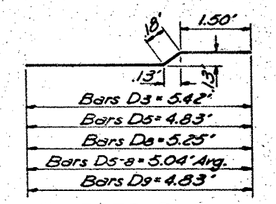


SECTION B-B



BARS C1-4



BARS D

Notes:

Concrete for transitions shall be the same type as used for pipe sewer and shall be placed monolithically with 102"dia. pipe.

Payment for transitions will be at unit price bid for 102" pipe sewer.

TEXAS HIGHWAY DEPARTMENT
HOUSTON URBAN PROJECT

TRANSITION DETAILS AT EXISTING 9'x6' BOX SEWER

146

Dr. J.A.N.	Drawing	Date	FED. ROAD Div. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
Ck. Dr. H.C.K.	ORIGINAL	MAY, 1967	6	TEXAS	S-48-(92)046 U 514(55)	146
Dr. M.G.A.			STATE DIST. NO.	COUNTY	CONT. NO.	SEC. NO.	JOB NO.	HIGHWAY NO.
Ck. Dr. H.C.K.					500	3	181	IH 45
Ys. -					27	19	49	U.S. 90
Ck. Ta. -								

APPENDIX D

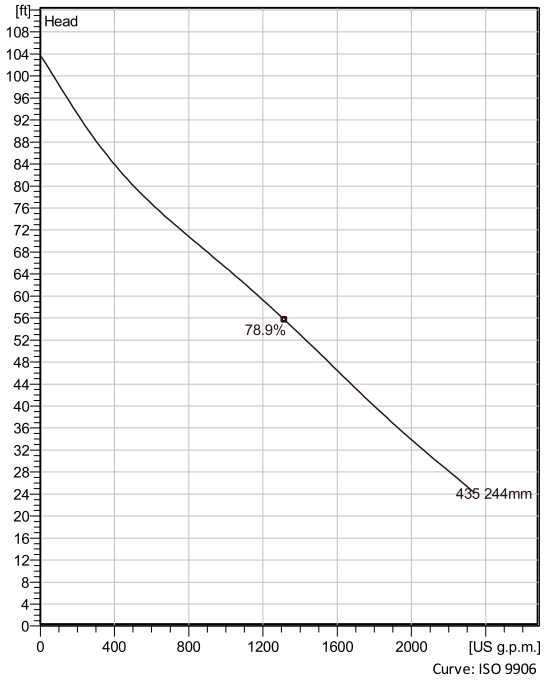
I-45 Pump Station Curves

NP 3171 MT 3~ 435

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3171.185 25-14-4AA-W 25hp

Installation type
P - Semi permanent, Wet

Impeller diameter
244 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
244 mm

Discharge diameter
6 inch

Inlet diameter
200 mm

Maximum operating speed
1755 rpm

Number of blades
2

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Hard-Iron ™

Project		**Created by**	Whit Kelley	
Block		**Created on**	2/2/2023	**Last update** 2/2/2023

NP 3171 MT 3~ 435

Technical specification

Motor - General

Motor number N3171.185 25-14-4AA-W 25hp	**Phases** 3~	**Rated speed** 1755 rpm	**Rated power** 25 hp
ATEX approved No	**Number of poles** 4	**Rated current** 30 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 185			

Motor - Technical

Power factor - 1/1 Load 0.89	**Motor efficiency - 1/1 Load** 88.0 %	**Total moment of inertia** 3.26 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.86	**Motor efficiency - 3/4 Load** 89.5 %	**Starting current, direct starting** 183 A	
Power factor - 1/2 Load 0.78	**Motor efficiency - 1/2 Load** 89.5 %	**Starting current, star-delta** 61 A	

Project	**Created by**	Whit Kelley		
Block	**Created on**	2/2/2023	**Last update**	2/2/2023

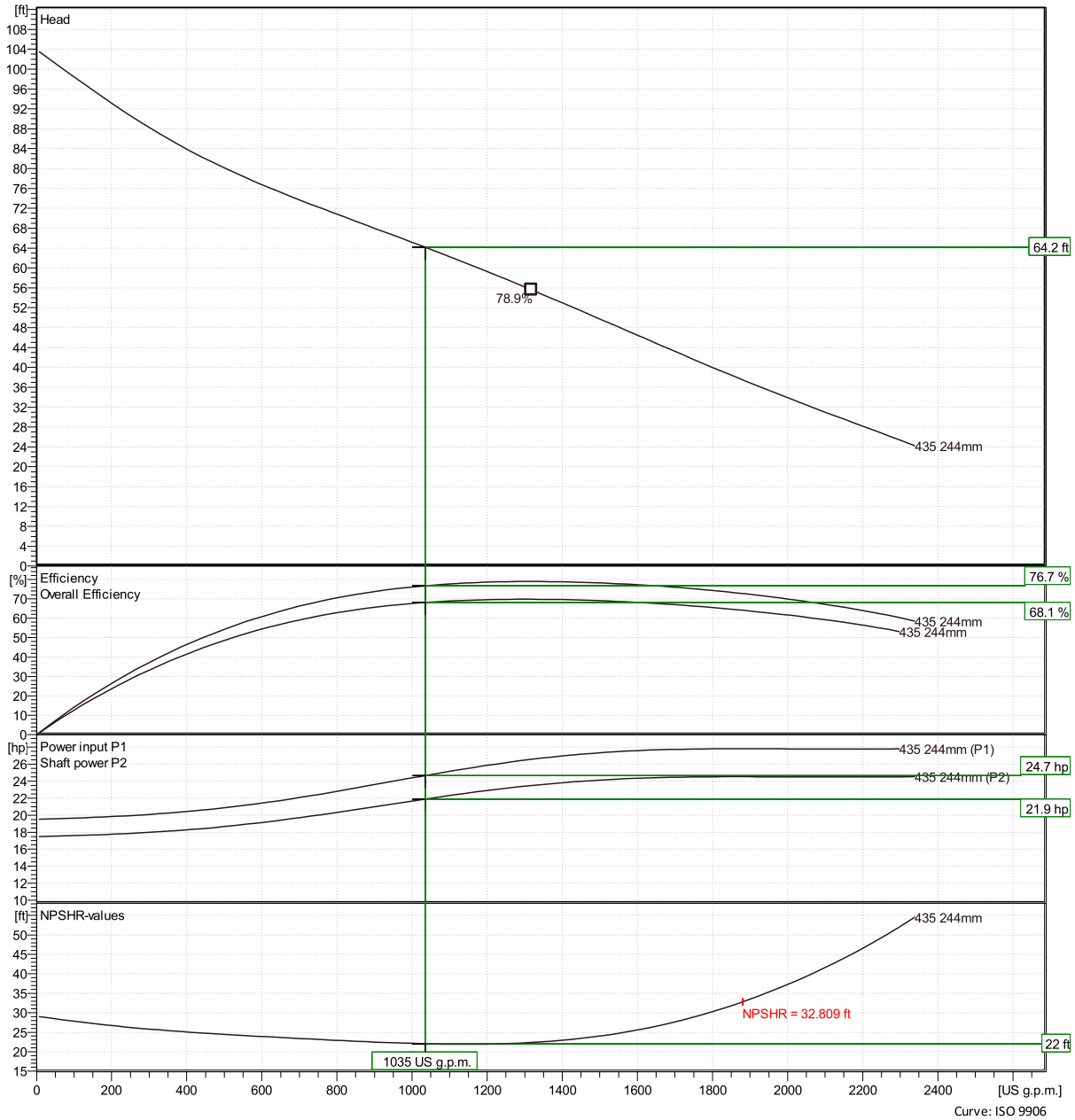
NP 3171 MT 3~ 435

Performance curve

Duty point

Flow	Head
1000 US g.p.m.	64.2 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

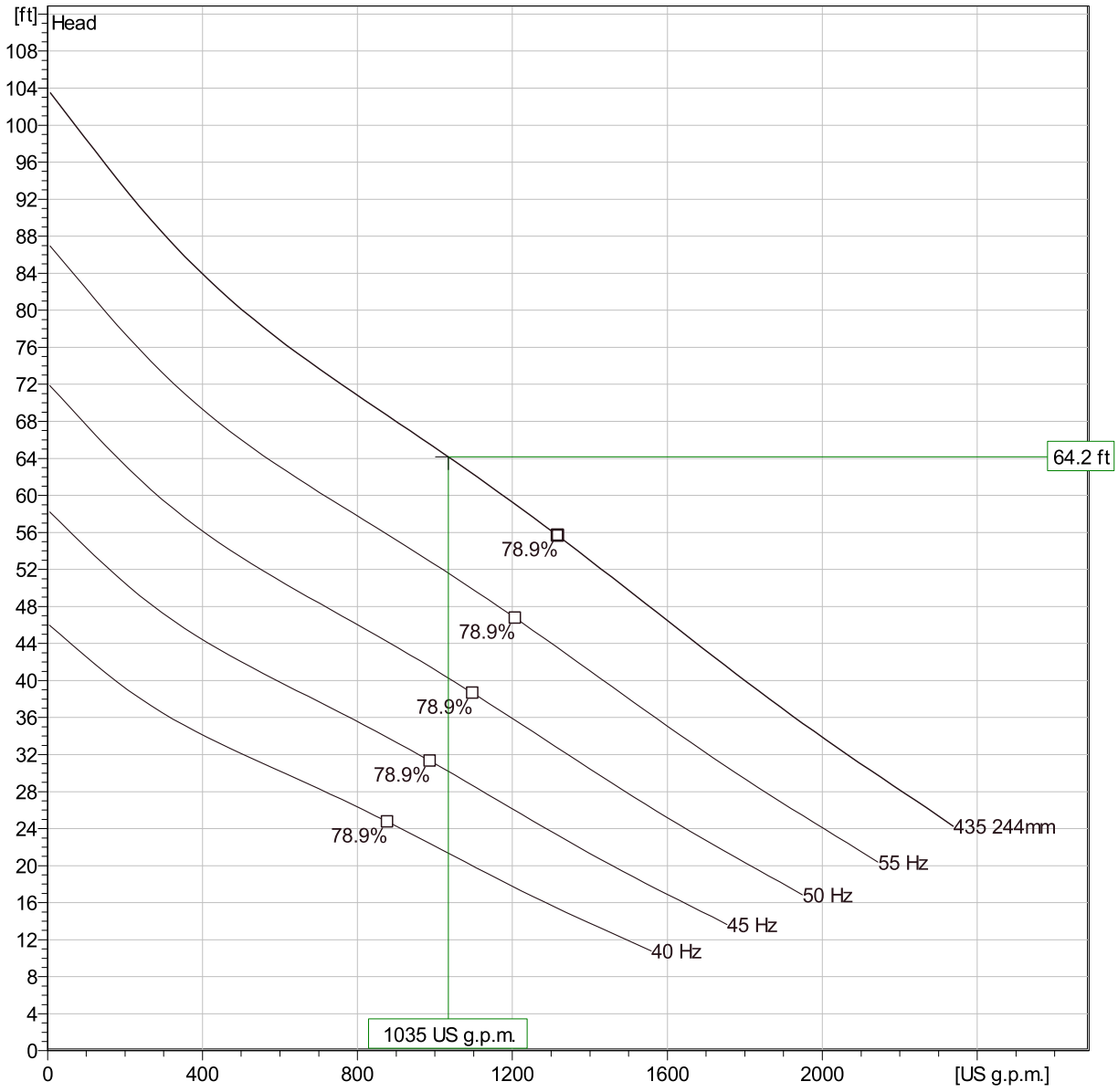
Whit Kelley

Created on 2/2/2023 **Last update** 2/2/2023

NP 3171 MT 3~ 435

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

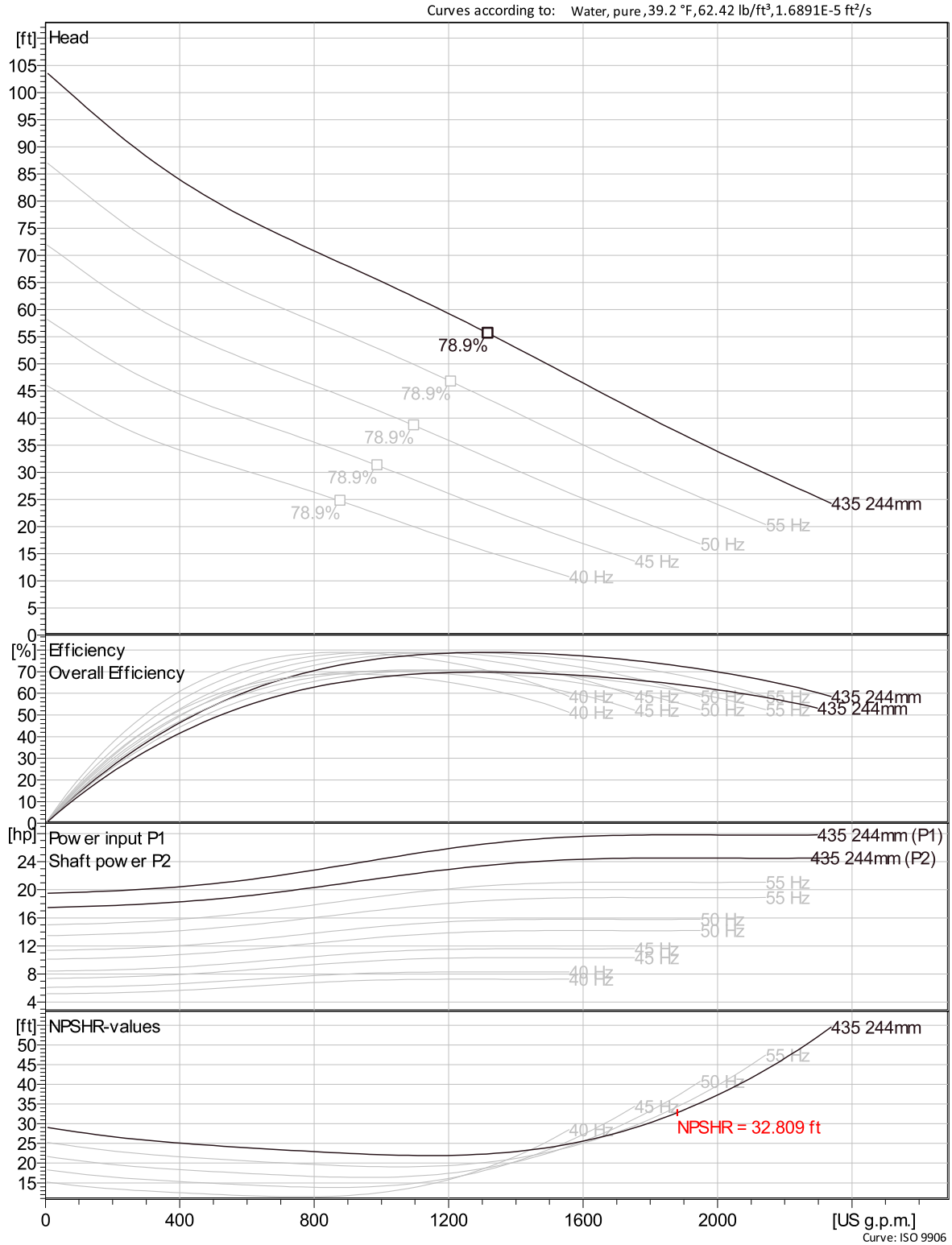
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US gal	ft
1	1000	64.2	21.7	1000	64.2	21.7	76.1 %	0.000303	22.1

Project		**Created by**	Whit Kelley		
Block		**Created on**	2/2/2023	**Last update**	2/2/2023

NP 3171 MT 3~ 435

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



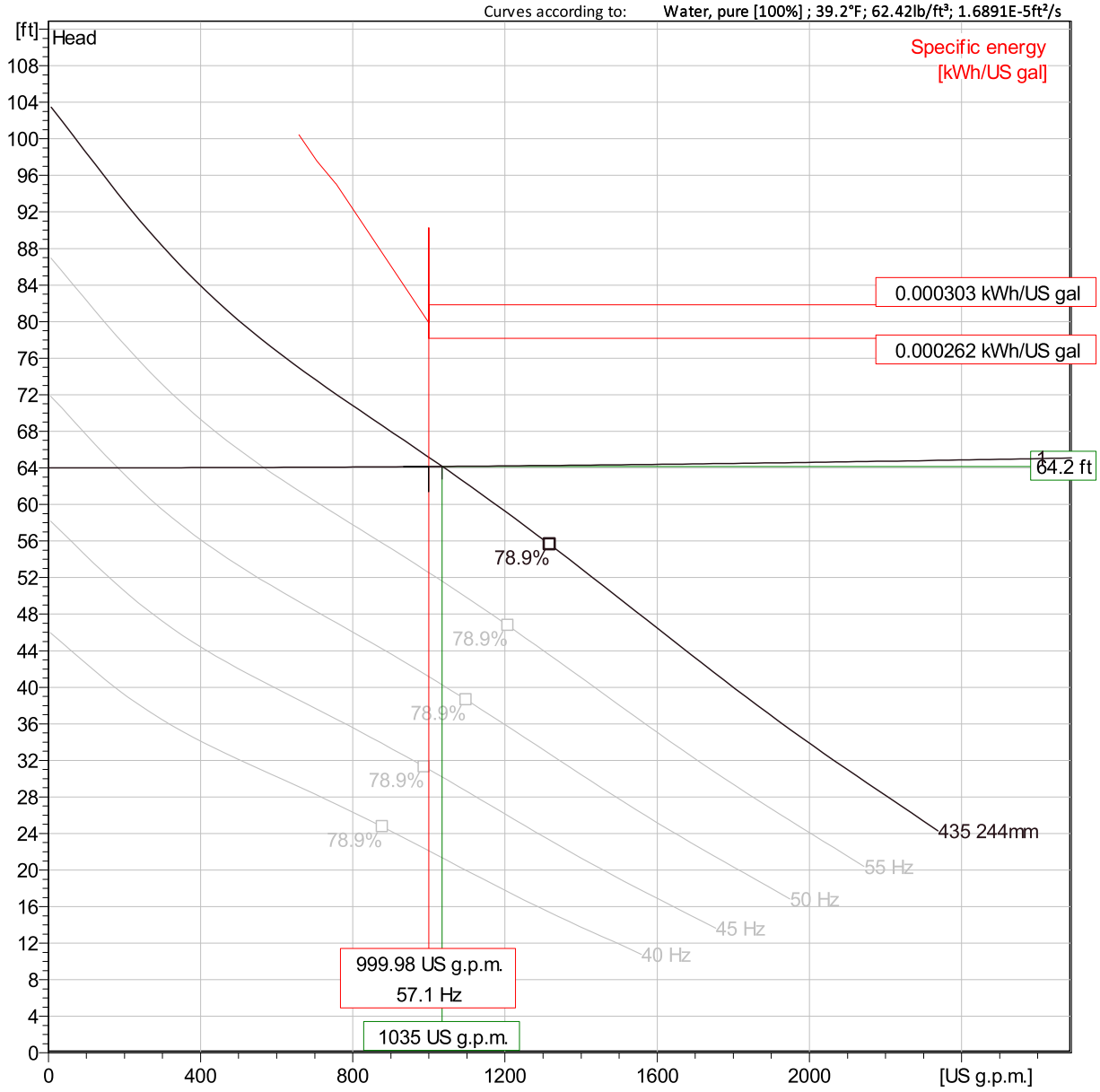
Curve: ISO 9906

Project		**Created by**	Whit Kelley		
Block		**Created on**	2/2/2023	**Last update**	2/2/2023

NP 3171 MT 3~ 435

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating Characteristics

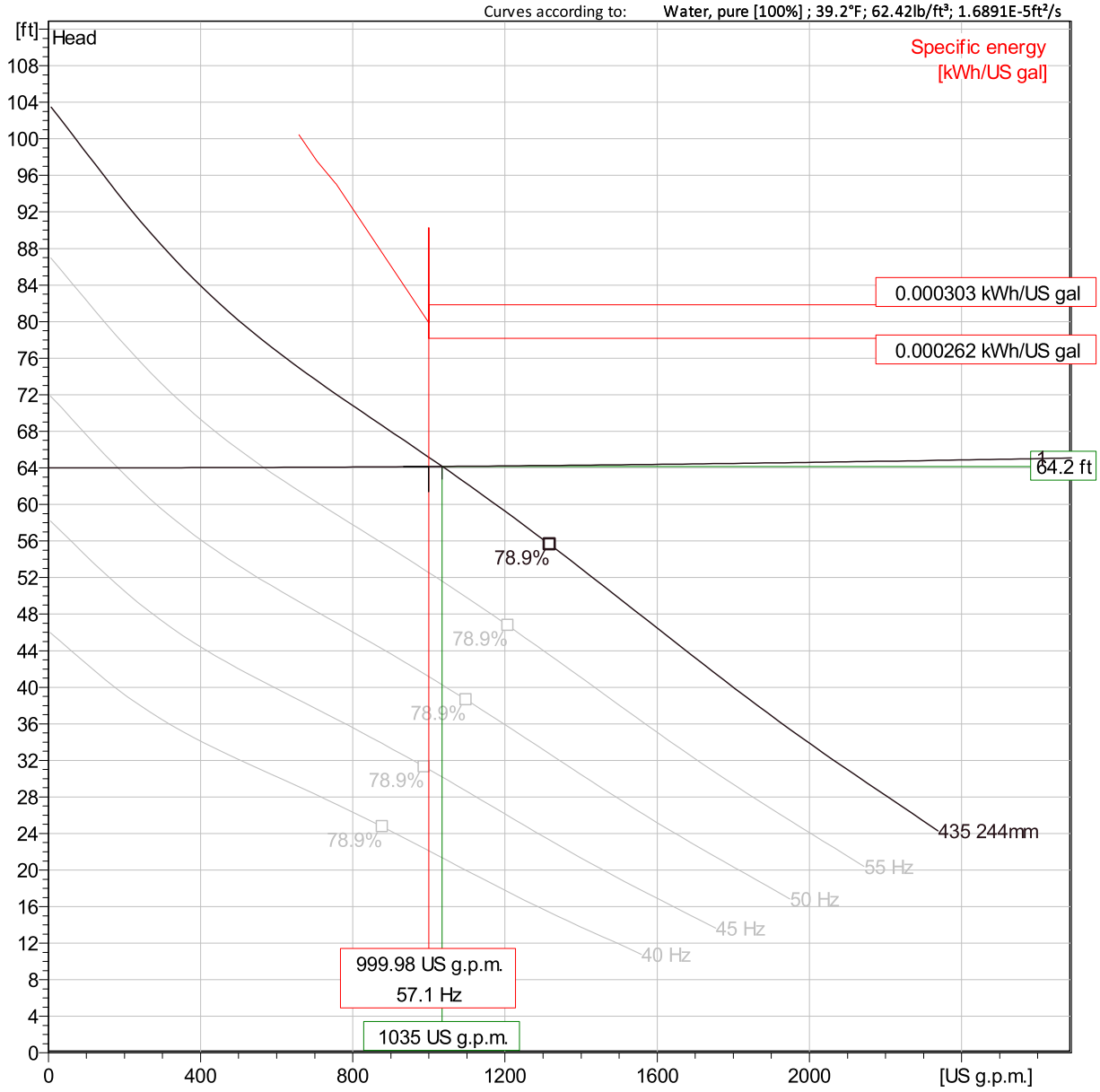
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US gal	ft
1	60 Hz	1000	64.2	21.7	1000	64.2	21.7	76.1 %	0.000303	22.1
1	55 Hz	566	64	14.8	566	64	14.8	61.9 %	0.000362	20.7
1	50 Hz	182	64	10.3	182	64	10.3	28.6 %	0.000787	19.8
1	45 Hz									

Project		**Created by**	Whit Kelley		
Block		**Created on**	2/2/2023	**Last update**	2/2/2023

NP 3171 MT 3~ 435

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



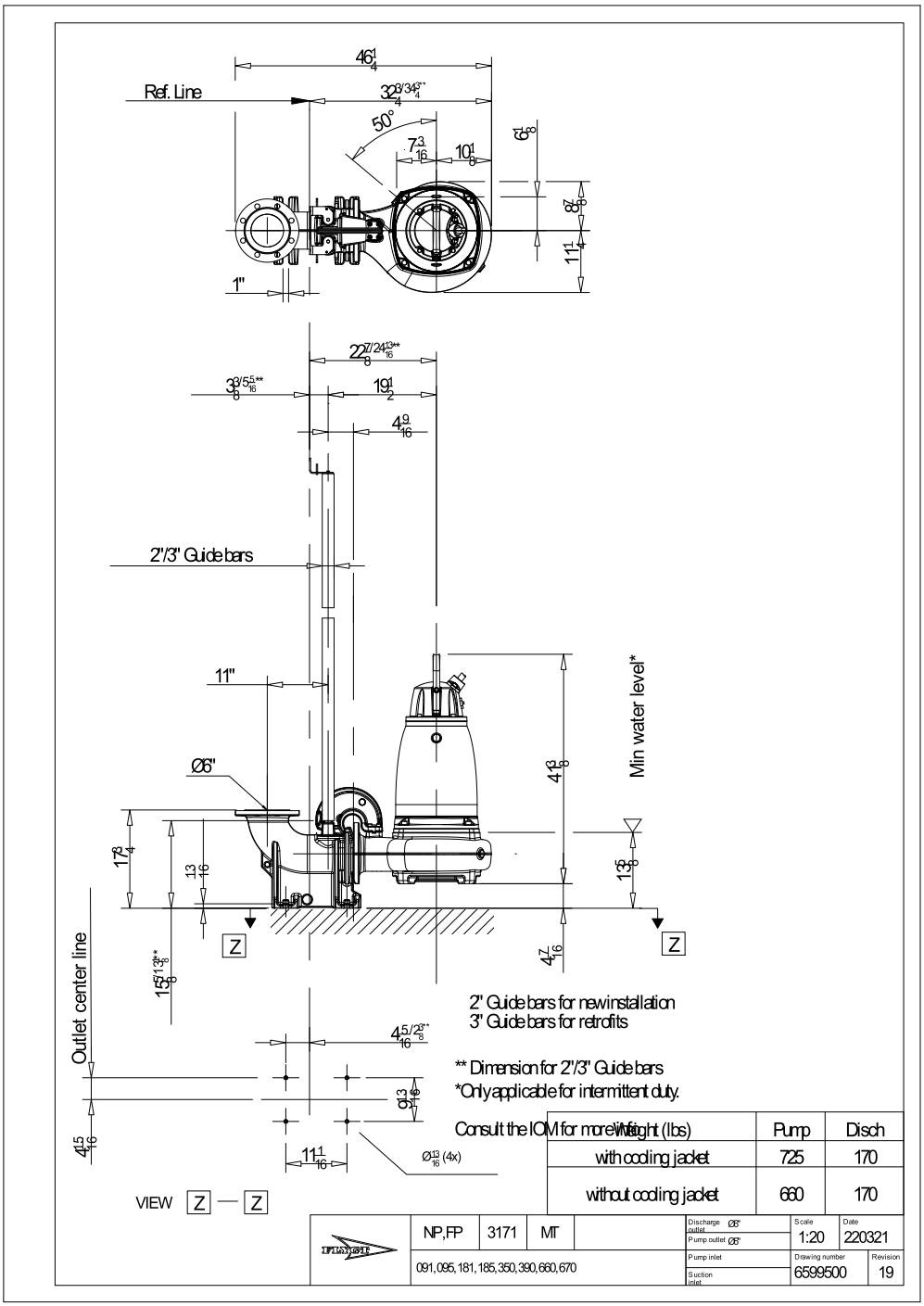
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US gal	ft
1	40 Hz									

Project		**Created by**	Whit Kelley		
Block		**Created on**	2/2/2023	**Last update**	2/2/2023

NP 3171 MT 3~ 435

Dimensional drawing



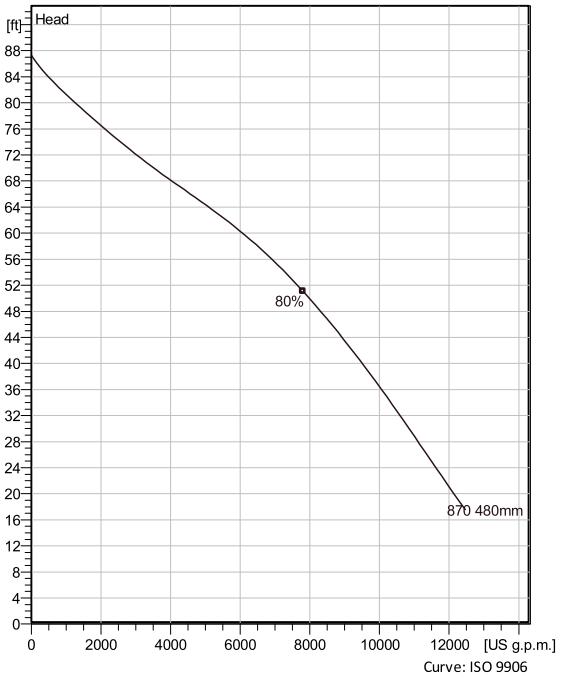
Project	**Created by**	Whit Kelley	
Block	**Created on**	2/2/2023	**Last update** 2/2/2023

NP 3400/706 3~ 870

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N0706.000 43-30-8ID-W 135hp

Installation type
P - Semi permanent, Wet

Impeller diameter
480 mm

Discharge diameter
16 inch

Pump information

Impeller diameter
480 mm

Discharge diameter
16 inch

Inlet diameter
500 mm

Maximum operating speed
880 rpm

Number of blades
3

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Grey cast iron

Project	Xylect-20585408	**Created by**	Patrick Palacios		
Block		**Created on**	5/17/2023	**Last update**	5/17/2023

NP 3400/706 3~ 870

Technical specification

Motor - General

Motor number N0706.000 43-30-8ID-W 135hp	**Phases** 3~	**Rated speed** 880 rpm	**Rated power** 135 hp
ATEX approved No	**Number of poles** 8	**Rated current** 172 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 000	**Closed loop cooling system**		

Motor - Technical

Power factor - 1/1 Load 0.79	**Motor efficiency - 1/1 Load** 93.1 %	**Total moment of inertia** 83.3 lb ft²	**Starts per hour max.** 10
Power factor - 3/4 Load 0.75	**Motor efficiency - 3/4 Load** 94.0 %	**Starting current, direct starting** 710 A	
Power factor - 1/2 Load 0.66	**Motor efficiency - 1/2 Load** 94.1 %	**Starting current, star-delta** 237 A	

Project	Xylect-20585408	**Created by**	Patrick Palacios		
Block		**Created on**	5/17/2023	**Last update**	5/17/2023

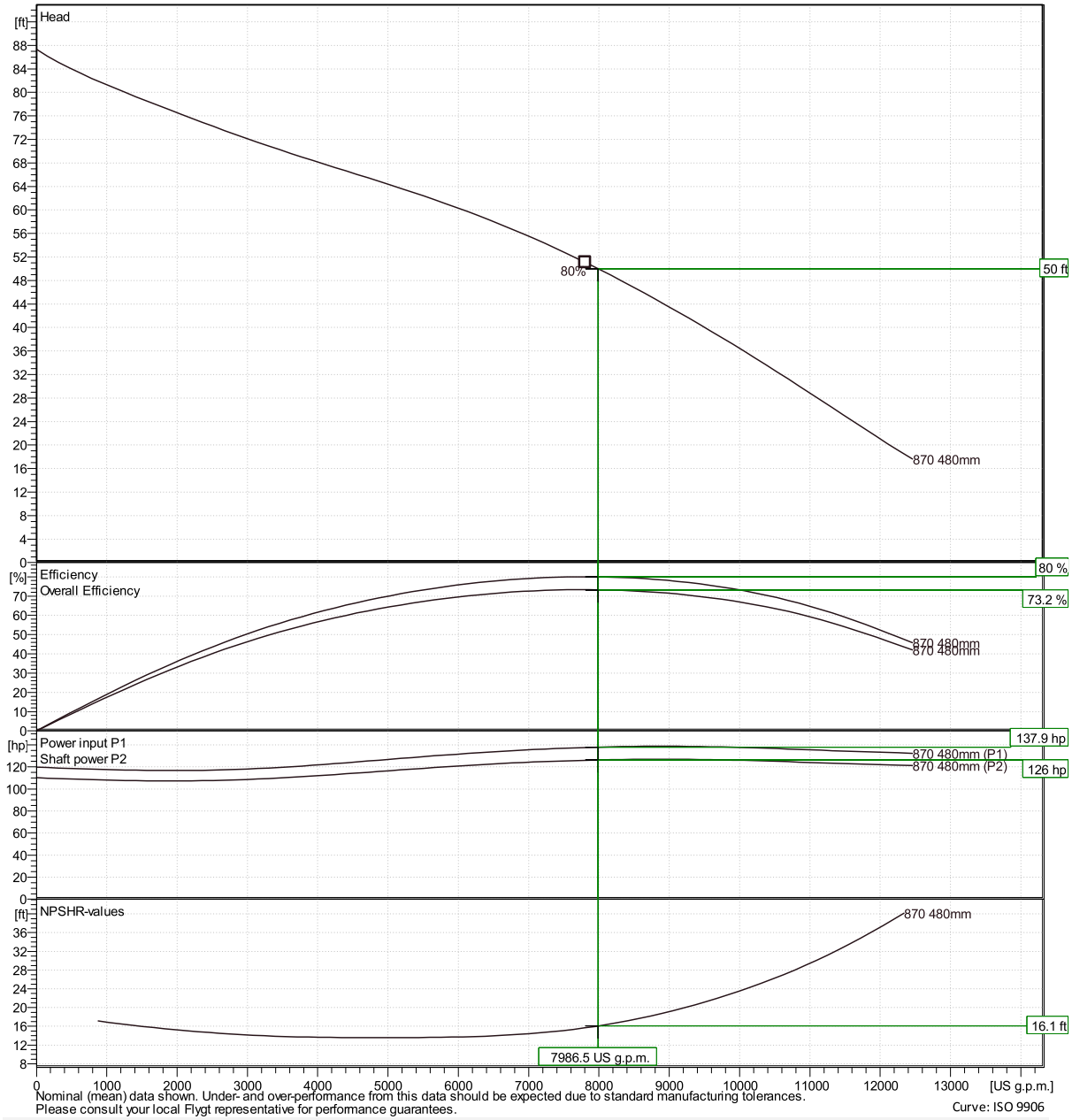
NP 3400/706 3~ 870

Performance curve

Duty point

Flow	Head
8000 US g.p.m.	50 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

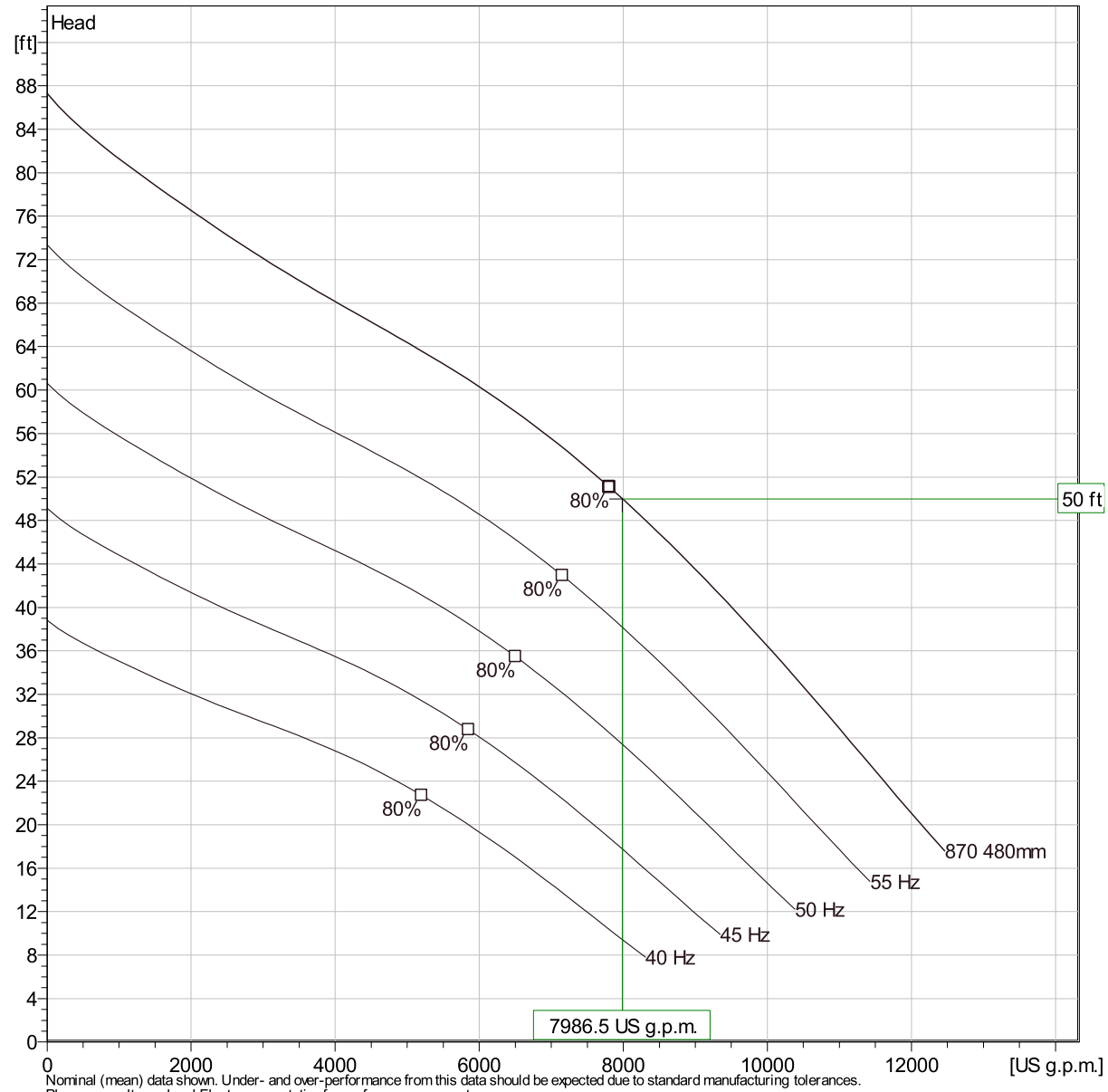
Curve: ISO 9906

Xylect-20585408		Patrick Palacios	
	Created on	5/17/2023 **Last update**	5/17/2023

NP 3400/706 3~ 870

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

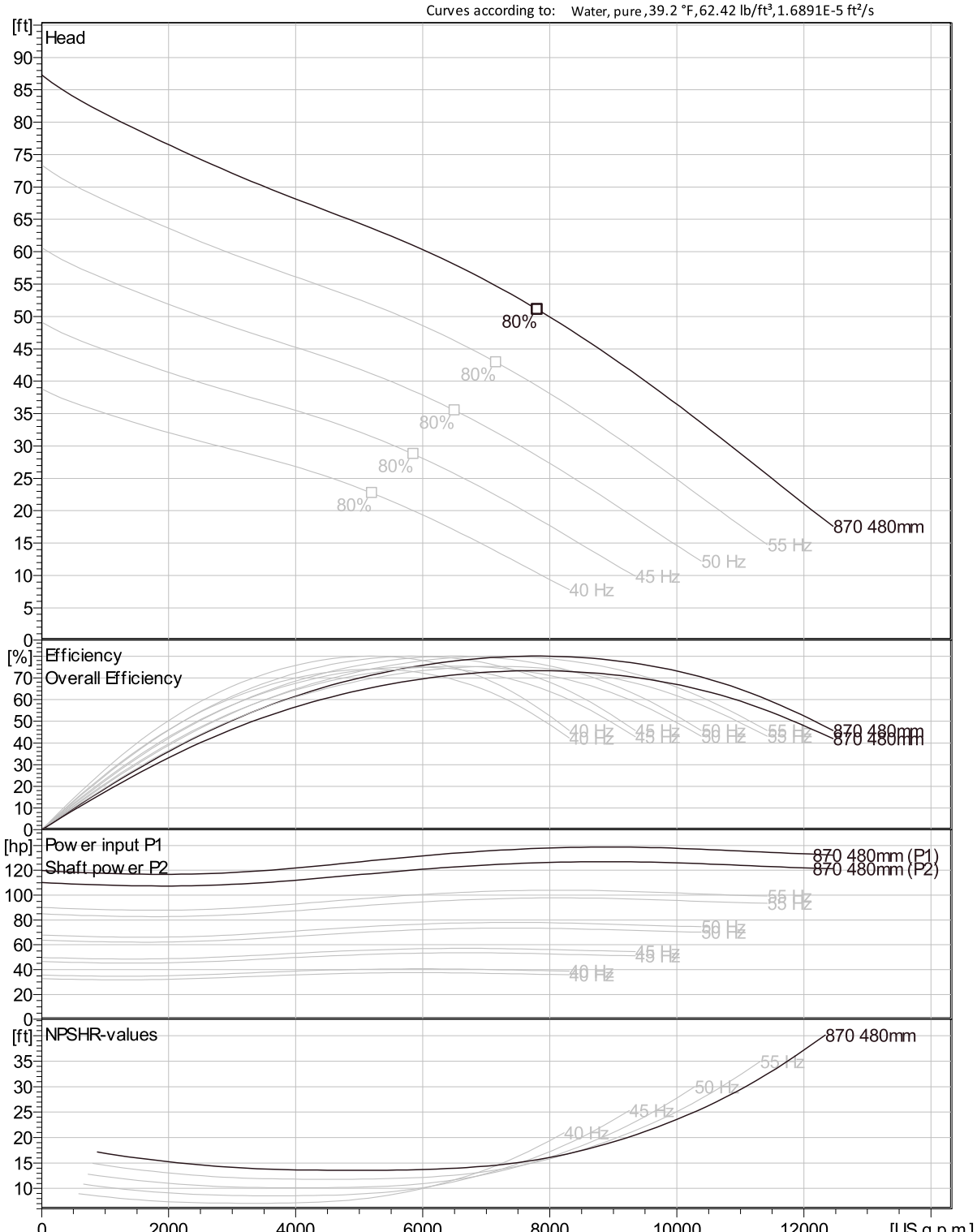
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	8000	50	126	8000	50	126	80 %	214	16.1

Project		**Created by**	Patrick Palacios		
Block	Xylect-20585408	**Created on**	5/17/2023	**Last update**	5/17/2023

NP 3400/706 3~ 870

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

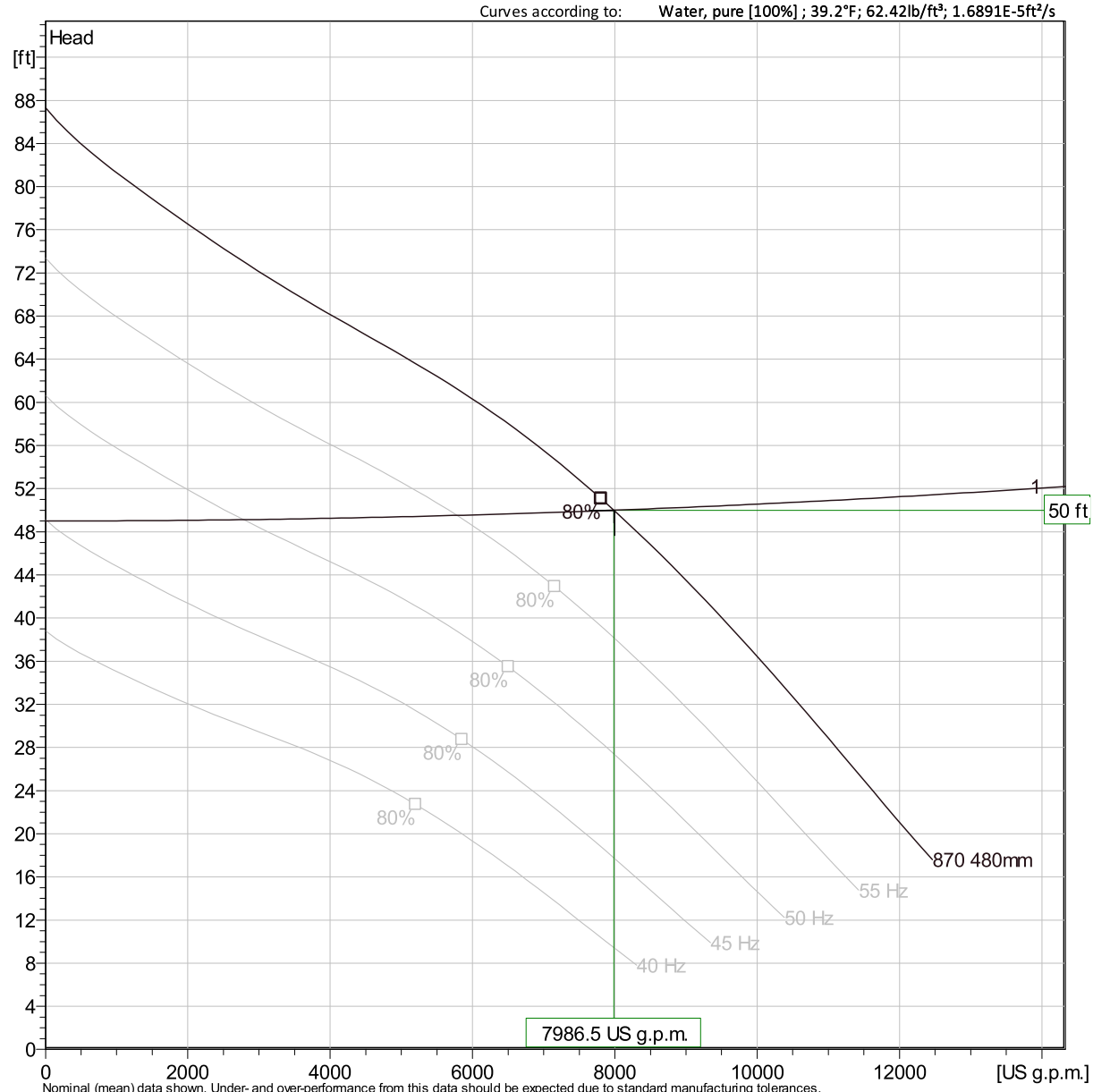
Curve: ISO 9906

Project	Xylect-20585408	**Created by**	Patrick Palacios		
Block		**Created on**	5/17/2023	**Last update**	5/17/2023

NP 3400/706 3~ 870

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating Characteristics

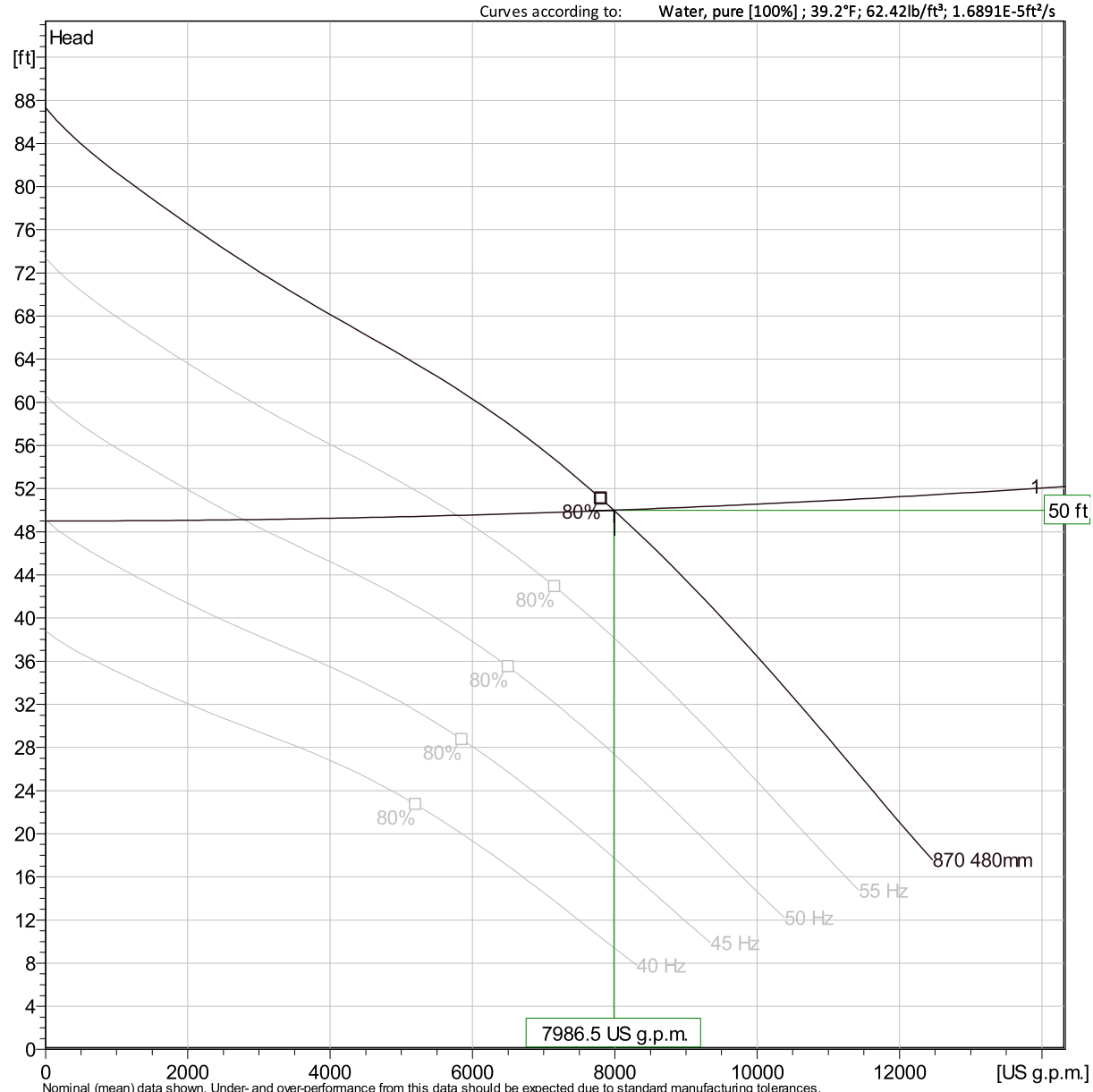
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	8000	50	126	8000	50	126	80 %	214	16.1
1	55 Hz	5780	49.5	93.9	5780	49.5	93.9	77.1 %	215	12.1
1	50 Hz	2780	49.1	63.4	2780	49.1	63.4	54.5 %	301	10.4
1	45 Hz	19.1	49	46.5	19.1	49	46.5	0.51 %	32400	

Project	Xylect-20585408	**Created by**	Patrick Palacios		
Block		**Created on**	5/17/2023	**Last update**	5/17/2023

NP 3400/706 3~ 870

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

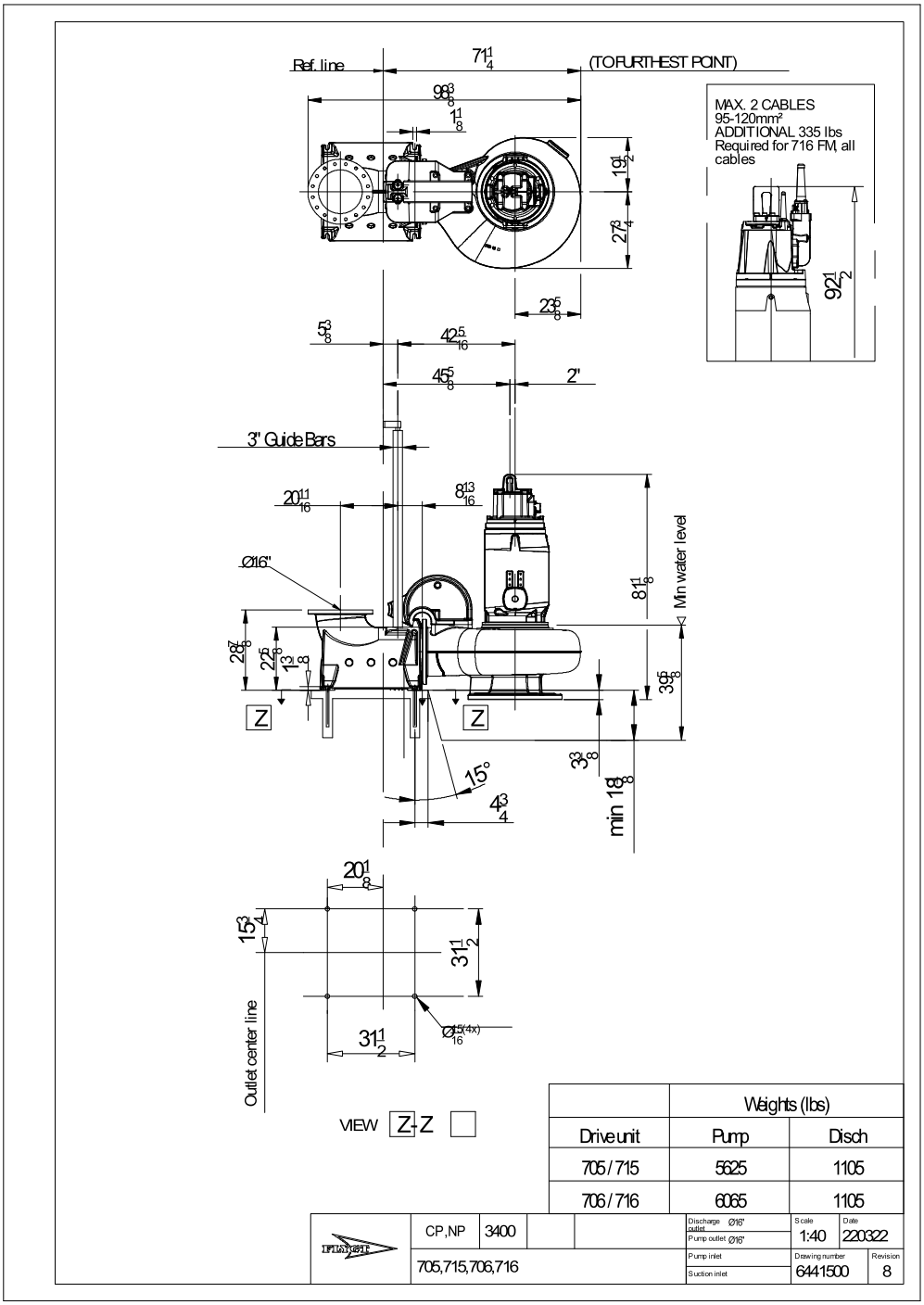
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project	Xylect-20585408	**Created by**	Patrick Palacios		
Block		**Created on**	5/17/2023	**Last update**	5/17/2023

NP 3400/706 3~ 870

Dimensional drawing



	Weights (lbs)	
Drive unit	Pump	Disch
705 / 715	5625	1105
706 / 716	6065	1105

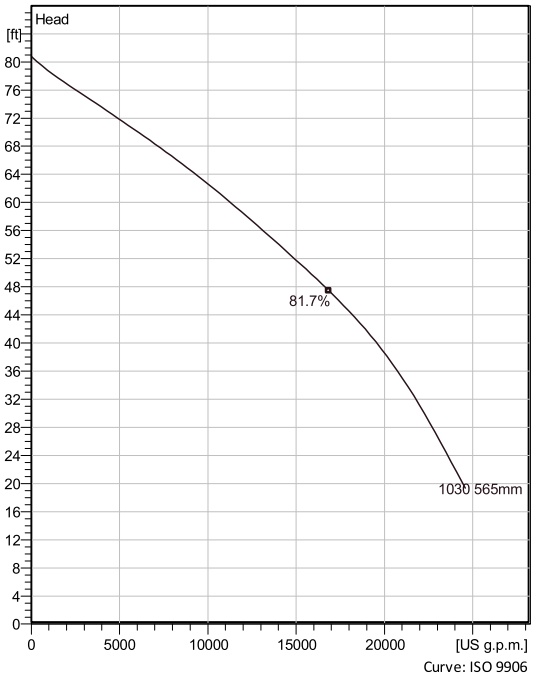
Project	Xylect-20585408	**Created by**	Patrick Palacios
Block		**Created on**	5/17/2023 **Last update** 5/17/2023

CP 3501/836 3~ 1030

Shrouded single or multi-channel impeller pumps with large throughlets and single volute pump casing for liquids containing solids and fibres. Cast iron design with double sealing technology. Some models available as stainless steel versions.

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
C0836.000 54-52-10ID-W 250hp

Installation type
P - Semi permanent, Wet

Impeller diameter
565 mm

Discharge diameter
20 inch

Pump information

Impeller diameter
565 mm

Discharge diameter
20 inch

Inlet diameter
800 mm

Maximum operating speed
715 rpm

Number of blades
3

Throughlet diameter
4 5/16 inch

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Grey cast iron

Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

CP 3501/836 3~ 1030

Technical specification

Motor - General

Motor number C0836.000 54-52-10ID-W 250hp	**Phases** 3~	**Rated speed** 715 rpm	**Rated power** 250 hp
ATEX approved No	**Number of poles** 10	**Rated current** 355 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 000	**Closed loop cooling system**		

Motor - Technical

Power factor - 1/1 Load 0.69	**Motor efficiency - 1/1 Load** 95.0 %	**Total moment of inertia** 322 lb ft²	**Starts per hour max.** 10
Power factor - 3/4 Load 0.61	**Motor efficiency - 3/4 Load** 95.0 %	**Starting current, direct starting** 2110 A	
Power factor - 1/2 Load 0.49	**Motor efficiency - 1/2 Load** 94.1 %	**Starting current, star-delta** 702 A	

Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

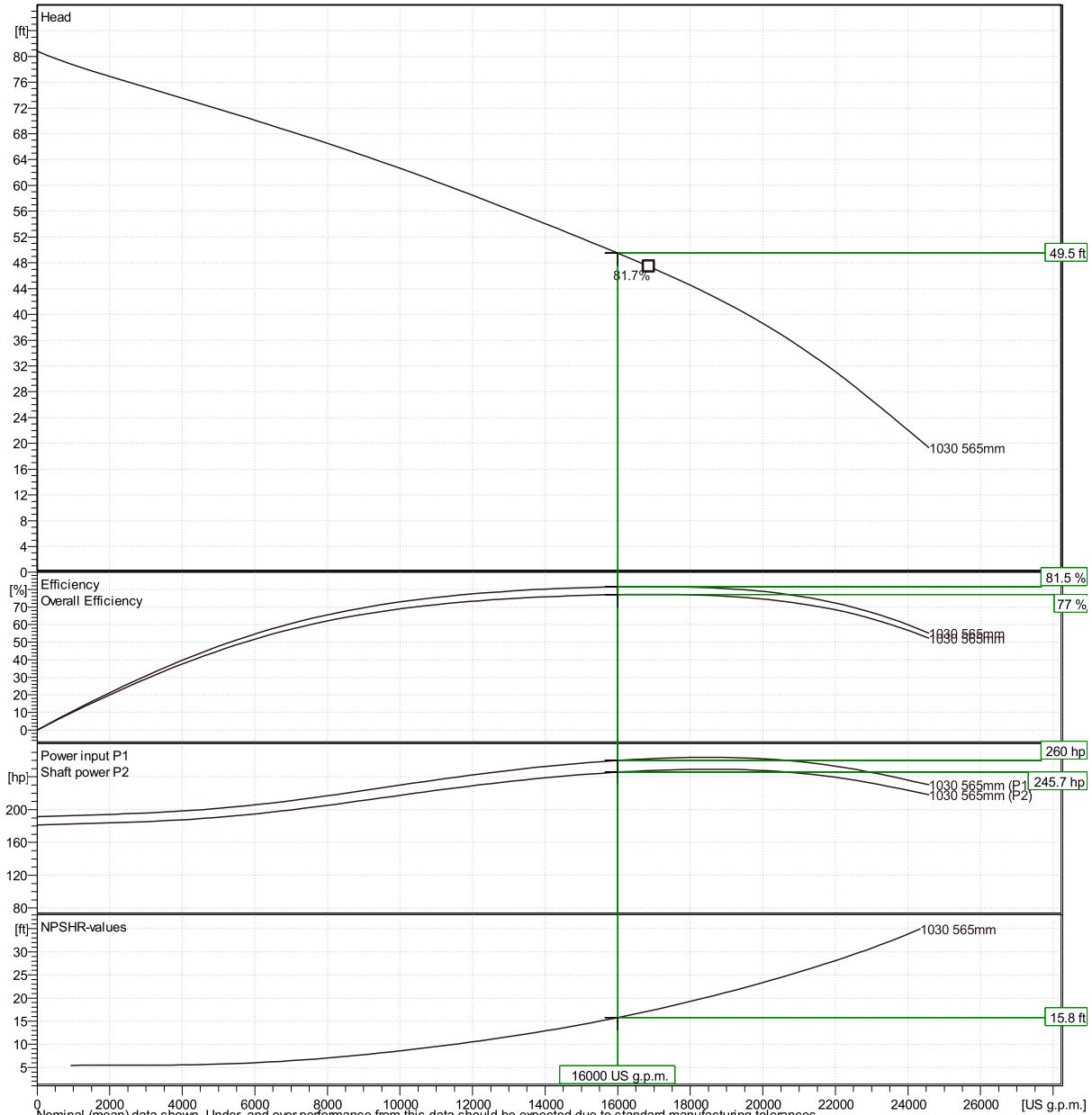
CP 3501/836 3~ 1030

Performance curve

Duty point

Flow	Head
16000 US g.p.m.	49.5 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

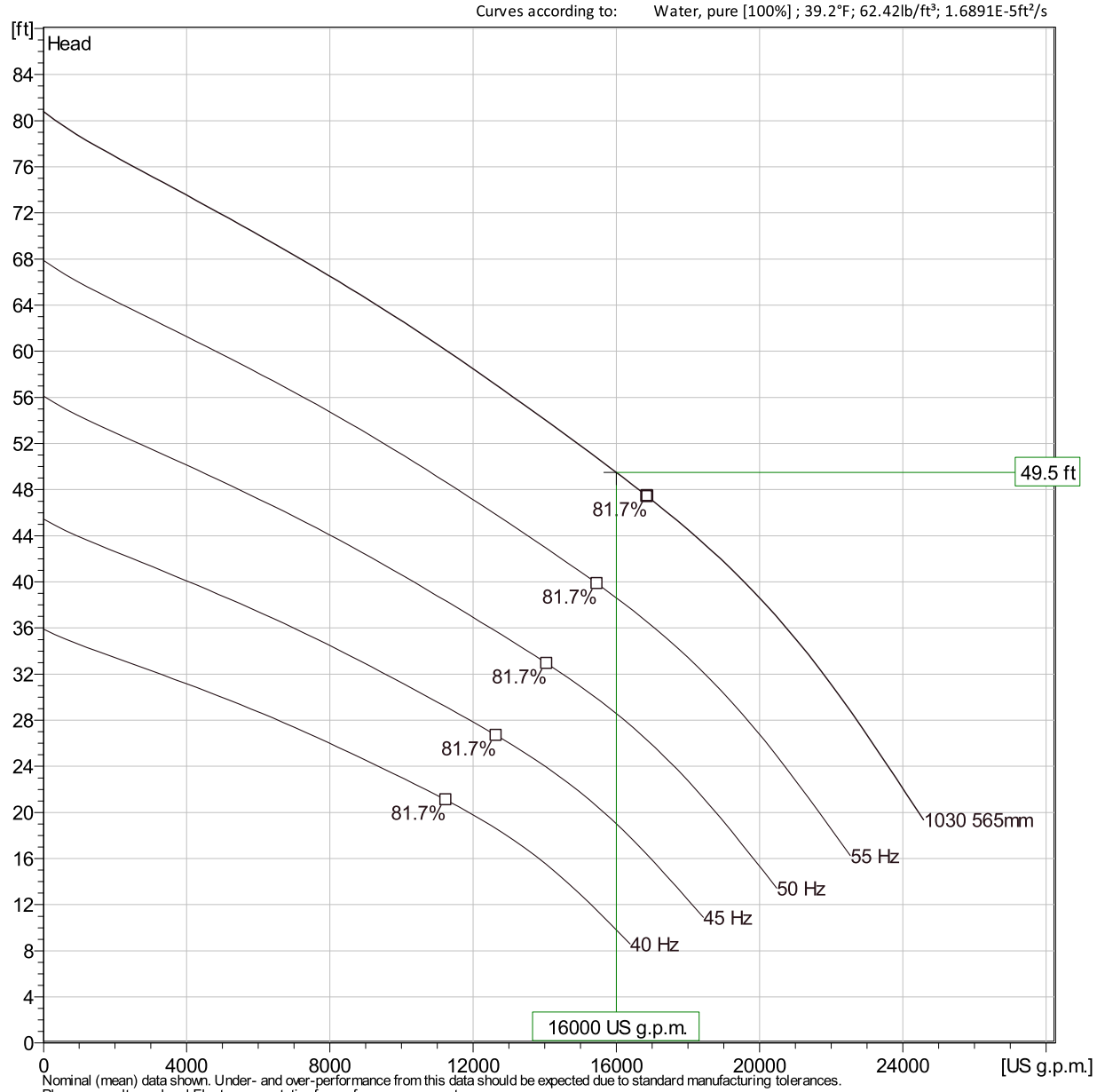
Xylect-20536952 Patrick Palacios

Created on 5/8/2023 **Last update** 5/8/2023

CP 3501/836 3~ 1030

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

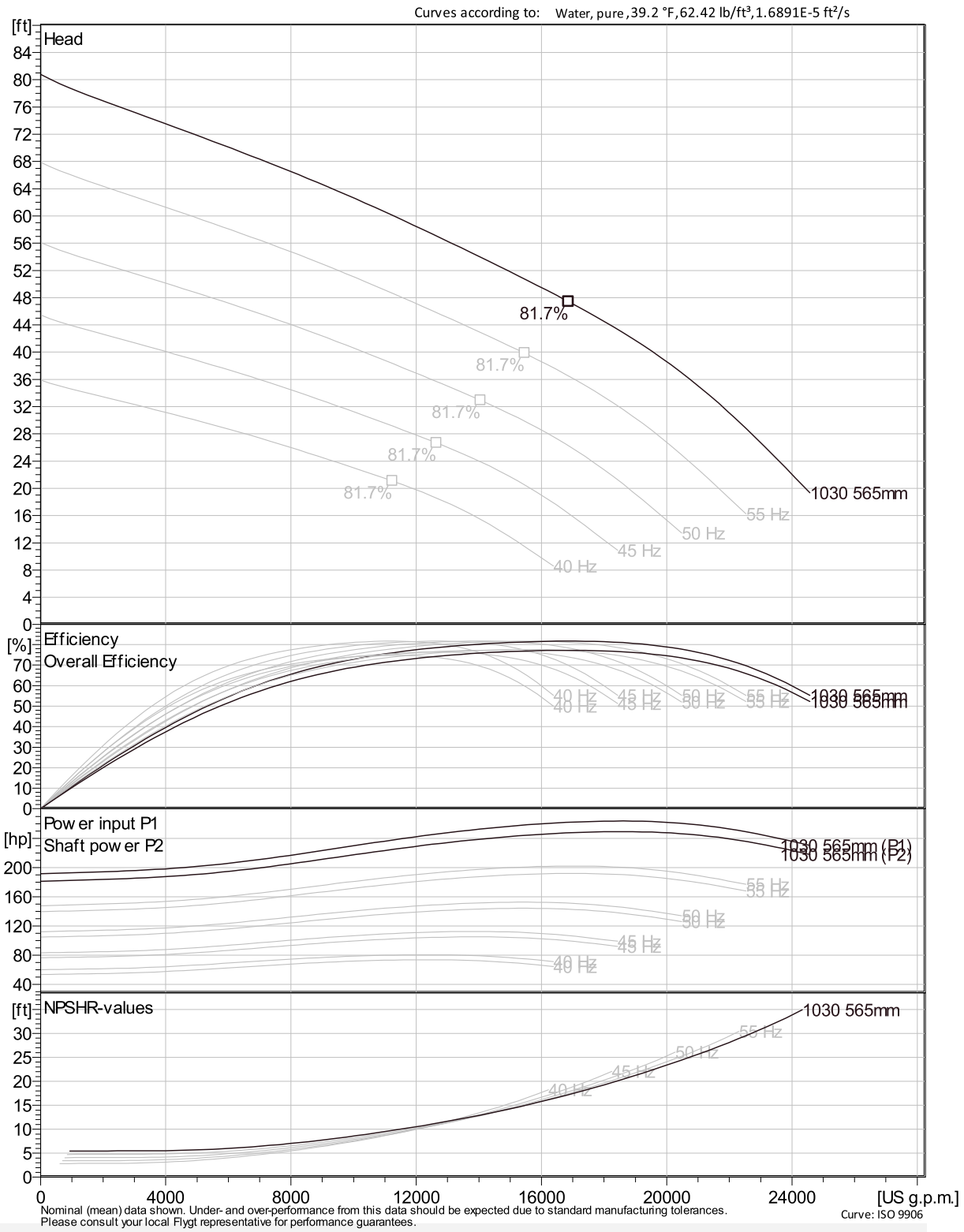
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	16000	49.5	246	16000	49.5	246	81.5 %	202	15.8

Project		**Created by**	Patrick Palacios		
Block	Xylect-20536952	**Created on**	5/8/2023	**Last update**	5/8/2023

CP 3501/836 3~ 1030

VFD Curve



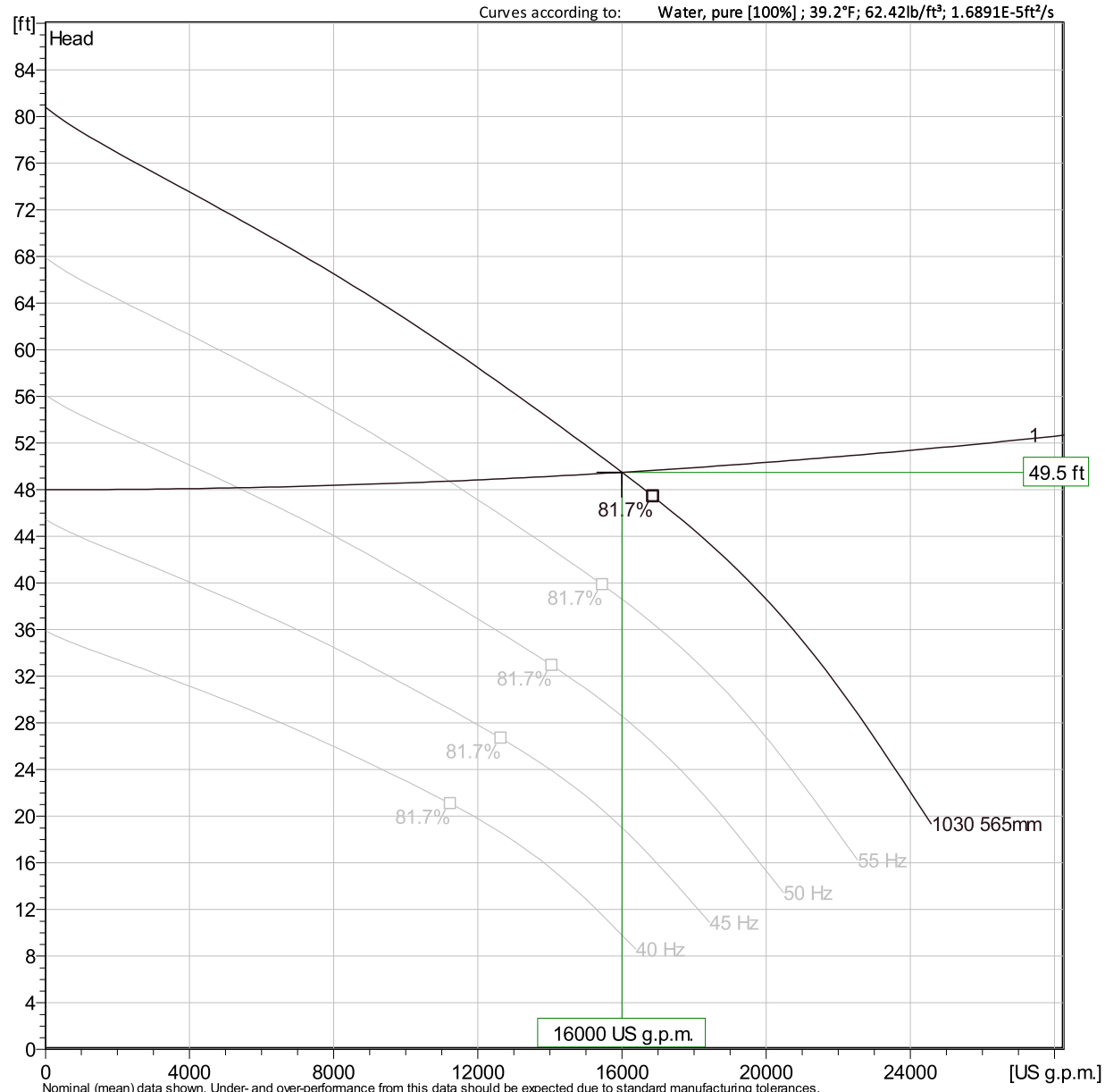
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

CP 3501/836 3~ 1030

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

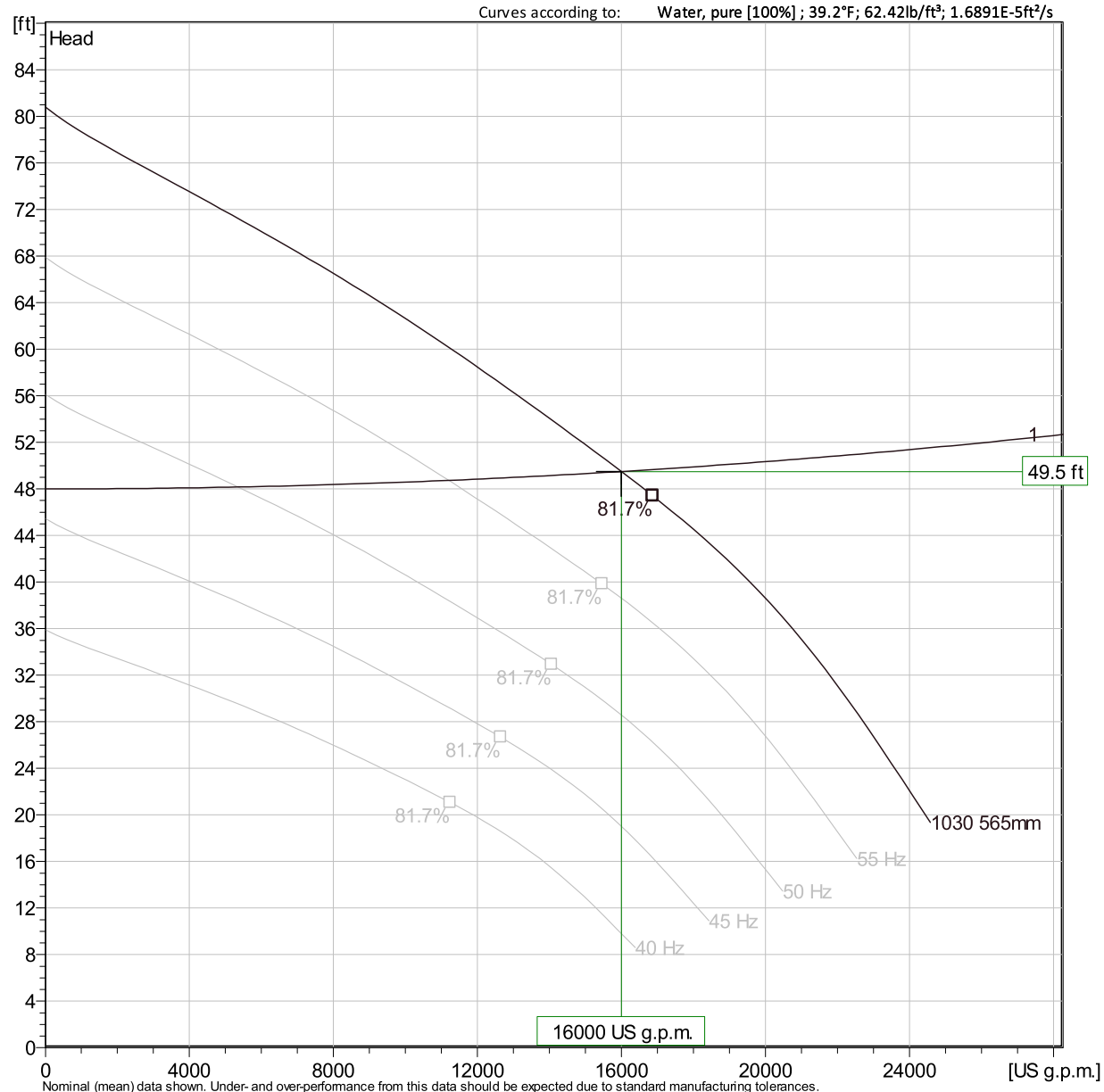
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	16000	49.5	246	16000	49.5	246	81.5 %	202	15.8
1	55 Hz	11200	48.7	177	11200	48.7	177	77.8 %	207	9.37
1	50 Hz	5350	48.2	114	5350	48.2	114	57.3 %	282	4.61
1	45 Hz									

Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

CP 3501/836 3~ 1030

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

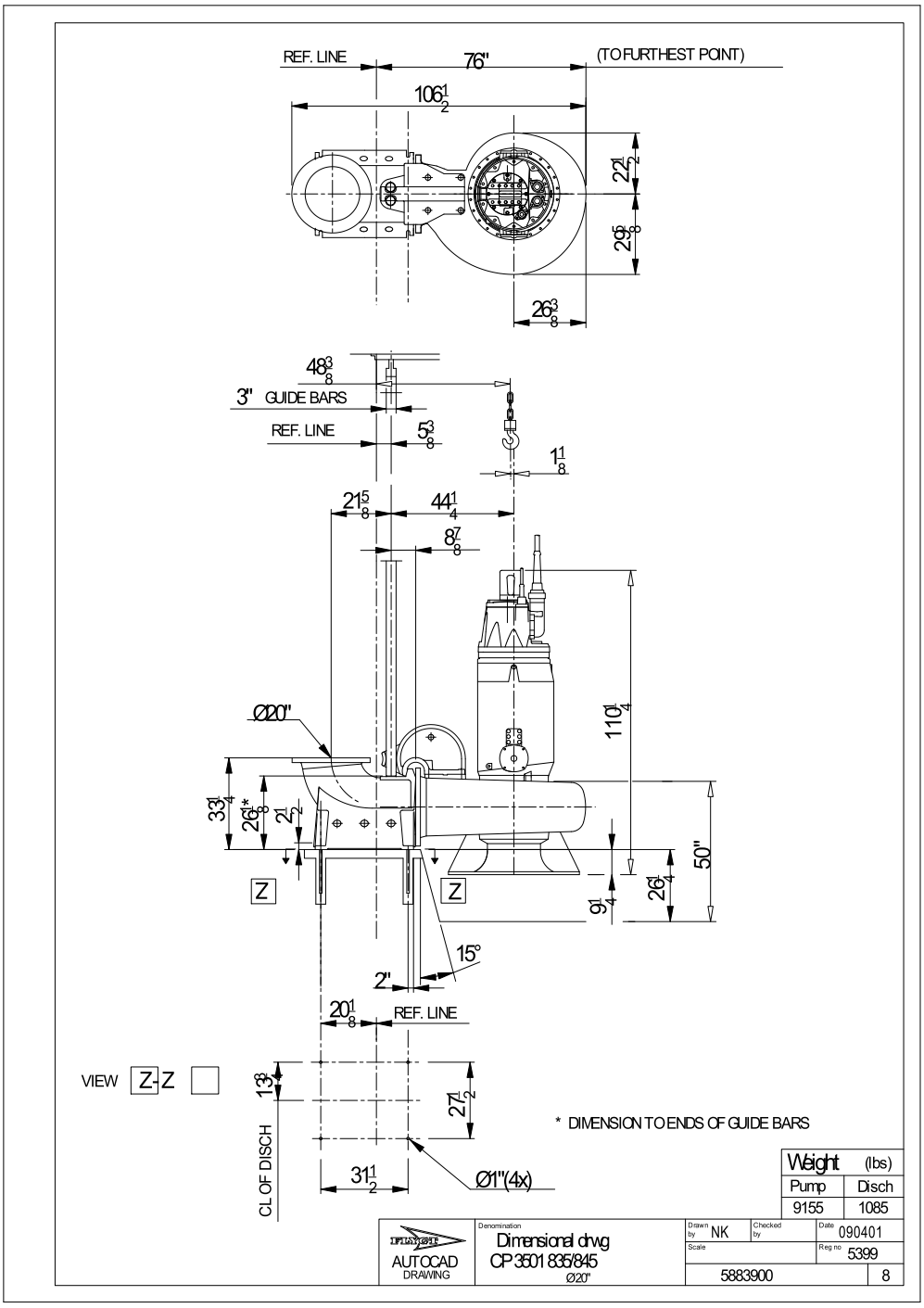
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

CP 3501/836 3~ 1030

Dimensional drawing



Project	Xylect-20536952	**Created by**	Patrick Palacios		
Block		**Created on**	5/8/2023	**Last update**	5/8/2023

APPENDIX E

Preliminary Cost Estimate

Preliminary Estimate

COUNTY: Harris **HWY:** NHHIP 3B

LIMITS: **FROM:** Alabama Street **LENGTH =** 4200 **FT.**

TO: McGowen Street **LENGTH =** 0.800 **MI.**

Hamilton Street

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	82,819	$14	$1,159,466
2.	Structural Excavation (Pipe)	CY	326	$11	$3,586
3.	Cement Stabilized Backfill	CY	14,337	$90	$1,290,330
4.	Temporary Special Shoring	SF	119,104	$20	$2,382,080
6.	Conc Box Culv (12 x 12)	LF	7,444	$3,000	$22,332,000
7.	RC Pipe (CL III) (48 IN)	LF	131	$245	$32,095
9.	Manhole/Inlets	EA	132	$8,000	$1,056,000
10.	Junction Box (COMPL) (SPL)	EA	2	$40,000	$80,000
12.	Dewatering Pump	EA	1	$3,300	$3,300
				Sub-Total	$27,175,805

Chartres Street - North

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	6,393	$14	$89,502
2.	Structural Excavation (Pipe)	CY	907	$11	$9,977
3.	Cement Stabilized Backfill	CY	2,013	$90	$181,170
4.	Trench Excavation Protection	LF	2,013	$6	$12,078
5.	Conc Box Culv (5 x 4)	LF	318	$460	$146,280
6.	Conc Box Culv (6 x 5)	LF	508	$500	$254,000
7.	Conc Box Culv (7 x 5)	LF	818	$730	$597,140
8.	RC Pipe (CL III) (48 IN)	LF	295	$250	$73,750
9.	Manhole/Inlets	EA	10	$8,000	$80,000
10.	Junction Box (COMPL) (PJB)	EA	1	$15,000	$15,000
				Sub-Total	$1,359,418

Preliminary Estimate

COUNTY: Harris **HWY:** NHHIP 3B

LIMITS: **FROM:** Alabama Street **LENGTH =** 4200 **FT.**

TO: McGowen Street **LENGTH =** 0.800 **MI.**

Chartres Street - South

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	6,472	$14	$90,608
2.	Structural Excavation (Pipe)	CY	6,114	$11	$67,254
3.	Cement Stabilized Backfill	CY	3,393	$90	$305,370
4.	Trench Excavation Protection	LF	3,646	$6	$21,876
5.	Conc Box Culv (5 x 5)	LF	179	$500	$89,500
6.	Conc Box Culv (6 x 5)	LF	1,441	$650	$936,650
7.	RC Pipe (CL III) (18 IN)	LF	145	$100	$14,500
8.	RC Pipe (CL III) (24 IN)	LF	312	$110	$34,320
9.	RC Pipe (CL III) (30 IN)	LF	122	$120	$14,640
10.	RC Pipe (CL III) (36 IN)	LF	348	$200	$69,600
11.	RC Pipe (CL III) (42 IN)	LF	424	$240	$101,760
12.	RC Pipe (CL III) (48 IN)	LF	497	$250	$124,250
13.	RC Pipe (CL III) (54 IN)	LF	110	$400	$44,000
14.	RC Pipe (CL III) (60 IN)	LF	68	$430	$29,240
15.	Manhole/Inlets	EA	25	$8,000	$200,000
				Sub-Total	$1,985,706

Depressed Section - I-45 Pump Station

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	8,159	$14	$114,226
2.	Structural Excavation (Pipe)	CY	67,230	$11	$739,530
3.	Cement Stabilized Backfill	CY	13,099	$90	$1,178,910
4.	Trench Excavation Protection	LF	14,460	$6	$86,760
5.	Temporary Special Shoring	SF	25,725	$20	$514,500
6.	Conc Box Culv (3 x 3)	LF	39	$310	$12,090
7.	Conc Box Culv (4 x 3)	LF	1,817	$350	$635,950
8.	Conc Box Culv (4 x 4)	LF	1,855	$400	$742,000
9.	Conc Box Culv (5 x 4)	LF	1,833	$460	$843,180
10.	RC Pipe (CL III) (24 IN)	LF	371	$110	$40,810
11.	RC Pipe (CL III) (30 IN)	LF	1,523	$120	$182,760
12.	RC Pipe (CL III) (36 IN)	LF	1,866	$200	$373,200
13.	RC Pipe (CL III) (42 IN)	LF	1,639	$240	$393,360
14.	RC Pipe (CL III) (48 IN)	LF	1,183	$250	$295,750
15.	RC Pipe (CL III) (90 IN)	LF	2,334	$900	$2,100,600
16.	Manhole/Inlets	EA	115	$8,000	$920,000
17.	Junction Box (COMPL) (SPL)	EA	10	$20,000	$200,000
18.	Jack Bore or Tunnel	LF	346	$2,500	$865,000
				Sub-Total	$9,384,870

Preliminary Estimate

COUNTY: Harris **HWY:** NHHIP 3B

LIMITS: **FROM:** Alabama Street **LENGTH =** 4200 **FT.**

TO: McGowen Street **LENGTH =** 0.800 **MI.**

I-45 Pump Station & St. Emanuel Pump Outfall

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	128,887	$14	$1,804,418
2.	Structural Excavation (Pipe)	CY	10,870	$11	$119,570
3.	Cement Stabilized Backfill	CY	15,976	$90	$1,437,840
4.	Temporary Special Shoring	SF	162,581	$20	$3,251,620
5.	Conc Box Culv (8 x 8)	LF	1,846	$950	$1,753,700
6.	Conc Box Culv (12 x 6)	LF	1,972	$1,635	$3,224,220
7.	Conc Box Culv (12 x 10)	LF	428	$3,000	$1,284,000
8.	Conc Box Culv (12 x 12)	LF	4,230	$3,000	$12,690,000
9.	RC Pipe (CL III) (42 IN)	LF	673	$240	$161,520
10.	RC Pipe (CL III) (54 IN)	LF	115	$400	$46,000
11.	Manhole/Inlets	EA	30	$8,000	$240,000
12.	Junction Box (COMPL) (SPL)	EA	2	$20,000	$40,000
13.	Junction Box (COMPL) (SPL) (Pond A)	EA	2	$200,000	$400,000
14.	SET (TY II) (54 IN)(RCP) (4:1) (C)	LF	1	$15,000	$15,000
15.	Pump Station	EA	1	$14,402,000	$14,402,000
				Sub-Total	$38,945,900

Detention Pond A

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Box)	CY	2,277	$14	$31,878
2.	Structural Excavation (Pipe)	CY	420	$11	$4,620
3.	Cement Stabilized Backfill	CY	257	$90	$23,130
4.	Trench Excavation Protection	LF	150	$6	$900
5.	Pond Excavation (Special)	CY	400,000	$60	$24,000,000
6.	Compost Manuf Topsoil (4")	SY	61,904	$2	$123,808
7.	Cell FBR Mulch Seed (PERM) (Urban) (Clay)	SY	61,904	$1	$61,904
8.	Conc Box Culv (10 x 5)	LF	150	$1,035	$155,250
9.	RC Pipe (CL III) (36 IN)	LF	100	$150	$15,000
10.	Wingwall (FW-0) (HW = 6 FT)	LF	1	$18,000	$18,000
11.	SET (TY II) (36 IN) (4:1) (C)	LF	1	$5,000	$5,000
				Sub-Total	$24,402,992

Preliminary Estimate

COUNTY: Harris **HWY:** NHHIP 3B

LIMITS: **FROM:** Alabama Street **LENGTH =** 4200 **FT.**

TO: McGowen Street **LENGTH =** 0.800 **MI.**

Detention Pond A2

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1.	Structural Excavation (Pipe)	CY	66	$11	$726
2.	Cement Stabilized Backfill	CY	24	$90	$2,160
3.	Trench Excavation Protection	LF	50	$6	$300
4.	Pond Excavation (Special)	CY	12,500	$60	$750,000
5.	Compost Manuf Topsoil (4")	SY	4,600	$2	$9,200
6.	Cell FBR Mulch Seed (PERM) (Urban) (Clay)	SY	4,600	$1	$4,600
7.	RC Pipe (CL III)(24 IN)	LF	50	$95	$4,750
8.	SET (TY II) (24 IN) (4:1) (C)	LF	1	$1,800	$1,800
				Sub-Total	$772,810
				Total Bid Items	$104,027,501
			Mobilization @	10 %	10,402,750
			Engineering and Contingencies @	20 %	20,805,500
				Total Estimate	135,235,751

APPENDIX F

USB with Hydraulic Models