Preliminary Engineering Report

For

Castell Avenue
From Bridge Street to Elliot Knox Boulevard (BUS 35)

Prepared For:

City of New Braunfels
Contract No. NB 22-004

9/23/2022

STATE OF TEXAS
JEFFREY A. WHITACRE
102469
LICENSED
PROFESSIONAL ENGINEER

9/23/2022

STATE OF TEXAS
NOLAN W. PIERCE
130905
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

State of Texas Registration No. F-928
10101 Reunion Place, Suite 400, San Antonio, TX 78216
Phone: (210) 541-9166
www.Kimley-Horn.com
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Contents

1.0 Project Overview and Description 4
1.1 Overview 4
1.2 Description 5
2.0 Urban Design Elements 5
2.1 Research and Background 5
2.1 Urban Design Elements 6
Overall Corridor Urban Design Layout 6
Landscape and Urban Furnishings 8
Illumination 8
Civic Plaza Details 9
Eye Renderings 10
3.0 Corridor Design Elements 11
3.1 Existing Conditions 11
3.2 Traffic Analysis 11
3.3 Drainage Analysis 13
Existing Drainage Conditions 13
Castell Avenue Improvements 13
Coll Street - Off-site Improvements 13
3.4 Roadway Design 13
Design Criteria & Alignment 13
Typical Sections 14
Pavement Section 15
3.5 Pedestrian Improvements 15
3.6 Vertical Design 16
3.7 Corridor Safety Enhancements 16
San Antonio Street 16
Coll Street 17
Garden Street 17
Jahn Street 18
Nacogdoches Street and Faust Street Realignments 18
3.8 Union Pacific Railroad Crossing – Existing Quiet Zone 19
3.9 Utilities 19
Typical Utilities and Conflicts 19
Underground Electric and Duct Bank Design 20
4.0 Conclusion 21
4.1 Budget 21
4.2 Construction Sequencing & Schedule 21
4.3 Recommendation 22
4.4 Appendices List 22

List of Appendices

Appendix A: Corridor Urban Design Horizontal Layout

Appendix B: Landscape & Urban Design Plan

Appendix C: Existing Conditions Images

Appendix D: Traffic Memo

Appendix E: Drainage Memo

Appendix F: Preliminary Corridor Plan & Profile Layout

Appendix G: Opinion of Probable Construction Cost

1.0 Project Overview and Description

1.1 Overview

The City of New Braunfels is preparing a preliminary design and streetscape plan for South Castell Avenue from Bridge Street to Elliot Knox Boulevard (BUS 35). This project is intended to align with Envision New Braunfels to "promote a compact urban fabric that includes walkable streets, mixed use development, and high-quality public spaces and create new and special destinations and experiences that build on New Braunfels' historic resources." This design will further impact the vision identified and detailed in the South Castell Avenue Master Plan.

The mission statement for the Castell Avenue preliminary design and streetscape plan is:

Design a complete street that serves as a model for fostering a more vibrant downtown through improvements that advance multi-modal connectivity, prioritize pedestrian safety, and comfort, and enhance the economic vitality of Castell Avenue.

The following are project goals for the preliminary design and streetscape plan:

- *Transform Castell Avenue into a thriving complete street.*
- *Incorporate design elements that enhance safety, pedestrian comfort, and elevate the experience of walking in downtown.*
- *Facilitate connections between public and private assets to reinforce the public realm of the Castell Avenue corridor.*
- *Create a downtown gateway/public plaza in and around the Civic/Convention Center that anticipates future mixed-use and infill development.*

Overall, the character of the Castell Avenue corridor falls into three main segments, as shown in Figure 1 and below:

- Downtown Core – Bridge Street to Coll Street
- Civic/Convention Center - Coll Street to Jahn Street, and
- Neighborhood Mixed – Jahn Street to BUS 35.

At a finer grain, there are several more zones to consider that capture the nuances from block to block such as changes in building height and scale, as well as variation in land use and spatial continuity.

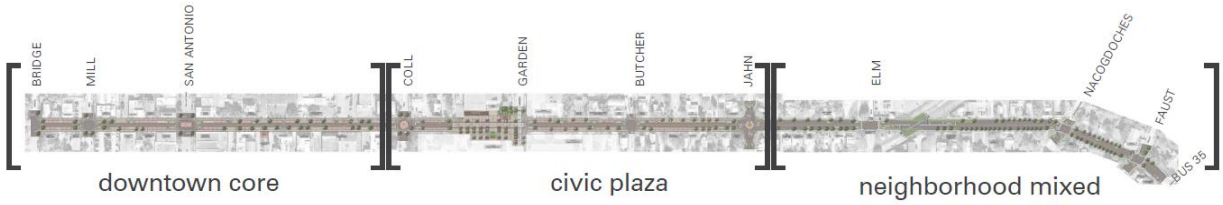


Figure 1 - Character Zones

1.2 Description

Castell Avenue will be reconstructed to include one travel lane in each direction, with on-street parking and improved pedestrian facilities along both sides of the corridor. The typical section will vary along the corridor related to the context zone, see Section 3.0 for further details. See Figure 2 for the project limits.

Figure 2 - Project Limits

The preliminary design contract also included the following tasks: data collection, topographic and boundary survey, conceptual traffic analysis, drainage study, landscape and urban design assessment, and public engagement.
The City intends Castell Avenue to become a gateway into downtown. The street will transform from a neighborhood feel to an urban civic plaza. This civic plaza will complement the existing New Braunfels Civic/Convention Center and become the heart and potential front porch of City activity. From the civic plaza there is a transition to the downtown core where Castell Avenue will serve as the new model for New Braunfels downtown investments into streetscape and urban design.

2.0 Urban Design Elements

2.1 Research and Background

Kimley-Horn along with TBG Partners conducted research of the landscape heritage of downtown New Braunfels and identified important aspects related to how this landscape was used as an enhancement to the quality of life and connection to the land.

The following diagram, shown in Figure 3, captures key concepts carried forward from the Downtown Implementation Plan and South Castell Master Plan with the following challenges and opportunities highlighted for consideration:

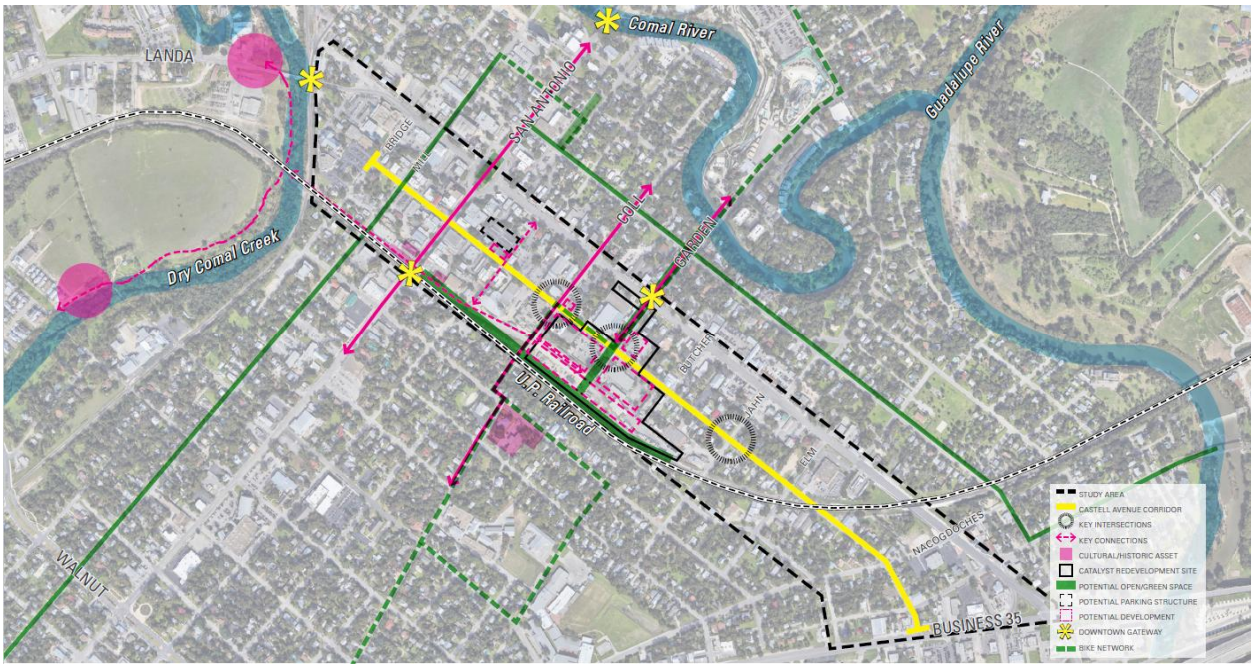


Figure 3 - Downtown New Braunfels Study Area

HISTORY/HERITAGE
Situated at the confluence of the Guadalupe and Comal Rivers, New Braunfels continues to grow and thrive as a livable city with rich a history and cultural heritage. Known for its German roots, New Braunfels has evolved into an ethnically diverse city with a strong presence of Hispanic cultural influences today. New Braunfels is also known for its water-related attractions and outdoor recreational activities that take place along the river and in parks and open spaces across the city.

PUBLIC SPACE
Castell Avenue, once the location of the old train station and rail yards is fast becoming a destination district for food and drink in downtown. It's where you can find local shops, a beer garden, brewery, farmers market, several bars and restaurants, as well as churches, the Civic/Convention Center, and small businesses and residences along its 1-mile length.

Through the streetscape improvements project, there is an opportunity to introduce new public spaces (small and large) that can enhance the experience of being downtown, in the outdoors, and taking part in a variety of cultural celebrations, contributing to the vibrancy of the city. Small-scale opportunities to do this include creating outdoor seating areas with shade and by leveraging the landscape to help tell the story of the significance of water and the legacy of green space in New Braunfels while the greatest opportunity for large-scale transformation is at the Civic Plaza, at the doorstep of the Civic/Convention Center.

2.1 Urban Design Elements

Overall Corridor Urban Design Layout

The streetscape improvements create a distinct identity for Castell Avenue through a cohesive palette of materials, plantings, furnishings, and lighting that can subsequently be carried throughout all of downtown as public realm design standards. Major design elements common throughout the corridor include wider sidewalks and pedestrian lighting to enhance walkability, new street trees to increase shade and sense of place, pocket gardens that feature native plantings, and strategic bulb-outs that accommodate important upgrades to utilities and drainage infrastructure

while establishing safe and accessible crossings for pedestrians. Kimley-Horn and TBG Partners worked together to develop a comprehensive landscape and urban design plan layout for Castell Avenue as part of the preliminary study. The overall corridor horizontal layout was developed to illustrate how the improvements could look. See Appendix A for details.

Key intersections such as San Antonio, Coll, and Jahn as well as on-street parking zones and crosswalks closest to downtown are accented with special pavers to provide visual interest and to relate to the historic aesthetic of New Braunfels. Street furnishings such as tables and chairs, benches, bike racks, and bins are intentionally located where they will get the most use and are placed in a way that supports the activities of adjacent businesses along Castell.

Further enhancements to the streetscape palette could include identifying spaces for local public art as well as interpretive elements that can help tell the story of Castell Avenue and the city's past, present and future. This could be done in collaboration with local artists, storytellers, and craftsmen.

SEGMENTS

While the palette of materials and lighting has a common design language throughout the corridor, the landscape character is expressed in three different character zones: the downtown core, the civic plaza, and the neighborhood mixed segment (Figure 1).

DOWNTOWN CORE

On the north end of the corridor, the urban segment has more hardscape and smaller street trees since buildings are closest to the street through downtown. This segment has the greatest number of on-street parking spaces, accent pavers, and streamlined curb cuts to optimize the pedestrian experience.

CIVIC PLAZA

The civic plaza segment of the corridor (from Coll to Butcher) will see significant change in the coming years with development slated to include housing, ground floor retail, restaurants and cafes, a hotel, and an expansion of the Civic/Convention Center. The Civic Plaza is an opportunity to create something new for New Braunfels; a place where locals and visitors alike will want to be - a place where the past, present, and future can be experienced simultaneously. The Plaza is designed as a flexible-use space that is a flat, curb-less, and provides a unique setting for the Civic/Convention Center. It can be used regularly as a place to hang out, and on special occasions for festivals, seasonal markets and as an extension of the Civic/Convention Center's programming.

Immediately adjacent to the Civic/Convention Center, Garden Street provides a direct connection between the Comal River and the Civic/Convention Center. This key link can be thought of as a green corridor, a true *garden street*. The future of that streetscape design can help reinforce the unique story of New Braunfels' founding along two rivers. In the meantime, through the design of a garden-like landscape, the open spaces along Castell near Garden Street can provide a fun and educational experience.

Jahn Street serves as the threshold between the urban and neighborhood segments. At Jahn is a roundabout that provides traffic calming while serving as a gateway between the neighborhood segment and the civic plaza - signifying entry into downtown from the south. The central island is thought of as a location for interesting plantings and potentially public art.

NEIGHBORHOOD MIXED

On the south end of the corridor, the neighborhood segment has more green and sidewalks are right-sized for the residential character. Larger street trees provide ample shade and there are more areas for understory plantings including a native mix of grasses, flowers, and shrubs. New sidewalks provide a safe walkway for pedestrians and facilitate better access to the neighborhood and to businesses. The sidewalks are well lit with pedestrian lighting and crossings are upgraded to improve safety and experience.

Landscape and Urban Furnishings

Several palettes were developed and presented to the City for a variety of different elements during the preliminary design phase including different types of trees, grasses, shrubs, wildflowers, hardscaping colors and textures, and furniture. These options were collected and presented as options that will tie together to meet the Vision of Castell Ave. The next design phase will include a more detailed look into the various elements to be considered for implementation that align with the City's goals for the corridor. Details on the types of different options that could be implemented are shown in Appendix B.

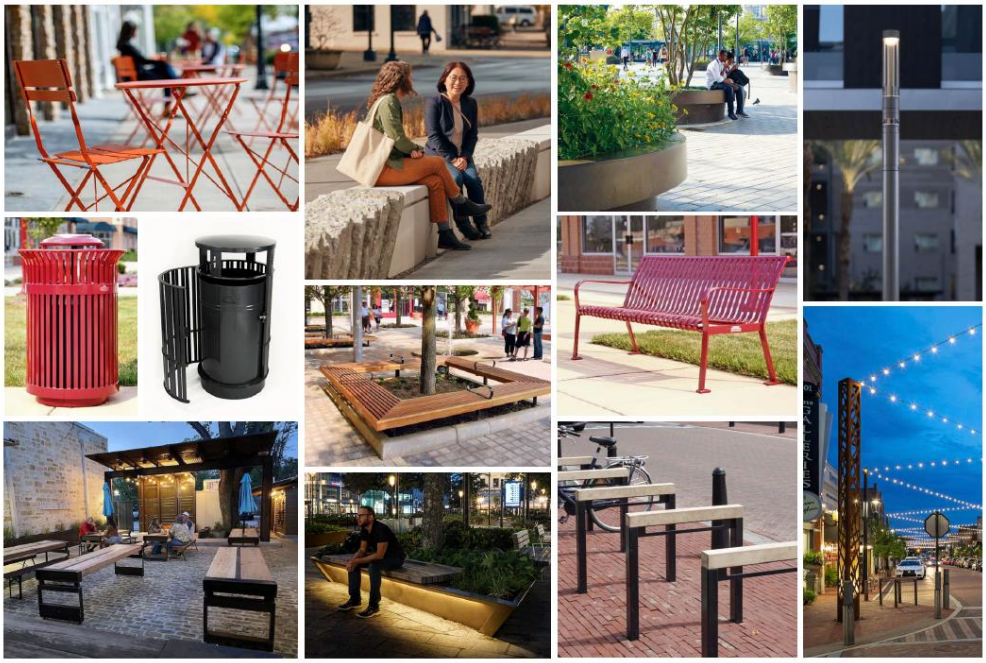


Figure 4 - Castell Ave Furnishings Palette Example

Illumination

Continuous roadway and pedestrian lighting improvements are recommended based on the proposed future use of the Castell Ave. The locations and visual spacing of the luminaire poles are also shown on the urban design plan layout in Appendix A.

Civic Plaza Details

Several considerations were analyzed for the Civic Plaza space along Castell Avenue from Coll Street to Garden Street. This space is intended to be used for community events with the street being closed to through traffic on each end. The space shown below in Figures 5 & 6 provides a visual example of how the space is envisioned and can tie-in with the entrance to the Civic/Convention Center for joint events. Some examples of the activity space shown includes: table and chair seating areas, food truck and vendor areas, screen/stage area to name a few. Other details can be found in Appendix B.

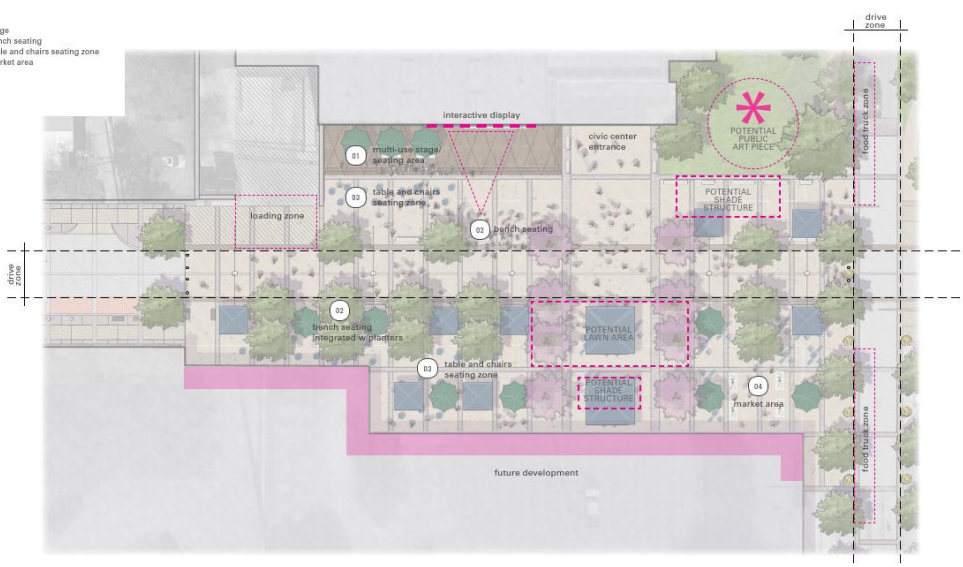


Figure 5 - Civic Plaza Activities Layout

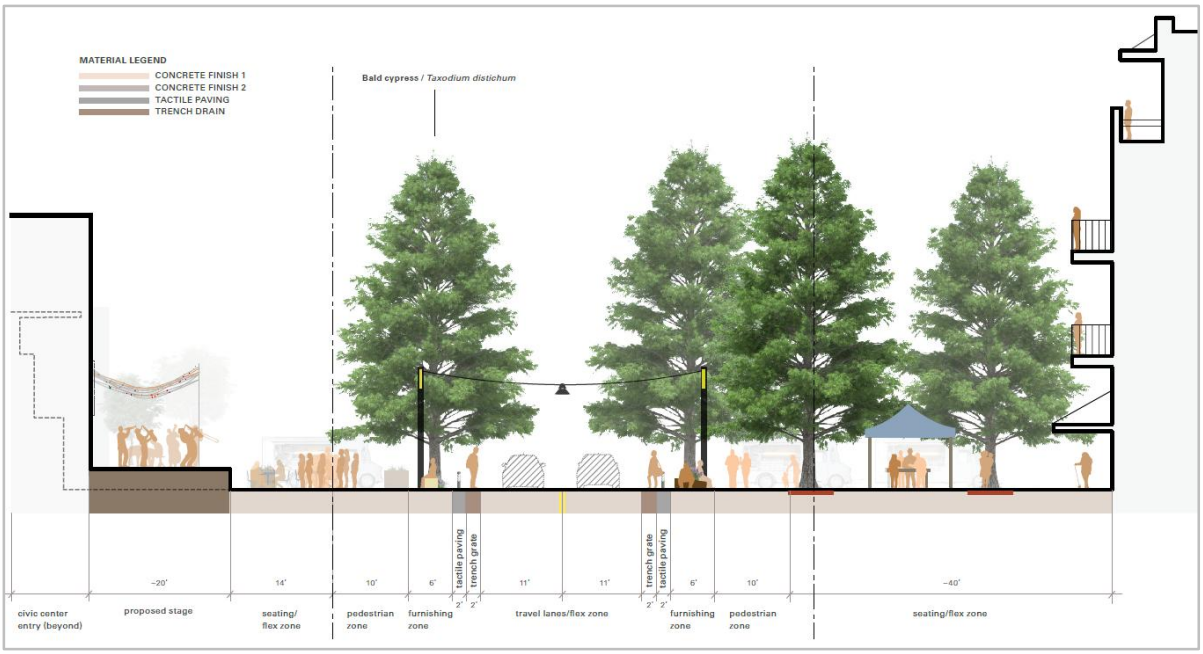


Figure 6 - Civic Plaza Section View

Eye Renderings

Three eye rendering sketches were also developed to help illustrate the proposed improvements at the three identified character zones. These views are shown below in Figures 7, 8, & 9. See Appendix B for larger images.

Figure 7 -
Downtown Core Eye Rendering
Farmers Market

Figure 8 -
Civic Plaza Eye Rendering

Figure 9 -
Neighborhood Mix Eye Rendering
Jahn Roundabout Intersection

3.0 Corridor Design Elements

3.1 Existing Conditions

Existing conditions of Castell Avenue were observed through on-site observation, studies, various modeling methods, and through topographic and boundary survey.

The current roadway has an asphalt paved width of 44' and allows for two travel lanes of 14' with on-street parking of 8' on either side. The typical sections shown in Figures 10 & 11 illustrations can be found below. The existing road has minimal striping and varies along the corridor. Centerlines, stop bars, crosswalks and parking spaces are poorly defined in some areas. See Appendix C for images of the existing street conditions.

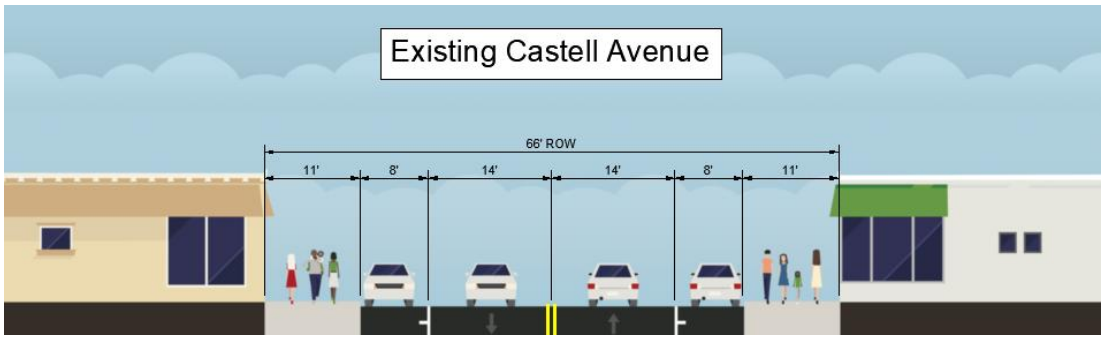


Figure 10 - Existing Downtown Typical Section

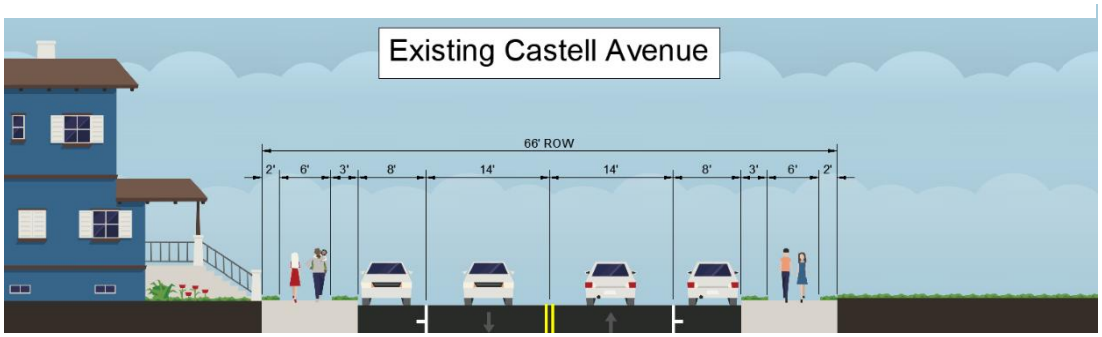


Figure 11 - Existing Neighborhood Typical Section

Pedestrian facilities are provided along portions of the project limits. Sidewalk is provided on both sides of the road from Bridge Street to Garden Street. South of Garden Street sidewalk becomes more sporadic and is nonexistent past Elm Street. Areas with sidewalk and other pedestrian facilities such as ramps do not always follow ADA compliancy rules or always provide the necessary accessible routes. Several locations along Castell Avenue do not have sidewalk ramps in locations that one would typically be expected, such as at the Coll Street signalized intersection. This same location also has directional ramps that do not have corresponding receiving ramps. Another common issue is driveways either being in poor repair or having curbing that disrupts an accessible path.

On street parking is currently permitted along most of the corridor with only signage and painted curbs limiting parking locations. From Bridge Street to Elliot Knox Boulevard there is an estimated 220 parking spaces available, both striped and unstriped.

3.2 Traffic Analysis

Kimley-Horn completed a conceptual analysis of existing traffic conditions as shown in Appendix D. The analysis identified crash locations along the corridor by type and severity of event and this information was used to identify

potential improvements including speed management, sight distance and walkability, driveway consolidation, and specific intersection improvements.

The following is a summary of improvements recommended in the traffic memo:

Speed Management: To achieve the 25-mph speed limit, consideration should be given to slow down traffic on speed management treatments at 500 foot to 1000 foot spacing between intersections. This could take the form of roundabouts, curb bulb-outs, or reducing lane width.

Sight Distance: It is recommended to implement corner bulb-outs on Castell Avenue where cars are currently allowed to park to improve visibility of both crossing pedestrians and cars on conflicting approaches and remediate any sight distance issues. This concept, "daylighting", is illustrated in Figure 5, and creates an opportunity for street beautification. It should be noted that anything occupying the space near crossings must be maintained at a height of no more than 3.5 feet to not occlude driver visibility for a passenger car, per the driver eye height of such a vehicle per the AASHTO Green Book. It should also be noted that this may result in the loss of parking spaces in some locations

Intersections: Jahn Street is a good candidate for implementation of a mini-roundabout. This intersection has roughly the 75' ICD recommended within existing corner radii curb. Jahn will serve as a gateway to the Civic Plaza area. Nacogdoches St could be improved from both an operational and safety standpoint with some low-cost improvements. First, delineating the location where vehicles should stop with stop bars would help increase awareness of the existing all way stop and can be placed to ensure there are not conflicts for larger turning vehicles. Operationally, additional capacity could be added through restriping of approaches for left or right turn pockets, but would require restriction of parking and likely supplemental signs to reinforce parking prohibitions where turn lanes could be implemented.

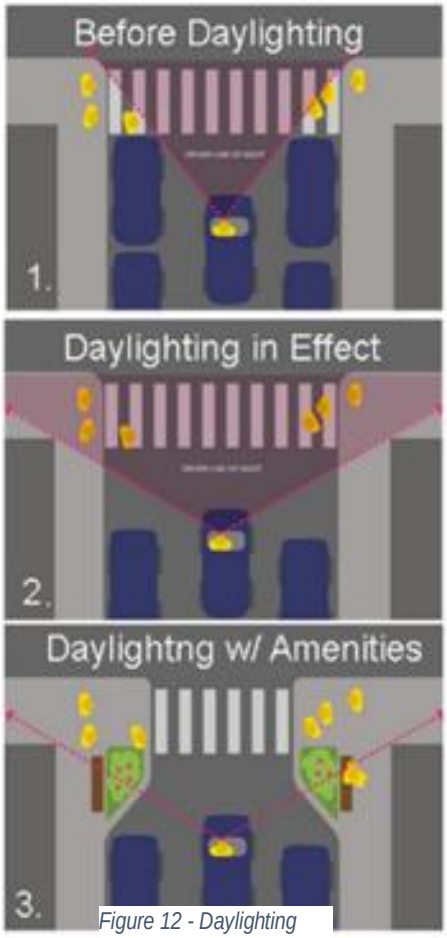


Figure 12 - Daylighting

3.3 Drainage Analysis

Existing Drainage Conditions

The existing drainage areas and infrastructure was evaluated by various modeling techniques in order better understand existing conditions. A 1D modeling method was used for Bridge Street to San Antonio Street, while a 2D method was used for San Antonio Street to Elliot Knox Boulevard. Existing storm systems were also modeled to allow for more precise calculation of current conditions.

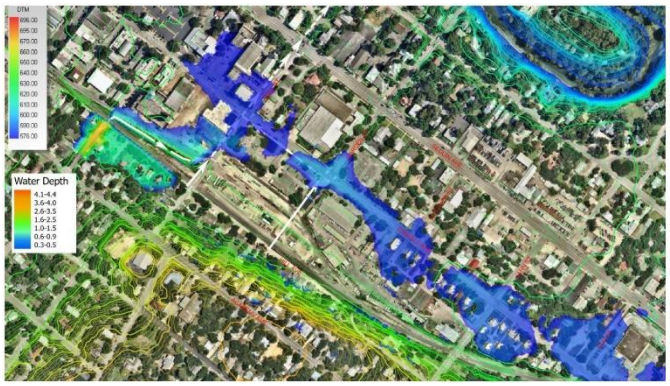


Figure 13 - Existing 100-yr Water Surface Elevations

Castell Avenue is required to serve approximately 300 acres of off-site runoff and serves as a low point for the surrounding area. Due to this, Castell Avenue suffers a widespread ponding issue during storm events, often exceeding Right-of-Way limits for higher intensity storm events. The existing storm system is minimal, undersized, and does not allow for the necessary conveyance of storm water.

Castell Avenue Improvements

The proposed system improvements include construction of curb inlets, grate inlets, and an underground storm system to convey the captured storm water. Three alternatives were analyzed with considerations of cost and constructability as a major factor. See Appendix E for details about the complete analysis and recommended improvements.

Figure 14 - Proposed 100-yr Water Surface Elevations

Coll Street - Off-site Improvements

The analysis resulted in finding the outfall to the Comal River under Coll Street is not large enough to take on the required flow from Castell Avenue. The offsite drainage improvements along Coll Street from Castell Ave to the Comal River is critical, and this infrastructure will need to be in place for the drainage system along Castell Ave to be successful. To resolve this issue, the design team has developed three possible solutions that could be implemented. The first option would be to construct two separate storm systems along Castell Avenue with outfalls running down San Antonio Street and Coll Street. The second option would be to add a parallel 9'X6' reinforced concrete box (RCB) under Coll Street, with the existing 5'X4' RCB. The third option is to remove and replace the existing storm line with a 10'X8' RCB. All three alternatives are shown schematically within Appendix E.

Recommendation: After examination the design team recommends the third option to remove and replace the existing storm line with a 10'X8' RCB. This removal option does have a slightly higher cost but will provide the more favorable outcome of the three. The replacement option will require less of an overall trench to install by utilizing some of the existing RCB cross section and will reduce the need for utility relocations where conflicts may arise.

3.4 Roadway Design

Design Criteria & Alignment

Castell Avenue is proposed as a two-lane undivided section with on-street parking. The design of the corridor utilized principle in the National Association of City Transportation Officials (NACTO) Urban Street Design Guide to create a roadway that focus on people and places. The proposed alignment runs centered within the existing right-of-way from

Bridge Street south-east to Elliot Knox Boulevard (Business 35). This is the recommended alignment as it does not require additional right-of-way, limiting costs to the city and impacts to residents adjacent to the corridor. The preliminary design plan & profile layout is shown in Appendix F.

Typical Sections

Castell Avenue is proposed to utilize the existing 66' Right-of-Way including two travel lanes, on-street parking, curbed bulb-outs, and improved pedestrian facilities. The Right-of-Way section narrows along Castell Avenue from from Nacogdoches Street to Elliot Knox (BUS 35) .

Two Lane Section with On-Street Parking

In sections where on-street parking is feasible, the proposed Castell Avenue layout allows for 2-12' travel lanes with 7' wide parallel parking stalls for a total face of curb to face of curb distance of 38'. Depending on location along the corridor, the parkway section varies based on the context of the character zone. In the downtown and civic plaza sections, from Bridge Street to Jahn Street, sidewalk and hardscape will be utilized from the proposed back of curb to Right-of-Way limits. The neighborhood mix section, south of Jahn Street to Elliott Knox (BUS 35) will include parkway green space with 6' wide sidewalks. Examples of both sections are shown in Figures 15 & 16.

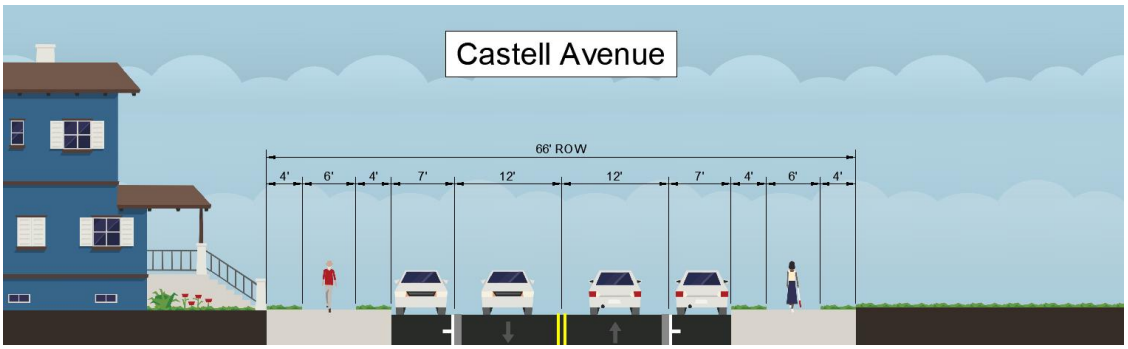


Figure 15 - Neighborhood Mix Section On-Street Parking Typical Section

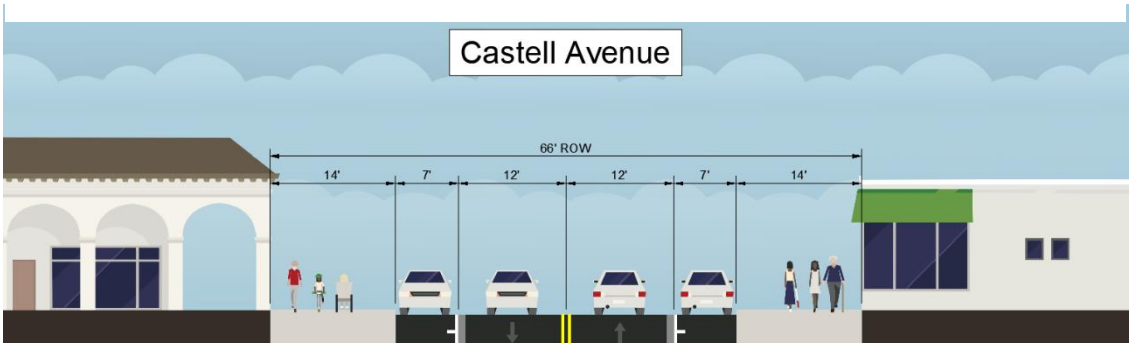


Figure 16 -Downtown Section On-Street Parking Typical Section

Two Lane Section with Bulb-outs

Throughout the project corridor curbed bulb-outs are included to achieve a variety of goals. Incorporating bulb-outs into the design of a street such as Castell Avenue allows for restriction of parking for improved visibility for pedestrians and vehicles and provides space for street beautification to install landscaping and underground utility pedestals. Along the entire corridor where curbed bulb-outs are proposed the section includes for 2-11' travel lanes with the elimination of the on-street parking for a total face of curb to face of curb distance of 22'. Depending on location along the corridor, the parkway section varies based on the context of the character zone. The bulb-out space allows room for landscaping or other urban design elements. Examples of both sections are shown in Figures 17 & 18.

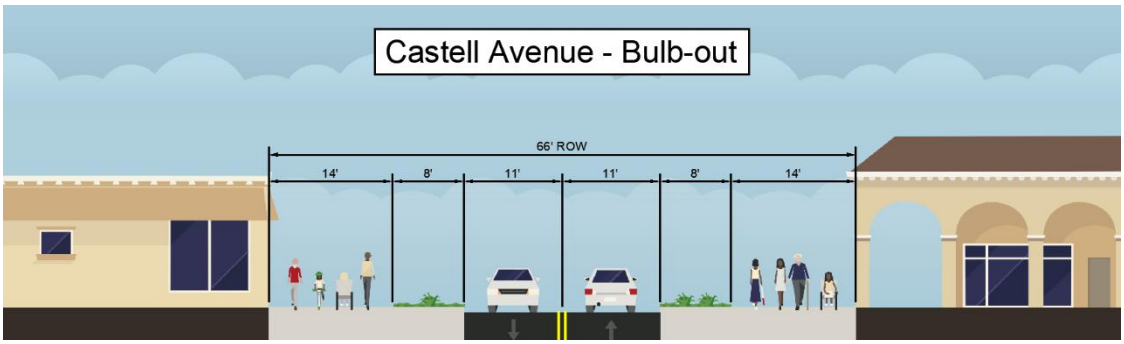


Figure 17 - Downtown Section Bulb-Out Typical Section

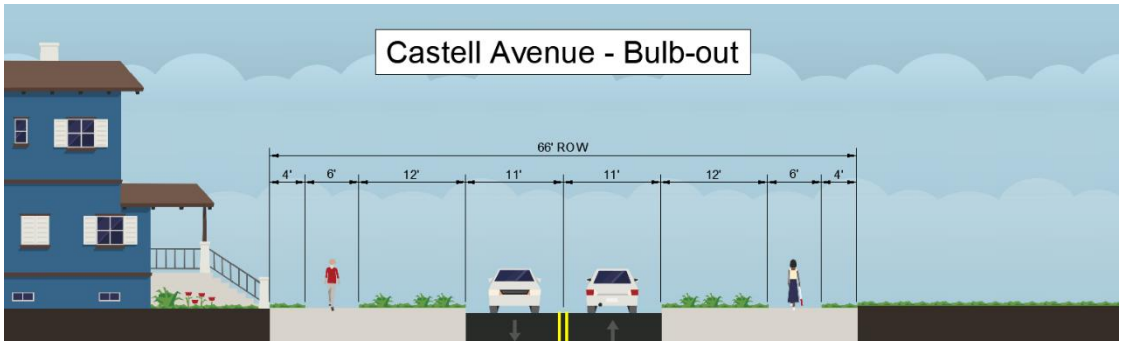


Figure 18 - Neighborhood Mix Section Bulb-Out Typical Section

Pavement Section

Geotechnical services were not conducted with this preliminary design phase, and will need to be included in future design phases to provide recommendations for pavement along this corridor. For construction costing the following pavement section was assumed: 2" Type D HMAC surface coarse on 4" Type B HMAC base coarse on 11" Flexible Base on 6" Lime stabilized subgrade for the roadway lanes and 7" RCP on 4" Flexible Base for the parallel parking.

3.5 Pedestrian Improvements

One of the major goals of this reconstruction project will be the improvement of pedestrian access and safety. Throughout the corridor it is proposed to construct sidewalk routes and accessible ramps to facilitate pedestrian access. The preliminary plan and profile layout attached in Appendix F illustrates the pedestrian improvements for the project shaded in yellow. Two specific examples shown are below in Figures 19 & 20. The first example includes new pedestrian ramps and crosswalks at Nacogdoches Street. This location has no existing pedestrian features, but sidewalk and ramps are proposed to improve pedestrian safety and connectivity. The second example is a mid-block crossing located between San Antonio Street and Coll Street just south of the New Braunfels Farmers Market area. This crossing will assist pedestrian travel in downtown zone and allow increased access to businesses from various parking areas.

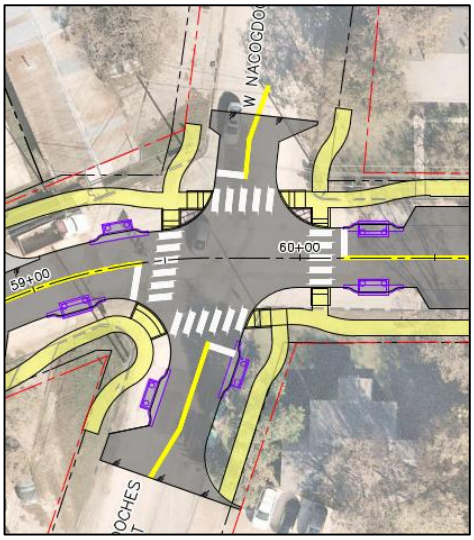


Figure 19 - Nacogdoches Street Pedestrian Improvements

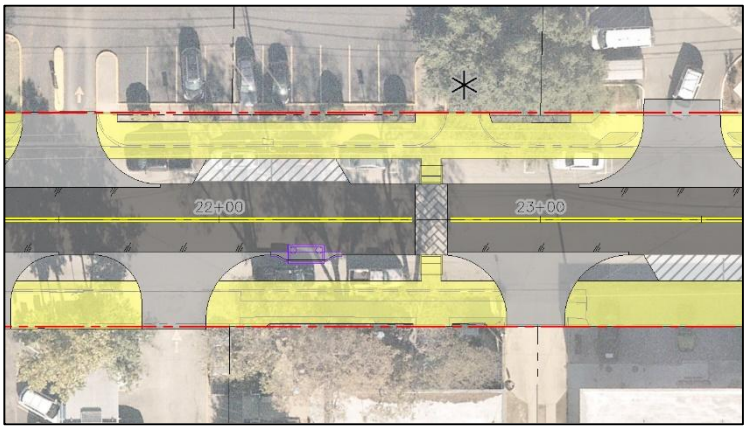


Figure 20 - Mid-block Crossing Layout

3.6 Vertical Design

The proposed profile was designed using topographic survey obtained from D.A. Mawyer Surveying. The profile was designed to better facilitate roadway storm water drainage when compared to existing. Existing conditions are generally very flat. Minimum vertical grades design criteria are not met due to existing conditions while minimizing impacts to adjacent properties. The proposed profile also balances grades with minimizing required cut and fill along the corridor to avoid existing utilities and allow room for proposed storm drain infrastructure.

This change of profile will require certain amounts of earthwork and topographic changes, but careful evaluation was conducted by the design team to ensure minimal negative effects to adjacent property owners. The proposed changes have been determined to improve upon the existing profile and not cause any unnecessary impacts to adjacent properties. The preliminary vertical design profile is shown on the plan & profile layout in Appendix F.

3.7 Corridor Safety Enhancements

Each intersection along the corridor was evaluated for both vehicle and pedestrian safety and access. All intersections along the corridor are four-way intersections with a different type of control including traffic signals, all way stop, and two way stop. All intersections are to include the installation of curbed bulb-outs on both Castell Avenue and the minor side street, directional pedestrian ramps, crosswalks, and updated pavement markings and signage. The various intersection improvements are described as follows:

San Antonio Street

One of two existing signal upgrades for this project will occur at the San Antonio Street & Castell Avenue intersection. The existing traffic signal system is proposed to be completely removed and replaced with a new system. The proposed intersection will maintain the four-lane traffic along San Antonio Street as well as the two-lane traffic along Castell Avenue.

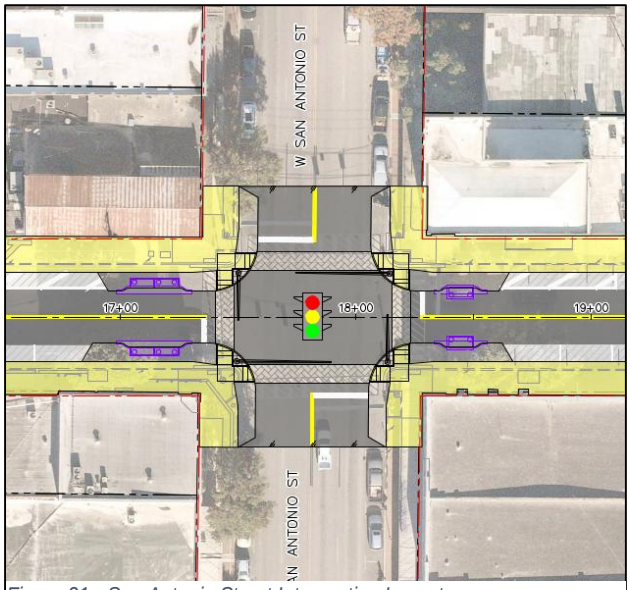


Figure 21 - San Antonio Street Intersection Layout

Bulb-outs are to be installed adjacent to the curb return to limit on-street parking and improve visibility at the intersection.

Coll Street

The second location for proposed signal upgrades is at the intersection of Coll Street and Castell Avenue. A complete removal and replacement of the existing system is proposed. The two-lane approach travel lanes are to be maintained and bulb-outs are to be installed adjacent to the curb return to limit on-street parking and improve visibility. The proposed signal infrastructure was designed to accommodate current improvements being installed by NBU for water and sewer to avoid relocations and minimize conflicts.

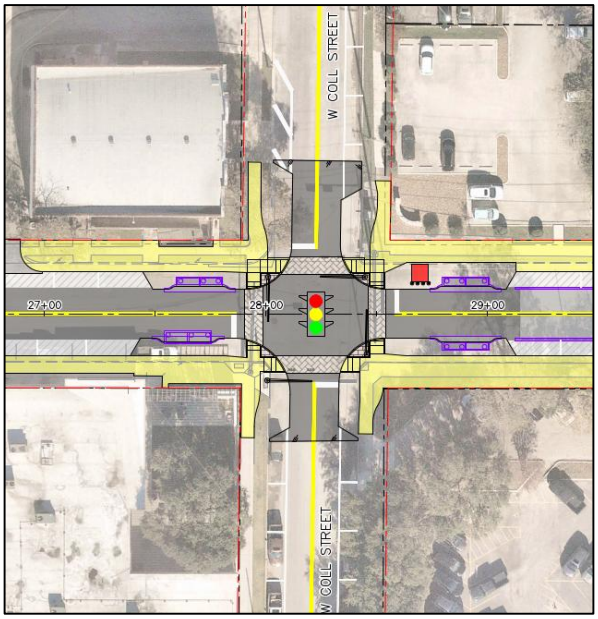


Figure 22 - Coll Street Intersection Layout

Garden Street

The Garden Street intersection is an area in which there are several proposed improvements. The existing intersection allows for two-way traffic in all directions and is four-way stop controlled. This intersection has been identified as a location for a further traffic study to determine if signalization warrants are meant. With the proximity to the proposed plaza location and the increased pedestrian and vehicular traffic that will occur, it is likely that a traffic signal will be

Figure 23 - Garden Street Intersection Layout

preferable to a four-way stop controlled intersection. In addition, Garden Street to the West can transition to an improved pedestrian corridor that connects with future re-development in the area.

Jahn Street

The Jahn Street and Castell Avenue intersection has been identified as a location for a compact mini-roundabout intersection improvement. The proposed roundabout layout has a 75' inscribed circle diameter (ICD). AutoTurn and fastest path design checks were used in the proposed design development. A City of New Braunfels fire truck design vehicle used to check the maneuverability of the various turning movements. This design layout requires the acquisition of Right-of-Way corner clips at the intersection for sidewalk, totaling approximately 120 square feet. Right-of-way acquisition could be avoided with pulling in the sidewalk to the back of curb, and can be further evaluated in next phase of design. This design ICD allows for turning movements to be completed without the installation of a full mountable central island. The non-mountable central island allows space for landscaping and can be utilized for public art or other urban design features.

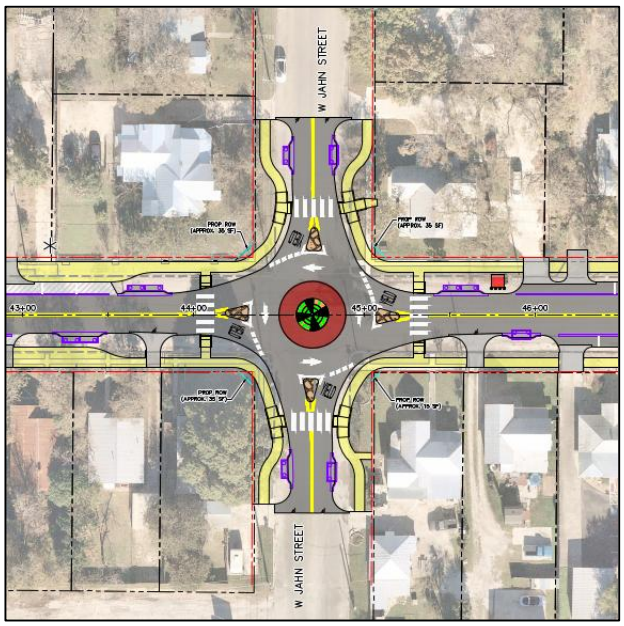


Figure 24 -Jahn Street Roundabout Intersection Layout

Nacogdoches Street and Faust Street Realignments

At the intersections of Castell Avenue with Nacogdoches Street and Faust Street the proposed layouts include realignment of the side streets to provide for a more favorable intersection layout for crosswalks. If the current

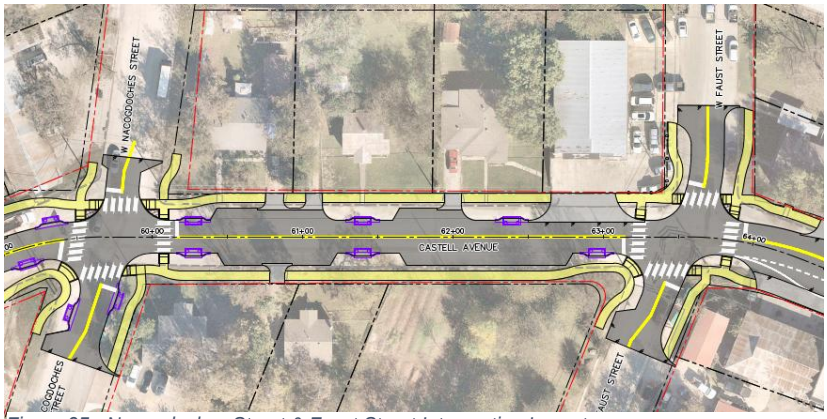


Figure 25 - Nacogdoches Street & Faust Street Intersection Layouts

alignments are followed the side street centerlines are offset from each other and would be unfavorable for both vehicular and pedestrian traffic. The recommended solution is to realign the side street as they approach Castell Avenue. This realignment can be seen on the schematic roll plot and will provide for increased safety at these intersections. The limits of the proposed improvements remain within the existing right-of-way and will transition back to the existing alignment before reaching the limits of the project.

3.8 Union Pacific Railroad Crossing – Existing Quiet Zone

The existing Union Pacific Railroad (UPRR) crossing is part of an existing quiet zone, but is not classified as an SSM (supplementary safety measure) crossing within the zone. Crossing layout is shown below in Figure 26.

The proposed vehicular improvements include installing a wider median in between the travel lanes, new pavement markings and signage, new crossing panels, and new crossing gates. The pedestrian improvements are to include sidewalk to force crossing perpendicular to rail, pedestrian flashing beacons, detectable warning surfaces, and fencing to discourage unwanted pedestrian travel. At this time, it is not recommended to include a gate with mast arm for pedestrian travel, bicyclists will not be on the sidewalk and view of flashing gates or beacons will not be obstructed.

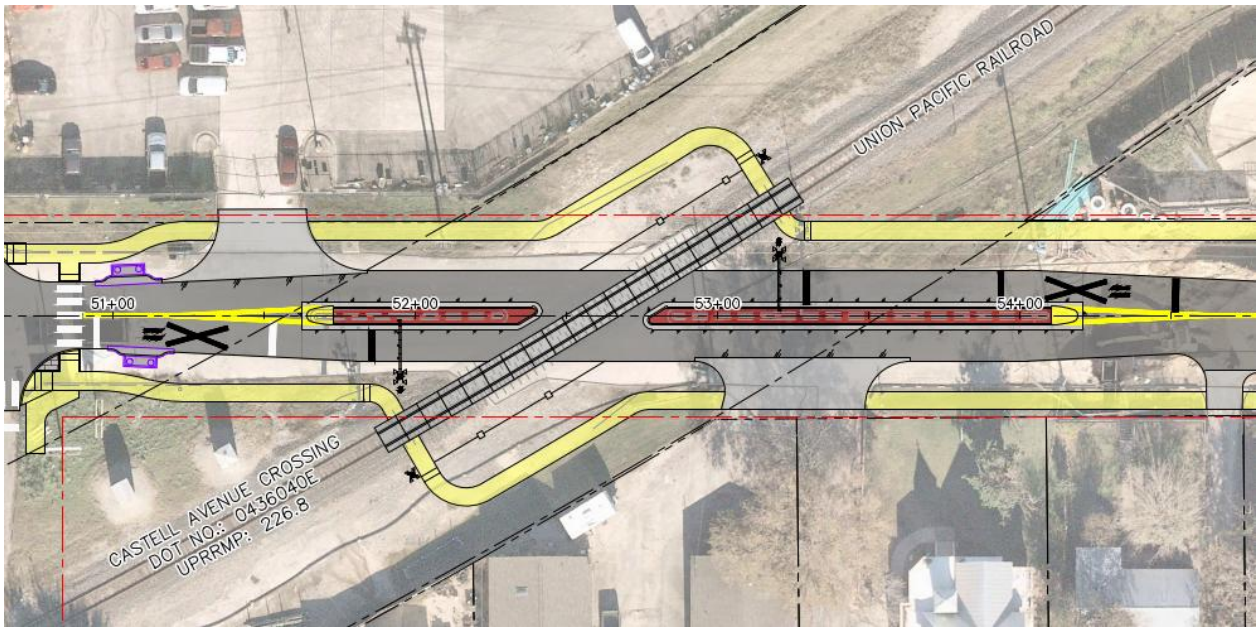


Figure 26 - Union Pacific Railroad Crossing Layout

3.9 Utilities

Typical Utilities and Conflicts

Castell Avenue is a very congested utility corridor, specifically underground. Upon examination of record drawings both abandoned and active utility lines can be seen running along Castell Avenue. Existing undergrounds lines include storm, water, sanitary sewer, gas, telecommunications, and underground electric.

The Kimley-Horn team also coordinated with the City and NBU to acquire information for adjacent projects that are currently under construction along the Castell Ave corridor. These design plans were used to anticipate where utilities will be placed in relation to future improvements needed along the corridor. This includes water and sewer rehabilitation projects and a current CenterPoint gas line relocation project. The new gas line is being installed at an approximate offset of 6 LF to the inside of the eastern Right-of-Way boundary. It is recommended that as-builts be acquired for in the future design phase in order to determine potential conflicts. More detailed utility exploration and engineering may need to be conducted to minimize impacts.

Overhead electric and telecommunication utilities also exist within the project limits along Castell Avenue. NBU indicated to the design team that Castell Ave is one of three critical power source corridors in the City of New Braunfels feeding many services to various customers.

Underground Electric and Duct Bank Design

Part of the Castell Avenue improvements be a new underground electric system that would allow for all overhead lines to be removed from Bridge Street to Elm Street. Removal of these overhead lines will further align the proposed design with goals and opportunities that will be discussed later within Urban Design.

Kimley-Horn and the City coordinated with NBU to provide feedback on relocation of their electrical facilities along Castell Avenue from Bridge Street to Elm Street. To construct an underground system, several improvements will be proposed with the roadway reconstruction. One of these improvements will be the construction of an underground duct bank running with Castell Avenue from Bridge Street and ending past Elm Street. This duct bank will house all necessary electrical lines, street lighting, and telecommunication lines. Above ground facilities will still be required and coordination with NBU and other owners to be in the proposed duct will be required as further design occurs. The attached schematic shows the proposed duct bank location and shows the location of NBU switchgear boxes.

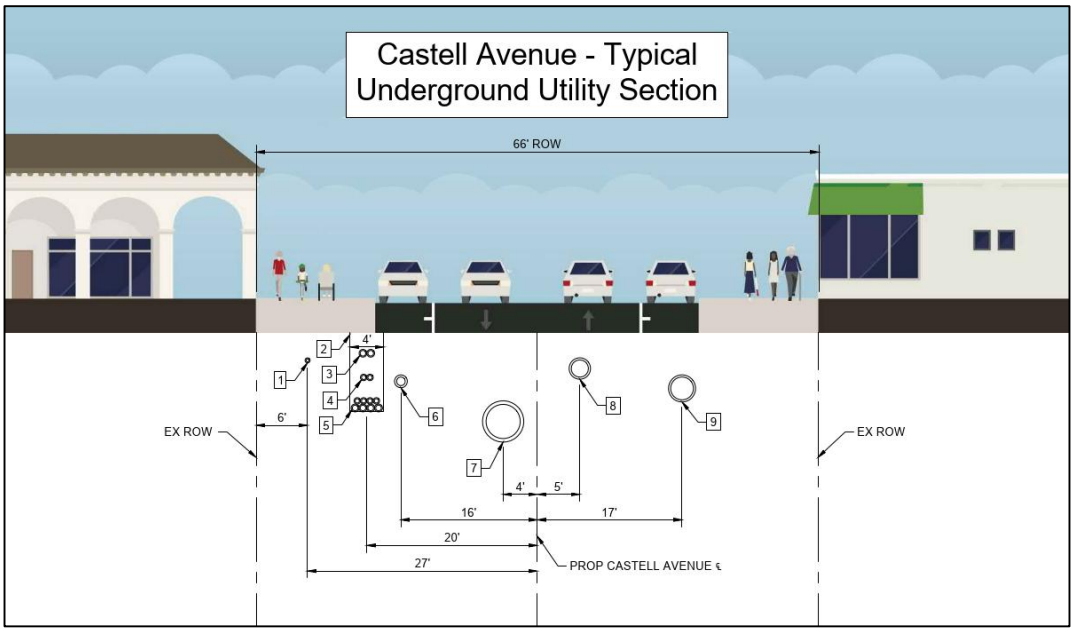


Figure 27 - Castell Avenue Typical Utility Section

CALLOUT	UTILITY TYPE	SIZE AND MATERIAL	OWNER	NOTES
1	EXISTING GAS LINE	2" PLASTIC	CENTERPOINT	RELO PROJECT ONGOING
2	PROP UTILTIY DUCT	4' WIDE TRENCH	NBU	ELECTRIC & COMM.
3	PROP COMMUNICATION CABLES	TBD	VARIOUS	AT&T, CHARTER, ETC.
4	PROP SECONDARY ELECTRIC, STREET LIGHTING AND FIBER OPTIC LINES	2-3" PVC	NBU	
5	PROP PRIMARY ELECTRIC	4-4" PVC & 4-3" PVC	NBU	
6	EX WATERLINE	12" PVC/DI	NBU	LOCATION VARIES
7	PROP STORM LINE	30" TO 48" RCP	CONB	SIZE VARIES
8	EX WATERLINE	24" DI	NBU	
9	EX SANITARY SEWER	16" PVC	NBU	

Figure 28 - Castell Avenue Typical Utility Section Labels

4.0 Conclusion

4.1 Budget

The Opinion of Probable Construction Cost (OPCC) summary for Castell Avenue is shown below and broken down into the various segments. The OPCC is based on available bid tabulations in the area as well as previous experience with typical projects and pricing. A detailed OPCC for each component can be referenced in Appendix G. The quantities are estimated based on the preliminary design layouts. In addition to Kimley-Horn's OPCC the City of New Braunfels contracted RHSI to create a 3rd party OPCC evaluation. This document can also be found in Appendix G.

Project Construction Component	Opinion of Probable Construction Cost*	Contingency (20% +/-)	Inflation Costs (4% per yr)**	Materials Testing (+/-)	Engineering & Design Costs (10%)	Total Project Cost
Coll St – Off-site Drainage Improvements	$ 3,430,000	$ 690,000	$ 330,000	$135,000	$ 445,000	$ 5,030,000
Castell Ave – from Bridge St to Coll St	$ 7,060,000	$ 1,420,000	$ 1,020,000	$290,000	$ 950,000	$ 10,740,000
Castell Ave – from Coll St to Garden St	$ 4,570,000	$ 920,000	$ 660,000	$185,000	$ 615,000	$ 6,950,000
Castell Ave – from Garden St to Jahn St	$ 3,630,000	$ 730,000	$ 530,000	$150,000	$ 490,000	$ 5,530,000
Castell Ave – from Jahn St to Elm St	$ 3,020,000	$ 610,000	$ 580,000	$130,000	$ 430,000	$ 4,770,000
Castell Ave – from Elm St to BUS 35	$ 3,460,000	$ 700,000	$ 840,000	$150,000	$ 500,000	$ 5,650,000
Totals	$ 25,170,000	$ 5,070,000	$ 3,960,000	$1,040,000	$ 3,430,000	$ 38,670,000

*The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
**Inflation number of years vary per project segment. Assumptions can be found in Appendix G.

4.2 Construction Sequencing & Schedule

Full corridor construction plan development to be initiated and coordinated by the City of New Braunfels in the future to build upon the preliminary engineering phase. The following sequencing is recommended with future considerations or pairing with other City projects to accomplish the needed infrastructure needs along Castell Ave. In particular, the offsite drainage improvements along Coll Street from Castell Ave to the Comal River will be needed to be in place for drainage system along Castell Ave to be successful.

Proposed Corridor Sequencing

1. Coll Street - Off-site Drainage Improvements
2. Castell Avenue – from Bridge Street to Coll Street
3. Castell Avenue – from Coll Street to Garden Street (Civic Plaza)
4. Castell Avenue – from Garden Street to Jahn Street
5. Castell Avenue – from Jahn Street to Elm Street (includes roundabout intersection)
6. Castell Avenue – from Elm Street to BUS 35 (include UPRR crossing)

Proposed Project Schedule

1. Preliminary Engineering Report (PER) – from September 2021 to July 2022
2. City Bond Committee Project Selection – Fall 2022
3. Proposed Bond Election – May 2023

4. Specific Project Design & Construction – TBD (based on results of prioritization and funding)

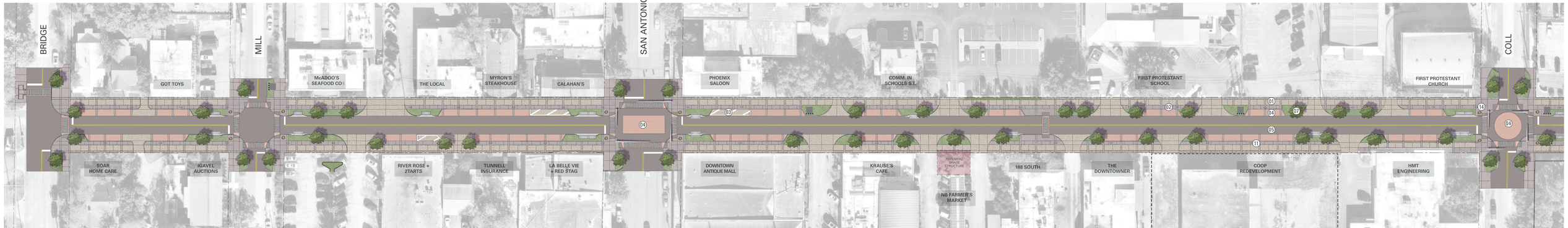
4.3 Recommendation

Kimley-Horn recommends proceeding with the next design steps and construction of the proposed sequencing for Castell Ave to meet the City's goals for the corridor.

4.4 Appendices List

Appendix A: Corridor Urban Design Horizontal Layout
Appendix B: Landscape & Urban Design Plan
Appendix C: Existing Conditions Images
Appendix D: Traffic Memo
Appendix E: Drainage Memo
Appendix F: Preliminary Corridor Plan & Profile Layout
Appendix G: Opinion of Probable Construction Cost

Appendix A: Corridor Urban Design Horizontal Layout



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castell avenue streetscape

landscape and urban design framework 9/21/2022

Legend

01_ integral color concrete finish #1
02_integral color concrete finish #2
03_loading / dropoff / food truck parking
04_pavers
05_regular concrete
06_asphalt
07_street tree
08_ornamental tree
09_bench
10_ bin
11_ lighting
12_ bollards
13_ bike racks
14_ big planter pots
15_ trench drain
16_ lights civic plaza

downtown core

0 10' 20' 40'

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Legend

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15_ trench drain
16_ lights civic plaza

civic plaza

0 10' 20' 40'

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Legend

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15_ trench drain
16_ lights civic plaza

neighborhood mixed

0 10' 20' 40'

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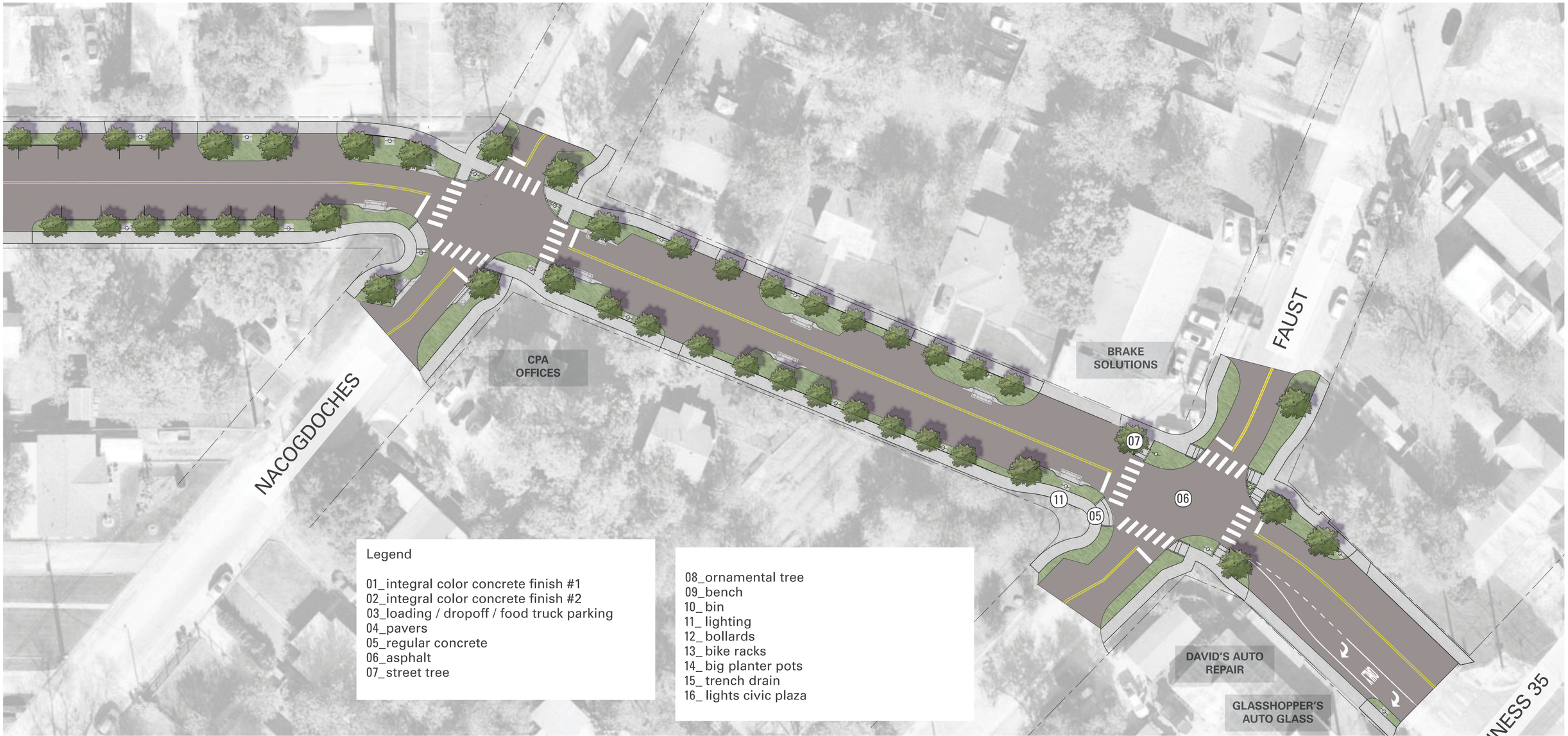

Legend

01_integral color concrete finish #1
02_integral color concrete finish #2
03_loading / dropoff / food truck parking
04_pavers
05_regular concrete
06_asphalt
07_street tree

08_ornamental tree
09_bench
10_ bin
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13_ bike racks
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15_ trench drain
16_ lights civic plaza

neighborhood mixed

0 10' 20' 40'

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Appendix B: Landscape & Urban Design Plan

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castell avenue streetscape

landscape and urban design plan

New Braunfels, Texas

07/08/2022

preserve the culture and
charm of New Braunfels

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castell avenue
streetscape

vision

WHO?

local community
visitors / tourists
food / beer garden lovers
festival enthusiasts
families
New Braunfels neighbors
farmers market regulars
downtown shoppers
cafe goers

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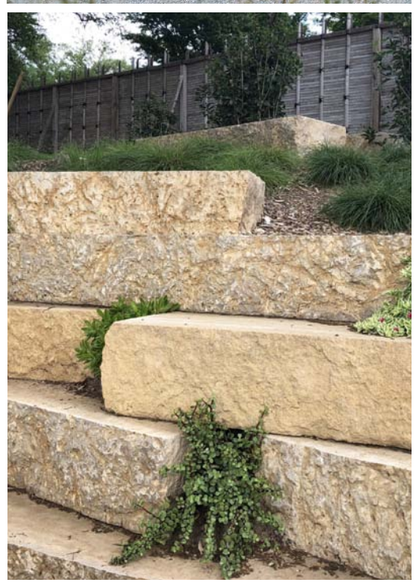
castell avenue
streetscape

character images

WHAT?

authentic to New Braunfels:
past, present, future
cultural art / murals
heritage celebrations
engaging to the community
family friendly



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streetscape

character images

social

provide new space for families
and the community

1. build community connections
2. variety of gathering spaces for all ages
3. authentic
4. spaces that facilitate a variety of cultural activities

heritage landscape

beauty of local plants and wildlife

1. native plants- story telling
2. low maintenance, low water requirements
3. chopped limestone (furniture)
4. create shade, pleasant spaces

economic

provide value to community

1. increase value for community, and the city
2. catalyzes further economic development
3. reuse local materials
4. establish a district identity

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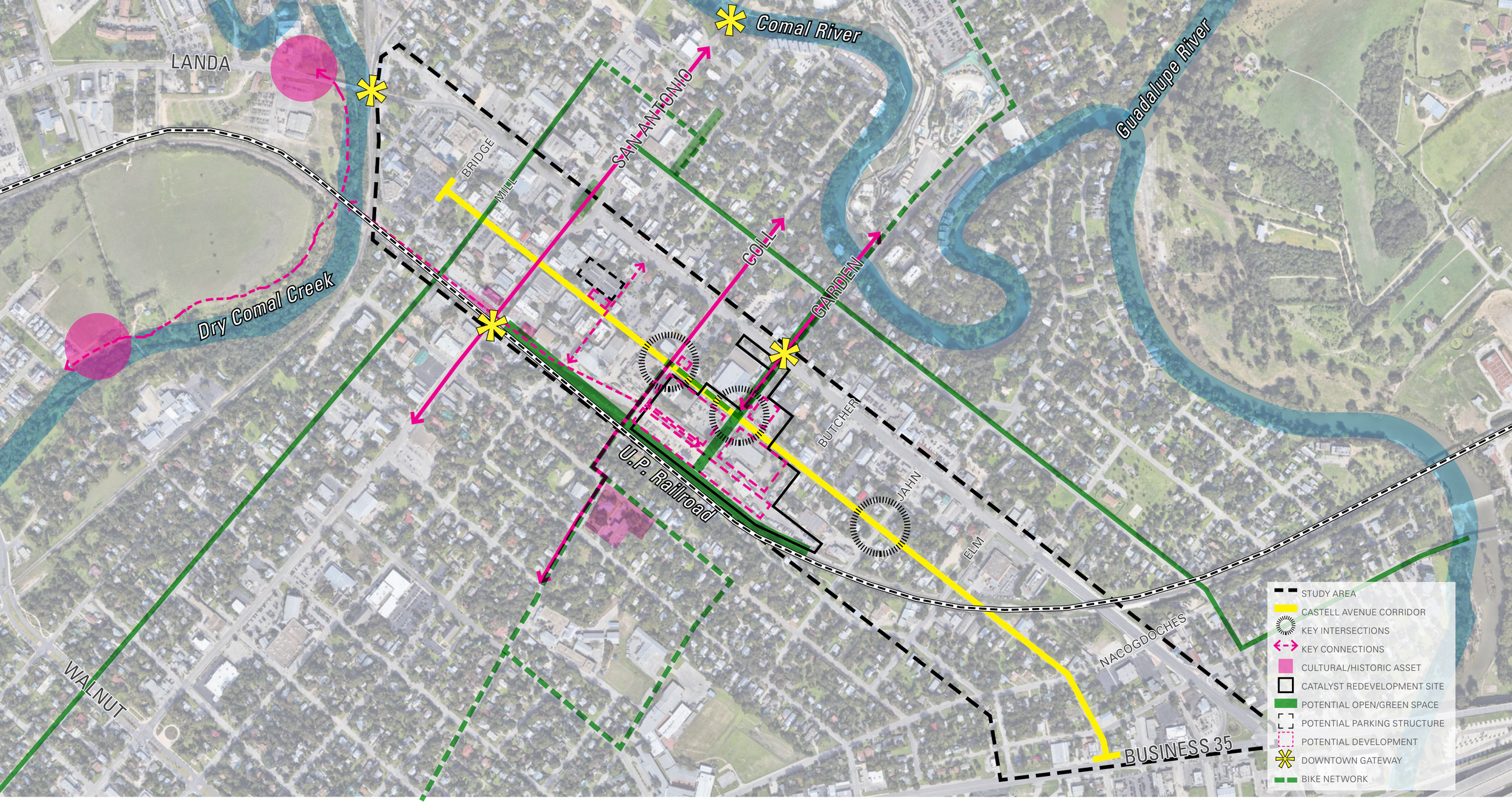
streetscape

opportunities



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urban design framework

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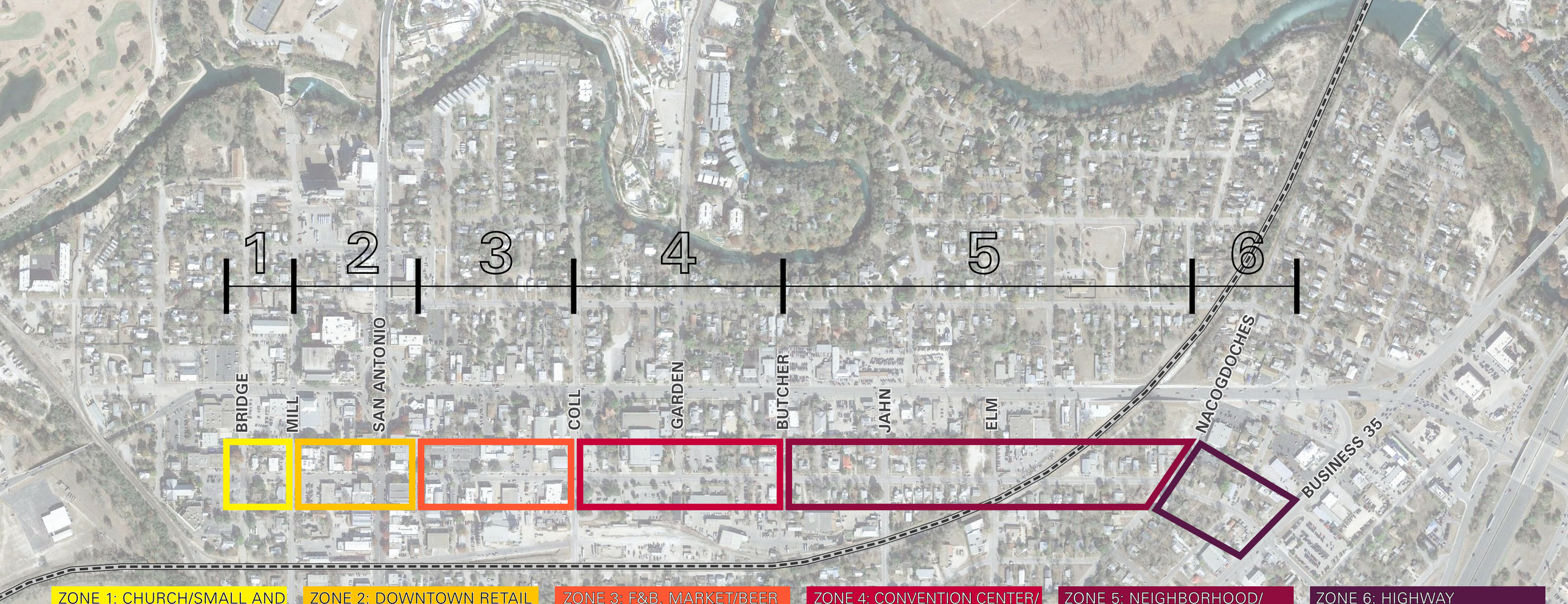


ZONE 1: CHURCH/SMALL AND MID-SCALE BUSINESSES

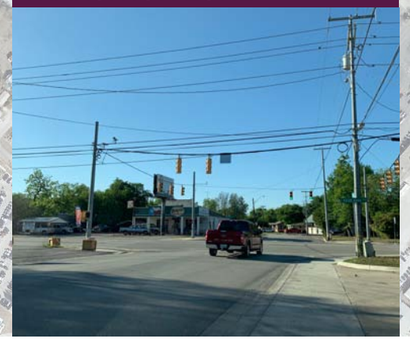
ZONE 2: DOWNTOWN RETAIL

ZONE 3: F&B, MARKET/BEER GARDENS, CIVIC/CULTURAL

ZONE 4: CONVENTION CENTER/ CATALYST DEVELOPMENT

ZONE 5: NEIGHBORHOOD/ BUNGALOW BUSINESSES

ZONE 6: HIGHWAY TRANSITION ZONE



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existing character zones

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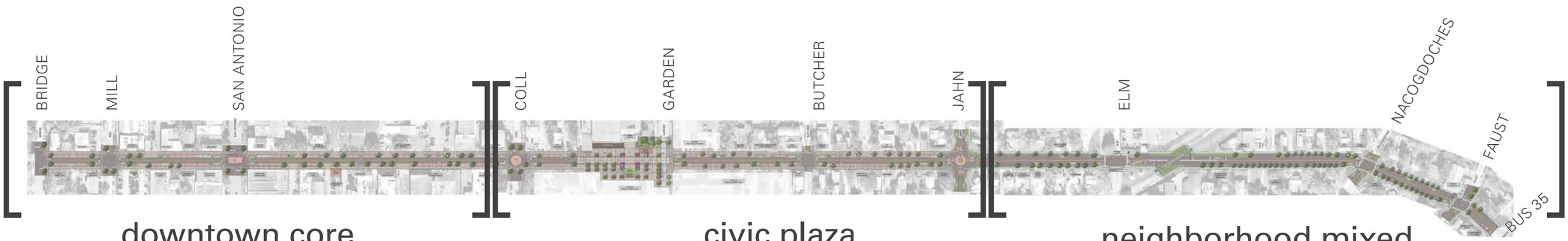
BRIDGE TO MILL

MILL TO GARDEN

GARDEN



GARDEN TO BUTCHER

BUTCHER TO JAHN

JAHN TO BUSINESS 35

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proposed landscape character zones

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multi-use sidewalk zone

Sidewalks play a vital role in city life. As conduits for pedestrian movement and access, they enhance connectivity and promote walking. As public spaces, sidewalks serve as the front steps to the city, activating streets socially and economically. Just as roadway expansions and improvements have historically enhanced travel for motorists, superior sidewalk design can encourage walking by making it more attractive.

strategic bulb-outs

Curb extensions/bulb-outs visually and physically narrow the road, creating safer and shorter crossings for pedestrians while increasing the available space for street furniture, benches, plantings, and street trees. Parklets are typically applied where narrow or congested sidewalks prevent the installation of traditional sidewalk cafes, or where local property owners or residents see a need to expand the seating capacity and public space on a given street.

street trees/ pocket gardens

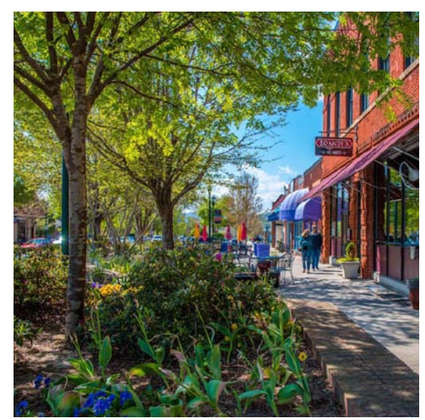
Street trees calm motor vehicle traffic by visually narrowing the street and providing a well-defined roadside edge. Trees can be used to break up long rows of on-street parking and play a role in a street's livability, creating shade, dampening noise pollution, improving mental well-being, reducing stress, adding aesthetic value, and contributing to a sense of place. Pocket gardens adds aesthetics, habitat, and ecological value to the city's right of way.

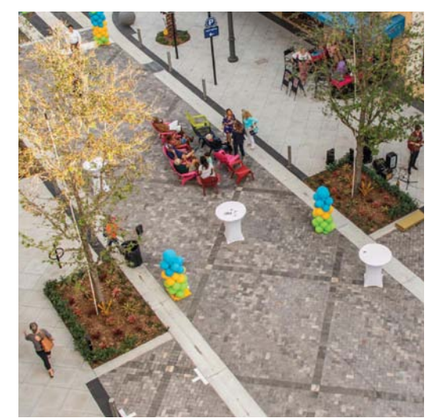
pedestrian prioritized shared streets

Shared streets prioritize walking over all other movement, while allowing motor vehicle access at extremely low speeds. Commercial shared street environments are most suitable in places where pedestrian activity is high and vehicle volumes are either low or discouraged. Street furniture, including bollards, benches, planters, and bicycle parking, can help define a shared space, delineating the traveled way from the pedestrian-only space.

pedestrian amenities/ furnishings

Site furnishings announce that pedestrians are welcome and that the street is a comfortable place to be. These amenities provide a functional service to the pedestrian and provide visual detail that makes a place comfortable and interesting. This can include: benches and seating, bicycle racks, bollards, flower stands, kiosks, gateway monuments, news racks, public art, sidewalk restrooms, wayfinding signage.





Source for definitions above: NATIONAL ASSOCIATION OF CITY TRANSPORTATION OFFICIALS (NACTO)

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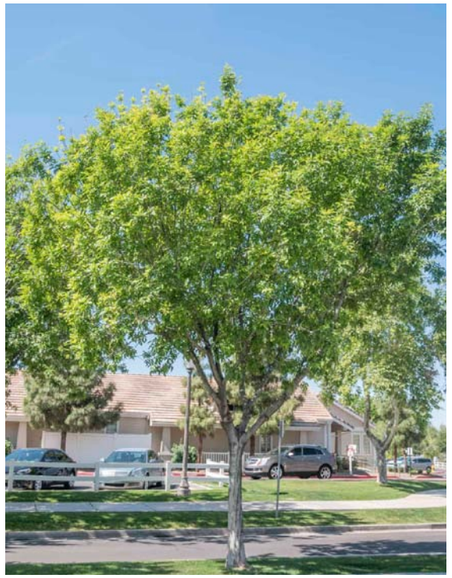
native trees



Texas ash-*Fraxinus texensis*

Bald cypress-*Taxodium distichum*

Cedar elm-*Ulmus crassifolia*

Bigtooth maple -*Acer grandidentatum*

Monterrey oak-*Quercus polymorpha*

Palo verde-*Parkinsonia florida*

Mexican plum-*Prunus mexicana*

Thornless honey mesquite-
Prosopis glandulosa 'Maverick'

Wax myrtle-*Morella cerifera*

Mexican buckeye-*Ungnadia speciosa*

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proposed tree palette

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native grasses

Blue grama- *Bouteloua gracilis*

Canadian wild-*Elymus canadensis*

Muhly grass-*Muhlenbergia capillaris*

M. feathergrass-*Nassella tenuissima*

Fountain grass-*Pennisetum setaceum*

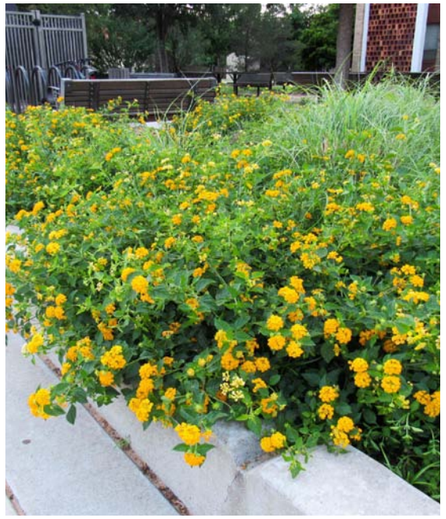
shrubs

Autumn sage-*Salvia greggii*

Texas sage-*Leucophyllum frutescens*

Red yucca-*Hesperaloe parviflora*

Turk's cap -*Lilium superbum*



Texas lantana-*Lantana urticoides*

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streetscape

proposed plant palette

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wild flowers

Basket flower-*Centaurea americana*

Indian paintbrush-*Castilleja indivisa*

Texas bluebonnet-*Lupinus texensis*

Winecup-*Callirhoe involucrata*

Barbados cherry-*Malpighia galbra*

Prairie verbena-*Glandularia bipinnatifida*

Mexican hat-*Ratibida columnifera*

Indian blanket-*Gaillardia pulchella*

Santolina-*Santolina chamaecyparissus*

Creeping phlox-*Phlox stolonifera*

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proposed plant palette

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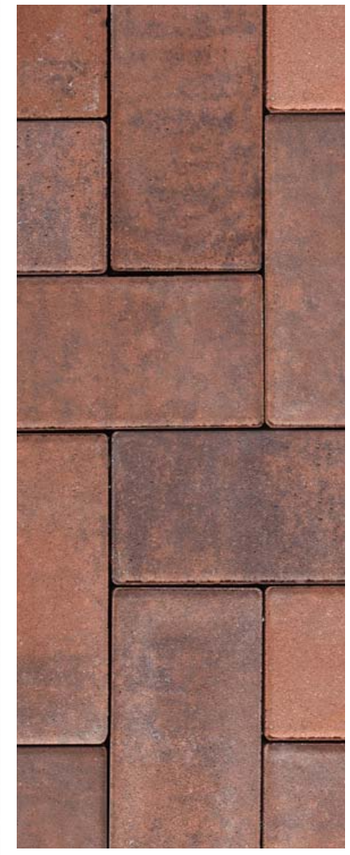
regular concrete

concrete acid-etched

integral color concrete

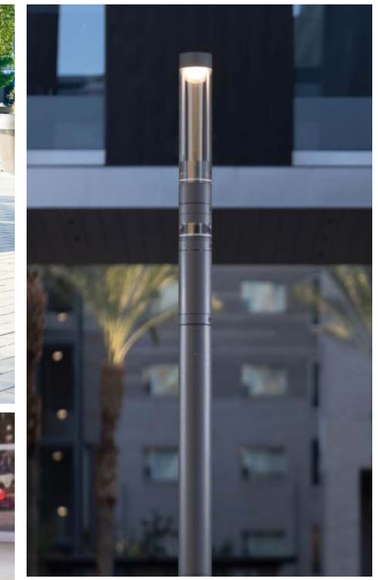


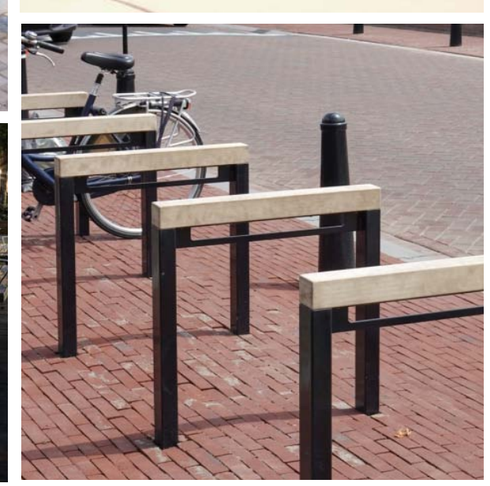
pavers

TBG

castell avenue streetscape

materials





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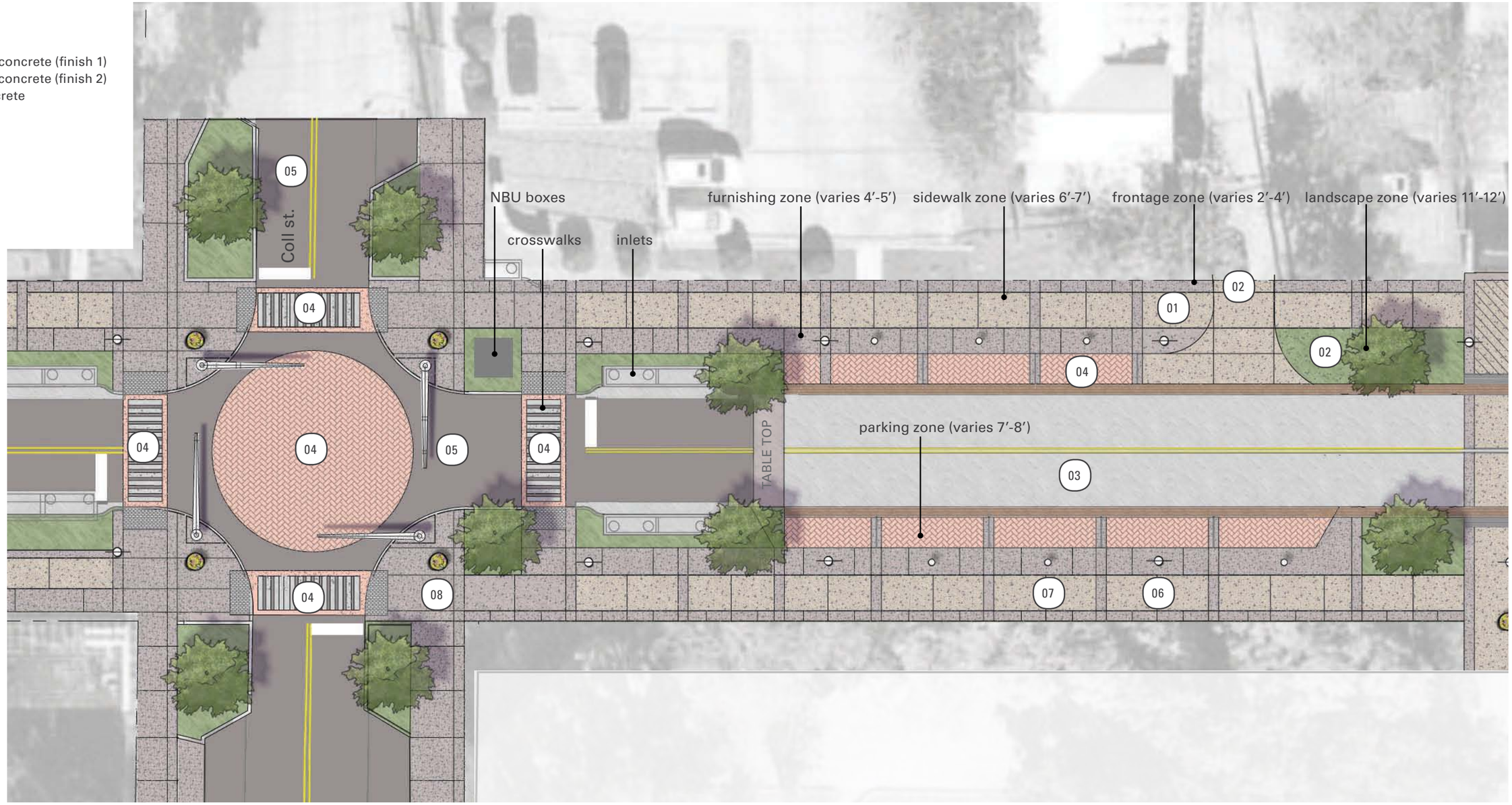
castell avenue streetscape

proposed street furniture palette

Legend

01_ integral color concrete (finish 1)
02_ integral color concrete (finish 2)
03_ standard concrete
04_ pavers
05_ asphalt
06_ lighting
07_ bollards
08_ planters



TBG

castell avenue streetscape

enlarged plan view
coll to civic plaza

0 75′ 150′ 300′

TBG – [210] 366 9933 – tbgpartners.com
430 austin street, suite 100, san antonio, tx 78215
The information shown is subject to change without notice.

legend

01_integral color concrete (finish 1)

02_integral color concrete (finish 2)

03_standard concrete

04_ pavers

05_ tactile paving

06_trench drain

07_ tree grate

TBG

castell avenue streetscape

enlarged plan view
civic plaza

0 75' 150' 300'

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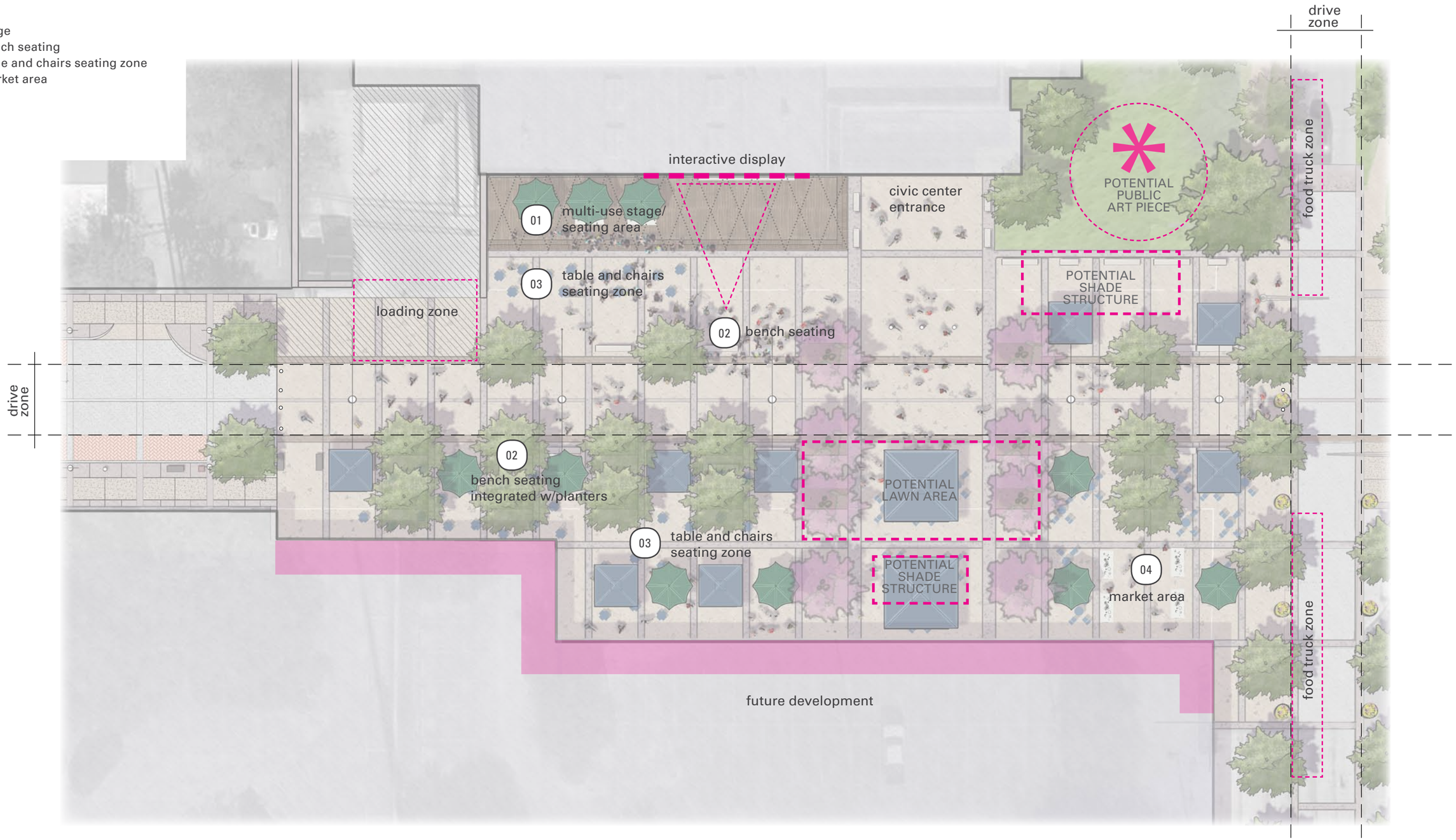
TBG

castell avenue
streetscape

civic plaza placemaking ideas

Legend

01_ stage
02_ bench seating
03_ table and chairs seating zone
04_ market area



TBG

castell avenue streetscape

civic plaza activities

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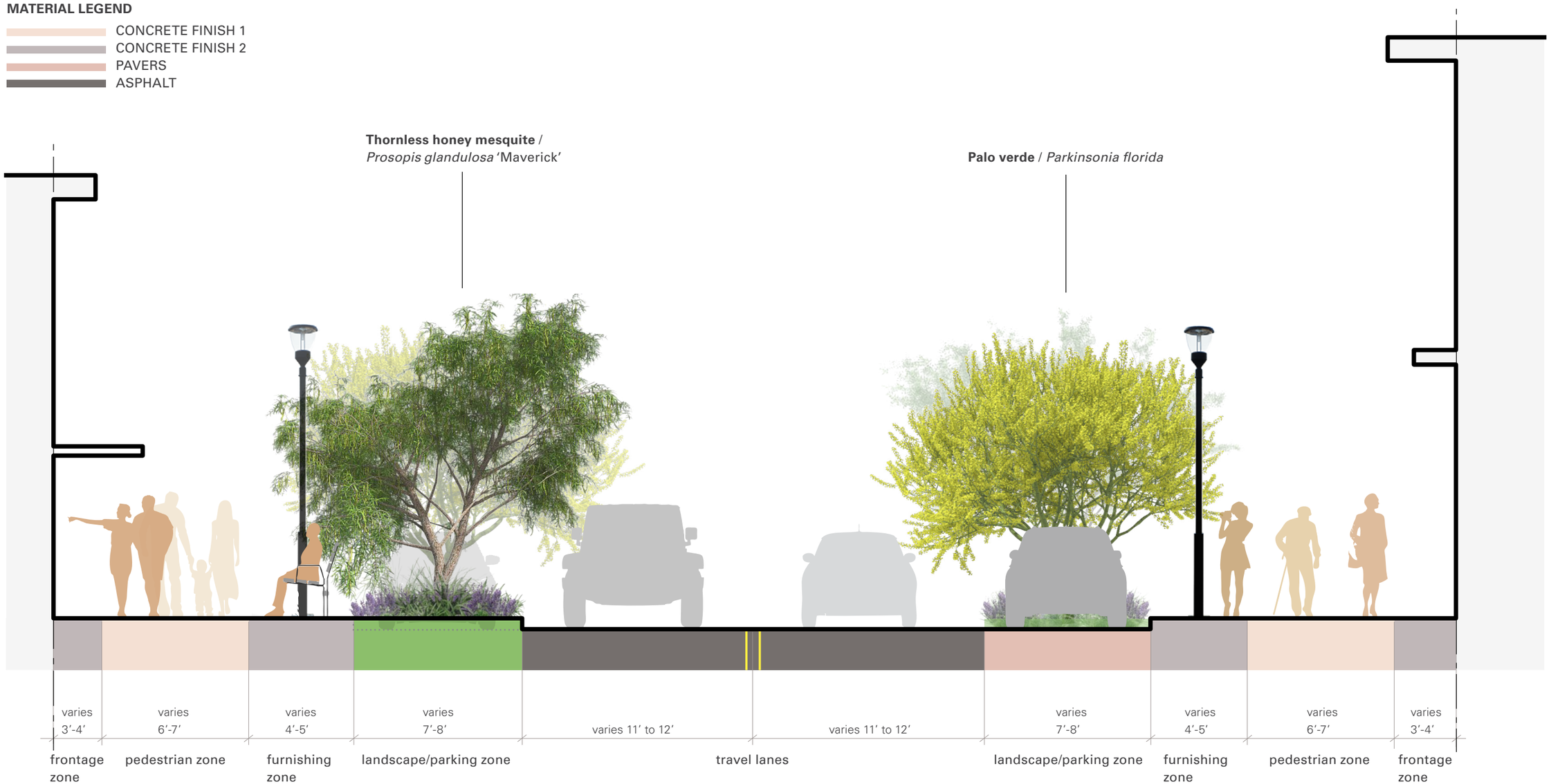
MATERIAL LEGEND

- CONCRETE FINISH 1
- CONCRETE FINISH 2
- PAVERS
- ASPHALT



TBG

castell avenue streetscape

section a: urban segment

0 5' 10'

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MATERIAL LEGEND

CONCRETE
ASPHALT

TBG

castell avenue streetscape

section b: neighborhood

0 5' 10'

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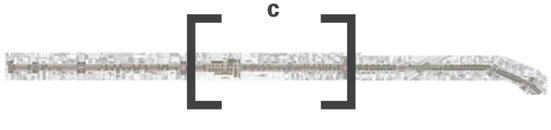
MATERIAL LEGEND

- CONCRETE FINISH 1
- CONCRETE FINISH 2
- TACTILE PAVING
- TRENCH DRAIN

TBG

castell avenue streetscape

section c1: civic plaza



0 5′ 10′ 20′

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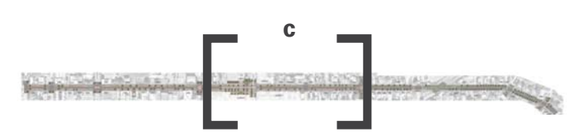
TBG

castell avenue streetscape

section c2: civic plaza street



0 5′ 10′

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TBG

castell avenue streetscape

view at krause's cafe looking north today

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TBG

castell avenue streetscape

view at krause's cafe looking north
proposed

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TBG

castell avenue streetscape

view at jahn looking south
today

TBG

castell avenue streetscape

view at jahn looking south
proposed

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The information shown is subject to change without notice.

TBG

castell avenue streetscape

view at civic plaza looking north today

TBG

castell avenue streetscape

view at civic plaza looking north
proposed

Appendix C: Existing Conditions Images

Image 1: Mill Street Parking Impeding Sight

Image 2: Business Parking Impeding Pedestrian Route

Image 3: Existing On Street Parking

Image 4: Existing Coll Street Signal

Image 5: Jahn Street Intersection

Image 6: Castell Avenue at Civic Center

Image 7: Garden Street Intersection

Image 8:Castell Avenue at Butcher Street

Image 9:Butcher Street Intersection

Image 10: Castell Avenue at Rail Crossing

Appendix D: Traffic Memo

TECHNICAL MEMORANDUM

DATE: April 21, 2022

JOB NUMBER: 064405305

RE: Castell Ave PER
Task 3.3 Deliverable
Conceptual Analysis of Traffic Conditions

Background

This memo documents the results of a study of traffic and crash history along Castell Ave between San Antonio St and Interstate 35 Southbound Frontage Road (SBFR) in the City of New Braunfels, Texas. This report contains recommendations related to appropriate cross sections for adequacy of capacity for traffic, intersection improvements and traffic calming strategies.

CORRIDOR CHARACTERISTICS

South Castell Ave runs in a general east-west direction with one lane of traffic in each direction and parking allowed on both sides of the street. The majority of the corridor does not have a posted speed limit, except for a sign posted near the intersection with Butcher street posted at 25 mph. The pavement width varies from 30' east of Elliot Knox Blvd to 42-44' width west of Elliot Knox Blvd.

CRASH HISTORY

Crash data was collected from the TxDOT Crash Reporting Information System (CRIS) from January 2017 to December 2021. Data was collected along Castell Ave between San Antonio St and I-35 SBFR. A total of 33 crashes were reported along the corridor during this period.

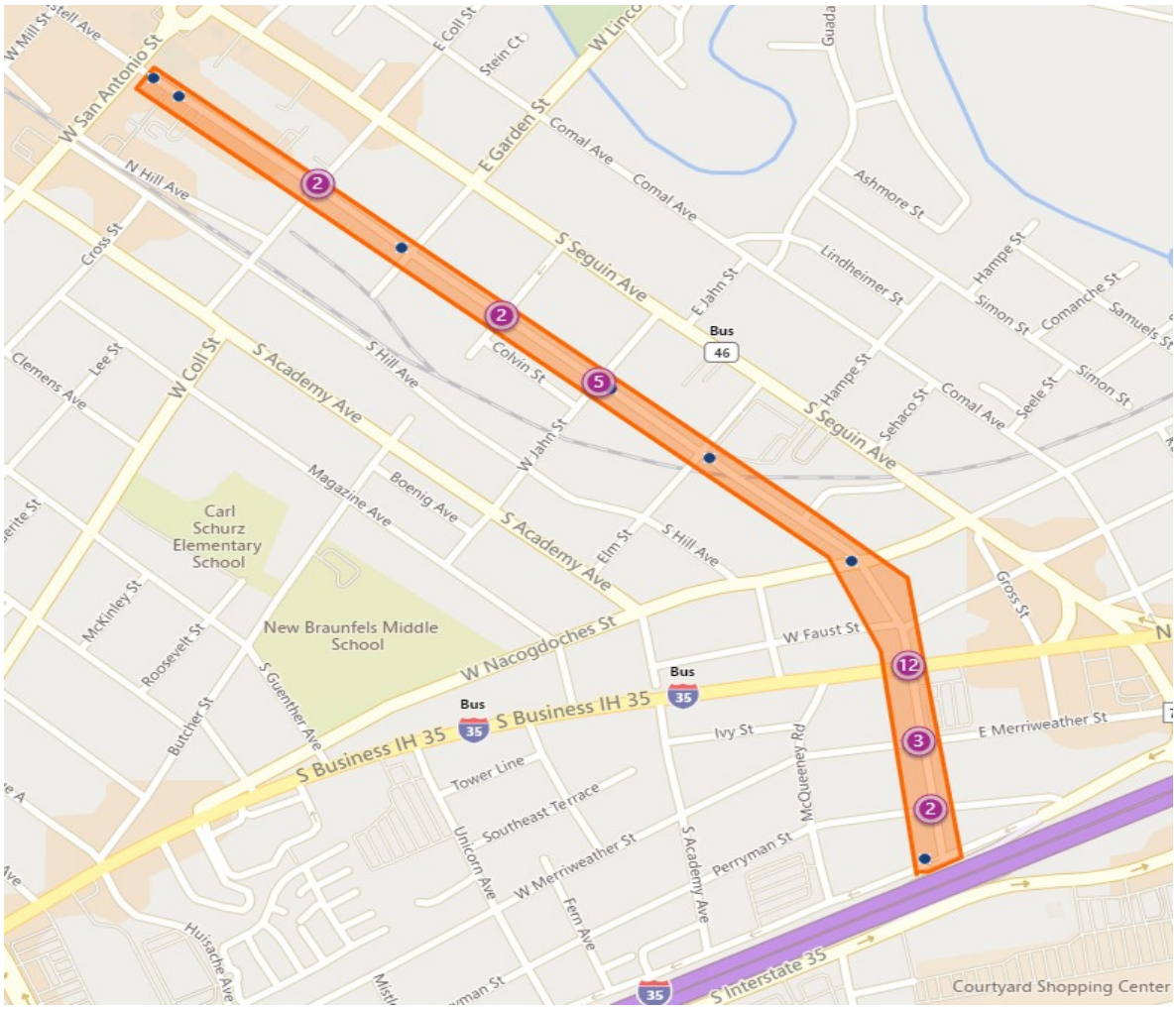
The frequency of crashes on Castell Ave per year is shown in **Table 1**. The crash totals by

location are presented graphically in **Figure 1**.

Table 1 – Crashes Per Year

Year	Crashes
2017	6
2018	9
2019	8
2020	6
2021	4
TOTAL	**33**

Figure 1 – Crash Location Map 2017 to 2021



The frequency of crashes by manner of collision is presented in **Table 2**. The frequency of crashes by contributing factors is presented in **Table 3**. The frequency of crashes by severity is presented in **Table 4**.

Table 2 – Crash Types by Year 2017 – 2021

Manner of Collision	2017	2018	2019	2020	2021	Grand Total
ANGLE - BOTH GOING STRAIGHT	1	3	2	5	1	12
ANGLE - ONE STRAIGHT-ONE BACKING			1			1
ANGLE - ONE STRAIGHT-ONE LEFT TURN		1	1			2
ANGLE - ONE STRAIGHT-ONE RIGHT TURN					1	1
ANGLE - ONE STRAIGHT-ONE STOPPED						0
ONE MOTOR VEHICLE - GOING STRAIGHT	1	1			1	3
ONE MOTOR VEHICLE - BACKING	1					1
OPPOSITE DIRECTION - ONE BACKING-ONE STOPPED						0
OPPOSITE DIRECTION - ONE STRAIGHT-ONE LEFT TURN		1	2	1		4
OPPOSITE DIRECTION - BOTH LEFT TURNS						0
SAME DIRECTION - BOTH GOING STRAIGHT-REAR END	1	2	1			4
SAME DIRECTION - BOTH GOING STRAIGHT-SIDESWIPE	1					1
SAME DIRECTION - ONE STRAIGHT-ONE STOPPED		1			1	2
SAME DIRECTION - ONE STRAIGHT-ONE LEFT TURN			1			1
SAME DIRECTION - ONE STRAIGHT-ONE RIGHT TURN	1					1
Grand Total	**6**	**9**	**8**	**6**	**4**	**33**

Table 3 – Crash Contributing Factors by Year 2017 – 2021

Contributing Factor	2017	2018	2019	2020	2021	Grand Total
3 - BACKED WITHOUT SAFETY	1		1			2
4 - CHANGED LANE WHEN UNSAFE	1					1
15 - DISREGARD STOP AND GO SIGNAL				3		3
16 - DISREGARD STOP SIGN OR LIGHT		2	3	1		6
19 - DISTRACTION IN VEHICLE				1		1
22 - FAILED TO CONTROL SPEED		3	2		2	7
23 - FAILED TO DRIVE IN SINGLE LANE		1				1
24 - FAILED TO GIVE HALF OF ROADWAY	1					1
28 - FAILED TO SIGNAL OR GAVE WRONG SIGNAL			1			1
34 - FAILED TO YIELD RIGHT OF WAY - PRIVATE DRIVE		1				1
35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	1	1	1		2	5
37 - FAILED TO YIELD RIGHT OF WAY - TURNING LEFT		1		1		2
44 - FOLLOWED TOO CLOSELY	1					1
67 - UNDER INFLUENCE - ALCOHOL	1					1
Grand Total	**6**	**9**	**8**	**6**	**4**	**33**

Table 4 – Crash Severity by Year 2017 – 2021

Crash Severity	2017	2018	2019	2020	2021	Grand Total
99 - UNKNOWN					1	1
A - SUSPECTED SERIOUS INJURY				1		1
B - SUSPECTED MINOR INJURY	2	1	1	2	1	7
C - POSSIBLE INJURY		2				2
N - NOT INJURED	4	6	7	3	2	22
Grand Total	**6**	**9**	**8**	**6**	**4**	**33**

Crash History Observations

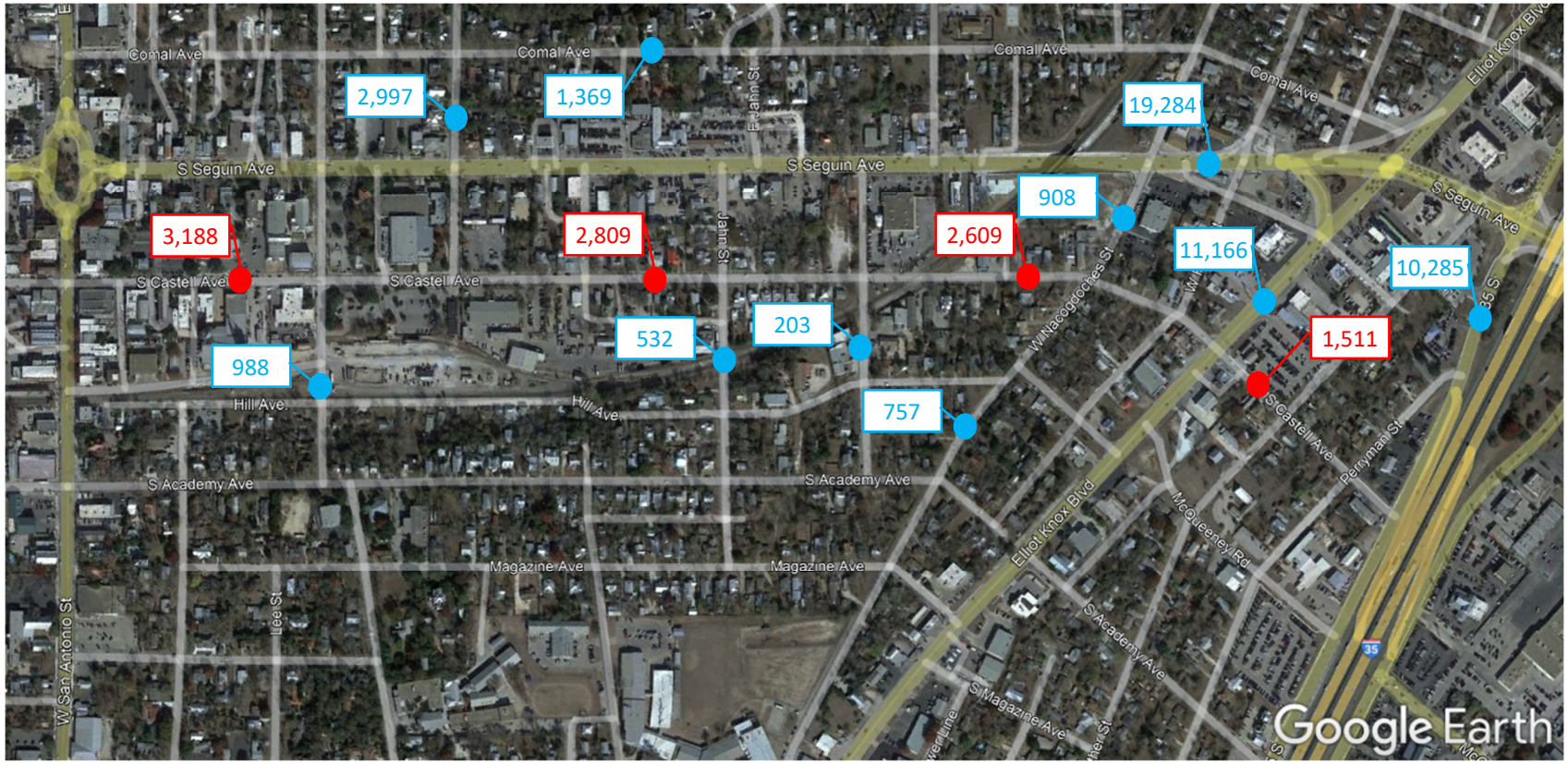
A majority of the crashes reported during the last 5 years occurred between Elliot Knox Blvd (I-35 BUS) and the I-35 SBFR. Another hot spot at the intersection of Jahn St and S Castell Ave, where about 20% of crashes occurred. Over two-thirds of crashes involved failure to control speed or failure to yield right of way at intersections of public streets, suggesting that there are challenges with speeding as well as disregarding stop signs along the corridor. This could also be in part due to the wider street section and parked cars blocking visibility, as was observed in a field visit on December 14, 2021 in **Figure 2**. In addition to these observations, there were multiple (3) instances of vehicles involved in a crash with a parked car. Nearly one-third of the crashes involved a possible or suspected injury. A full detail of crash information for every crash is provided in **Appendix A** for reference.

Figure 2 – Cars Blocking Visibility Example – Mill St Intersection

TRAFFIC VOLUMES

Average daily traffic volumes from 2020 sourced from the TxDOT Traffic Count Database System (TCDS) are presented in **Figure 3**. Volumes in red are on S Castell Ave and volumes in blue are off corridor volumes for context of the surround street network and alternative routes in the area. *Due to the street closures on Castell Ave for construction, it was not practical to collect new speed and or volume data, which would affect results.*

Figure 3 – Corridor Daily Traffic Volumes (2020)



CROSS SECTION ADEQUACY EVALUATION

To evaluate the volume to capacity (v/c) ratio for S Castell Ave, a calculation of the street's daily capacity must be determined to compare with volumes along the corridor. Based on a collector capacity of 420 vehicles per hour per lane (vphpl) from the latest Roadway Impact Fee Study, and a k-factor of 0.1 the following is the resulting daily capacity for S Castell Ave as a 2-lane collector roadway:

(420 vphpl * 2 lanes) / 0.1 = 8,400 vehicles per day

Comparing the daily capacity of 8,400 vehicles per day for S Castell Ave to the maximum existing daily volume of 3,188 vehicles per day yields a v/c ratio of roughly 0.38, well below capacity and likely operating a high level of service. This suggests that a collector street with 2 lanes of travel is sufficient for operations on the corridor.

POTENTIAL IMPROVEMENTS

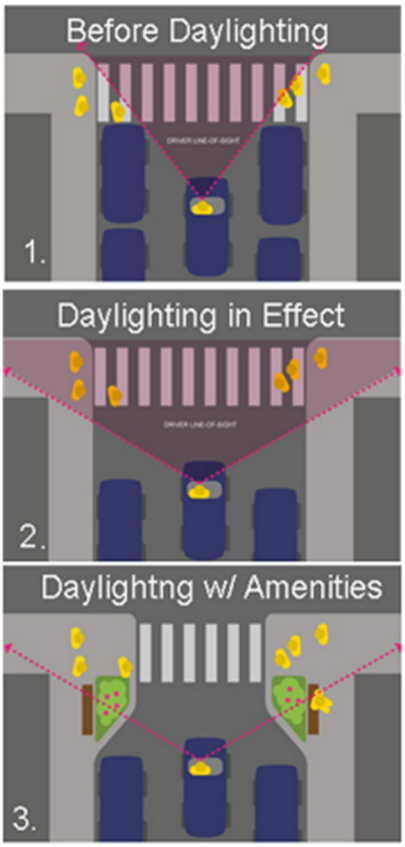
Speed Management

To address speed along the corridor, several potential improvements are recommended to both along the corridor and at intersections to break up long straightaway between San Antonio St and Nacogdoches St. In practice, achieving the posted speed of 25 miles per hour is extremely difficult without introducing horizontal and vertical deflections in the path of travel at regular intervals. Installing speed management treatments at 500 foot to 1000 foot spacing between intersections, a traffic calming effect is likely with the requirement to slow down at these locations. This could take the form of roundabouts, curb bulb-outs, median islands, or other speed management treatments.

Sight Distance and Walkability

It is recommended to implement corner bulb-outs on Castell Ave where cars are currently allowed to park to improve visibility of both crossing pedestrians and cars on conflicting approaches and remediate any sight distance issues. This concept, "daylighting", is illustrated in **Figure 4**, and creates an opportunity for street beautification. It should be noted that anything occupying the space near crossings must be maintained at a height of no more than 3.5 feet to not occlude driver visibility for a passenger car, per the driver eye height of such a vehicle per the AASHTO Green Book. It should also be noted that this may result in the loss of parking spaces in some locations.

Figure 4 – Intersection Daylighting



It was also observed that sidewalk gaps exist in several locations between Butcher St and Elliot Knox Blvd, with high frequency of driveways. Consolidating driveways and improving driveway crossing quality may create opportunities for more parking space and will improve walkability to complement the vision for redevelopment of adjacent parcels into a walkable urban thoroughfare. An example of a poor driveway crossing for pedestrians can be seen with the pull in parking at the Downtowner Bar, which creates a barrier to walkability along the corridor.

Intersection Specific Improvements

Merriweather St and Perryman St

The current pavement width and intersection areas at Merriweather St and Perryman St are too small for implementation of mini-roundabouts and the recommended Inscribed Circle

Diameter (ICD) of 65 feet. However, the area east of Elliot Knox Blvd could be improved by adding bulb outs or pavement markings to define parking areas and narrow the street to reduce lane widths and improve speed compliance.

Business 35 / Elliot Knox Blvd

The intersection with Elliot Knox Blvd is the highest crash location observed on the corridor, with 6 crashes occurring in 2020 alone and one involving a suspected serious injury crash. Contributing factors to crashes generally included either a failure to obey the signal red and green phases or failing to yield right-of-way. Crash types were a mix of t-bone crashes with both vehicles going straight (failure to obey red light indication in one direction) or vehicles making a left turn and crashing with a vehicle going straight in the opposing direction. Notable also was that the majority of crashes occurred in the afternoon hours between 2-7PM. It is possible that the lack of backplates and possible sunlight interference could be causing visibility issues of signal heads, especially with the curve to the west on Castell Ave just north of the intersection. It is recommended to install backplates on all signal heads to aid in visibility, recalculate and adjust yellow and all red clearance intervals if too short, and restripe castell for exclusive left turn lanes on both sides of the intersection and implement protected only left turn phases on Castell Ave with appropriate left turn signal heads and associated regulatory signs on the span wire signal.

Nacogdoches St

The intersection with Nacogdoches St could be improved from both an operational and safety standpoint with some low-cost improvements. First, delineating the location where vehicles should stop with stop bars would help increase awareness of the existing all way stop and can be placed to ensure there are not conflicts for larger turning vehicles. This is especially important for right turns from Castell to west-southwestbound Nacogdoches where there is a sharp intersection angle. Additionally, yellow paint on curbs should be refreshed to delineate areas where no parking is allowed to ensure sight distance is not obstructed, especially for the building on the northeast corner that obstructs view from Castell of approaching vehicles on Nacodgoches from the northeast. Operationally, additional capacity could be added through restriping of approaches for left or right turn pockets, but would require restriction of parking and likely supplemental signs to reinforce parking prohibitions where turn lanes could be implemented. However, volumes appear sufficiently low that additional turn capacity does not appear to be necessary for the all-way stop configuration.

Elm St

Elm Street did not include any recommendations, and it is noted that it is a private street north of Castell Ave.

Jahn St

On the western portion of the corridor Jahn St appears to be a good candidate for implementation of a mini-roundabout. This intersection has roughly the 65' ICD recommended within existing corner radii curb lines (see **Figure 5** at Garden St), but would require further design and evaluation for drainage and feasibility with pedestrian connections. Coll St was also evaluated for a conversion from a traffic signal to a roundabout, but space and right-of-way challenges led to a determination that this location would not be feasible or practical.

Figure 5 – 65 Foot Inscribed Circle Diameter at Jahn St and S Castell Ave

Butcher St

The intersection with Butcher St (a one-way alley north of Castell Ave) does not appear suitable in size or traffic for a roundabout but could serve as a transition point with planned

development to the west with use of a 16’ wide median island in lieu of corner bulb-outs for a short distance with a monument sign welcoming people to “downtown” or some other appropriate messaging. Alternative intersection speed management treatments or mid-block median islands may be explored at locations where mini-roundabouts are likely not appropriate, such as at Jahn and Garden streets to complement speed management techniques on the western portion of the corridor.

Garden St

The intersection with Garden St has significant traffic north of the intersection with Castell Ave due to connectivity across the Comal River and has been identified for further study for a future traffic signal, if warrants are met and justified by engineering judgment.

Appendix

Crash ID	Crash Date	Cross Street Name	Crash Severity	Crash Time	Crash Year	First Harmful Event	Manner of Collision	Surface Condition	Weather Condition	Contributing Factor 1	Contributing Factor 2	Contributing Factor 3	Possible Contributing Factor 1	Possible Contributing Factor 2
15682539	4/2/2017	ELM ST	N - NOT INJURED	113	2017	PARKED CAR	ONE MOTOR VEHICLE - GOING STRAIGHT	1 - DRY	1 - CLEAR	67 - UNDER INFLUENCE - ALCOHOL	No Data	No Data	76 - CELL/MOBILE DEVICE USE - OTHER	No Data
15792537	6/1/2017	W JAHN ST	N - NOT INJURED	1800	2017	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	No Data	No Data
15868652	7/11/2017	ELLIOT KNOX BLVD	N - NOT INJURED	2204	2017	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - BOTH GOING STRAIGHT-SIDESWIPE	1 - DRY	1 - CLEAR	4 - CHANGED LANE WHEN UNSAFE	No Data	No Data	45 - HAD BEEN DRINKING	No Data
15982845	9/18/2017	W COLL ST	B - SUSPECTED MINOR INJURY	1227	2017	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - ONE STRAIGHT-ONE RIGHT TURN	1 - DRY	1 - CLEAR	24 - FAILED TO GIVE HALF OF ROADWAY	No Data	No Data	No Data	No Data
16086285	10/28/2017	W SAN ANTONIO ST	N - NOT INJURED	1247	2017	OTHER OBJECT	ONE MOTOR VEHICLE - BACKING	1 - DRY	1 - CLEAR	3 - BACKED WITHOUT SAFETY	No Data	No Data	No Data	No Data
16120121	11/30/2017	ELLIOT KNOX BLVD	B - SUSPECTED MINOR INJURY	1728	2017	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - BOTH GOING STRAIGHT-REAR END	1 - DRY	1 - CLEAR	44 - FOLLOWED TOO CLOSELY	22 - FAILED TO CONTROL SPEED	No Data	No Data	No Data
16204990	1/9/2018	ELLIOT KNOX BLVD	N - NOT INJURED	1451	2018	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - BOTH GOING STRAIGHT-REAR END	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	No Data	No Data	44 - FOLLOWED TOO CLOSELY	No Data
16394343	5/5/2018	BUTCHER ST	B - SUSPECTED MINOR INJURY	1347	2018	MOTOR VEHICLE IN TRANSPORT	ANGLE - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	1 - CLEAR	34 - FAILED TO YIELD RIGHT OF WAY - PRIVATE DRIVE	No Data	No Data	No Data	No Data
16399232	5/7/2018	E MERRIWEATHER ST	N - NOT INJURED	1847	2018	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - ONE STRAIGHT-ONE STOPPED	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	No Data	No Data	No Data	No Data
16424789	5/18/2018	E MERRIWEATHER ST	C - POSSIBLE INJURY	1833	2018	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	16 - DISREGARD STOP SIGN OR LIGHT	No Data	No Data	No Data	No Data
16436730	5/26/2018	W NACOGDOCHES ST	N - NOT INJURED	2230	2018	PARKED CAR	ONE MOTOR VEHICLE - GOING STRAIGHT	1 - DRY	1 - CLEAR	23 - FAILED TO DRIVE IN SINGLE LANE	67 - UNDER INFLUENCE - ALCOHOL	No Data	No Data	No Data
16704508	10/17/2018	W SAN ANTONIO ST	N - NOT INJURED	1239	2018	MOTOR VEHICLE IN TRANSPORT	OPPOSITE DIRECTION - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	2 - CLOUDY	37 - FAILED TO YIELD RIGHT OF WAY - TURNING LEFT	No Data	No Data	No Data	No Data
16750253	11/11/2018	W JAHN ST	N - NOT INJURED	1806	2018	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	2 - WET	3 - RAIN	16 - DISREGARD STOP SIGN OR LIGHT	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	No Data
16800345	12/6/2018	W JAHN ST	N - NOT INJURED	1607	2018	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	2 - WET	3 - RAIN	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	No Data	No Data
16803709	12/9/2018	ELLIOT KNOX BLVD	C - POSSIBLE INJURY	1604	2018	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - BOTH GOING STRAIGHT-REAR END	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	No Data	No Data	No Data	No Data
16850657	1/11/2019	PERRYMAN ST	N - NOT INJURED	1111	2019	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	1 - CLEAR	16 - DISREGARD STOP SIGN OR LIGHT	26 - FAILED TO PASS TO LEFT SAFELY	No Data	No Data	No Data
17059445	5/2/2019	BUTCHER ST	N - NOT INJURED	1018	2019	MOTOR VEHICLE IN TRANSPORT	ANGLE - ONE STRAIGHT-ONE BACKING	1 - DRY	2 - CLOUDY	3 - BACKED WITHOUT SAFETY	No Data	No Data	No Data	No Data
17073121	5/12/2019	JAHN ST	N - NOT INJURED	2330	2019	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - BOTH GOING STRAIGHT-REAR END	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	67 - UNDER INFLUENCE - ALCOHOL	No Data	No Data	No Data
17105452	5/25/2019	ELLIOT KNOX BLVD	B - SUSPECTED MINOR INJURY	2053	2019	MOTOR VEHICLE IN TRANSPORT	OPPOSITE DIRECTION - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	1 - CLEAR	66 - TURNED WHEN UNSAFE	No Data	No Data	No Data	No Data
17136245	6/14/2019	FAUST ST	N - NOT INJURED	1855	2019	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	16 - DISREGARD STOP SIGN OR LIGHT	No Data	No Data	No Data	No Data
17215964	7/18/2019	JAHN ST	N - NOT INJURED	856	2019	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	1 - CLEAR	No Data	No Data	No Data	No Data	No Data
17278773	9/1/2019	PERRYMAN ST	N - NOT INJURED	1853	2019	MOTOR VEHICLE IN TRANSPORT	ANGLE - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	2 - CLOUDY	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	48 - IMPAIRED VISIBILITY (EXPLAIN IN NARRATIVE)	No Data
17413700	11/10/2019	W GARDEN ST	N - NOT INJURED	2056	2019	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	16 - DISREGARD STOP SIGN OR LIGHT	No Data	No Data	No Data	No Data
17509663	1/6/2020	ELLIOT KNOX BLVD	N - NOT INJURED	1229	2020	MOTOR VEHICLE IN TRANSPORT	OPPOSITE DIRECTION - ONE STRAIGHT-ONE LEFT TURN	1 - DRY	1 - CLEAR	37 - FAILED TO YIELD RIGHT OF WAY - TURNING LEFT	No Data	No Data	No Data	No Data
17790615	7/19/2020	ELLIOT KNOX BLVD	B - SUSPECTED MINOR INJURY	1410	2020	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	19 - DISTRACTION IN VEHICLE	15 - DISREGARD STOP AND GO SIGNAL	No Data	No Data	No Data
17790779	7/24/2020	ELLIOT KNOX BLVD	N - NOT INJURED	1912	2020	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	16 - DISREGARD STOP SIGN OR LIGHT	No Data	No Data	No Data	No Data
17867674	9/16/2020	ELLIOT KNOX BLVD	A - SUSPECTED SERIOUS INJURY	1436	2020	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	15 - DISREGARD STOP AND GO SIGNAL	No Data	No Data	No Data	No Data
17882390	9/18/2020	ELLIOT KNOX BLVD	B - SUSPECTED MINOR INJURY	927	2020	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	15 - DISREGARD STOP AND GO SIGNAL	No Data	No Data	No Data	No Data
18015939	12/2/2020	ELLIOT KNOX BLVD	N - NOT INJURED	1541	2020	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	15 - DISREGARD STOP AND GO SIGNAL	No Data	No Data	No Data	No Data
18088366	1/21/2021	W JAHN ST	N - NOT INJURED	1622	2021	MOTOR VEHICLE IN TRANSPORT	ANGLE - BOTH GOING STRAIGHT	1 - DRY	1 - CLEAR	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	No Data	No Data
18328037	6/11/2021	W COLL ST	99 - UNKNOWN	2302	2021	PARKED CAR	ONE MOTOR VEHICLE - GOING STRAIGHT	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	No Data	No Data	No Data	No Data
18439821	8/23/2021	W MERRIWEATHER ST	N - NOT INJURED	1550	2021	MOTOR VEHICLE IN TRANSPORT	ANGLE - ONE STRAIGHT-ONE RIGHT TURN	1 - DRY	1 - CLEAR	35 - FAILED TO YIELD RIGHT OF WAY - STOP SIGN	No Data	No Data	No Data	No Data
18473391	9/11/2021	S I 35 SBFR	B - SUSPECTED MINOR INJURY	1123	2021	MOTOR VEHICLE IN TRANSPORT	SAME DIRECTION - ONE STRAIGHT-ONE STOPPED	1 - DRY	1 - CLEAR	22 - FAILED TO CONTROL SPEED	No Data	No Data	No Data	No Data

Appendix E: Drainage Memo

FINAL

PRELIMINARY ENGINEERING REPORT

Trevor Renn

STATE OF TEXAS
TREVOR Q. RENN
135269
LICENSED
PROFESSIONAL ENGINEER

09/12/2022

To: Garry Ford, P.E., PTOE

From: Lance Parisher, P.E.; Trevor Renn, P.E.

Kimley-Horn and Associates, Inc.
Firm # 2740

Date: Sept 12th, 2022

Subject: Castell Improvements Drainage Study

Organization:

- Project Background
- Modeling Methodology
- Existing Drainage Study
- Proposed Drainage Study
- Future improvements at UPRR drainage
- Cost Estimate
- Recommendations
- Exhibits:
  - 1 – Drainage Area Map
  - 2 – Existing Infrastructure
  - 3 – Existing 2D Output – 25 year
  - 4 – Existing 2D Output – 100 year
  - 5 – Proposed Infrastructure
  - 6 – Proposed 2D Output – 25 Year
  - 7 – Proposed 2D Output – 100 Year
- Appendix
  - A – Detailed OPCC
  - B – Storm Sewer HGLs
  - C – XPSWMM Output
  - D – Hydrograph Outputs
  - E – Autodesk SSA Output
  - FFA – Record Plans

Project Background

The City of New Braunfels (CoNB) is investigating improvements to Castell Avenue to create a public plaza, downtown gateway, and improve walkability. In addition to the surface features analysis and design, the drainage along the street has been identified as being deficient. This led to engaging Kimley-Horn to study the existing and proposed drainage impacts. Figure 1 below shows the limits of the Castell Avenue project – Bridge Street to Business 35.

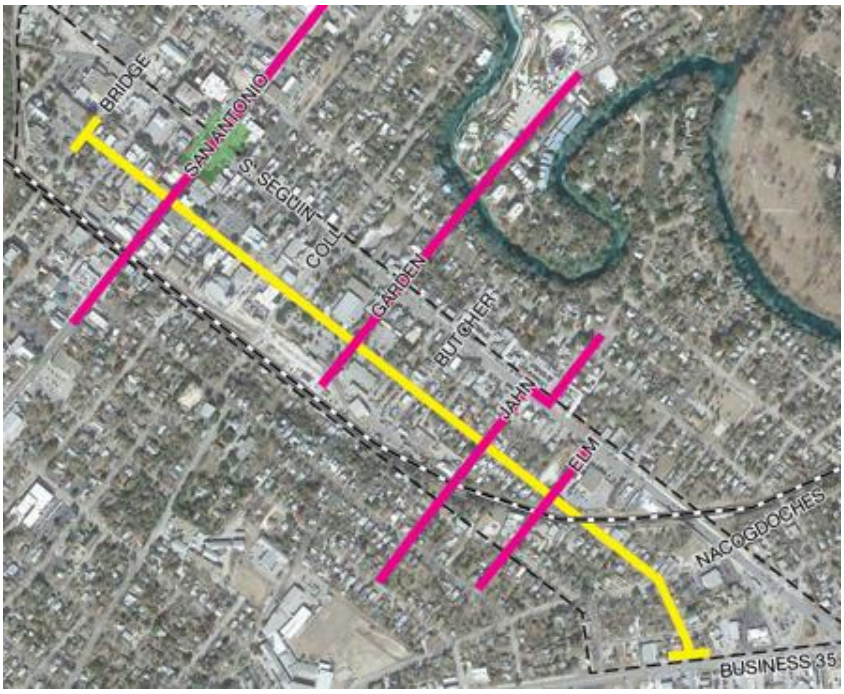


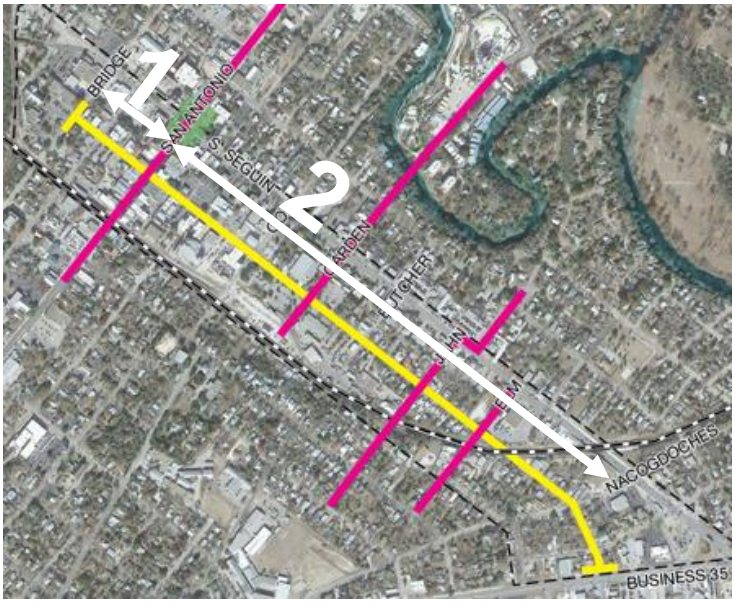
Figure 1 – Castell Improvements in Yellow

Modeling Methodology

Kimley-Horn used the 2D modeling method for most of the project area due to the steep slopes of offsite runoff, flat project area and lack of infrastructure. The 2D modeling method is beneficial when considering the large offsite drainage areas, lack of storm infrastructure, overland flow and storage of offsite areas. The project area modeled as 2D was east of San Antonio Street to Business 35 on Castell Avenue. Bridge Street to San Antonio Street on Castell Avenue was modeled as 1D in Autodesk SSA due to the small offsite areas and simpler drainage areas. See Figure 2.

Point of Study

Kimley-Horn identified 3 points of study for the project area to compare existing and proposed conditions: Outfall at the Comal River on San Antonio; Outfall at the Comal River from Coll Street; Outfall into TxDOT System on South Seguin Avenue west of Nacogdoches Street. **Exhibit 1** shows these outfall comparison points more clearly. All rainfall intensities that were used are from the recently updated Atlas 14.



XPSWMM Methodology and Criteria – 2D:

An XPSWMM model was created with 2ft LIDAR downloaded from the CoNB open data hub and rain on grid at 10x10 grids to model the surface runoff. Existing and proposed inlets were modeled using rating curves and a hydrograph at Coll Street near the railroad crossing. This was used to represent the upstream flows that drain to this area.

Kimley-Horn delineated and analyzed the existing watersheds along Castell Avenue corridor to determine the areas to focus on with the 2D study. Kimley-Horn used HEC-HMS to determine Atlas 14 precipitation in the region. Hyetographs, generated by HEC-HMS, were adopted as XPSWMM rainfall data. Three types of land use were utilized in the study including inactive area (buildings), impervious area (paved area), and pervious area (grass) to best simulate the flood condition in the urban area.

1D Modeling Methodology:

Autodesk SSA was used to model the existing storm sewer system along San Antonio Street. The existing storm sewer plans were used to build the model and run the analysis. The CoNB criteria was used to analyze the hydrology using the rational method and hydraulics for hydraulic gradient, inlet capacity, spread, and velocity.

Existing Drainage Study

Figure 3 is taken from the **Exhibit 1** to show the drainage area map contributing to Castell Avenue. The existing offsite drainage areas serve around 300 acres that drain toward the Castell ROW.

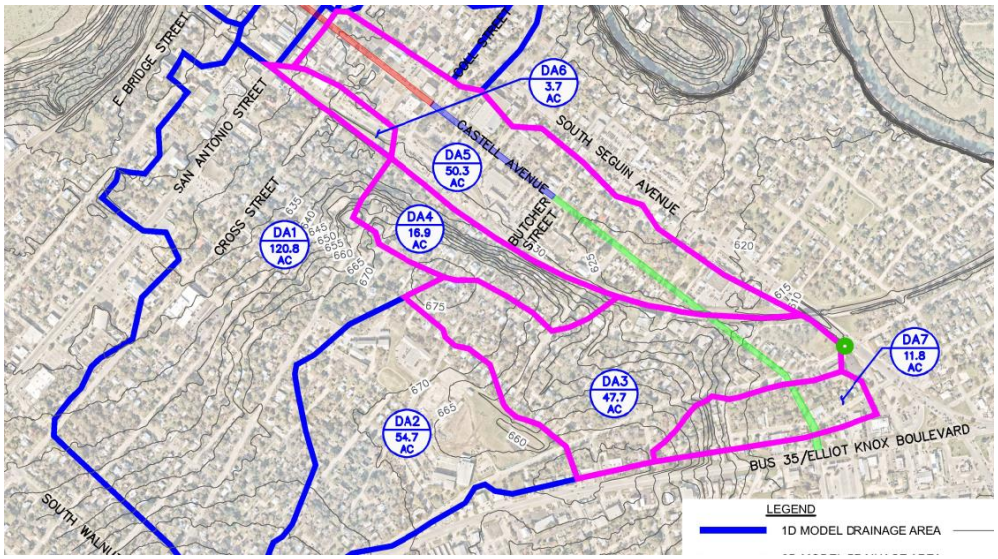


Figure 3

Large offsite areas, inlets and outfalls, and Castell Avenue being a low point contribute to flooding in the area. There is also a high point between Castell Avenue and Seguin Avenue that create a bowl for runoff; without inlets, the conveyance is the streets. The conveyance exceeds the ROW limits and causes flooding on private property. **Exhibit 2** shows the existing infrastructure that Kimley-Horn was able to find to model the area. In the existing condition, a 60" storm pipe drains San Antonio Street to the Comal River, a 5'x4' storm box drains Coll Street to Comal River, and a 54" drains DA2 from Hill Ave. between Jahn Street and Elm Street to the Seguin Avenue. **Exhibits 3 and 4** show the existing 2D outputs for the 25- and 100-year storm events. **Figure 4** shows a snip of the 100-year storm event water ponding as it currently exists.

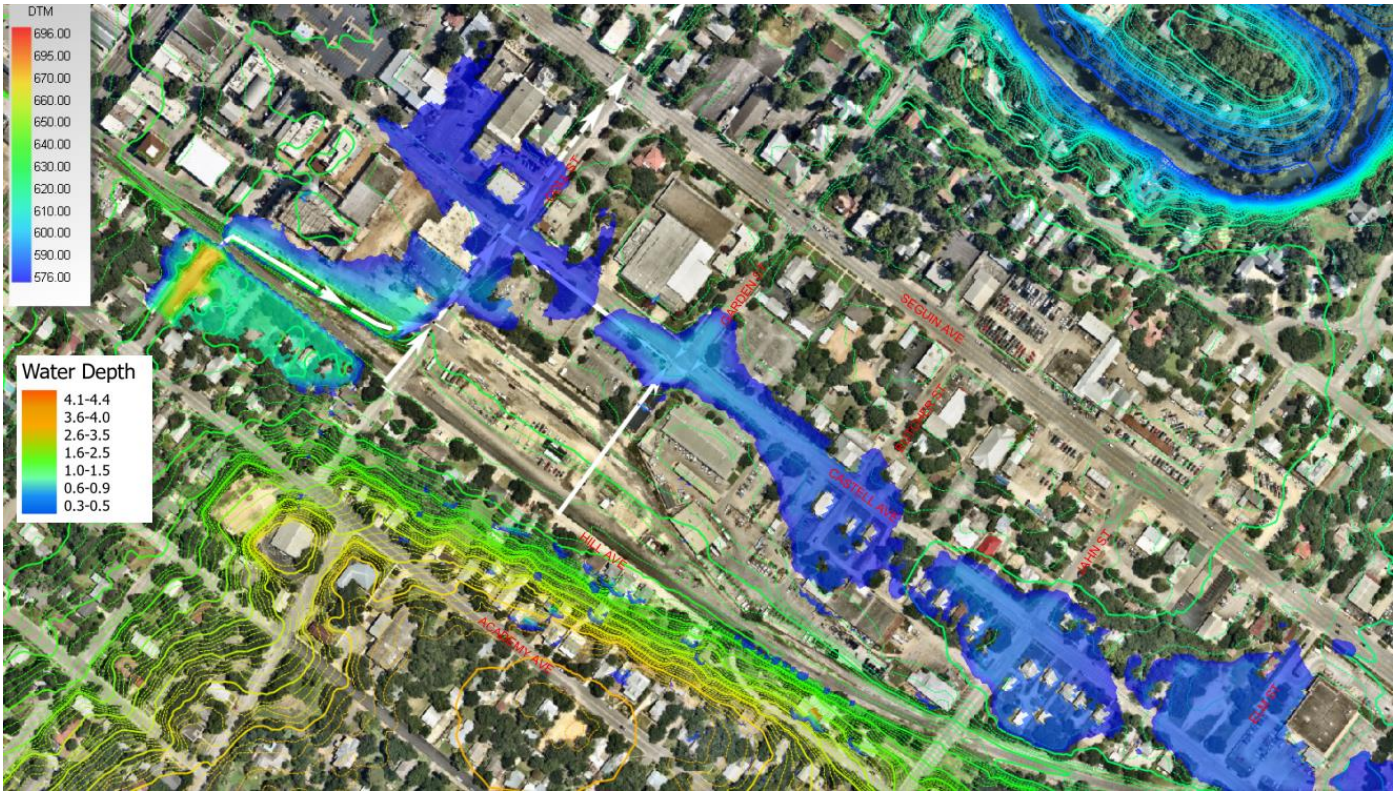


Figure 4 – Existing 100-year Water Surface Elevation

Figure 4 shows water depths of approximate 0.25-1.5' in the project area. **Exhibit 2** shows that there are inlets at Garden Street, Coll Street, and Elm Street. Given the Castell Avenue is in a sump, the water ponds up and drains slowly through the existing inlets. In heavier storm events, water exceeds the ROW, specifically at Elm Street where it spills into Seguin Highway.

Proposed Drainage Study

When analyzing proposed solutions, the approach was to limit design and construction to the Castell project area. Often with the nature of these projects, the downstream pipes and outfalls are inadequate. Therefore, it is expected to rebuild an outfall pipe to convey the flow to the appropriate point downstream. When the project area has large drainage areas, most of the drainage issues

come from outside of the project boundaries. This creates an issue when these offsite drainage areas have little to no infrastructure. At this point, Kimley Horn has not recommended any upstream or downstream improvements, except outfall pipes, and has limited the analysis to Castell Road. The outfall pipe proposed in the study is properly sized to convey Atlas 14 100yr peak runoff from large offsite drainage areas. Given the very large drainage areas contributing to Castell Avenue, not only will storm pipes be required, but also a large number of inlets to capture the flow. The actual placement of the inlets will be analyzed during design, but for this preliminary, the engineer examined how many inlets would be needed. See **Exhibit 5**, proposed drainage infrastructure, for a more detailed look at the required infrastructure to meet the CoNB drainage criteria. A summary of that exhibit is shown in **Figure 5**.

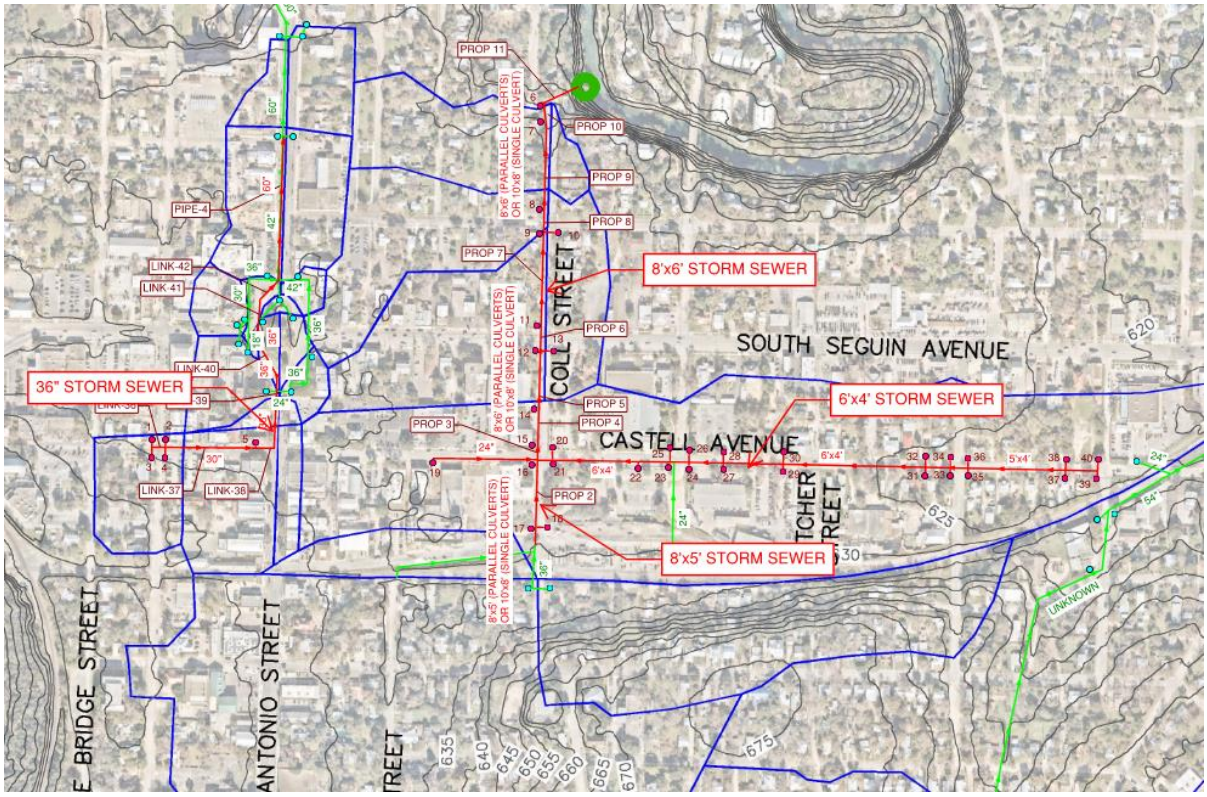


Figure 5 – Proposed Storm Sewer

With the proposed infrastructure modeled, the 100-year ponding is reduced to what is shown in **Exhibits 6 & 7. Figure 6** shows a sample of this output and how the proposed improvements can capture this volume of water and reduce ponding and flooding.

Figure 6 – Proposed Ponding with 100yr Storm Event

Adverse Impact

As Kimley-Horn evaluate options, the engineer made sure to observe modifications or changes to the drainage paths, not to move the flooding from one area to another, and not to create adverse flooding impacts. For the 3 outfall locations, the engineer analyzed the downstream impacts in a few different ways:

1) Outfall at the Comal River along San Antonio Street

   Based on modeling from record plans, the proposed plan is to place inlets along Castell Avenue and construct a 36” pipe to tie into the existing 60” storm pipe at Market Avenue. This system will require survey to confirm capacity based on actual depths. At this point, the existing pipe is recorded to change sizes from a 42” to 60” and increase in slope to the outfall, allowing for additional flow to the system. From the output of SSA model, the peak discharge at San Antonio Street outfall for 100 year storm event is about 26 CFS higher than the existing at 194.35 CFS. The proposed storm drain system captures upstream flow from Castell Avenue before existing peak occurs in the system, which helps the existing San Antonio Street drainage system from getting surcharged during 100yr storm event. Even though the early peak helps San Antonio Street drainage, conveying a small amount of the flow to Comal River earlier will not impact the downstream.

2) Outfall at the Comal River along Coll Street

The proposed plan to help convey the storm runoff is to install a parallel storm sewer pipe to the existing 5'x4' storm box with an additional 8'x6' storm box with inlets. To analyze the adverse impact to the Comal River, Kimley-Horn modeled the sub-basin in HEC-HMS to show the hydrograph differences between existing and proposed. The following hydrograph shows the peak existing versus proposed for 100yr storm event.

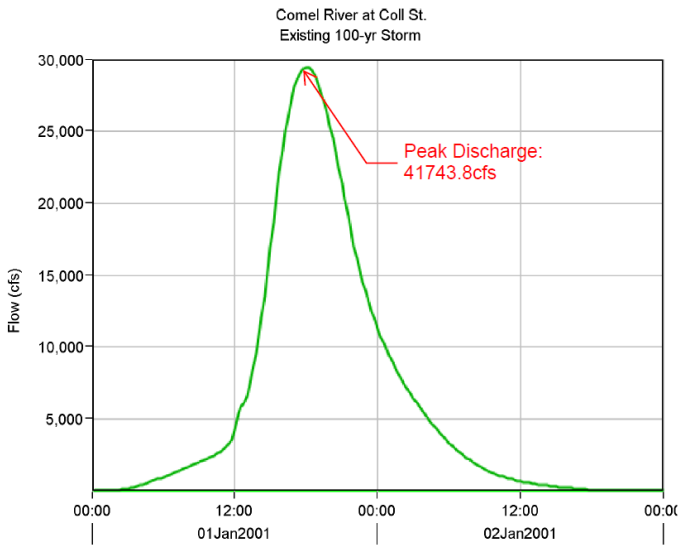


Figure 7 – Existing Hydrograph at Comal River Outfall (100yr)

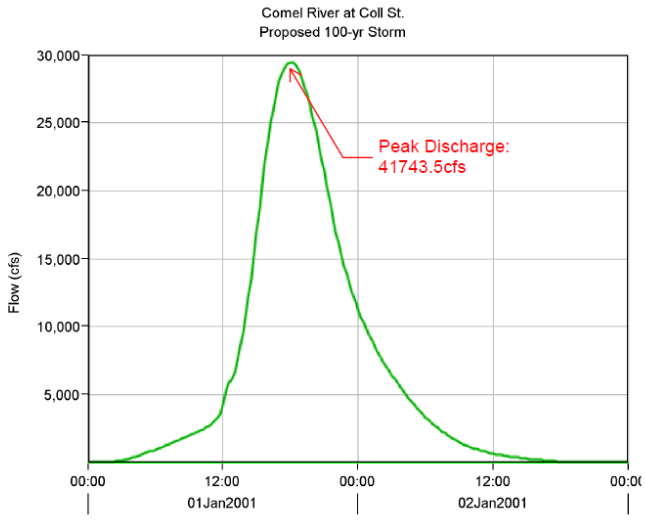
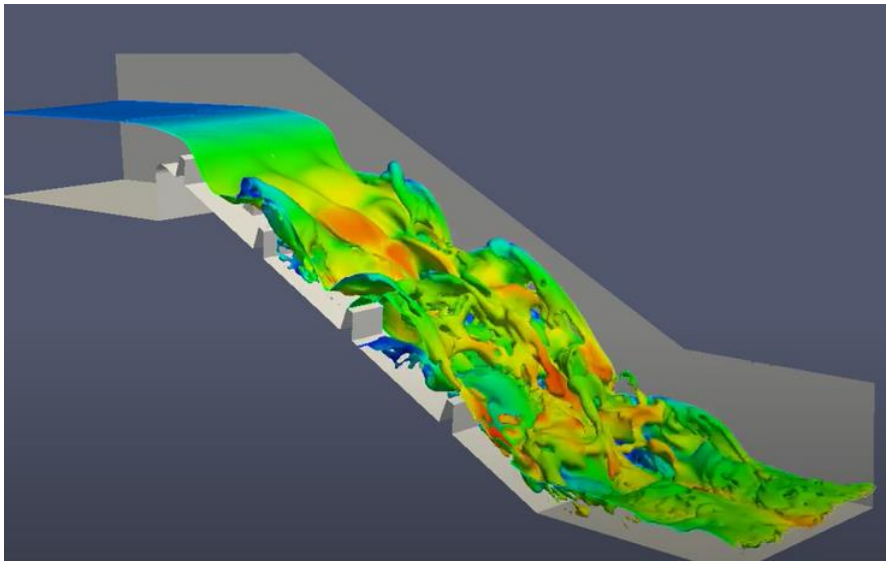


Figure 8 – Proposed Hydrograph at Comal River Outfall (100yr)

By looking at the Comal River watershed, the total area for the watershed is approximately 39,138 acres and the total drainage area for the Castell Avenue study area is approximately 306 acres. The proposed system captures more runoff and conveys it to the downstream faster than the existing condition. Additionally, the peak discharge time for Castell Avenue watershed occurs earlier than existing condition. As the result, the Peak Discharge at Comal River is 0.3 CFS less than existing condition.

Erosion Control at Coll Street Outfall

By capturing and conveying approximately 300 acres of runoff to the outfall at Comal River, measuring the erosion control of existing riverbank is necessary during the design. Evaluating soil sampling and existing bank conditions is necessary in the next phase to provide the best erosion control measures, benefiting the environment in the long term. The design engineer could examine the erosion control from two aspects. First, reducing the outfall velocity by utilizing drop structure, energy dissipater, or stilling basin at the outfall will minimize the adverse impact to the existing riverbank. Second, improving existing riverbank ability will help the bank to withstand greater stresses. This includes but is not limited to grouted rocks, channel bank armor, soil retention blanket, and vegetation. The recommendation will be studied further but will consist of a combination of both aspects. To establish the recommendation, this section of the Comal River will need to be model with HEC-RAS in the next phase.



3) Outfall at TxDOT Seguin Avenue
Due to existing undersized TxDOT drainage infrastructures on Seguin Avenue, the railroad crossing at Seguin Avenue is the focal point of the study. Offsite overland and street runoff along Castell Avenue corridor slowly drains towards the point of the interest. As runoff moves eastward, the exiting railroad south of Elm Street acts as a dam, stopping runoff from crossing. This causes the runoff to pond at Elm Street before approaching the TxDOT outfall. See **Figure 9** and **Figure 10** below for existing and proposed ponding conditions at Castell Avenue and Elm Street during the 100yr storm event.

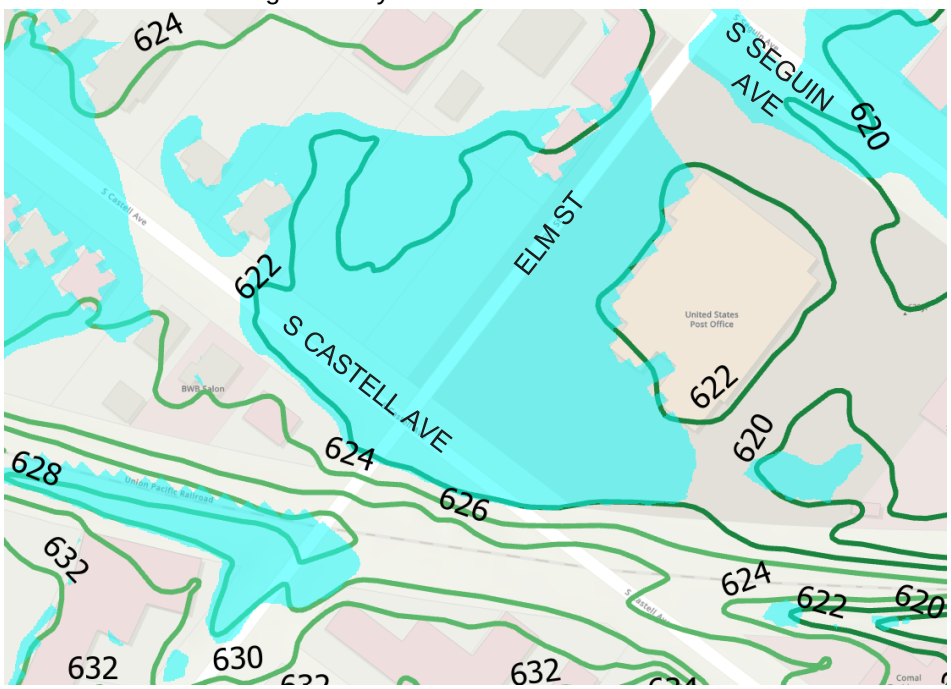


Figure 9 – Existing Ponding Condition at Castell & Elm

Figure 10 – Proposed Ponding Condition at Castell & Elm

Under the existing condition, storm water initially would pond up at Castell Avenue and Elm Street. With the depth of ponding increases, runoff will eventually start moving towards Seguin Avenue and causing significant ponding underneath the railroad bridge. The model outcome shows the maximum water depth underneath the railroad crossing is approximately 12.5 feet during 100-year storm event. With the proposed improvements by installing series of inlets and large storm trunk line along Castell Ave, the results from the model shows that approximately 300 CFS of peak flow will be captured between Coll Street and Elm Street which will reduce the maximum depth of ponding to 11.1 feet and eliminated flooding of private properties along the Castell Avenue corridor. **Figure 11** and **Figure 12** on the next page include ponding depths of existing and proposed systems during the 100-year storm event at Seguin Avenue railroad crossing. By comparing existing and the proposed ponding volume from XPSWMM model. It is estimated that 1.71 ac-in of ponding volume will be captured by the proposed system. The engineer modeled the TxDOT system based on record drawings and the engineering judgement. The total depths may not reflect the exact condition underneath the bridge, but it does present how the proposed improvements made the positive impact to the current flooding issue at existing undersized TxDOT outfall. The engineer has accouraged that the proposed project has some overlapped areas with the ongoing Faust/Nacogdoches Drainage study. Those areas and the downstream UPRR channel will be discussed in Faust/Nacogdoches Drainage Report.

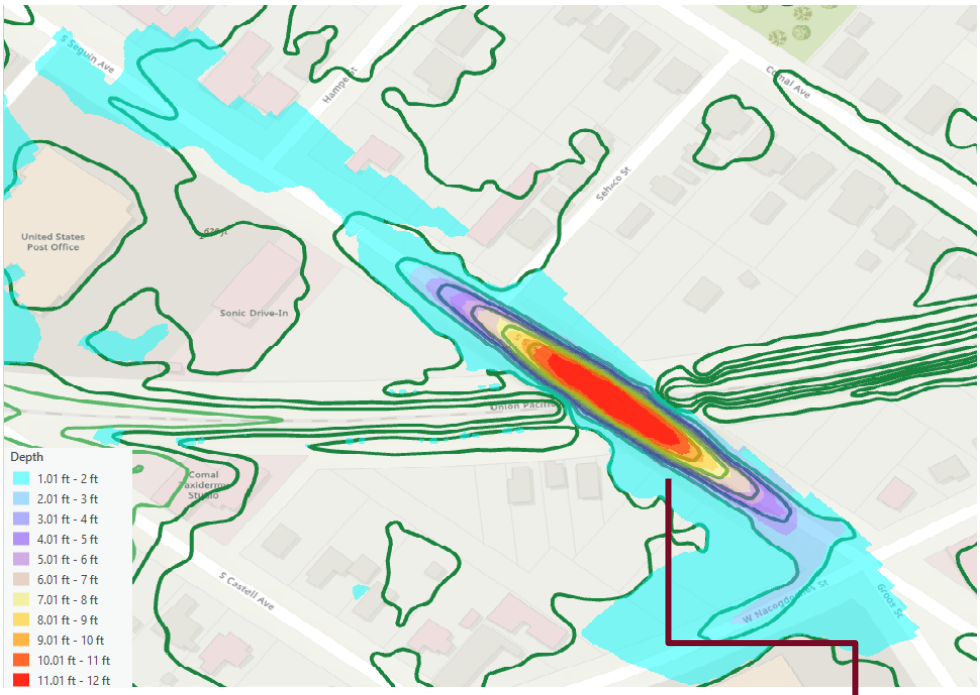


Figure 11 – Existing Condition at Seguin & Railroad Crossing

Figure 12 – Proposed Condition at Seguin & Railroad Crossing

Future improvements at UPRR drainage

By comparing **Exhibit 4** with **Exhibit 7,** the ponding depth from XPSWMM model results. Despite the improvements proposed along Castell Avenue and the outfall pipe along Coll Street, the proposed system won't make too much impact at the existing culverts crossing UPRR and the downstream open channel. The picture on the right-hand side shows the existing condition of the open channel which is in poor condition and lack of maintenance. Due to insufficient capacity of the existing open channel and the cross culverts, runoff is likely to pond at the upstream side. To be able to convey Atlas 14 100yr runoff, it is recommended to upsize existing 9'x5' culverts to 10'x5' culverts and reconfiguring the existing open channel to provide additional capacity. The engineer have proposed the discharge pipe along Coll Street to start two feet lower than the existing 5'x4' box culvert to provide addition depth for future open channel improvements Further study will be needed to properly size the existing open channel.

Opinion of Construction Costs

The Opinion of Probable Construction Cost (OPCC) below only include the probable cost for each storm drain alternatives. Utility conflicts have not been analyzed in the preliminary study and utility relocation is not included in the drainage OPCC.

ALTERNATIVES

Three alternatives have been developed during the study. All of the alternatives will achieve the same result and meet the City's DCM to capture 25-year storm and keep 100-year storm within the Right of Way as shown in **Exhibit 6** and **Exhibit 7**. Please note the proposed system at Castell & Nacogdoches is a separate effort, the design engineer will need to evaluate and potentially combining two systems together based on the timeline of Castell Ave. improvements and Faust/Nacogdoches improvements.

Alternative 1

Starting from the W Mill Street intersection, standard inlets are proposed at each corner with 30-inch trunk line going eastward. Additional inlets are proposed along Castell Avenue to capture offsite runoff. The line will then go northeast along San Antonio Street with a 36-inch trunk line. Due to the capacity of existing storm sewer system, the engineer proposes to replace the existing 42-inch trunk line with 60-inch line from north of the roundabout to Market Avenue. **Exhibit 5 –** Alternative 1 shows the proposed storm pipe improvements in Alternative 1, an 8'x5' box culvert along Coll Street from Hill Avenue to Castell Avenue. The box culvert upsized to 8'x6' from Castell Avenue to the outfall at

Comal River. To convey storm runoff back to the proposed 8'x6' box culvert, it is recommended to install approximately 500 linear feet (LF) of 5'x4' and 1,600 LF of 6'x4' box culverts with approximately 730 LF of inlets along Castell Avenue from Coll Street to Elm Street. Six inlets are proposed at the crossing of W Nacogdoches Street and W Faust Street with 24-inch trunk line to convey storm runoff to the existing TxDOT system at Seguin Avenue. The total opinion of probable construction cost for alternative 1 is $6,051,000. See Appendix 1 for a detailed OPCC.

Alternative 2

By considering the traffic impact on San Antonio Street, the storm sewer system from W Mill Street can be extended east towards Coll Street and tie into the proposed trunk line at Coll Street. By doing this, it is recommended to upsize the proposed 8'x6' box culvert to 9'x6' box culvert from Castell Avenue to Comal River. The proposed improvements are shown in **Exhibit 5** – Alternative 2 and 3. This alternative can be constructed along with Castell Avenue roadway improvements to avoid adverse impacts on traffic, local businesses, and existing utilities along San Antonio Street. The total opinion of probable construction cost for alternative 2 is $5,845,000. See Appendix 1 for detailed OPCC.

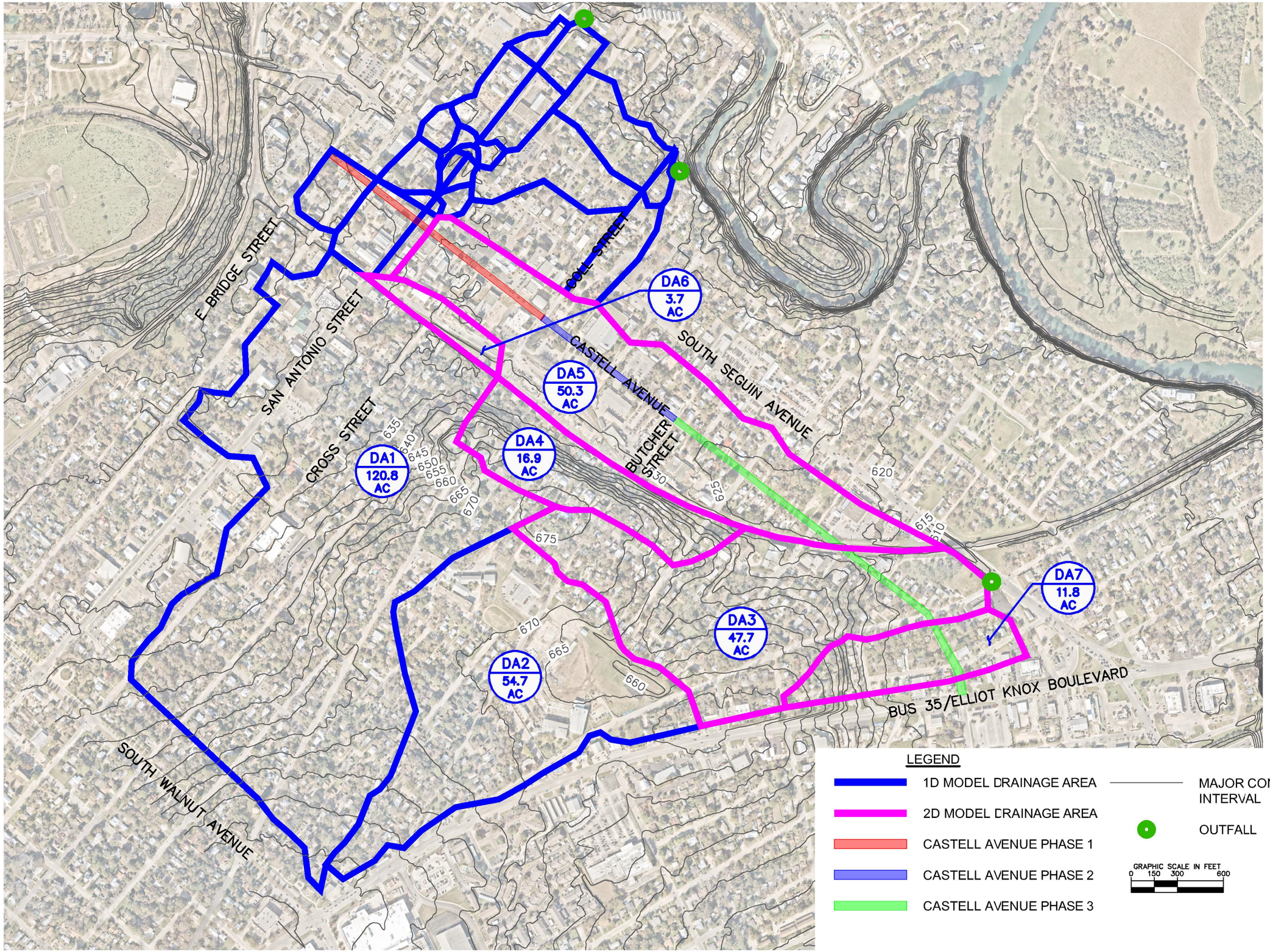
Alternative 3

This alternative includes constructing a new 10'x8' box culvert to replace the existing 5'x4' box culvert, located in the center of Southbound lane along Coll Street. By replacing the existing box culvert in place, it gives more room along Coll Street for any future utilities and potential underground storm water storage. The proposed improvements are shown in **Exhibit 5** – Alternative 2 and 3. The total opinion of probable construction cost for alternative 3 is $6,264,000. See Appendix 1 for detailed OPCC. Additional study will need to be performed on this option to verify its feasibility due to ROW impacts, unknown utility conflicts, and TxDOT coordination.

RECOMMENDATION

By considering any existing and future utilities along Coll Street, Castell Avenue, and Seguin Avenue. Alternative 3 may fit the City's interests in the long term. Removing the existing culvert and building a deeper large culvert in place will free up more spaces for any future utilities running along or crossing Coll Street which will bring more value to the City. Single culvert will also reduce the number of utility relocations during the constructions as well. The higher initial cost of Alternative 3 will likely to be offset by higher utility relocation costs of other alternatives.

EXHIBIT 1 – DRAINAGE AREA MAP



Kimley»Horn

Firm No. F-928
2900 Via Fortuna, Terrace I, Suite 300, Austin TX, 78746 P:512-646-2237

No.	Revision	By	Date

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JAMES LANCE PARISHER, P.E.
SERIAL NO. 108221
DATE: JANUARY 2021

CITY OF NEW BRAUNFELS
CASTELL AVE.
IMPROVEMENTS

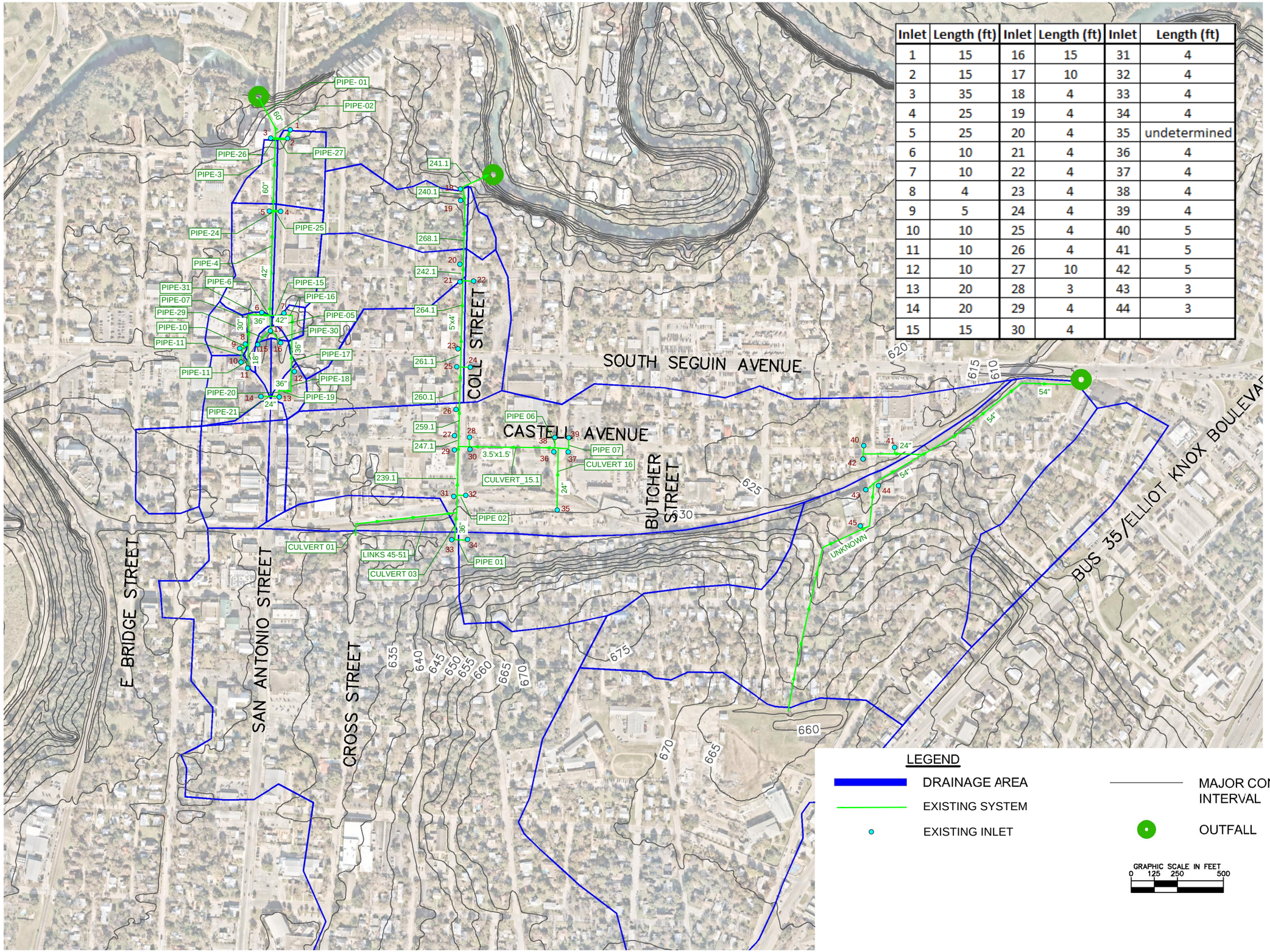
OVERALL DRAINAGE AREA MAP

City of New Braunfels

DATE: JANUARY 2021
DESIGN: TR
DRAWN: RK
CHECKED: LP
KHA NO.: 064405311

SHEET
E1

EXHIBIT 2 – EXISTING INFRASTRUCTURE



Inlet	Length (ft)	Inlet	Length (ft)	Inlet	Length (ft)
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2	15	17	10	32	4
3	35	18	4	33	4
4	25	19	4	34	4
5	25	20	4	35	undetermined
6	10	21	4	36	4
7	10	22	4	37	4
8	4	23	4	38	4
9	5	24	4	39	4
10	10	25	4	40	5
11	10	26	4	41	5
12	10	27	10	42	5
13	20	28	3	43	3
14	20	29	4	44	3
15	15	30	4		

Kimley»Horn

Firm No. F-928
2600 Via Fortuna, Terrace 1, Suite 200, Austin TX, 78746 P: 512-646-2237

No.	Revision	By	Date

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JAMES LANCE BARGSER, P.E.
SERIAL NO. 108421
DATE: JANUARY 2021

CITY OF NEW BRAUNFELS
CASTELL AVE. IMPROVEMENTS

EXISTING DRAINAGE SYSTEM

City of New Braunfels

DATE:	JANUARY 2021
DESIGN:	TR
DRAWN:	RK
CHECKED:	LP
KHA NO.:	064405311

SHEET
EX2

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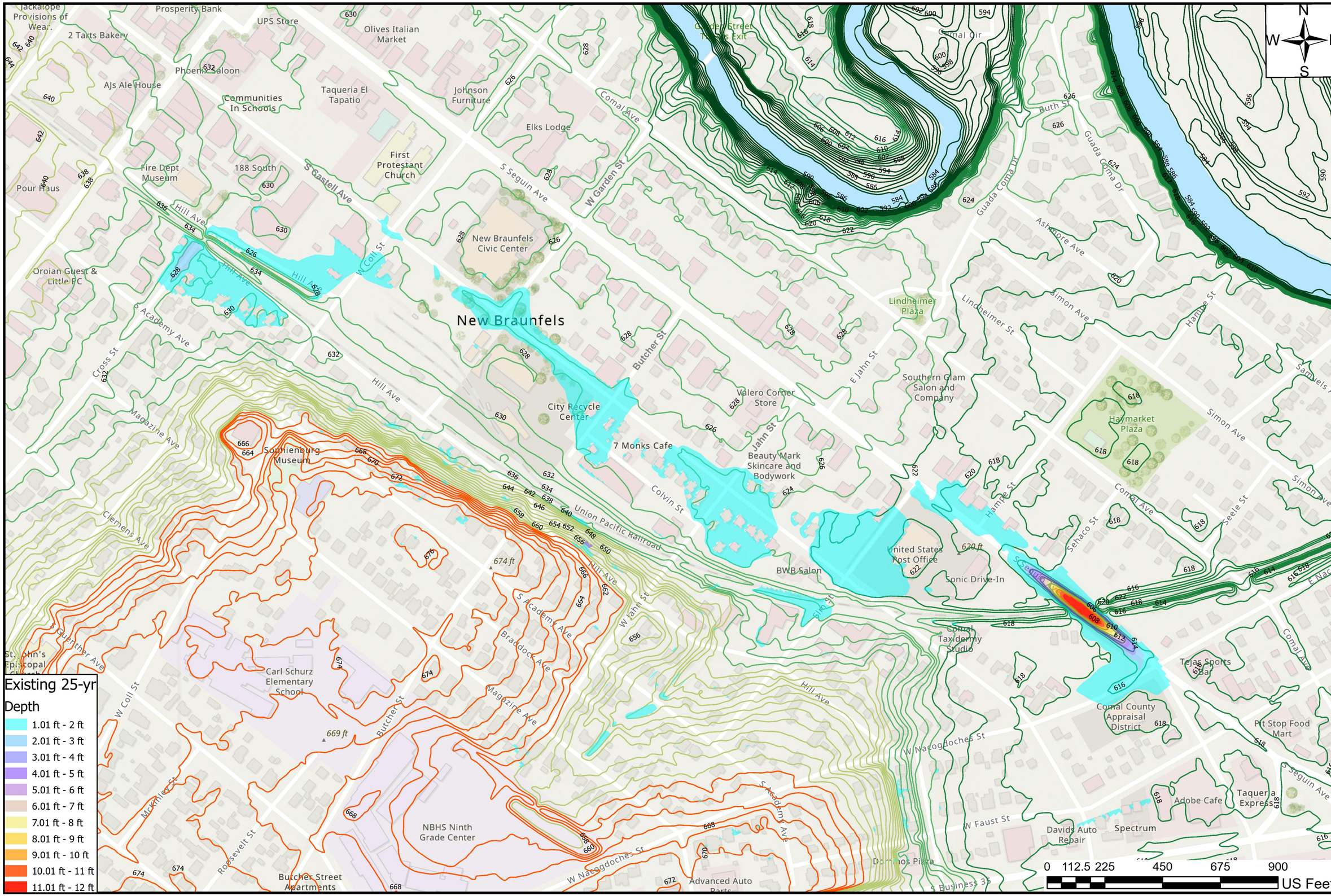
EXHIBIT 3 – EXISTING 2D OUTPUT – 25 YEAR



Kimley»Horn
10814 Jollyville Road Campus IV, Suite 200
Austin, TX 78759
(512) 418-1771 Phone
Engineering Firm Registration No. F-928

City of New Braunfels, Texas

SOUTH CASTELL AVENUE DRAINAGE STUDY

ATLAS 14 EXISTING 25-YEAR FLOODING MAP

DATE:	MARCH 2022
DESIGN:	TR
DRAWN:	TR
CHECKED:	LP
KH NO.:	061200015

SHEET

EX3

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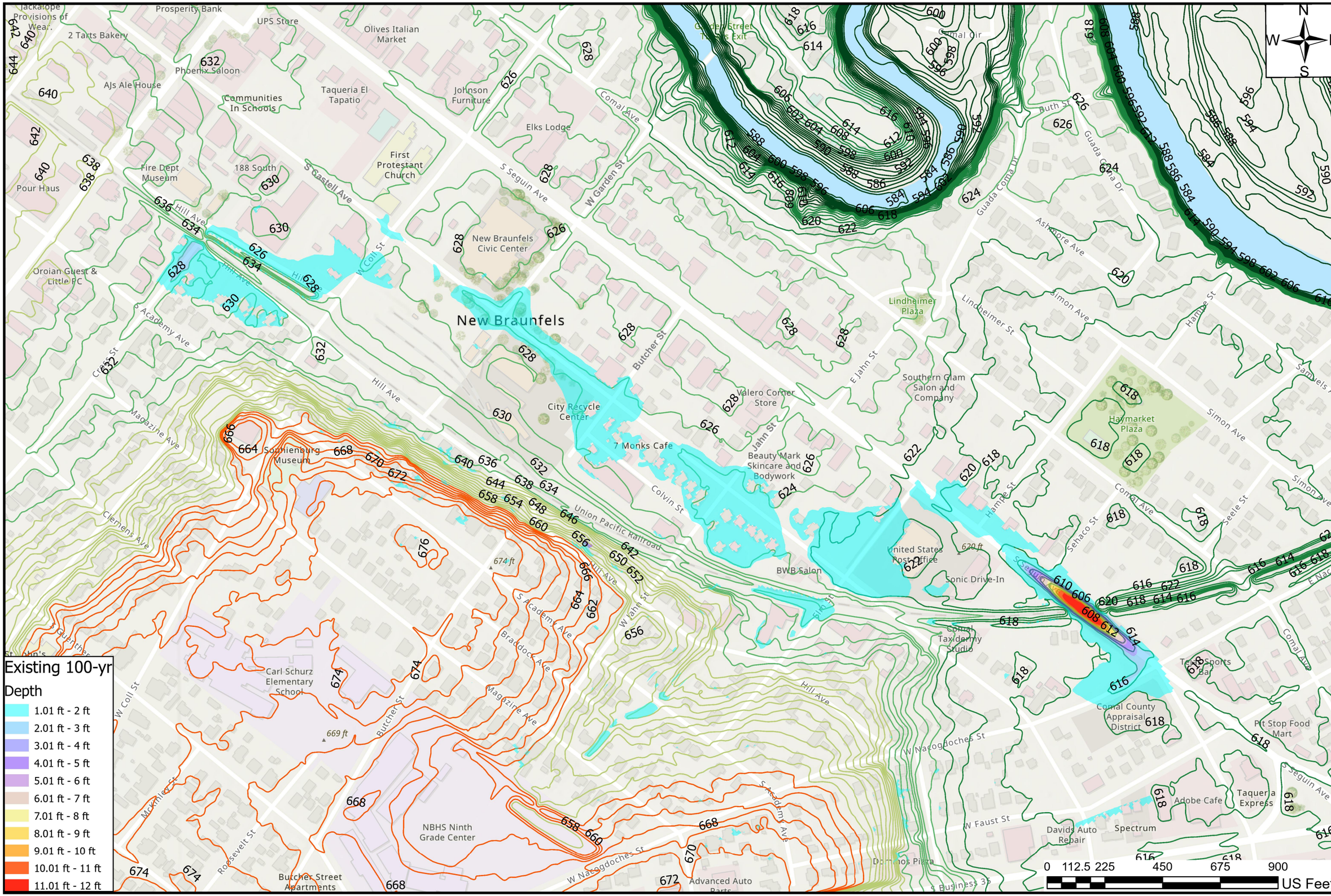
EXHIBIT 4 – EXISTING 2D OUTPUT – 100 YEAR



Kimley»Horn
10814 Jollyville Road Campus IV, Suite 200
Austin, TX 78759
(512) 418-1771 Phone
Engineering Firm Registration No. F-928

City of New Braunfels, Texas

SOUTH CASTELL AVENUE DRAINAGE STUDY

ATLAS 14 EXISTING 100-YEAR FLOODING MAP

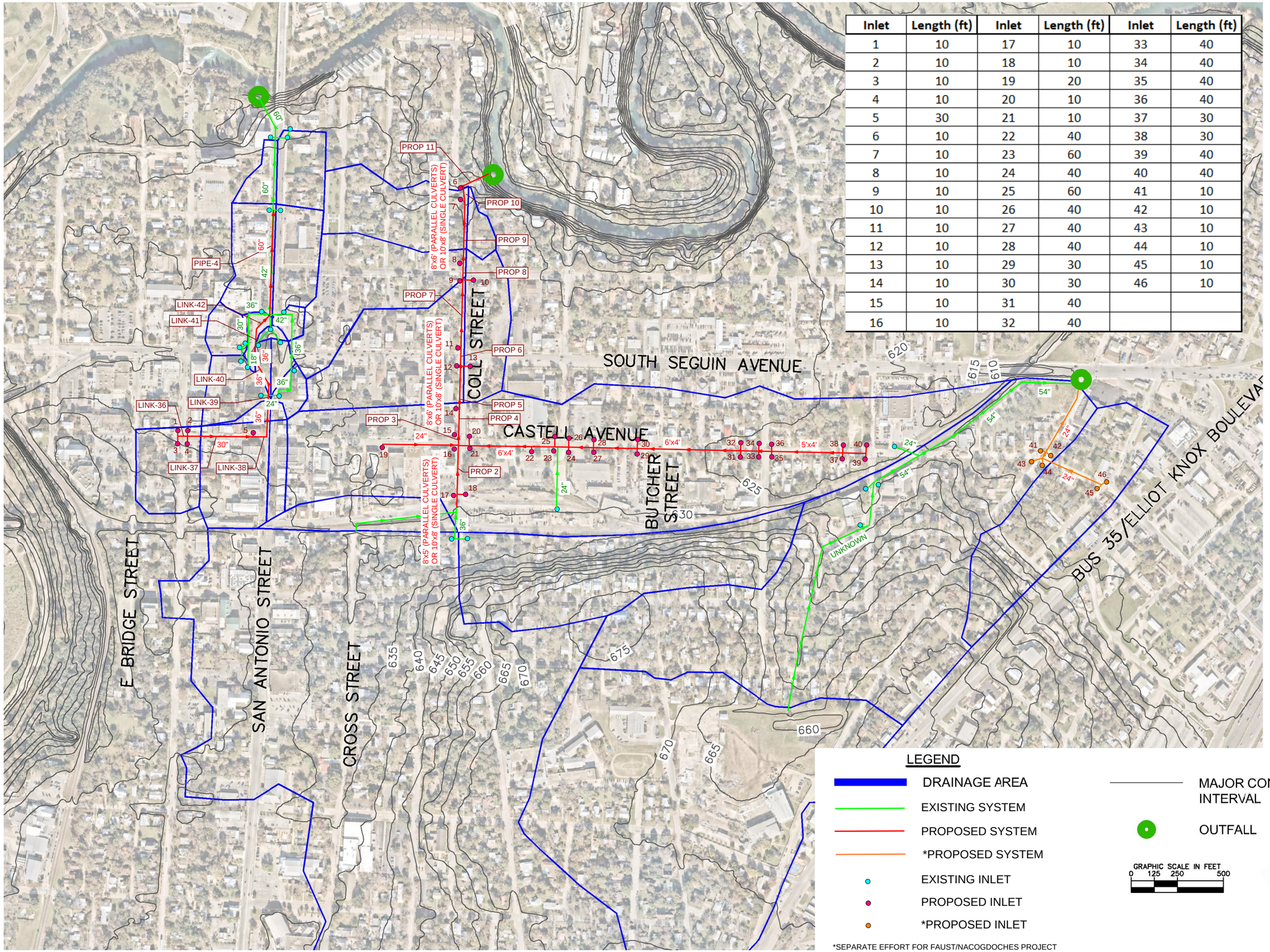
DATE:	MARCH 2022
DESIGN:	TR
DRAWN:	TR
CHECKED:	LP
KH NO.:	061200015

SHEET

EX4

C:\Users\trevor.renn\OneDrive - KHI\Documents\ArcGIS\Projects\Castell Exhibit\Castell Exhibit.aprx

EXHIBIT 5 – PROPOSED INFRASTRUCTURE



Inlet	Length (ft)	Inlet	Length (ft)	Inlet	Length (ft)
1	10	17	10	33	40
2	10	18	10	34	40
3	10	19	20	35	40
4	10	20	10	36	40
5	30	21	10	37	30
6	10	22	40	38	30
7	10	23	60	39	40
8	10	24	40	40	40
9	10	25	60	41	10
10	10	26	40	42	10
11	10	27	40	43	10
12	10	28	40	44	10
13	10	29	30	45	10
14	10	30	30	46	10
15	10	31	40		
16	10	32	40		

*SEPARATE EFFORT FOR FAUST/NACOGDOCHES PROJECT

Kimley»Horn

Firm No. F-928
2900 Via Fortuna, Terrace I, Suite 350, Austin TX, 78746 P:512-646-2237

No.	Revision	By	Date

THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.
JAMES LANCE PARISHER, P.E.
SERIAL NO. 106221
DATE: JANUARY 2021

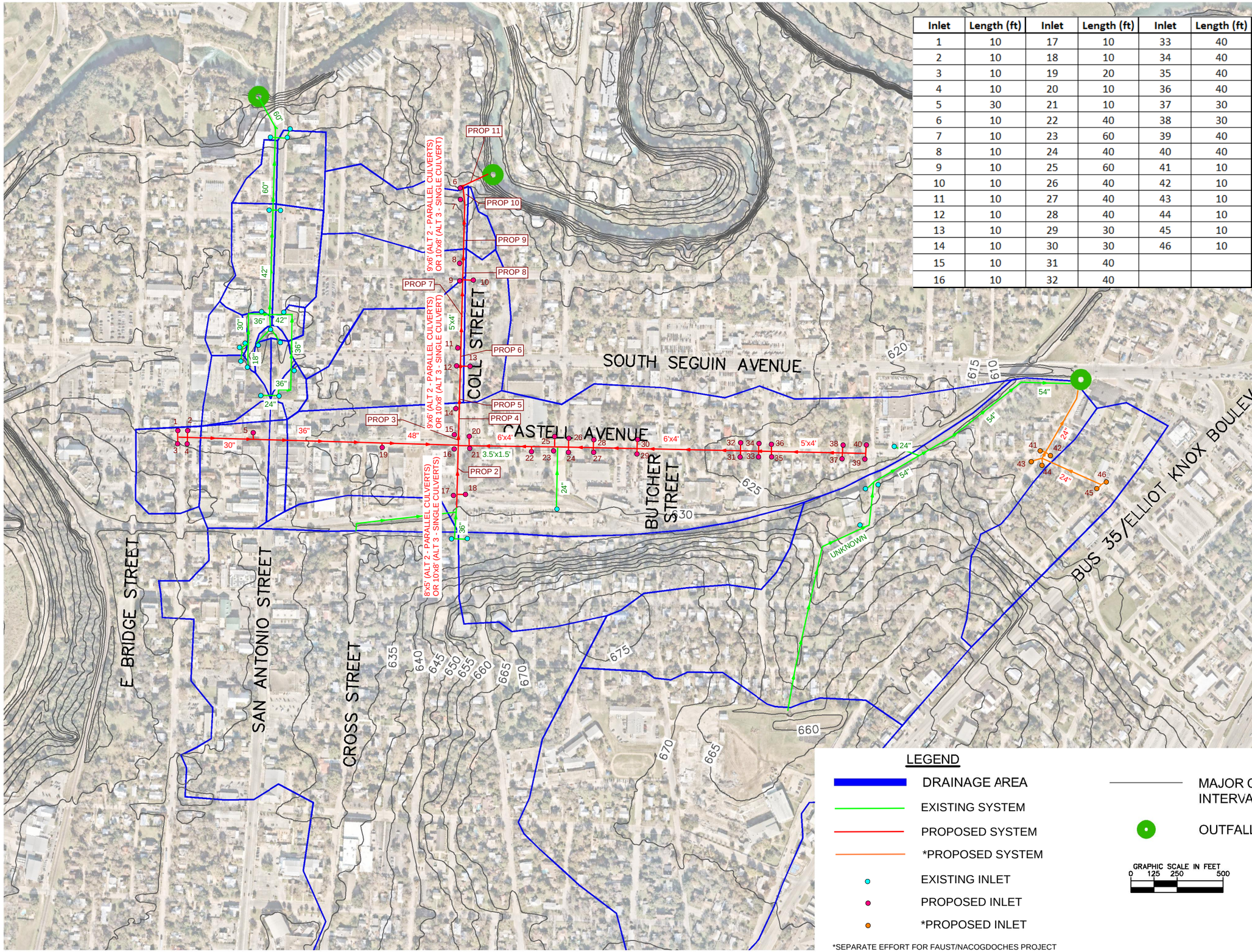
CITY OF NEW BRAUNFELS
CASTELL AVE.
IMPROVEMENTS

PROPSED
DRAINAGE SYSTEM

City of New Braunfels

DATE: JANUARY 2021
DESIGN: TR
DRAWN: RK
CHECKED: LP
KHA NO.: 064405311

SHEET
EX5
ALT1



Inlet	Length (ft)	Inlet	Length (ft)	Inlet	Length (ft)
1	10	17	10	33	40
2	10	18	10	34	40
3	10	19	20	35	40
4	10	20	10	36	40
5	30	21	10	37	30
6	10	22	40	38	30
7	10	23	60	39	40
8	10	24	40	40	40
9	10	25	60	41	10
10	10	26	40	42	10
11	10	27	40	43	10
12	10	28	40	44	10
13	10	29	30	45	10
14	10	30	30	46	10
15	10	31	40		
16	10	32	40		

*SEPARATE EFFORT FOR FAUST/NACOGDOCHES PROJECT

Kimley»Horn
Firm No. F-928
2600 Via Fortuna, Terrace 1, Suite 200, Austin TX, 78746 P: 512-418-1557

No.	Revision	By	Date

THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.
JAMES LANCE BARBISIER, P.E.
SERIAL NO. 108421
DATE: JANUARY 2021

CITY OF NEW BRAUNFELS
CASTELL AVE. IMPROVEMENTS

PROPOSED DRAINAGE SYSTEM

City of New Braunfels

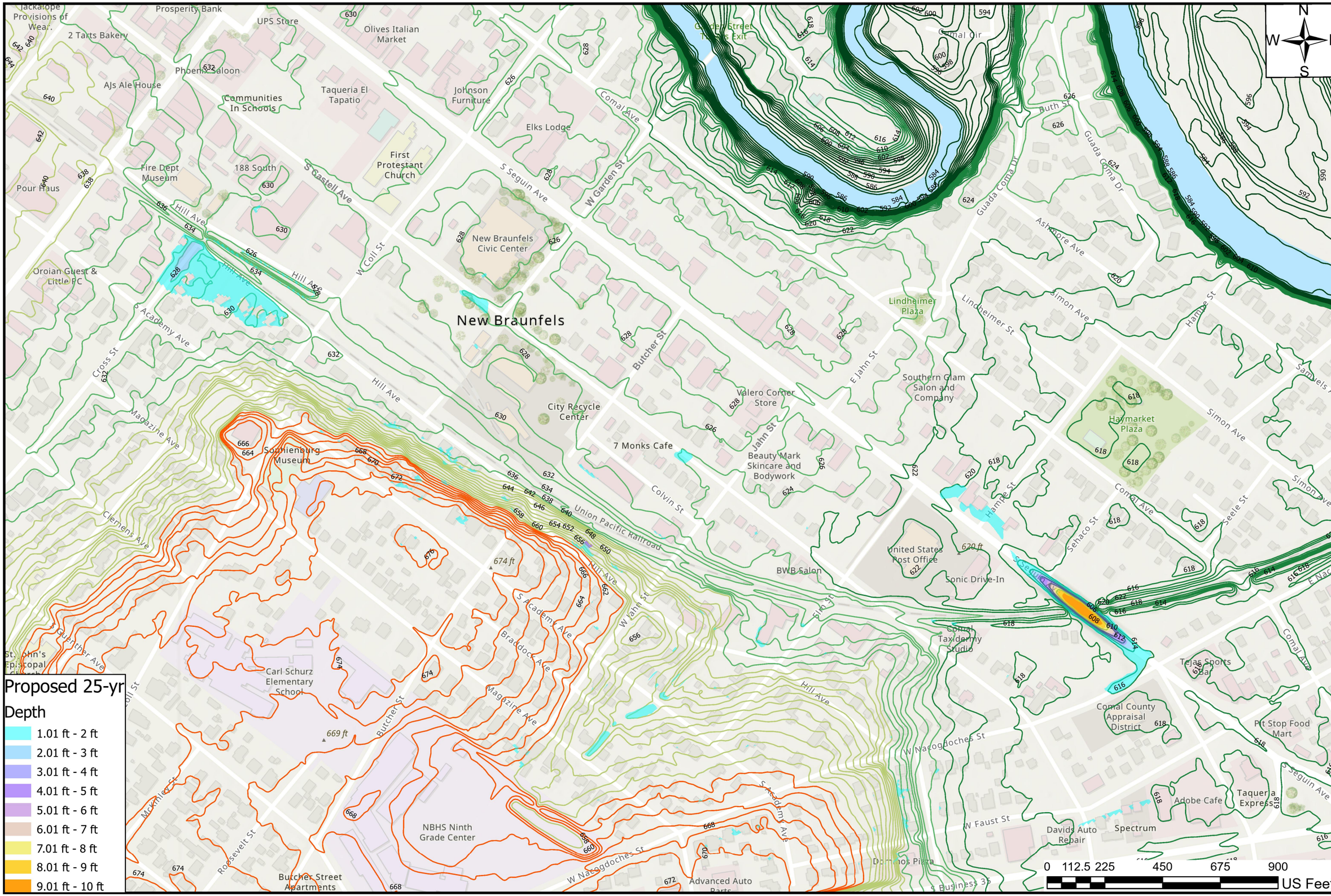
DATE:	JANUARY 2021
DESIGN:	TR
DRAWN:	RK
CHECKED:	LP
KHA NO.:	064405311

SHEET
EX5
ALT2/3

K:\AUS_LWR\064405311_New Braunfels-Castell Ave PER\CADD\Exhibits\EX_ALWR-SHM.dwg 1/11/2022 5:15 PM

EXHIBIT 6 – PROPOSED 2D OUTPUT – 25 YEAR

(Alternative 1, 2, and 3)



Kimley»Horn
10814 Jollyville Road Campus IV, Suite 200
Austin, TX 78759
(512) 418-1771 Phone
Engineering Firm Registration No. F-928

City of New Braunfels, Texas

SOUTH CASTELL AVENUE DRAINAGE STUDY

ATLAS 14 PROPOSED 25-YEAR FLOODING MAP

DATE:	MARCH 2022
DESIGN:	TR
DRAWN:	TR
CHECKED:	LP
KH NO.:	061200015

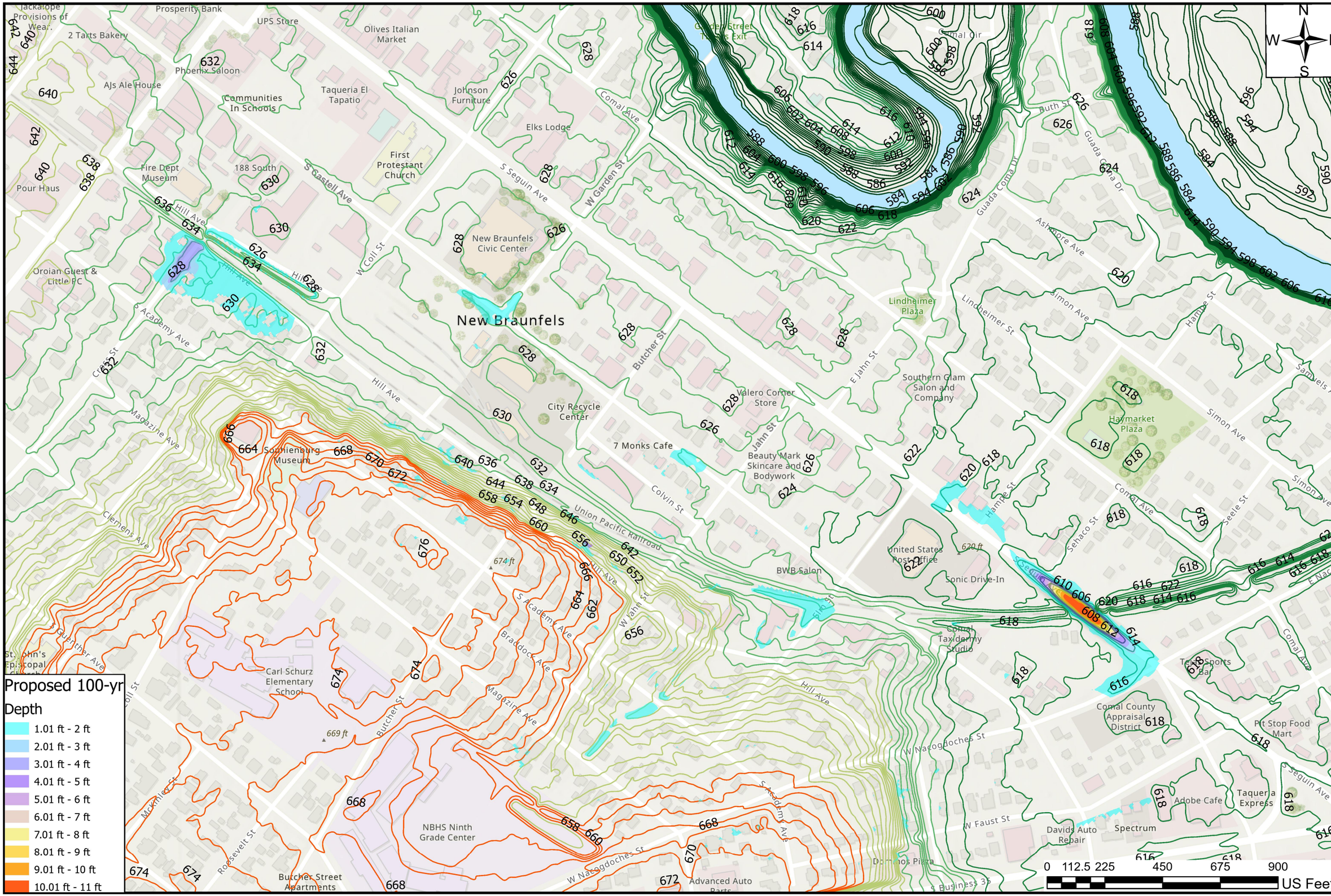
SHEET

EX6

C:\Users\trevor.renn\OneDrive - KH\Documents\ArcGIS\Projects\Castell Exhibit\Castell Exhibit.aprx

EXHIBIT 7 – PROPOSED 2D OUTPUT – 100 YEAR

(Alternative 1, 2, and 3)



Kimley»Horn
10814 Jollyville Road Campus IV, Suite 200
Austin, TX 78759
(512) 418-1771 Phone
Engineering Firm Registration No. F-928

City of New Braunfels, Texas

SOUTH CASTELL AVENUE DRAINAGE STUDY

ATLAS 14 PROPOSED 100-YEAR FLOODING MAP

DATE:	MARCH 2022
DESIGN:	TR
DRAWN:	TR
CHECKED:	LP
KH NO.:	061200015

SHEET

EX7

C:\Users\trevor.renn\OneDrive - KH\Documents\ArcGIS\Projects\Castell Exhibit\Castell Exhibit.aprx

APPENDIX A – DETAILED OPINION OF PROBABLE CONSTRUCTION COST

Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 1 Bridge-Coll - Preliminary Design Opinion of Probable Construction Cost**

Alternative 1

Line No.	Description	Quantity	Unit	Unit Price	Cost
1	INLET (COMPL)(TY C)(10FT)	4	EA	$7,000	$28,000
2	INLET (COMPL)(TY C)(20FT)	2	EA	$10,000	$20,000
3	INLET (COMPL)(TY C)(30FT)	1	EA	$12,500	$12,500
4	RC PIPE (CL III)(18 IN)	60	LF	$70	$4,200
5	RC PIPE (CL III)(30 IN)	410	LF	$100	$41,000
6	RC PIPE (CL III)(36 IN)	720	LF	$130	$93,600
7	RC PIPE (CL III)(60 IN)	570	LF	$350	$199,500
8	JCTBOX(COMPL)(PJB)(4FTX4FT)	5	EA	$5,500	$27,500
9	TRENCH EXCAVATION PROTECTION	1,760	LF	$2	$3,520
10	PLANE ASPH CONC PAV	2,912	SY	$3.5	$10,192
11	D-GR HMA(SQ) TY-D	498	TON	$140	$69,713
12	PAVEMENT REPAIR	800	SY	$80	$64,000
13	TRAFFIC CONTROL PLAN	1	LS	$45,898	$45,898
		Subtotal:			$573,725
		Conting. (%,+/-)		25%	$144,275
		Total*			**$718,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 1 Bridge-Coll - Preliminary Design Opinion of Probable Construction Cost**

Alternative 2

Line No.	Description	Quantity	Unit	Unit Price	Cost
1	INLET (COMPL)(TY C)(10FT)	4	EA	$7,000	$28,000
2	INLET (COMPL)(TY C)(20FT)	2	EA	$10,000	$20,000
3	INLET (COMPL)(TY C)(30FT)	1	EA	$12,500	$12,500
4	RC PIPE (CL III)(18 IN)	60	LF	$70	$4,200
5	RC PIPE (CL III)(30 IN)	410	LF	$100	$41,000
6	RC PIPE (CL III)(36 IN)	700	LF	$130	$91,000
7	RC PIPE (CL III)(48 IN)	415	LF	$183	$75,945
8	JCTBOX(COMPL)(PJB)(4FTX4FT)	5	EA	$5,500	$27,500
9	TRENCH EXCAVATION PROTECTION	1,585	LF	$2	$3,170
10	TRAFFIC CONTROL PLAN	1	LS	$12,133	$12,133
		Subtotal:			$303,315
		Conting. (%,+/-)		25%	$76,685
		Total*			**$380,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

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Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 2 Coll-Butcher - Preliminary Design Opinion of Probable Construction Cost**

Alternative 1

Line No.	Description	Quantity	Unit	Unit Price	Cost
	ON SITE				
1	CONC BOX CULVERT (6FT X 4FT)	970	LF	$520	$504,400
2	REMOVE STR (INLET)	8	EA	$1,200	$9,600
3	REMOVE STR (PIPE)	690	LF	$30	$20,700
4	INLET (COMPL)(TY C)(10FT)	4	EA	$7,000	$28,000
5	INLET (COMPL)(TY C)(20FT)	2	EA	$10,000	$20,000
6	INLET (COMPL)(TY C)(30FT)	2	EA	$12,500	$25,000
7	INLET (COMPL)(TY C)(40FT)	7	EA	$15,000	$105,000
8	RC PIPE (CL III)(24 IN)	46	LF	$80	$3,680
9	RC PIPE (CL III)(30 IN)	70	LF	$100	$7,000
10	JCTBOX(COMPL)(PJB)(8FTX8FT)	2	EA	$19,600	$39,200
11	TRENCH EXCAVATION PROTECTION	1,086	LF	$2	$2,172
	OFF SITE				
12	INLET 45 DEG SKEWED HEADWALL W/ WINGWALL	1	LS	$45,000	$45,000
13	CONC BOX CULVERT (8FT X 5FT)	382	LF	$670	$255,940
14	CONC BOX CULVERT (8FT X 6FT)	1,510	LF	$730	$1,102,300
15	INLET (COMPL)(TY C)(10FT)	1	EA	$8,000	$8,000
16	RC PIPE (CL III)(24 IN)	30	LF	$80	$2,400
17	JCTBOX(COMPL)(PJB)(10FTX10FT)	6	EA	$27,000	$162,000
18	RIPRAP (STONE PROTECTION)	70	CY	$150	$10,500
19	TRENCH EXCAVATION PROTECTION	1,922	LF	$2	$3,844
20	SOIL RETENTION BLANKET	130	SY	$2	$260
21	PLANE ASPH CONC PAV	4,203	SY	$3.5	$14,711
22	D-GR HMA(SQ) TY-D	719	TON	$140	$100,620
23	OUTFALL STRUCTURE AND ERORION CONTROL	1	LS	$250,000	$250,000
24	RIVER BANK ARMOR/GABION MATTRESS	190	CY	$300	$57,000
25	PAVEMENT REPAIR	2,200	SY	$80	$176,000
26	TRAFFIC CONTROL PLAN	1	LS	$118,133	$118,133
		Subtotal:			$2,953,326
		Conting. (%,+/-)		25%	$738,674
		Total*			**$3,692,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

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Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 2 Coll-Butcher - Preliminary Design Opinion of Probable Construction Cost**

Alternative 2

Line No.	Description	Quantity	Unit	Unit Price	Cost
	ON SITE				
1	CONC BOX CULVERT (6FT X 4FT)	970	LF	$520	$504,400
2	REMOVE STR (INLET)	8	EA	$1,200	$9,600
3	REMOVE STR (PIPE)	690	LF	$30	$20,700
4	INLET (COMPL)(TY C)(10FT)	4	EA	$7,000	$28,000
5	INLET (COMPL)(TY C)(20FT)	2	EA	$10,000	$20,000
6	INLET (COMPL)(TY C)(30FT)	2	EA	$12,500	$25,000
7	INLET (COMPL)(TY C)(40FT)	7	EA	$15,000	$105,000
8	RC PIPE (CL III)(24 IN)	46	LF	$80	$3,680
9	RC PIPE (CL III)(30 IN)	70	LF	$100	$7,000
10	JCTBOX(COMPL)(PJB)(8FTX8FT)	2	EA	$19,600	$39,200
11	TRENCH EXCAVATION PROTECTION	1,086	LF	$2	$2,172
	OFF SITE				
12	INLET 45 DEG SKEWED HEADWALL W/ WINGWALL	1	LS	$45,000	$45,000
13	CONC BOX CULVERT (8FT X 5FT)	382	LF	$670	$255,940
14	CONC BOX CULVERT (9FT X 6FT)	1,510	LF	$800	$1,208,000
15	INLET (COMPL)(TY C)(10FT)	1	EA	$8,000	$8,000
16	RC PIPE (CL III)(24 IN)	30	LF	$80	$2,400
17	JCTBOX(COMPL)(PJB)(10FTX10FT)	6	EA	$27,000	$162,000
18	RIPRAP (STONE PROTECTION)	70	CY	$150	$10,500
19	TRENCH EXCAVATION PROTECTION	1,922	LF	$2	$3,844
20	SOIL RETENTION BLANKET	130	SY	$2	$260
21	PLANE ASPH CONC PAV	4,203	SY	$3.5	$14,711
22	D-GR HMA(SQ) TY-D	719	TON	$140	$100,620
23	OUTFALL STRUCTURE AND ERORION CONTROL	1	LS	$250,000	$250,000
24	RIVER BANK ARMOR/GABION MATTRESS	190	CY	$300	$57,000
25	PAVEMENT REPAIR	2,200	SY	$80	$176,000
26	TRAFFIC CONTROL PLAN	1	LS	$122,361	$122,361
		Subtotal:			$3,059,026
		Conting. (%,+/-)		25%	$764,974
		Total*			**$3,824,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

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Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 2 Coll-Butcher - Preliminary Design Opinion of Probable Construction Cost**

Alternative 3

Line No.	Description	Quantity	Unit	Unit Price	Cost
	ON SITE				
1	CONC BOX CULVERT (6FT X 4FT)	970	LF	$520	$504,400
2	REMOVE STR (INLET)	8	EA	$1,200	$9,600
3	REMOVE STR (PIPE)	690	LF	$30	$20,700
4	INLET (COMPL)(TY C)(10FT)	4	EA	$7,000	$28,000
5	INLET (COMPL)(TY C)(20FT)	2	EA	$10,000	$20,000
6	INLET (COMPL)(TY C)(30FT)	2	EA	$12,500	$25,000
7	INLET (COMPL)(TY C)(40FT)	7	EA	$15,000	$105,000
8	RC PIPE (CL III)(24 IN)	46	LF	$80	$3,680
9	RC PIPE (CL III)(30 IN)	70	LF	$100	$7,000
10	JCTBOX(COMPL)(PJB)(8FTX8FT)	2	EA	$19,600	$39,200
11	TRENCH EXCAVATION PROTECTION	1,086	LF	$2	$2,172
	OFF SITE				
12	INLET 45 DEG SKEWED HEADWALL W/ WINGWALL	1	LS	$45,000	$45,000
13	CONC BOX CULVERT (10FT X 8FT)	1,892	LF	$911	$1,723,612
14	INLET (COMPL)(TY C)(10FT)	3	EA	$8,000	$24,000
15	RC PIPE (CL III)(24 IN)	90	LF	$80	$7,200
16	JCTBOX(COMPL)(PJB)(10FTX10FT)	8	EA	$27,000	$216,000
17	RIPRAP (STONE PROTECTION)	70	CY	$150	$10,500
18	TRENCH EXCAVATION PROTECTION	1,982	LF	$2	$3,964
19	SOIL RETENTION BLANKET	130	SY	$2	$260
20	PLANE ASPH CONC PAV	4,203	SY	$3.5	$14,711
21	D-GR HMA(SQ) TY-D	719	TON	$140	$100,620
22	OUTFALL STRUCTURE AND ERORION CONTROL	1	LS	$250,000	$250,000
23	RIVER BANK ARMOR/GABION MATTRESS	190	CY	$300	$57,000
24	PAVEMENT REPAIR	2,200	SY	$80	$176,000
25	TRAFFIC CONTROL PLAN	1	LS	$135,745	$135,745
		Subtotal:			$3,393,618
		Conting. (%,+/-)		25%	$849,382
		Total*			**$4,243,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

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Kimley-Horn and Associates, Inc.

Client:	**City of New Braunfels**	**Date:**	**3/30/2022**
Project:	**Castell Road Improvements**	**Prepared By:**	**TR**
KHA No:	**061200015**	**Checked By:**	**LP**

Title: **Phase 3 Butcher-I35 - Preliminary Design Opinion of Probable Construction Cost**

Line No.	Description	Quantity	Unit	Unit Price	Cost
1	INLET 45 DEG SKEWED HEADWALL W/ WINGWALL	1	LS	$45,000	$45,000
2	CONC BOX CULVERT (5FT X 4FT)	583	LF	$480	$279,840
3	CONC BOX CULVERT (6FT X 4FT)	670	LF	$520	$348,400
4	REMOVE STR (INLET)	3	EA	$1,200	$3,600
5	REMOVE STR (PIPE)	80	LF	$30	$2,400
6	INLET (COMPL)(TY C)(10FT)	6	EA	$7,000	$42,000
7	INLET (COMPL)(TY C)(15FT)	8	EA	$8,500	$68,000
8	INLET (COMPL)(TY C)(30FT)	2	EA	$12,500	$25,000
9	INLET (COMPL)(TY C)(40FT)	8	EA	$15,000	$120,000
10	RC PIPE (CL III)(18 IN)	260	LF	$70	$18,200
11	RC PIPE (CL III)(24 IN)	860	LF	$80	$68,800
12	RC PIPE (CL III)(30 IN)	845	LF	$100	$84,500
13	RC PIPE (CL III)(36 IN)	300	LF	$130	$39,000
14	JCTBOX(COMPL)(PJB)(4FTX4FT)	2	EA	$5,500	$11,000
15	JCTBOX(COMPL)(PJB)(6FTX6FT)	3	EA	$11,500	$34,500
16	JCTBOX(COMPL)(PJB)(8FTX8FT)	2	EA	$19,600	$39,200
17	RIPRAP (CONCRETE PROTECTION)	3	CY	$550	$1,650
18	TRENCH EXCAVATION PROTECTION	3,518	LF	$2	$7,036
19	PLANE ASPH CONC PAV	1,284	SY	$3.5	$4,494
20	D-GR HMA(SQ) TY-D	220	TON	$140	$30,739
21	PAVEMENT REPAIR	490	SY	$80	$39,200
22	TRAFFIC CONTROL PLAN	1	LS	$52,502	$52,502
		Subtotal:			$1,312,559
		Conting. (%,+/-)		25%	$328,441
		Total*			**$1,641,000**

- [x] No Design Completed
- [ ] Preliminary Design
- [ ] Final Design

***This total does not reflect land acquisition or engineering services.**

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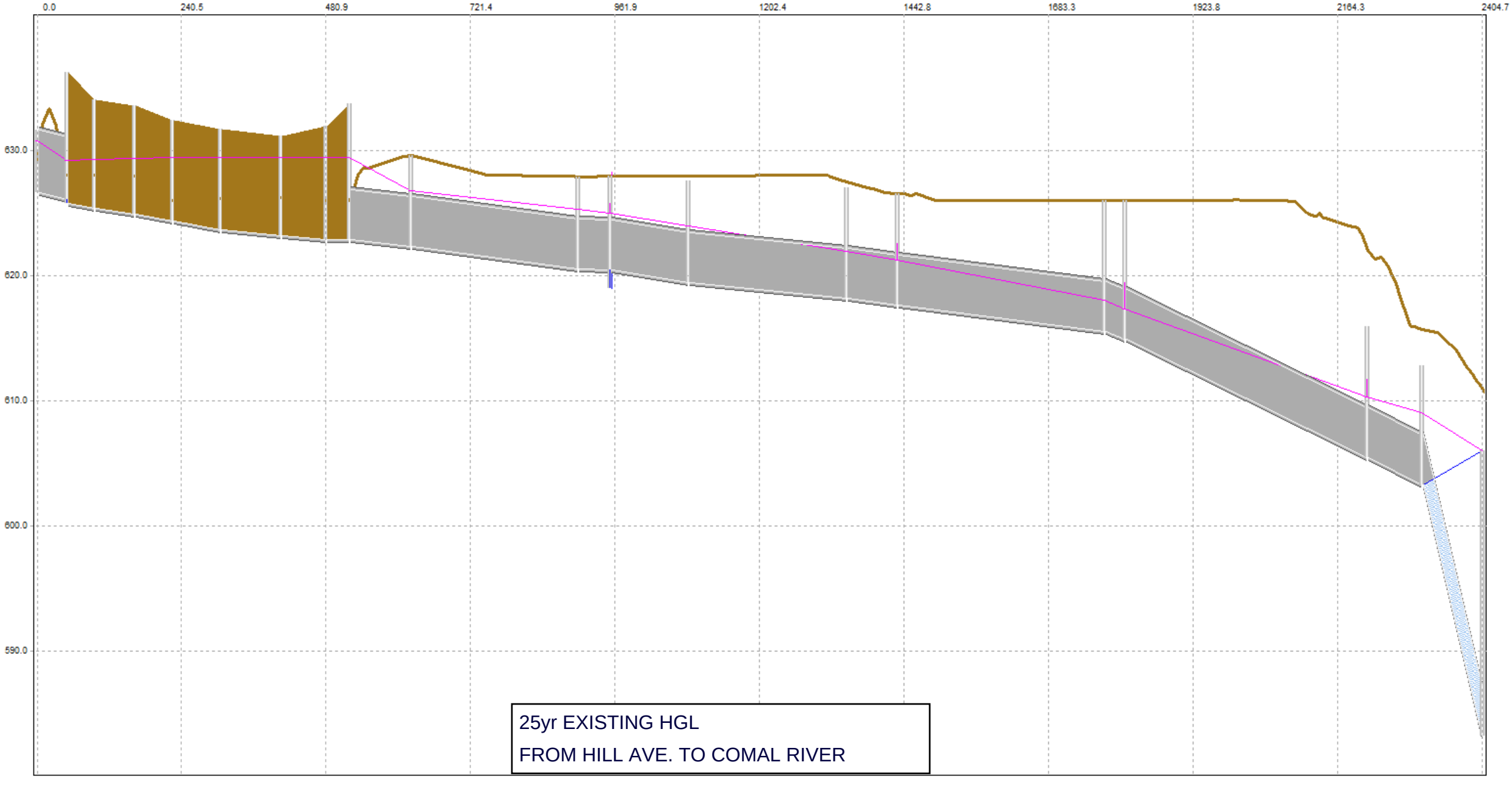
APPENDIX B – STORM SEWER HGL'S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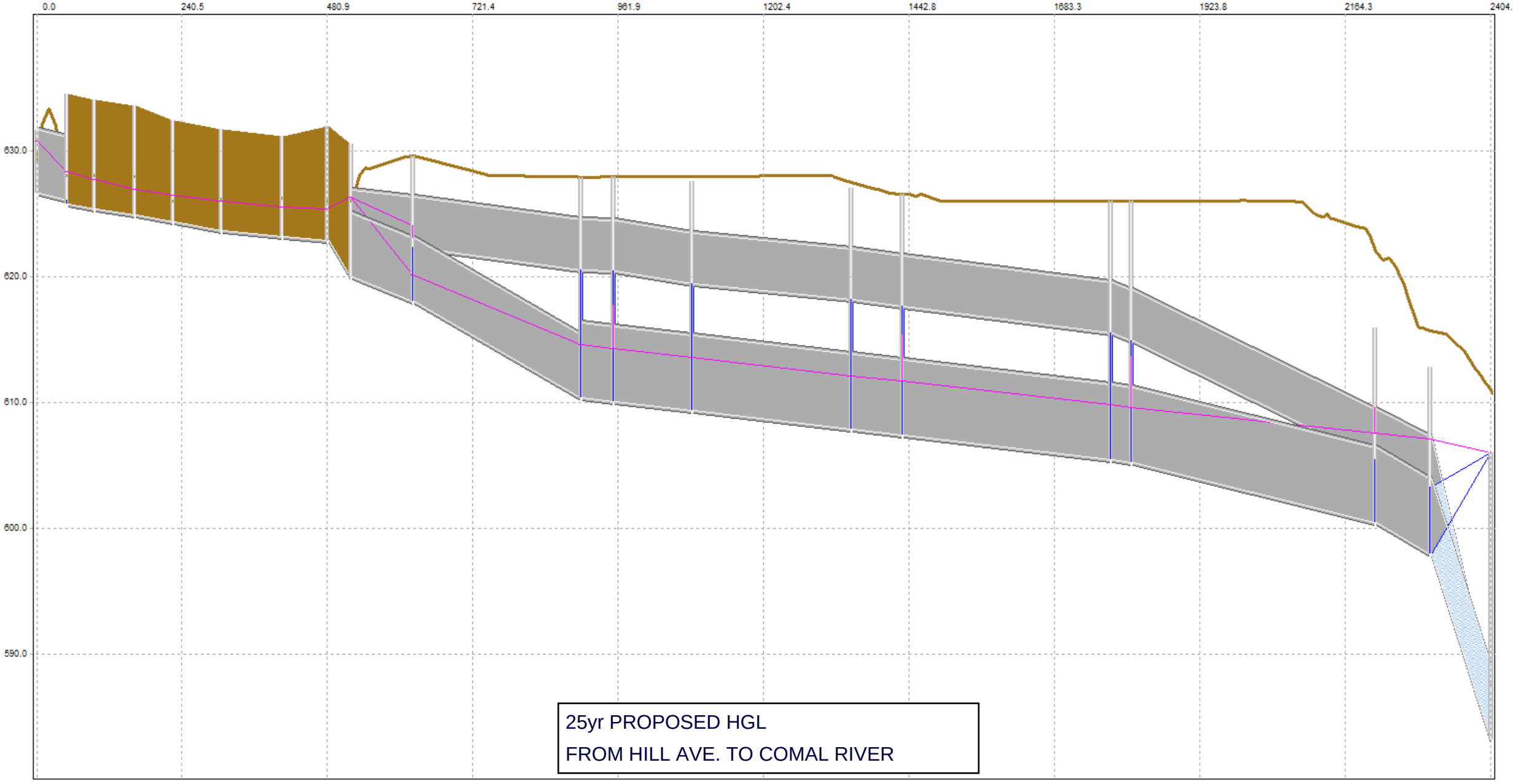
25yr EXISTING HGL
FROM HILL AVE. TO COMAL RIVER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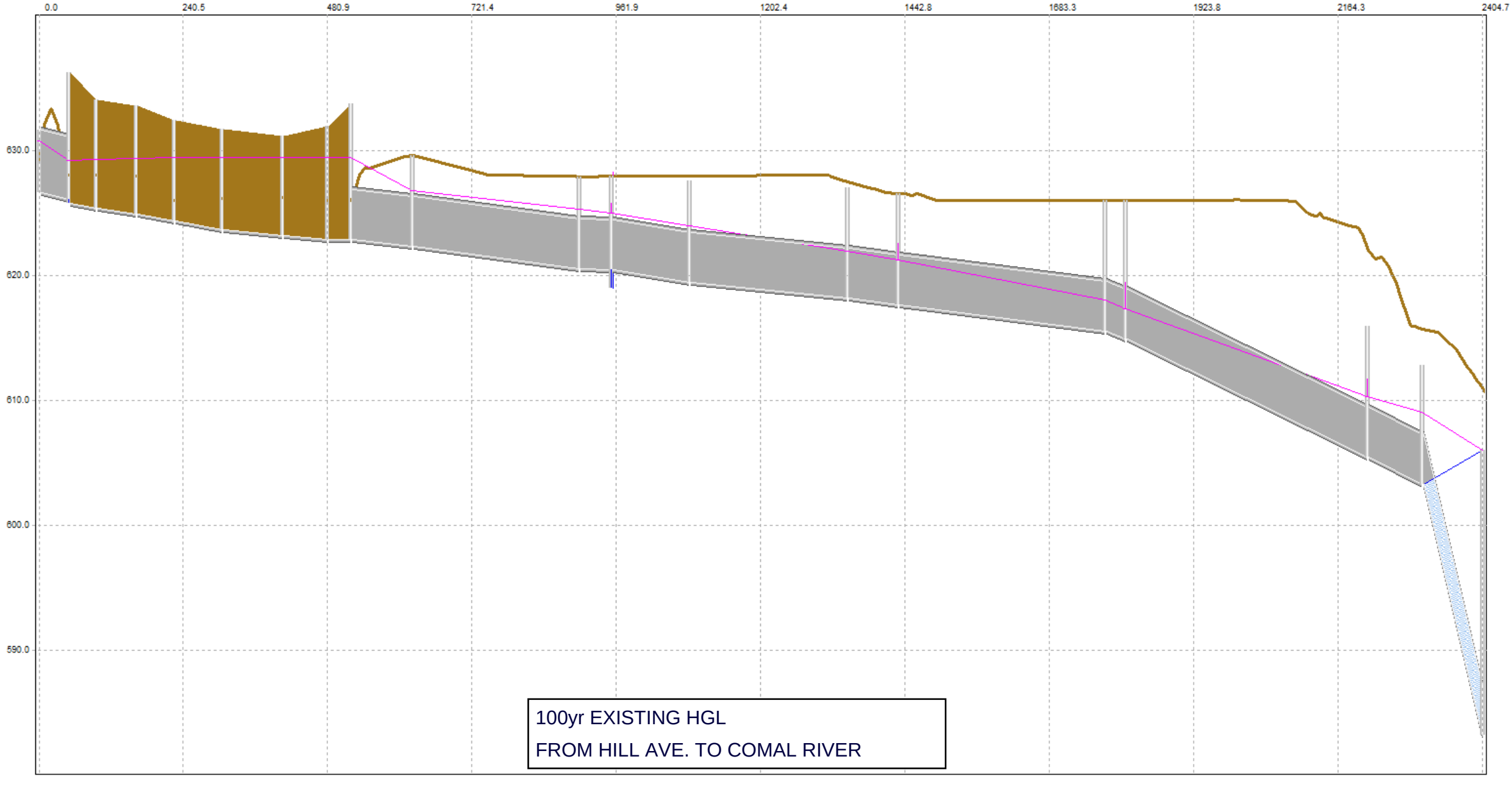
590.0
25yr PROPOSED HGL
FROM HILL AVE. TO COMAL RIVER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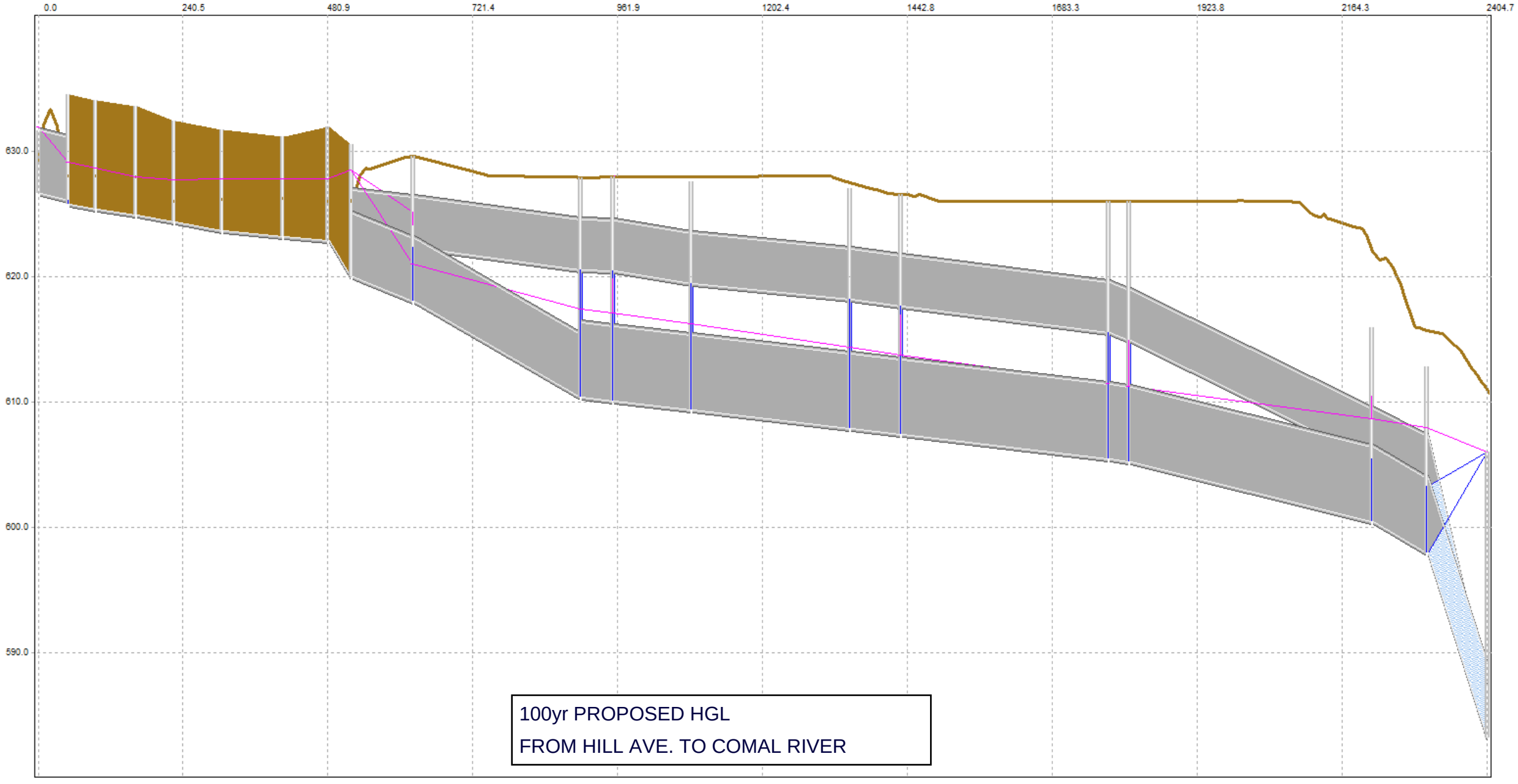
1202.4
1442.8
1683.3
1923.8
2164.3
2404.7
630.0
620.0
610.0
600.0
590.0
100yr EXISTING HGL
FROM HILL AVE. TO COMAL RIVER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240.5
480.9
721.4
961.9
1202.4
1442.8
1683.3
1923.8
2164.3
2404.7
630.0
620.0
610.0
600.0
590.0
100yr PROPOSED HGL
FROM HILL AVE. TO COMAL RIVER

APPENDIX C – XPSWMM OUTPUT

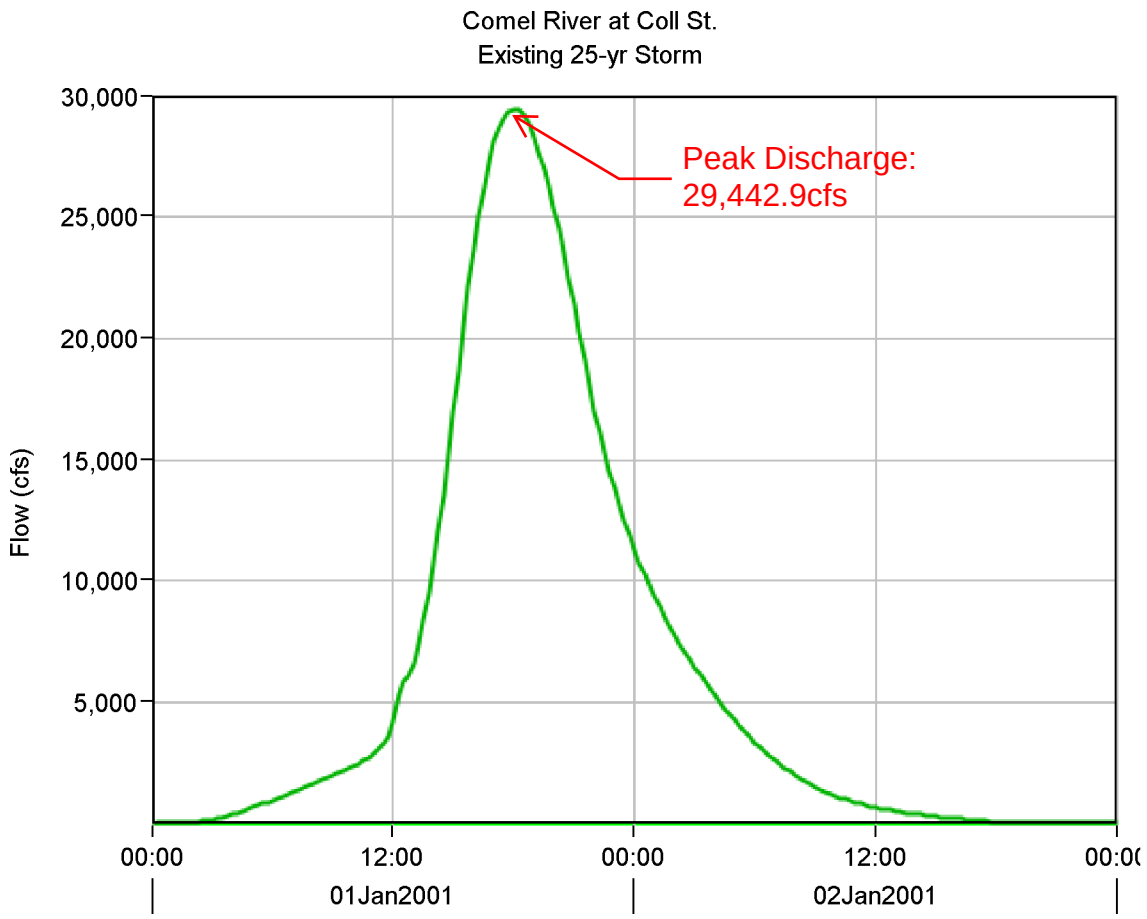
25yr Exisitng	Culvert_01	Link45	Link46	Link47	Link48	Link49	Link50	Link51	238.1	239.1	247.1	259.1	260.1	261.1	264.1	242.1	268.1	240.1	241.1
Length ft	50.06	45	66	64	80	100	75	40	102	278.664	53.335	130.074	262.936	85.328	344.672	33	403.187	91.169	100.302
Shape	Rectangular	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular
Diameter (Height) ft	5	8.66	8.66	8	8	8	8	9	4	4	4	4	4	4	4	4	4	4	4
Height of Rectangle ft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Width ft	9	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5
Conduit Slope	0.98	1	0.66	0.85	0.85	0.51	0.36	7.26	0.57	0.65	0.02	0.83	0.47	0.61	0.61	2.05	2.34	2.34	20.06
Downstream Invert Elevation ft	626.1	625.345	624.91	624.366	623.686	623.176	622.904	622.89	622.31	620.5	620.488	619.41	618.18	617.66	615.56	614.883	605.45	603.32	583.2
Upstream Invert Elevation ft	626.59	625.794	625.345	624.91	624.366	623.686	623.176	622.904	622.89	622.31	620.5	620.488	619.41	618.18	617.66	615.56	614.883	605.45	603.32
Upstream Node Name	Node001	Node002	Node003	Node004	Node005	Node006	Node007	Node008	Node009	Node010	Node011	Inlet 008	Node012	Node013	Inlet017	Node014	Inlet 020	Inlet 021	Node015
Max Flow cfs	410.132	483.636	483.692	483.733	483.752	483.719	483.645	483.567	190.801	190.835	215.374	230.918	234.501	234.497	234.507	234.508	234.511	234.513	234.514
Max Velocity ft/s	5.92	7.6	7.35	5.13	4.68	3.28	2.34	2.24	9.51	10.36	10.76	12.25	11.8	12.71	13.54	18.85	18.4	11.71	11.68
Max Depth ft	4.14	3.936	4.421	5.025	5.759	6.284	6.558	6.567	6.567	4.83	4.83	4.588	4.588	3.727	3.573	2.497	4.841	5.752	22.8
Max Headwater ft	630.73	629.166	629.28	629.33	629.391	629.445	629.46	629.462	629.457	626.76	625.326	624.978	623.997	621.907	621.233	618.057	617.313	610.29	609.072
Design Velocity ft/s; m/s	16.81	28.99	24.27	25.96	24.29	19.26	15.65	5.21	10.02	10.71	1.99	12.09	9.09	10.37	10.37	19.03	20.32	20.31	59.5
Design Full Flow cfs	756.44	7462.37	7810.68	7680.55	6517.06	5218.39	4984.38	1974.73	200.35	214.13	39.85	241.87	181.72	207.41	207.39	380.55	406.39	406.11	1189.96

25yr Proposed	Culvert_01	Link45	Link46	Link47	Link48	Link49	Link50	Link51	238.1	Prop 1	239.1	Prop 2	247.1	Prop 3	259.1	Prop 4	260.1	Prop 5	261.1	Prop 6	264.1	Prop 7	242.1	Prop 8	268.1	Prop 9	240.1	Prop 10	241.1	Prop 11
Scenario	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed
Length ft	50.06	45	66	64	80	100	75	40	102	102	278.664	278.664	53.335	53.335	130.074	130.074	262.936	262.936	85.328	85.328	344.672	344.672	33	33	403.187	403.187	91.169	91.169	100.302	100.302
Shape	Rectangular	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular
Diameter (Height) ft	5	8.66	8.66	8	8	8	8	9	4	5	4	5	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Height of Rectangle ft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Width ft	9	0	0	0	0	0	0	0	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8
Conduit Slope	0.98	1	0.66	0.85	0.85	0.51	0.36	7.26	0.57	1.96	0.65	2.73	0.02	0.56	0.83	0.56	0.47	0.56	0.61	0.56	0.61	0.56	2.05	0.56	2.34	1.18	2.34	2.74	20.06	14.76
Downstream Invert Elevation ft	626.1	625.345	624.91	624.366	623.686	623.176	622.904	620	622.31	618	620.5	610.4	620.488	610.099	619.41	609.365	618.18	607.881	617.66	607.4	615.56	605.455	614.883	605.269	605.45	600.5	603.32	598	583.2	583.2
Upstream Invert Elevation ft	626.59	625.794	625.345	624.91	624.366	623.686	623.176	622.904	622.89	620	622.31	618	620.5	610.4	620.488	610.099	619.41	609.365	618.18	607.881	617.66	607.4	615.56	605.455	614.883	605.269	605.45	600.5	603.32	598
Upstream Node Name	Node001	Node002	Node003	Node004	Node005	Node006	Node007	Node008	Node009	Node009	Node010	Node010	Node011	Node011	Inlet 008	Inlet 008	Node012	Node012	Node013	Node013	Inlet017	Inlet017	Node014	Node014	Inlet 020	Inlet 020	Inlet 021	Inlet 021	Node015	Node015
Max Flow cfs	409.389	410.938	410.932	410.922	410.84	410.941	413.14	419.845	83.111	331.042	0	412.835	0	497.744	0	501.135	0	502.676	0	502.325	0	502.957	0	502.777	0	502.979	95.241	-515.134	145.65	-499.695
Max Velocity ft/s	7.04	12.65	14.01	11.47	11.14	9.85	8.68	10.4	5.51	10.95	0	22.61	0	14.82	0	14.89	0	14.88	0	14.76	0	14.67	0	14.34	0	14.04	8.28	-11.15	7.63	-10.32
Max Depth ft	4.135	2.51	2.405	2.12	2.298	2.386	2.505	6.291	3.401	6.291	-9.00E+99	4.204	-9.00E+99	4.212	-9.00E+99	4.229	-9.00E+99	4.261	-9.00E+99	4.282	-9.00E+99	4.393	-9.00E+99	4.393	2.135	7.085	3.79	9.11	22.8	22.8
Max Headwater ft	630.725	628.302	627.749	626.947	626.483	625.978	625.552	625.351	626.275	626.275	0	620.099	0	614.603	0	614.311	0	613.593	0	612.135	0	611.676	0	609.847	0	609.584	607.581	607.581	607.107	607.107
Design Velocity ft/s; m/s	16.81	28.99	24.27	25.96	24.29	19.26	15.65	75.02	10.02	23.11	10.71	27.25	1.99	13.33	12.09	13.32	9.09	13.33	10.37	13.32	10.37	13.32	19.03	13.32	20.32	19.29	20.31	29.37	59.5	68.13
Design Full Flow cfs	756.44	7462.37	7810.68	7680.55	6517.06	5218.39	4984.38	28440.82	200.35	924.35	214.13	1090.16	39.85	639.6	241.87	639.57	181.72	639.63	207.41	639.24	207.39	639.57	380.55	639.2	406.39	925.97	406.11	1409.88	1189.96	3270.47

100yr Exisitng	Culvert_01	Link45	Link46	Link47	Link48	Link49	Link50	Link51	238.1	239.1	247.1	259.1	260.1	261.1	264.1	242.1	268.1	240.1	241.1
Length ft	50.06	45	66	64	80	100	75	40	102	278.664	53.335	130.074	262.936	85.328	344.672	33	403.187	91.169	100.302
Shape	Rectangular	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular
Diameter (Height) ft	5	8.66	8.66	8	8	8	8	9	4	4	4	4	4	4	4	4	4	4	4
Height of Rectangle ft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Width ft	9	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5
Conduit Slope	0.98	1	0.66	0.85	0.85	0.51	0.36	7.26	0.57	0.65	0.02	0.83	0.47	0.61	0.61	2.05	2.34	2.34	20.06
Downstream Invert Elevation ft	626.1	625.345	624.91	624.366	623.686	623.176	622.904	622.89	622.31	620.5	620.488	619.41	618.18	617.66	615.56	614.883	605.45	603.32	583.2
Upstream Invert Elevation ft	626.59	625.794	625.345	624.91	624.366	623.686	623.176	622.904	622.89	622.31	620.5	620.488	619.41	618.18	617.66	615.56	614.883	605.45	603.32
Upstream Node Name	Node001	Node002	Node003	Node004	Node005	Node006	Node007	Node008	Node009	Node010	Node011	Inlet 008	Node012	Node013	Inlet017	Node014	Inlet 020	Inlet 021	Node015
Max Flow cfs	410.132	483.636	483.692	483.733	483.752	483.719	483.645	483.567	190.801	190.835	215.374	230.918	234.501	234.497	234.507	234.508	234.511	234.513	234.514
Max Velocity ft/s	5.92	7.6	7.35	5.13	4.68	3.28	2.34	2.24	9.51	10.36	10.76	12.25	11.8	12.71	13.54	18.85	18.4	11.71	11.68
Max Depth ft	4.14	3.936	4.421	5.025	5.759	6.284	6.558	6.567	6.567	4.83	4.83	4.588	4.588	3.727	3.573	2.497	4.841	5.752	22.8
Max Headwater ft	630.73	629.166	629.28	629.33	629.391	629.445	629.46	629.462	629.457	626.76	625.326	624.978	623.997	621.907	621.233	618.057	617.313	610.29	609.072
Design Velocity ft/s; m/s	16.81	28.99	24.27	25.96	24.29	19.26	15.65	5.21	10.02	10.71	1.99	12.09	9.09	10.37	10.37	19.03	20.32	20.31	59.5
Design Full Flow cfs	756.44	7462.37	7810.68	7680.55	6517.06	5218.39	4984.38	1974.73	200.35	214.13	39.85	241.87	181.72	207.41	207.39	380.55	406.39	406.11	1189.96

100yr Proposed	Culvert_01	Link45	Link46	Link47	Link48	Link49	Link50	Link51	238.1	Prop 1	239.1	Prop 2	247.1	Prop 3	259.1	Prop 4	260.1	Prop 5	261.1	Prop 6	264.1	Prop 7	242.1	Prop 8	268.1	Prop 9	240.1	Prop 10	241.1	Prop 11
Scenario	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed
Length ft	50.06	45	66	64	80	100	75	40	102	102	278.664	278.664	53.335	53.335	130.074	130.074	262.936	262.936	85.328	85.328	344.672	344.672	33	33	403.187	403.187	91.169	91.169	100.302	100.302
Shape	Rectangular	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular
Diameter (Height) ft	5	8.66	8.66	8	8	8	8	9	4	5	4	5	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
Height of Rectangle ft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Width ft	9	0	0	0	0	0	0	0	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8	5	8
Conduit Slope	0.98	1	0.66	0.85	0.85	0.51	0.36	7.26	0.57	1.96	0.65	2.73	0.02	0.56	0.83	0.56	0.47	0.56	0.61	0.56	0.61	0.56	2.05	0.56	2.34	1.18	2.34	2.74	20.06	14.76
Downstream Invert Elevation ft	626.1	625.345	624.91	624.366	623.686	623.176	622.904	620	622.31	618	620.5	610.4	620.488	610.099	619.41	609.365	618.18	607.881	617.66	607.4	615.56	605.455	614.883	605.269	605.45	600.5	603.32	598	583.2	583.2
Upstream Invert Elevation ft	626.59	625.794	625.345	624.91	624.366	623.686	623.176	622.904	622.89	620	622.31	618	620.5	610.4	620.488	610.099	619.41	609.365	618.18	607.881	617.66	607.4	615.56	605.455	614.883	605.269	605.45	600.5	603.32	598
Upstream Node Name	Node001	Node002	Node003	Node004	Node005	Node006	Node007	Node008	Node009	Node009	Node010	Node010	Node011	Node011	Inlet 008	Inlet 008	Node012	Node012	Node013	Node013	Inlet017	Inlet017	Node014	Node014	Inlet 020	Inlet 020	Inlet 021	Inlet 021	Node015	Node015
Max Flow cfs	599.306	631.734	595.665	588.749	587.918	587.387	625.467	882.309	162.811	439.887	0	593.678	0	676.276	0	685.764	0	677.984	0	678.593	0	674.564	0	670.162	0	668.12	170.575	-514.863	189.345	-499.695
Max Velocity ft/s	6.95	12.67	14.12	11.62	11.12	9.81	8.64	10.49	8.37	11.48	0	24.14	0	15.81	0	15.78	0	15.55	0	15.36	0	15.3	0	14.81	0	14.85	10.23	-11.14	9.44	-10.32
Max Depth ft	5.332	3.296	3.291	3.336	4.082	4.636	4.907	8.509	5.619	8.509	-9.00E+99	7.015	-9.00E+99	7.014	-9.00E+99	6.994	-9.00E+99	6.873	-9.00E+99	6.483	-9.00E+99	6.365	-9.00E+99	6.044	3.262	8.212	4.681	10.001	22.8	22.8
Max Headwater ft	631.921	629.082	628.517	627.916	627.676	627.702	627.118	626.944	628.33	628.33	0	621.026	0	616.432	0	616.692	0	615.407	0	613.91	0	613.442	0	611.497	0	611.218	608.688	608.672	607.971	607.971
Design Velocity ft/s; m/s	16.81	28.99	24.27	25.96	24.29	19.26	15.65	75.02	10.02	23.11	10.71	27.25	1.99	13.33	12.09	13.32	9.09	13.33	10.37	13.32	10.37	13.32	19.03	13.32	20.32	19.29	20.31	29.37	59.5	68.13
Design Full Flow cfs	756.44	7462.37	7810.68	7680.55	6517.06	5218.39	4984.38	28440.82	200.35	924.35	214.13	1090.16	39.85	639.6	241.87	639.57	181.72	639.63	207.41	639.24	207.39	639.57	380.55	639.2	406.39	925.97	406.11	1409.88	1189.96	3270.47

APPENDIX D – HYDROGRAPH OUTPUT


Comel River at Coll St.
Existing 25-yr Storm
Peak Discharge:
29,442.9cfs
Flow (cfs)
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25,000
20,000
15,000
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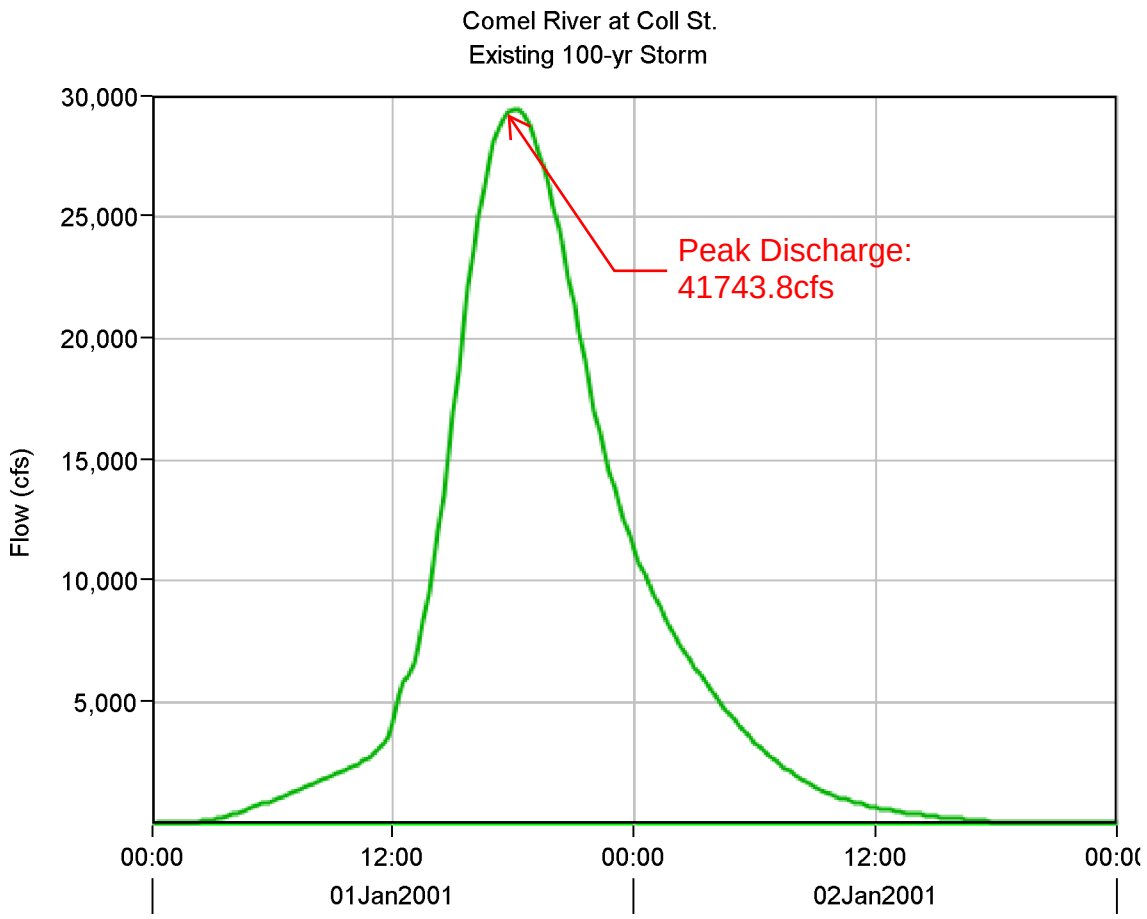
00:00
12:00
00:00
12:00
01Jan2001
02Jan2001


Comel River at Coll St.
Existing 100-yr Storm
Flow (cfs)
30,000
25,000
20,000
15,000
10,000
5,000
Peak Discharge:
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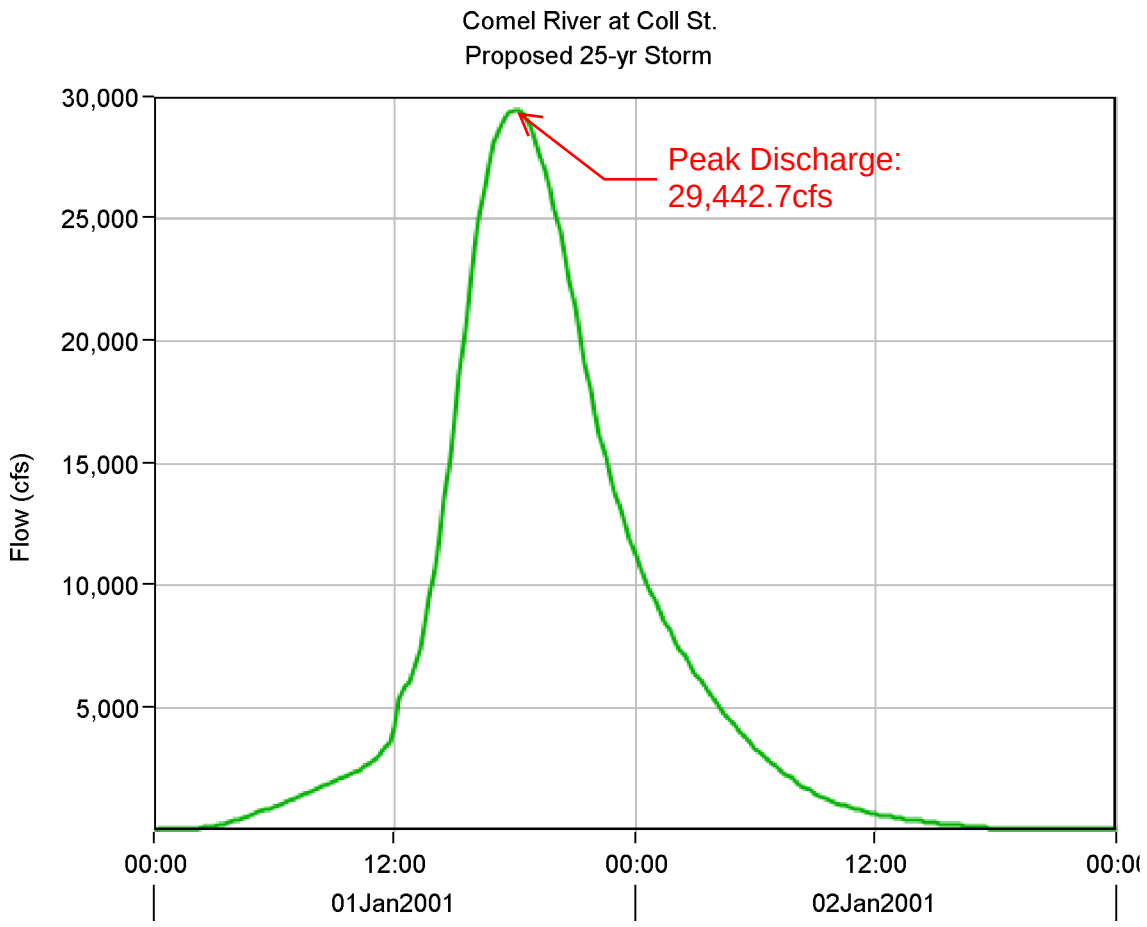
00:00
12:00
00:00
12:00
01Jan2001
02Jan2001


Comel River at Coll St.
Proposed 25-yr Storm
Peak Discharge:
29,442.7cfs
Flow (cfs)
30,000
25,000
20,000
15,000
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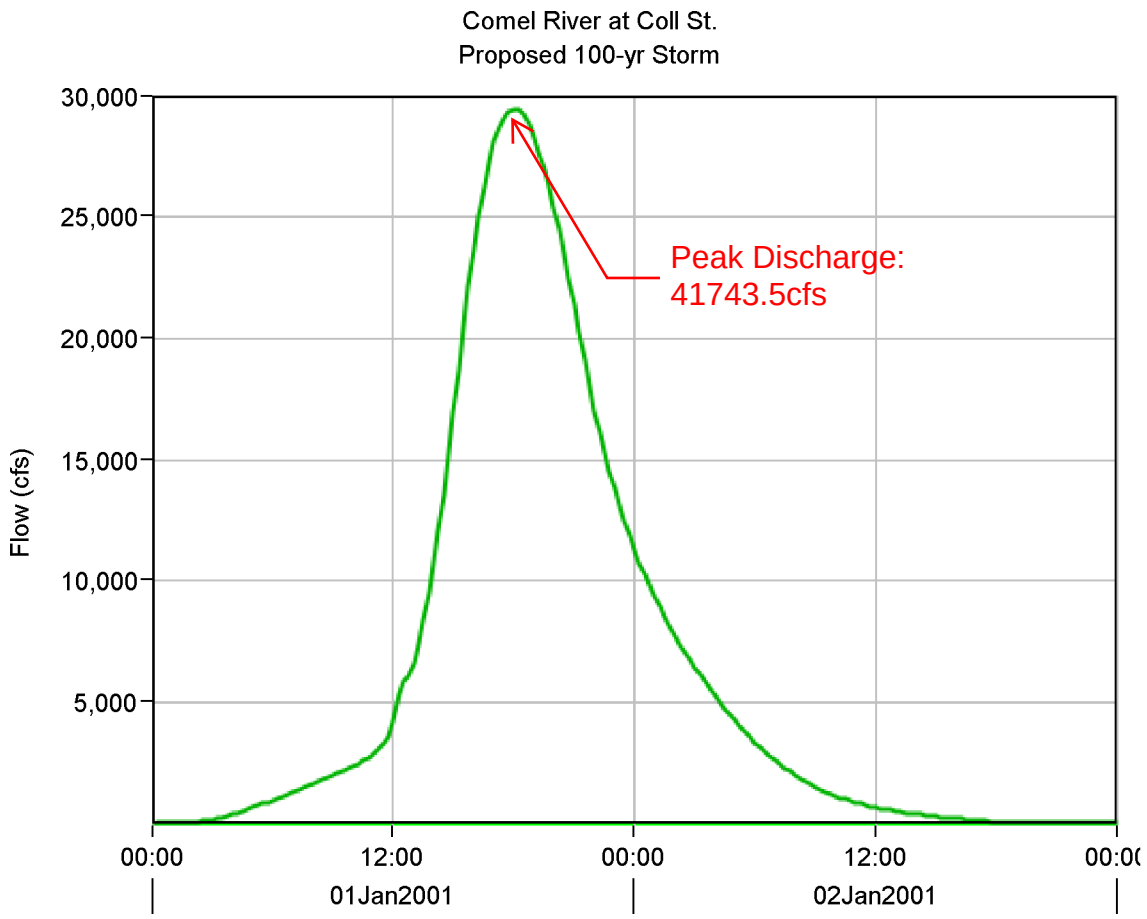
01Jan2001
02Jan2001


Comel River at Coll St.
Proposed 100-yr Storm
Flow (cfs)
30,000
25,000
20,000
15,000
10,000
5,000
Peak Discharge:
41743.5cfs
00:00
12:00
00:00
12:00
01Jan2001
02Jan2001

APPENDIX E – AUTODESK SSA SAN ANTONIO STREET OUTPUT

Project Description

File Name	SA Street Existing.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jan 04, 2022	00:00:00
End Analysis On	Jan 05, 2022	00:00:00
Start Reporting On	Jan 04, 2022	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	20
Nodes	36
Junctions	17
Outfalls	2
Flow Diversions	0
Inlets	17
Storage Nodes	0
Links	44
Channels	3
Pipes	41
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	1.10	0.8600	0.89	0.76	0.84	11.21	0 00:04:30
2	Sub-02	1.25	0.8500	0.89	0.76	0.94	12.59	0 00:04:30
3	Sub-03	1.20	0.8500	1.03	0.87	1.05	11.42	0 00:05:30
4	Sub-04	2.97	0.8500	1.15	0.98	2.90	26.81	0 00:06:30
5	Sub-05	3.10	0.8500	1.15	0.98	3.03	27.98	0 00:06:30
6	Sub-06	0.66	0.8500	0.81	0.69	0.46	6.85	0 00:04:00
7	Sub-07	0.77	0.8500	0.96	0.82	0.63	7.53	0 00:05:00
8	Sub-08	5.12	0.8500	1.15	0.98	5.01	46.21	0 00:06:30
9	Sub-09	1.39	0.8500	0.81	0.69	0.96	14.43	0 00:04:00
10	Sub-10	0.78	0.8500	0.65	0.55	0.43	8.64	0 00:03:00
11	Sub-11	0.57	0.8500	0.65	0.55	0.32	6.32	0 00:03:00
12	Sub-12	0.47	0.8500	0.65	0.55	0.26	5.21	0 00:03:00
13	Sub-13	0.52	0.8500	0.81	0.69	0.36	5.40	0 00:04:00
14	Sub-14	0.21	0.8500	0.47	0.40	0.08	2.50	0 00:02:00
15	Sub-16	0.53	0.8500	0.89	0.76	0.40	5.34	0 00:04:30
16	Sub-17	1.40	0.8500	0.96	0.82	1.14	13.70	0 00:05:00
17	Sub-18	0.55	0.8500	0.65	0.55	0.30	6.09	0 00:03:00
18	Sub-21	2.42	0.8500	0.96	0.82	1.97	23.66	0 00:05:00
19	Sub-22	0.51	0.8500	0.56	0.48	0.24	5.83	0 00:02:30
20	Sub-23	0.24	0.8500	0.36	0.31	0.08	3.01	0 00:01:30

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	Junction	608.62	624.02	608.62	624.02	0.00	156.10	610.97	0.00	13.05	0 00:00	0.00	0.00
2	03	Junction	610.59	624.23	610.59	624.23	0.00	156.13	613.46	0.00	10.76	0 00:00	0.00	0.00
3	04	Junction	612.85	627.93	612.85	627.93	0.00	128.46	615.73	0.00	12.20	0 00:00	0.00	0.00
4	05	Junction	617.41	630.00	617.41	630.00	0.00	86.53	620.61	0.00	9.38	0 00:00	0.00	0.00
5	06	Junction	618.70	630.00	618.70	630.00	0.00	24.32	621.20	0.00	8.80	0 00:00	0.00	0.00
6	07	Junction	619.21	629.28	619.21	629.28	0.00	26.53	629.28	0.00	0.00	0 00:04	0.11	3.00
7	08	Junction	621.73	630.00	621.73	630.00	0.00	21.21	622.44	0.00	7.55	0 00:00	0.00	0.00
8	10	Junction	624.20	630.00	624.20	630.00	0.00	8.10	624.94	0.00	5.06	0 00:00	0.00	0.00
9	11	Junction	617.99	630.00	617.99	630.00	0.00	30.82	619.21	0.00	10.79	0 00:00	0.00	0.00
10	12	Junction	617.56	628.44	617.56	630.00	0.00	50.62	628.44	0.00	0.00	0 00:04	0.15	3.00
11	13	Junction	618.20	630.00	618.20	630.00	0.00	43.87	621.16	0.00	8.84	0 00:00	0.00	0.00
12	14	Junction	619.18	630.00	619.18	629.40	0.00	45.56	630.00	0.00	0.00	0 00:05	0.20	4.00
13	15	Junction	619.77	631.17	619.77	631.17	0.00	46.30	631.17	0.00	0.00	0 00:06	0.15	4.00
14	16	Junction	620.08	631.39	620.08	631.39	0.00	51.28	631.39	0.00	0.00	0 00:06	0.23	3.00
15	Jun-02	Junction	636.00	636.50	0.00	0.00	0.00	23.66	636.38	0.00	0.12	0 00:00	0.00	0.00
16	Jun-03	Junction	634.00	634.50	0.00	0.00	0.00	23.53	634.50	0.00	0.00	0 00:05	0.02	1.00
17	Jun-04	Junction	631.00	631.50	0.00	0.00	0.00	20.40	631.49	0.00	0.01	0 00:00	0.00	0.00
18	01	Outfall	586.68					159.18	587.97					
19	Jun-05	Outfall	610.00					13.49	610.39					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-10	Pipe	Inlet-12	Inlet-15	156.29	625.04	623.97	0.6800	0.000	0.0150	2.36	0.00	0.00	0.00	0.00	0.00	0.00	
2	Link-12	Pipe	Inlet-11	Inlet-05	571.04	623.40	621.17	0.3900	0.000	0.0150	3.60	0.00	0.00	0.00	0.00	0.00	0.00	
3	Link-13	Pipe	Inlet-06	Inlet-04	564.81	623.83	618.52	0.9400	0.000	0.0150	4.06	0.00	0.00	0.00	0.00	0.00	0.00	
4	Link-14	Pipe	Inlet-05	Inlet-02	367.74	621.17	617.28	1.0600	0.000	0.0150	2.80	0.00	0.00	0.00	0.00	0.00	0.00	
5	Link-15	Pipe	Inlet-04	Inlet-03	370.53	618.52	615.77	0.7400	0.000	0.0150	2.39	0.00	0.00	0.00	0.00	0.00	0.00	
6	Link-16	Pipe	Inlet-03	01	238.51	615.77	586.68	12.2000	0.000	0.0150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	Link-17	Pipe	Inlet-02	01	256.67	617.28	586.68	11.9200	0.000	0.0150	3.12	0.00	0.00	0.00	0.00	0.00	0.00	
8	Link-18	Pipe	Inlet-01	01	208.23	617.76	586.68	14.9300	0.000	0.0150	1.97	0.00	0.00	0.00	0.00	0.00	0.00	
9	Link-25	Pipe	Inlet-09	Inlet-08	74.52	624.25	624.00	0.3400	0.000	0.0150	1.74	0.00	0.00	0.00	0.00	0.00	0.00	
10	Link-26	Pipe	Inlet-10	Inlet-09	31.56	624.40	624.25	0.4800	0.000	0.0150	5.59	0.00	0.00	0.00	0.00	0.00	0.00	
11	PIPE -01	Pipe	02	01	129.85	608.62	586.68	16.9000	60.000	0.0130	156.09	1070.54	0.15	38.90	1.29	0.26	0.00	Calculated
12	PIPE -02	Pipe	03	02	110.00	609.17	608.62	0.5000	60.000	0.0130	156.10	348.54	0.45	17.27	2.35	0.47	0.00	Calculated
13	PIPE -03	Pipe	04	03	370.00	611.35	610.59	0.2100	60.000	0.0130	127.76	203.55	0.63	11.17	2.87	0.57	0.00	Calculated
14	PIPE -04	Pipe	05	04	574.21	613.72	612.85	0.1500	42.000	0.0130	82.74	89.66	0.92	10.87	2.63	0.75	0.00	Calculated
15	PIPE -05	Pipe	Inlet-17	05	76.87	623.56	617.41	8.0000	24.000	0.0130	14.49	63.99	0.23	16.51	0.65	0.32	0.00	Calculated
16	PIPE -06	Pipe	11	05	26.63	617.99	617.41	2.1800	36.000	0.0130	30.80	98.44	0.31	12.31	1.15	0.38	0.00	Calculated
17	PIPE -07	Pipe	07	06	170.54	619.21	618.70	0.3000	30.000	0.0130	24.32	22.47	1.08	5.58	2.50	1.00	1.00	SURCHARGED
18	PIPE -08	Pipe	08	07	3.46	620.00	619.21	22.7800	18.000	0.0130	21.21	89.61	0.24	41.50	0.50	0.33	0.00	Calculated
19	PIPE -09	Pipe	10	08	89.00	624.20	621.73	2.7800	18.000	0.0130	8.06	17.50	0.46	9.73	0.71	0.48	0.00	Calculated
20	PIPE -10	Pipe	Inlet-08	08	21.99	624.00	621.73	10.3200	18.000	0.0130	14.12	33.75	0.42	18.25	0.68	0.45	0.00	Calculated
21	PIPE -11	Pipe	Inlet-09	Inlet-08	69.47	624.25	624.00	0.3600	18.000	0.0130	6.82	6.30	1.08	6.20	1.50	1.00	3.00	SURCHARGED
22	PIPE -12	Pipe	Inlet-10	10	7.97	624.40	624.20	2.5100	18.000	0.0130	8.10	16.64	0.49	9.35	0.74	0.49	0.00	Calculated
23	PIPE -13	Pipe	Inlet-07	07	9.23	624.99	619.21	62.6100	18.000	0.0130	5.32	83.12	0.06	26.29	0.26	0.17	0.00	Calculated
24	PIPE -14	Pipe	Inlet-06	11	9.24	623.83	617.99	63.2200	18.000	0.0130	12.16	83.52	0.15	33.70	0.39	0.26	0.00	Calculated
25	PIPE -15	Pipe	12	05	75.58	617.56	617.41	0.2000	42.000	0.0130	48.68	44.99	1.08	5.49	3.31	0.94	0.00	> CAPACITY
26	PIPE -16	Pipe	13	12	64.59	617.69	617.56	0.2000	42.000	0.0130	43.53	100.07	0.44	10.19	1.60	0.46	0.00	Calculated
27	PIPE -17	Pipe	14	13	263.99	619.18	618.20	0.3700	36.000	0.0130	43.87	40.58	1.08	7.08	2.82	0.94	0.00	> CAPACITY
28	PIPE -18	Pipe	15	14	155.19	619.77	619.18	0.3800	36.000	0.0130	44.58	41.23	1.08	7.02	2.85	0.95	0.00	> CAPACITY
29	PIPE -19	Pipe	16	15	75.31	620.08	619.77	0.4100	36.000	0.0130	46.30	42.79	1.08	7.21	3.00	1.00	1.00	SURCHARGED
30	PIPE -20	Pipe	Inlet-13	16	41.17	621.88	620.08	4.3700	30.000	0.0130	51.28	85.76	0.60	18.25	1.39	0.56	0.00	Calculated
31	PIPE -21	Pipe	Inlet-14	Inlet-13	74.24	625.70	621.88	5.1500	24.000	0.0130	46.05	51.32	0.90	18.52	1.48	0.74	0.00	Calculated
32	PIPE -22	Pipe	Inlet-12	14	17.83	625.04	619.18	32.8900	24.000	0.0130	6.27	129.74	0.05	21.38	0.30	0.15	0.00	Calculated
33	PIPE -23	Pipe	Inlet-11	12	10.57	623.40	617.56	55.2400	24.000	0.0130	10.78	168.14	0.06	29.93	0.34	0.17	0.00	Calculated
34	PIPE -24	Pipe	Inlet-04	04	12.60	618.52	612.85	45.0000	24.000	0.0130	24.41	151.75	0.16	35.43	0.54	0.27	0.00	Calculated
35	PIPE -25	Pipe	Inlet-05	04	53.54	621.17	612.85	15.5400	24.000	0.0130	26.51	89.18	0.30	24.76	0.75	0.37	0.00	Calculated
36	PIPE -26	Pipe	Inlet-03	03	5.44	615.77	610.59	95.3100	24.000	0.0130	11.44	220.85	0.05	37.04	0.31	0.15	0.00	Calculated
37	PIPE -27	Pipe	Inlet-02	03	60.05	617.28	610.59	11.1400	24.000	0.0130	18.89	75.51	0.25	19.99	0.68	0.34	0.00	Calculated
38	PIPE -28	Pipe	Inlet-01	Inlet-02	61.26	617.76	617.28	0.7800	24.000	0.0130	9.40	20.02	0.47	7.98	0.96	0.48	0.00	Calculated
39	PIPE -29	Pipe	Inlet-16	Inlet-17	77.56	623.90	623.56	0.4400	24.000	0.0130	5.06	14.98	0.34	5.04	0.80	0.40	0.00	Calculated
40	PIPE -30	Pipe	Inlet-15	Inlet-17	79.15	623.97	623.56	0.5200	24.000	0.0130	8.37	16.28	0.51	5.35	1.01	0.51	0.00	Calculated
41	PIPE -31	Pipe	06	11	64.29	618.20	617.99	0.3300	36.000	0.0130	24.29	70.09	0.35	9.06	1.22	0.41	0.00	Calculated
42	Link-28	Channel	Jun-02	Jun-03	42.99	636.00	634.00	4.6500	6.000	0.0320	23.53	52.98	0.44	6.76	0.38	0.76	0.00	
43	Link-29	Channel	Jun-03	Jun-04	387.37	634.00	631.00	0.7700	6.000	0.0320	20.40	21.61	0.94	4.08	0.48	0.96	0.00	
44	Link-30	Channel	Jun-04	Jun-05	1506.52	631.00	610.00	1.3900	6.000	0.0320	13.49	29.00	0.47	3.29	0.36	0.71	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft²)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	617.76	N/A	11.42	9.45	1.96	82.79	7.00	17.55	623.53
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	617.28	N/A	12.59	9.46	3.13	75.12	7.00	16.94	624.05
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	615.77	N/A	11.21	11.21	0.00	100.00	7.00	16.14	624.56
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	618.52	N/A	26.81	24.42	2.39	91.10	7.00	27.95	627.60
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	621.17	N/A	27.98	25.18	2.80	90.00	7.00	28.37	627.55
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	623.83	0.00	6.09	N/A	N/A	N/A	7.00	16.80	628.93
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	624.99	0.00	5.34	N/A	N/A	N/A	7.00	9.37	629.80
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	624.00	0.00	6.85	N/A	N/A	N/A	7.00	20.86	630.50
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	624.25	N/A	7.53	5.80	1.73	76.99	7.00	15.56	630.42
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	624.40	N/A	13.70	8.10	5.60	59.14	7.00	19.73	630.50
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	623.40	0.00	5.40	N/A	N/A	N/A	7.00	15.49	629.08
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	625.04	N/A	8.64	6.28	2.36	72.73	7.00	16.44	629.78
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	621.88	0.00	14.43	N/A	N/A	N/A	7.00	19.04	631.04
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	625.70	0.00	46.21	N/A	N/A	N/A	7.00	74.74	632.18
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	623.97	0.00	6.31	N/A	N/A	N/A	7.00	13.49	629.54
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	623.90	0.00	5.21	N/A	N/A	N/A	7.00	11.86	629.32
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	623.56	0.00	2.50	N/A	N/A	N/A	7.00	9.27	629.27

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac) 1.10
Weighted Runoff Coefficient 0.8600

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.90	-	0.95
-	0.20	-	0.47
Composite Area & Weighted Runoff Coeff.	1.10		0.86

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 11.21
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8600
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-02

Input Data

Area (ac) 1.25
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.00	-	0.95
-	0.25	-	0.47
Composite Area & Weighted Runoff Coeff.	1.25		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 12.59
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-03

Input Data

Area (ac) 1.20
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.96	-	0.95
-	0.24	-	0.47
Composite Area & Weighted Runoff Coeff.	1.20		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.03
Total Runoff (in) 0.87
Peak Runoff (cfs) 11.42
Rainfall Intensity 11.192
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:30

Subbasin : Sub-04

Input Data

Area (ac) 2.97
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.38	-	0.95
-	0.59	-	0.47
Composite Area & Weighted Runoff Coeff.	2.97		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 26.81
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-05

Input Data

Area (ac) 3.10
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.48	-	0.95
-	0.62	-	0.47
Composite Area & Weighted Runoff Coeff.	3.10		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 27.98
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-06

Input Data

Area (ac) 0.66
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.53	-	0.95
-	0.13	-	0.47
Composite Area & Weighted Runoff Coeff.	0.66		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 6.85
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-07

Input Data

Area (ac) 0.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.15	-	0.47
Composite Area & Weighted Runoff Coeff.	0.77		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 7.53
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-08

Input Data

Area (ac) 5.12
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.10	-	0.95
-	1.02	-	0.47
Composite Area & Weighted Runoff Coeff.	5.12		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 46.21
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-09

Input Data

Area (ac) 1.39
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.11	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.39		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 14.43
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-10

Input Data

Area (ac) 0.78
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.16	-	0.47
Composite Area & Weighted Runoff Coeff.	0.78		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 8.64
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-11

Input Data

Area (ac) 0.57
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.46	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.57		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 6.32
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-12

Input Data

Area (ac) 0.47
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.38	-	0.95
-	0.09	-	0.47
Composite Area & Weighted Runoff Coeff.	0.47		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 5.21
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-13

Input Data

Area (ac) 0.52
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.52		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 5.40
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-14

Input Data

Area (ac) 0.21
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.17	-	0.95
-	0.04	-	0.47
Composite Area & Weighted Runoff Coeff.	0.21		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.47
Total Runoff (in) 0.40
Peak Runoff (cfs) 2.50
Rainfall Intensity 14.003
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-16

Input Data

Area (ac) 0.53
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.53		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 5.34
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-17

Input Data

Area (ac) 1.40
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.12	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.40		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 13.70
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18

Input Data

Area (ac) 0.55
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.44	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.55		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 6.09
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-21

Input Data

Area (ac) 2.42
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.94	-	0.95
-	0.48	-	0.47
Composite Area & Weighted Runoff Coeff.	2.42		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 23.66
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22

Input Data

Area (ac) 0.51
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.41	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.51		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.56
Total Runoff (in) 0.48
Peak Runoff (cfs) 5.83
Rainfall Intensity 13.497
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:30

Subbasin : Sub-23

Input Data

Area (ac) 0.24
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.95
-	0.05	-	0.47
Composite Area & Weighted Runoff Coeff.	0.24		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.36
Total Runoff (in) 0.31
Peak Runoff (cfs) 3.01
Rainfall Intensity 14.558
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:01:30

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	02	608.62	624.02	15.40	608.62	0.00	624.02	0.00	0.00	0.00
2	03	610.59	624.23	13.64	610.59	0.00	624.23	0.00	0.00	0.00
3	04	612.85	627.93	15.08	612.85	0.00	627.93	0.00	0.00	0.00
4	05	617.41	630.00	12.59	617.41	0.00	630.00	0.00	0.00	0.00
5	06	618.70	630.00	11.30	618.70	0.00	630.00	0.00	0.00	0.00
6	07	619.21	629.28	10.07	619.21	0.00	629.28	0.00	0.00	0.00
7	08	621.73	630.00	8.27	621.73	0.00	630.00	0.00	0.00	0.00
8	10	624.20	630.00	5.80	624.20	0.00	630.00	0.00	0.00	0.00
9	11	617.99	630.00	12.01	617.99	0.00	630.00	0.00	0.00	0.00
10	12	617.56	628.44	10.88	617.56	0.00	630.00	1.56	0.00	0.00
11	13	618.20	630.00	11.80	618.20	0.00	630.00	0.00	0.00	0.00
12	14	619.18	630.00	10.82	619.18	0.00	629.40	-0.60	0.00	0.00
13	15	619.77	631.17	11.40	619.77	0.00	631.17	0.00	0.00	0.00
14	16	620.08	631.39	11.31	620.08	0.00	631.39	0.00	0.00	0.00
15	Jun-02	636.00	636.50	0.50	0.00	-636.00	0.00	-636.50	0.00	0.00
16	Jun-03	634.00	634.50	0.50	0.00	-634.00	0.00	-634.50	0.00	0.00
17	Jun-04	631.00	631.50	0.50	0.00	-631.00	0.00	-631.50	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	156.10	0.00	610.97	2.35	0.00	13.05	608.64	0.02	0 00:05	0 00:00	0.00	0.00
2	03	156.13	0.00	613.46	2.87	0.00	10.76	610.61	0.02	0 00:05	0 00:00	0.00	0.00
3	04	128.46	0.00	615.73	2.88	0.00	12.20	612.87	0.02	0 00:05	0 00:00	0.00	0.00
4	05	86.53	0.00	620.61	3.20	0.00	9.38	617.43	0.02	0 00:07	0 00:00	0.00	0.00
5	06	24.32	0.00	621.20	2.50	0.00	8.80	618.71	0.01	0 00:05	0 00:00	0.00	0.00
6	07	26.53	0.00	629.28	10.07	0.00	0.00	619.24	0.03	0 00:03	0 00:04	0.11	3.00
7	08	21.21	0.00	622.44	0.71	0.00	7.55	621.73	0.00	0 00:05	0 00:00	0.00	0.00
8	10	8.10	0.00	624.94	0.74	0.00	5.06	624.20	0.00	0 00:05	0 00:00	0.00	0.00
9	11	30.82	0.00	619.21	1.22	0.00	10.79	618.00	0.01	0 00:04	0 00:00	0.00	0.00
10	12	50.62	0.00	628.44	10.88	0.00	0.00	617.60	0.04	0 00:04	0 00:04	0.15	3.00
11	13	43.87	0.00	621.16	2.96	0.00	8.84	618.22	0.02	0 00:08	0 00:00	0.00	0.00
12	14	45.56	0.00	630.00	10.82	0.00	0.00	619.22	0.04	0 00:04	0 00:05	0.20	4.00
13	15	46.30	0.00	631.17	11.40	0.00	0.00	619.81	0.04	0 00:04	0 00:06	0.15	4.00
14	16	51.28	0.00	631.39	11.31	0.00	0.00	620.12	0.04	0 00:04	0 00:06	0.23	3.00
15	Jun-02	23.66	23.66	636.38	0.38	0.00	0.12	636.00	0.00	0 00:05	0 00:00	0.00	0.00
16	Jun-03	23.53	3.01	634.50	0.50	0.00	0.00	634.00	0.00	0 00:04	0 00:05	0.02	1.00
17	Jun-04	20.40	0.00	631.49	0.49	0.00	0.01	631.01	0.01	0 00:06	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-28	42.99	636.00	0.00	634.00	0.00	2.00	4.6500	User-Defined	0.500	39.000	0.0320	0.1000	0.1000	0.0000	0.00	No
2	Link-29	387.37	634.00	0.00	631.00	0.00	3.00	0.7700	User-Defined	0.500	39.000	0.0320	0.1000	0.1000	0.0000	0.00	No
3	Link-30	1506.52	631.00	0.00	610.00	0.00	21.00	1.3900	User-Defined	0.500	39.000	0.0320	0.1000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-28	23.53	0 00:05	52.98	0.44	6.76	0.11	0.38	0.76	0.00		
2	Link-29	20.40	0 00:06	21.61	0.94	4.08	1.58	0.48	0.96	0.00		
3	Link-30	13.49	0 00:13	29.00	0.47	3.29	7.63	0.36	0.71	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-10	156.29	625.04	0.00	623.97	0.00	1.07	0.6800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-12	571.04	623.40	0.00	621.17	0.00	2.23	0.3900	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
3	Link-13	564.81	623.83	0.00	618.52	0.00	5.31	0.9400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
4	Link-14	367.74	621.17	0.00	617.28	0.00	3.89	1.0600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
5	Link-15	370.53	618.52	0.00	615.77	0.00	2.75	0.7400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
6	Link-16	238.51	615.77	0.00	586.68	0.00	29.09	12.2000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
7	Link-17	256.67	617.28	0.00	586.68	0.00	30.60	11.9200	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
8	Link-18	208.23	617.76	0.00	586.68	0.00	31.08	14.9300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
9	Link-25	74.52	624.25	0.00	624.00	0.00	0.25	0.3400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
10	Link-26	31.56	624.40	0.00	624.25	0.00	0.15	0.4800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
11	PIPE -01	129.85	608.62	0.00	586.68	0.00	21.94	16.9000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
12	PIPE -02	110.00	609.17	-1.42	608.62	0.00	0.55	0.5000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
13	PIPE -03	370.00	611.35	-1.50	610.59	0.00	0.76	0.2100	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
14	PIPE -04	574.21	613.72	-3.69	612.85	0.00	0.87	0.1500	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
15	PIPE -05	76.87	623.56	0.00	617.41	0.00	6.15	8.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
16	PIPE -06	26.63	617.99	0.00	617.41	0.00	0.58	2.1800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
17	PIPE -07	170.54	619.21	0.00	618.70	0.00	0.51	0.3000	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
18	PIPE -08	3.46	620.00	-1.73	619.21	0.00	0.79	22.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
19	PIPE -09	89.00	624.20	0.00	621.73	0.00	2.47	2.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
20	PIPE -10	21.99	624.00	0.00	621.73	0.00	2.27	10.3200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
21	PIPE -11	69.47	624.25	0.00	624.00	0.00	0.25	0.3600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
22	PIPE -12	7.97	624.40	0.00	624.20	0.00	0.20	2.5100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
23	PIPE -13	9.23	624.99	0.00	619.21	0.00	5.78	62.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
24	PIPE -14	9.24	623.83	0.00	617.99	0.00	5.84	63.2200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
25	PIPE -15	75.58	617.56	0.00	617.41	0.00	0.15	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
26	PIPE -16	64.59	617.69	-0.51	617.56	0.00	0.13	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
27	PIPE -17	263.99	619.18	0.00	618.20	0.00	0.98	0.3700	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
28	PIPE -18	155.19	619.77	0.00	619.18	0.00	0.59	0.3800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
29	PIPE -19	75.31	620.08	0.00	619.77	0.00	0.31	0.4100	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
30	PIPE -20	41.17	621.88	0.00	620.08	0.00	1.80	4.3700	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
31	PIPE -21	74.24	625.70	0.00	621.88	0.00	3.82	5.1500	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
32	PIPE -22	17.83	625.04	0.00	619.18	0.00	5.86	32.8900	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
33	PIPE -23	10.57	623.40	0.00	617.56	0.00	5.84	55.2400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
34	PIPE -24	12.60	618.52	0.00	612.85	0.00	5.67	45.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
35	PIPE -25	53.54	621.17	0.00	612.85	0.00	8.32	15.5400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
36	PIPE -26	5.44	615.77	0.00	610.59	0.00	5.18	95.3100	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
37	PIPE -27	60.05	617.28	0.00	610.59	0.00	6.69	11.1400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
38	PIPE -28	61.26	617.76	0.00	617.28	0.00	0.48	0.7800	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
39	PIPE -29	77.56	623.90	0.00	623.56	0.00	0.34	0.4400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
40	PIPE -30	79.15	623.97	0.00	623.56	0.00	0.41	0.5200	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
41	PIPE -31	64.29	618.20	-0.50	617.99	0.00	0.21	0.3300	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-10	2.36	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
2	Link-12	3.60	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
3	Link-13	4.06	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
4	Link-14	2.80	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
5	Link-15	2.39	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
6	Link-16	0.00	0 00:00	0.00	0.00	0.00		0.00	0.00	0.00		
7	Link-17	3.12	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
8	Link-18	1.97	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
9	Link-25	1.74	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
10	Link-26	5.59	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
11	PIPE -01	156.09	0 00:05	1070.54	0.15	38.90	0.06	1.29	0.26	0.00		Calculated
12	PIPE -02	156.10	0 00:05	348.54	0.45	17.27	0.11	2.35	0.47	0.00		Calculated
13	PIPE -03	127.76	0 00:05	203.55	0.63	11.17	0.55	2.87	0.57	0.00		Calculated
14	PIPE -04	82.74	0 00:05	89.66	0.92	10.87	0.88	2.63	0.75	0.00		Calculated
15	PIPE -05	14.49	0 00:03	63.99	0.23	16.51	0.08	0.65	0.32	0.00		Calculated
16	PIPE -06	30.80	0 00:04	98.44	0.31	12.31	0.04	1.15	0.38	0.00		Calculated
17	PIPE -07	24.32	0 00:04	22.47	1.08	5.58	0.51	2.50	1.00	1.00		SURCHARGED
18	PIPE -08	21.21	0 00:04	89.61	0.24	41.50	0.00	0.50	0.33	0.00		Calculated
19	PIPE -09	8.06	0 00:05	17.50	0.46	9.73	0.15	0.71	0.48	0.00		Calculated
20	PIPE -10	14.12	0 00:04	33.75	0.42	18.25	0.02	0.68	0.45	0.00		Calculated
21	PIPE -11	6.82	0 00:03	6.30	1.08	6.20	0.19	1.50	1.00	3.00		SURCHARGED
22	PIPE -12	8.10	0 00:05	16.64	0.49	9.35	0.01	0.74	0.49	0.00		Calculated
23	PIPE -13	5.32	0 00:04	83.12	0.06	26.29	0.01	0.26	0.17	0.00		Calculated
24	PIPE -14	12.16	0 00:03	83.52	0.15	33.70	0.00	0.39	0.26	0.00		Calculated
25	PIPE -15	48.68	0 00:07	44.99	1.08	5.49	0.23	3.31	0.94	0.00		> CAPACITY
26	PIPE -16	43.53	0 00:08	100.07	0.44	10.19	0.11	1.60	0.46	0.00		Calculated
27	PIPE -17	43.87	0 00:08	40.58	1.08	7.08	0.62	2.82	0.94	0.00		> CAPACITY
28	PIPE -18	44.58	0 00:08	41.23	1.08	7.02	0.37	2.85	0.95	0.00		> CAPACITY
29	PIPE -19	46.30	0 00:06	42.79	1.08	7.21	0.17	3.00	1.00	1.00		SURCHARGED
30	PIPE -20	51.28	0 00:06	85.76	0.60	18.25	0.04	1.39	0.56	0.00		Calculated
31	PIPE -21	46.05	0 00:06	51.32	0.90	18.52	0.07	1.48	0.74	0.00		Calculated
32	PIPE -22	6.27	0 00:03	129.74	0.05	21.38	0.01	0.30	0.15	0.00		Calculated
33	PIPE -23	10.78	0 00:04	168.14	0.06	29.93	0.01	0.34	0.17	0.00		Calculated
34	PIPE -24	24.41	0 00:06	151.75	0.16	35.43	0.01	0.54	0.27	0.00		Calculated
35	PIPE -25	26.51	0 00:06	89.18	0.30	24.76	0.04	0.75	0.37	0.00		Calculated
36	PIPE -26	11.44	0 00:04	220.85	0.05	37.04	0.00	0.31	0.15	0.00		Calculated
37	PIPE -27	18.89	0 00:05	75.51	0.25	19.99	0.05	0.68	0.34	0.00		Calculated
38	PIPE -28	9.40	0 00:05	20.02	0.47	7.98	0.13	0.96	0.48	0.00		Calculated
39	PIPE -29	5.06	0 00:03	14.98	0.34	5.04	0.26	0.80	0.40	0.00		Calculated
40	PIPE -30	8.37	0 00:03	16.28	0.51	5.35	0.25	1.01	0.51	0.00		Calculated
41	PIPE -31	24.29	0 00:04	70.09	0.35	9.06	0.12	1.22	0.41	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft²)	Grate Clogging Factor (%)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	5.34	617.76	0.00	N/A	0.00
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	6.35	617.28	0.00	N/A	0.00
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	8.38	615.77	0.00	N/A	0.00
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	8.44	618.52	0.00	N/A	0.00
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	5.73	621.17	0.00	N/A	0.00
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	4.43	623.83	0.00	0.00	0.00
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	4.29	624.99	0.00	0.00	0.00
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	5.75	624.00	0.00	0.00	0.00
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	5.77	624.25	0.00	N/A	0.00
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	5.62	624.40	0.00	N/A	0.00
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	5.04	623.40	0.00	0.00	0.00
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	4.33	625.04	0.00	N/A	0.00
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	8.45	621.88	0.00	0.00	0.00
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	4.65	625.70	0.00	0.00	0.00
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	4.97	623.97	0.00	0.00	0.00
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	4.85	623.90	0.00	0.00	0.00
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	5.19	623.56	0.00	0.00	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	Inlet-01	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00
2	Inlet-02	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
3	Inlet-03	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
4	Inlet-04	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
5	Inlet-05	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
6	Inlet-06	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
7	Inlet-07	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
8	Inlet-08	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
9	Inlet-09	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
10	Inlet-10	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
11	Inlet-11	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
12	Inlet-12	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
13	Inlet-13	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
14	Inlet-14	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
15	Inlet-15	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
16	Inlet-16	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
17	Inlet-17	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Inlet-01	11.42	11.42	9.45	1.96	82.79	17.55	623.53	0.43	0 00:05	0.00	0.00
2	Inlet-02	12.59	12.59	9.46	3.13	75.12	16.94	624.05	0.42	0 00:05	0.00	0.00
3	Inlet-03	11.21	11.21	11.21	0.00	100.00	16.14	624.56	0.41	0 00:04	0.00	0.00
4	Inlet-04	26.81	26.81	24.42	2.39	91.10	27.95	627.60	0.64	0 00:06	0.00	0.00
5	Inlet-05	27.98	27.98	25.18	2.80	90.00	28.37	627.55	0.65	0 00:06	0.00	0.00
6	Inlet-06	6.09	6.09	N/A	N/A	N/A	16.80	628.93	0.67	0 00:03	0.00	0.00
7	Inlet-07	5.34	5.34	N/A	N/A	N/A	9.37	629.80	0.52	0 00:04	0.00	0.00
8	Inlet-08	6.85	6.85	N/A	N/A	N/A	20.86	630.50	0.75	0 00:03	0.00	0.00
9	Inlet-09	7.53	7.53	5.80	1.73	76.99	15.56	630.42	0.40	0 00:03	0.17	4.00
10	Inlet-10	13.70	13.70	8.10	5.60	59.14	19.73	630.50	0.48	0 00:05	0.00	0.00
11	Inlet-11	5.40	5.40	N/A	N/A	N/A	15.49	629.08	0.64	0 00:04	0.00	0.00
12	Inlet-12	8.64	8.64	6.28	2.36	72.73	16.44	629.78	0.41	0 00:03	0.00	0.00
13	Inlet-13	14.43	14.43	N/A	N/A	N/A	19.04	631.04	0.71	0 00:06	0.00	0.00
14	Inlet-14	46.21	46.21	N/A	N/A	N/A	74.74	632.18	1.83	0 00:06	0.00	0.00
15	Inlet-15	6.31	6.31	N/A	N/A	N/A	13.49	629.54	0.60	0 00:03	0.00	0.00
16	Inlet-16	5.21	5.21	N/A	N/A	N/A	11.86	629.32	0.57	0 00:03	0.00	0.00
17	Inlet-17	2.50	2.50	N/A	N/A	N/A	9.27	629.27	0.52	0 00:03	0.00	0.00

Project Description

File Name	SA Street Proposed.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jan 04, 2022	00:00:00
End Analysis On	Jan 05, 2022	00:00:00
Start Reporting On	Jan 04, 2022	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	22
Nodes	46
Junctions	22
Outfalls	2
Flow Diversions	0
Inlets	22
Storage Nodes	0
Links	59
Channels	1
Pipes	58
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	1.10	0.8600	0.89	0.76	0.84	11.21	0 00:04:30
2	Sub-02	1.25	0.8500	0.89	0.76	0.94	12.59	0 00:04:30
3	Sub-03	1.20	0.8500	1.03	0.87	1.05	11.42	0 00:05:30
4	Sub-04	2.97	0.8500	1.15	0.98	2.90	26.81	0 00:06:30
5	Sub-05	3.10	0.8500	1.15	0.98	3.03	27.98	0 00:06:30
6	Sub-06	0.66	0.8500	0.81	0.69	0.46	6.85	0 00:04:00
7	Sub-07	0.77	0.8500	0.96	0.82	0.63	7.53	0 00:05:00
8	Sub-08	2.77	0.8500	1.15	0.98	2.71	25.04	0 00:06:30
9	Sub-09	1.39	0.8500	0.81	0.69	0.96	14.43	0 00:04:00
10	Sub-10	0.78	0.8500	0.65	0.55	0.43	8.64	0 00:03:00
11	Sub-11	0.57	0.8500	0.65	0.55	0.32	6.32	0 00:03:00
12	Sub-12	0.47	0.8500	0.65	0.55	0.26	5.21	0 00:03:00
13	Sub-13	0.52	0.8500	0.81	0.69	0.36	5.40	0 00:04:00
14	Sub-14	0.21	0.8500	0.47	0.40	0.08	2.50	0 00:02:00
15	Sub-16	0.53	0.8500	0.89	0.76	0.40	5.34	0 00:04:30
16	Sub-17	1.40	0.8500	0.96	0.82	1.14	13.70	0 00:05:00
17	Sub-18	0.55	0.8500	0.65	0.55	0.30	6.09	0 00:03:00
18	Sub-24	0.23	0.8500	0.56	0.48	0.11	2.66	0 00:02:30
19	Sub-25	0.14	0.8500	0.47	0.40	0.06	1.67	0 00:02:00
20	Sub-26	1.89	0.8500	1.09	0.93	1.75	17.46	0 00:06:00
21	Sub-27	0.88	0.8500	0.96	0.82	0.72	8.64	0 00:05:00
22	Sub-28	2.35	0.8500	0.96	0.82	1.91	22.95	0 00:05:00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-10	Pipe	Inlet-12	Inlet-15	156.29	625.04	623.97	0.6800	0.000	0.0150	2.36	0.00	0.00	0.00	0.00	0.00	0.00	
2	Link-12	Pipe	Inlet-11	Inlet-05	571.04	623.40	621.17	0.3900	0.000	0.0150	3.60	0.00	0.00	0.00	0.00	0.00	0.00	
3	Link-13	Pipe	Inlet-06	Inlet-04	564.81	623.83	618.52	0.9400	0.000	0.0150	4.06	0.00	0.00	0.00	0.00	0.00	0.00	
4	Link-14	Pipe	Inlet-05	Inlet-02	367.74	621.17	617.28	1.0600	0.000	0.0150	2.80	0.00	0.00	0.00	0.00	0.00	0.00	
5	Link-15	Pipe	Inlet-04	Inlet-03	370.53	618.52	615.77	0.7400	0.000	0.0150	2.39	0.00	0.00	0.00	0.00	0.00	0.00	
6	Link-16	Pipe	Inlet-03	01	238.51	615.77	586.68	12.2000	0.000	0.0150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	Link-17	Pipe	Inlet-02	01	256.67	617.28	586.68	11.9200	0.000	0.0150	3.12	0.00	0.00	0.00	0.00	0.00	0.00	
8	Link-18	Pipe	Inlet-01	01	208.23	617.76	586.68	14.9300	0.000	0.0150	1.97	0.00	0.00	0.00	0.00	0.00	0.00	
9	Link-25	Pipe	Inlet-09	Inlet-08	74.52	624.25	624.00	0.3400	0.000	0.0150	1.74	0.00	0.00	0.00	0.00	0.00	0.00	
10	Link-26	Pipe	Inlet-10	Inlet-09	31.56	624.40	624.25	0.4800	0.000	0.0150	5.59	0.00	0.00	0.00	0.00	0.00	0.00	
11	Link-31	Pipe	Inlet-19	Jun-02	24.89	629.00	628.70	1.2100	18.000	0.0150	3.43	9.99	0.34	5.15	0.60	0.40	0.00	Calculated
12	Link-32	Pipe	Inlet-20	Jun-02	46.93	629.00	628.70	0.6400	30.000	0.0150	13.95	28.42	0.49	6.85	1.24	0.49	0.00	Calculated
13	Link-33	Pipe	Inlet-21	Jun-06	39.75	628.50	628.30	0.5000	24.000	0.0150	8.44	13.91	0.61	5.67	1.12	0.56	0.00	Calculated
14	Link-34	Pipe	Inlet-22	Jun-06	16.82	628.50	628.30	1.1900	18.000	0.0150	1.65	9.93	0.17	5.12	0.41	0.28	0.00	Calculated
15	Link-35	Pipe	Inlet-23	Jun-07	13.03	627.00	625.10	14.5800	30.000	0.0150	21.98	135.74	0.16	20.33	0.68	0.27	0.00	Calculated
16	Link-36	Pipe	Jun-02	Jun-06	39.45	628.70	628.30	1.0100	24.000	0.0150	17.33	19.74	0.88	7.11	1.45	0.73	0.00	Calculated
17	Link-37	Pipe	Jun-06	Jun-07	321.03	628.30	625.10	1.0000	30.000	0.0150	24.05	35.49	0.68	7.98	1.50	0.60	0.00	Calculated
18	Link-38	Pipe	Jun-07	Jun-08	86.60	625.10	624.21	1.0300	36.000	0.0150	42.62	58.60	0.73	9.05	1.90	0.63	0.00	Calculated
19	Link-39	Pipe	Jun-08	Jun-09	301.33	624.21	621.20	1.0000	36.000	0.0150	42.27	57.77	0.73	9.08	1.90	0.63	0.00	Calculated
20	Link-40	Pipe	Jun-09	Jun-10	103.44	621.20	620.16	1.0100	36.000	0.0150	42.25	57.96	0.73	8.96	1.90	0.63	0.00	Calculated
21	Link-41	Pipe	Jun-10	Jun-11	160.83	620.16	618.56	0.9900	36.000	0.0150	42.19	57.66	0.73	8.96	1.91	0.64	0.00	Calculated
22	Link-42	Pipe	Jun-11	05	114.60	618.56	617.41	1.0000	36.000	0.0150	42.15	57.91	0.73	8.96	1.90	0.63	0.00	Calculated
23	Link-43	Pipe	Inlet-23	Inlet-14	228.38	627.00	625.70	0.5700	0.000	0.0150	0.95	0.00	0.73	0.00	1.90	0.63	0.00	Calculated
24	Link-45	Pipe	Inlet-19	Jun-12	443.12	629.00	631.00	-0.4500	0.000	0.0150	0.04	0.00	0.00	0.00	0.03	0.05	0.00	Calculated
25	Link-47	Pipe	Inlet-22	Jun-12	449.96	628.50	631.00	-0.5600	0.000	0.0150	0.00	0.00	0.00	0.00	0.03	0.05	0.00	Calculated
26	Link-49	Pipe	Inlet-20	Inlet-19	66.34	629.00	629.00	0.0000	0.000	0.0150	3.46	0.00	0.00	0.00	0.03	0.05	0.00	Calculated
27	Link-50	Pipe	Inlet-21	Inlet-22	68.43	628.50	628.50	0.0000	0.000	0.0150	0.14	0.00	0.00	0.00	0.03	0.05	0.00	Calculated
28	PIPE -01	Pipe	02	01	129.85	608.62	586.68	16.9000	60.000	0.0130	179.87	1070.54	0.17	40.49	1.39	0.28	0.00	Calculated
29	PIPE -02	Pipe	03	02	110.00	609.17	608.62	0.5000	60.000	0.0130	179.88	348.54	0.52	17.90	2.55	0.51	0.00	Calculated
30	PIPE -03	Pipe	04	03	370.00	611.35	610.59	0.2100	60.000	0.0130	155.01	203.55	0.76	11.55	3.26	0.65	0.00	Calculated
31	PIPE -04	Pipe	05	04	574.21	613.72	612.85	0.1500	60.000	0.0130	105.13	232.09	0.45	11.73	2.36	0.47	0.00	Calculated
32	PIPE -05	Pipe	Inlet-17	05	76.87	623.56	617.41	8.0000	24.000	0.0130	14.49	63.99	0.23	16.51	0.65	0.32	0.00	Calculated
33	PIPE -06	Pipe	11	05	26.63	617.99	617.41	2.1800	36.000	0.0130	30.80	98.44	0.31	12.31	1.15	0.38	0.00	Calculated
34	PIPE -07	Pipe	07	06	170.54	619.21	618.70	0.3000	30.000	0.0130	24.32	22.47	1.08	5.58	2.50	1.00	1.00	SURCHARGED
35	PIPE -08	Pipe	08	07	3.46	620.00	619.21	22.7800	18.000	0.0130	21.21	89.61	0.24	41.50	0.50	0.33	0.00	Calculated
36	PIPE -09	Pipe	10	08	89.00	624.20	621.73	2.7800	18.000	0.0130	8.06	17.50	0.46	9.73	0.71	0.48	0.00	Calculated
37	PIPE -10	Pipe	Inlet-08	08	21.99	624.00	621.73	10.3200	18.000	0.0130	14.12	33.75	0.42	18.25	0.68	0.45	0.00	Calculated
38	PIPE -11	Pipe	Inlet-09	Inlet-08	69.47	624.25	624.00	0.3600	18.000	0.0130	6.82	6.30	1.08	6.20	1.50	1.00	3.00	SURCHARGED
39	PIPE -12	Pipe	Inlet-10	10	7.97	624.40	624.20	2.5100	18.000	0.0130	8.10	16.64	0.49	9.35	0.74	0.49	0.00	Calculated
40	PIPE -13	Pipe	Inlet-07	07	9.23	624.99	619.21	62.6100	18.000	0.0130	5.32	83.12	0.06	26.29	0.26	0.17	0.00	Calculated
41	PIPE -14	Pipe	Inlet-06	11	9.24	623.83	617.99	63.2200	18.000	0.0130	12.16	83.52	0.15	33.70	0.39	0.26	0.00	Calculated
42	PIPE -15	Pipe	12	05	75.58	617.56	617.41	0.2000	42.000	0.0130	40.22	44.99	0.89	5.31	2.58	0.74	0.00	Calculated
43	PIPE -16	Pipe	13	12	64.59	617.69	617.56	0.2000	42.000	0.0130	32.72	100.07	0.33	9.31	1.38	0.39	0.00	Calculated
44	PIPE -17	Pipe	14	13	263.99	619.18	618.20	0.3700	36.000	0.0130	32.73	40.58	0.81	6.55	2.04	0.68	0.00	Calculated
45	PIPE -18	Pipe	15	14	155.19	619.77	619.18	0.3800	36.000	0.0130	30.63	41.23	0.74	6.54	1.92	0.64	0.00	Calculated
46	PIPE -19	Pipe	16	15	75.31	620.08	619.77	0.4100	36.000	0.0130	30.76	42.79	0.72	6.64	1.88	0.63	0.00	Calculated
47	PIPE -20	Pipe	Inlet-13	16	41.17	621.88	620.08	4.3700	30.000	0.0130	30.82	85.76	0.36	16.05	1.04	0.41	0.00	Calculated
48	PIPE -21	Pipe	Inlet-14	Inlet-13	74.24	625.70	621.88	5.1500	24.000	0.0130	24.92	51.32	0.49	16.39	0.98	0.49	0.00	Calculated
49	PIPE -22	Pipe	Inlet-12	14	17.83	625.04	619.18	32.8900	24.000	0.0130	6.27	129.74	0.05	21.38	0.30	0.15	0.00	Calculated
50	PIPE -23	Pipe	Inlet-11	12	10.57	623.40	617.56	55.2400	24.000	0.0130	10.78	168.14	0.06	29.93	0.34	0.17	0.00	Calculated
51	PIPE -24	Pipe	Inlet-04	04	12.60	618.52	612.85	45.0000	24.000	0.0130	24.41	151.75	0.16	35.43	0.54	0.27	0.00	Calculated
52	PIPE -25	Pipe	Inlet-05	04	53.54	621.17	612.85	15.5400	24.000	0.0130	26.51	89.18	0.30	24.76	0.75	0.37	0.00	Calculated
53	PIPE -26	Pipe	Inlet-03	03	5.44	615.77	610.59	95.3100	24.000	0.0130	11.44	220.85	0.05	37.04	0.31	0.15	0.00	Calculated
54	PIPE -27	Pipe	Inlet-02	03	60.05	617.28	610.59	11.1400	24.000	0.0130	18.89	75.51	0.25	19.99	0.68	0.34	0.00	Calculated
55	PIPE -28	Pipe	Inlet-01	Inlet-02	61.26	617.76	617.28	0.7800	24.000	0.0130	9.40	20.02	0.47	7.98	0.96	0.48	0.00	Calculated
56	PIPE -29	Pipe	Inlet-16	Inlet-17	77.56	623.90	623.56	0.4400	24.000	0.0130	5.06	14.98	0.34	5.04	0.80	0.40	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
57	PIPE -30	Pipe	Inlet-15	Inlet-17	79.15	623.97	623.56	0.5200	24.000	0.0130	8.37	16.28	0.51	5.35	1.01	0.51	0.00	Calculated
58	PIPE -31	Pipe	06	11	64.29	618.20	617.99	0.3300	36.000	0.0130	24.29	70.09	0.35	9.06	1.22	0.41	0.00	Calculated
59	Link-44	Channel	Jun-12	Jun-13	542.82	631.00	610.00	3.8700	6.000	0.0320	0.03	48.31	0.00	2.19	0.03	0.05	0.00	

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac) 1.10
Weighted Runoff Coefficient 0.8600

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.90	-	0.95
-	0.20	-	0.47
Composite Area & Weighted Runoff Coeff.	1.10		0.86

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 11.21
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8600
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-02

Input Data

Area (ac) 1.25
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.00	-	0.95
-	0.25	-	0.47
Composite Area & Weighted Runoff Coeff.	1.25		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 12.59
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-03

Input Data

Area (ac) 1.20
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.96	-	0.95
-	0.24	-	0.47
Composite Area & Weighted Runoff Coeff.	1.20		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.03
Total Runoff (in) 0.87
Peak Runoff (cfs) 11.42
Rainfall Intensity 11.192
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:30

Subbasin : Sub-04

Input Data

Area (ac) 2.97
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.38	-	0.95
-	0.59	-	0.47
Composite Area & Weighted Runoff Coeff.	2.97		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 26.81
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-05

Input Data

Area (ac) 3.10
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.48	-	0.95
-	0.62	-	0.47
Composite Area & Weighted Runoff Coeff.	3.10		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 27.98
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-06

Input Data

Area (ac) 0.66
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.53	-	0.95
-	0.13	-	0.47
Composite Area & Weighted Runoff Coeff.	0.66		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 6.85
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-07

Input Data

Area (ac) 0.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.15	-	0.47
Composite Area & Weighted Runoff Coeff.	0.77		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 7.53
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-08

Input Data

Area (ac) 2.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.10	-	0.95
-	1.02	-	0.47
Composite Area & Weighted Runoff Coeff.	5.12		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.15
Total Runoff (in) 0.98
Peak Runoff (cfs) 25.04
Rainfall Intensity 10.619
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-09

Input Data

Area (ac) 1.39
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.11	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.39		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 14.43
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-10

Input Data

Area (ac) 0.78
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.16	-	0.47
Composite Area & Weighted Runoff Coeff.	0.78		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 8.64
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-11

Input Data

Area (ac) 0.57
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.46	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.57		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 6.32
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-12

Input Data

Area (ac) 0.47
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.38	-	0.95
-	0.09	-	0.47
Composite Area & Weighted Runoff Coeff.	0.47		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 5.21
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-13

Input Data

Area (ac) 0.52
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.52		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.81
Total Runoff (in) 0.69
Peak Runoff (cfs) 5.40
Rainfall Intensity 12.213
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-14

Input Data

Area (ac) 0.21
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.17	-	0.95
-	0.04	-	0.47
Composite Area & Weighted Runoff Coeff.	0.21		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.47
Total Runoff (in) 0.40
Peak Runoff (cfs) 2.50
Rainfall Intensity 14.003
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-16

Input Data

Area (ac) 0.53
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.53		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.89
Total Runoff (in) 0.76
Peak Runoff (cfs) 5.34
Rainfall Intensity 11.848
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-17

Input Data

Area (ac) 1.40
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.12	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.40		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 13.70
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18

Input Data

Area (ac) 0.55
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.44	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.55		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.65
Total Runoff (in) 0.55
Peak Runoff (cfs) 6.09
Rainfall Intensity 13.033
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-24

Input Data

Area (ac) 0.23
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.95
-	0.05	-	0.47
Composite Area & Weighted Runoff Coeff.	0.24		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.56
Total Runoff (in) 0.48
Peak Runoff (cfs) 2.66
Rainfall Intensity 13.497
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:30

Subbasin : Sub-25

Input Data

Area (ac) 0.14
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.11	-	0.95
-	0.03	-	0.47
Composite Area & Weighted Runoff Coeff.	0.14		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.47
Total Runoff (in) 0.40
Peak Runoff (cfs) 1.67
Rainfall Intensity 14.003
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-26

Input Data

Area (ac) 1.89
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.51	-	0.95
-	0.38	-	0.47
Composite Area & Weighted Runoff Coeff.	1.89		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 17.46
Rainfall Intensity 10.896
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:00

Subbasin : Sub-27

Input Data

Area (ac) 0.88
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.71	-	0.95
-	0.18	-	0.47
Composite Area & Weighted Runoff Coeff.	0.89		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 8.64
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-28

Input Data

Area (ac) 2.35
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.88	-	0.95
-	0.47	-	0.47
Composite Area & Weighted Runoff Coeff.	2.35		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.96
Total Runoff (in) 0.82
Peak Runoff (cfs) 22.95
Rainfall Intensity 11.509
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	179.88	0.00	611.17	2.55	0.00	12.85	608.64	0.02	0 00:06	0 00:00	0.00	0.00
2	03	179.94	0.00	613.86	3.27	0.00	10.37	610.61	0.02	0 00:06	0 00:00	0.00	0.00
3	04	155.44	0.00	616.12	3.27	0.00	11.81	612.87	0.02	0 00:06	0 00:00	0.00	0.00
4	05	106.61	0.00	619.99	2.58	0.00	10.00	617.43	0.02	0 00:05	0 00:00	0.00	0.00
5	06	24.32	0.00	621.20	2.50	0.00	8.80	618.71	0.01	0 00:05	0 00:00	0.00	0.00
6	07	26.53	0.00	629.28	10.07	0.00	0.00	619.24	0.03	0 00:03	0 00:04	0.11	3.00
7	08	21.21	0.00	622.44	0.71	0.00	7.55	621.73	0.00	0 00:05	0 00:00	0.00	0.00
8	10	8.10	0.00	624.94	0.74	0.00	5.06	624.20	0.00	0 00:05	0 00:00	0.00	0.00
9	11	30.82	0.00	619.21	1.22	0.00	10.79	618.00	0.01	0 00:04	0 00:00	0.00	0.00
10	12	40.25	0.00	620.15	2.59	0.00	8.29	617.58	0.02	0 00:05	0 00:00	0.00	0.00
11	13	32.73	0.00	620.24	2.04	0.00	9.76	618.21	0.01	0 00:05	0 00:00	0.00	0.00
12	14	33.08	0.00	621.24	2.06	0.00	8.76	619.19	0.01	0 00:04	0 00:00	0.00	0.00
13	15	30.76	0.00	621.70	1.93	0.00	9.47	619.78	0.01	0 00:05	0 00:00	0.00	0.00
14	16	30.82	0.00	621.97	1.89	0.00	9.42	620.09	0.01	0 00:05	0 00:00	0.00	0.00
15	Jun-02	17.37	0.00	630.16	1.46	0.00	4.14	628.71	0.01	0 00:06	0 00:00	0.00	0.00
16	Jun-06	24.19	0.00	629.82	1.52	0.00	4.37	628.31	0.01	0 00:06	0 00:00	0.00	0.00
17	Jun-07	42.65	0.00	627.00	1.90	0.00	6.22	625.11	0.01	0 00:05	0 00:00	0.00	0.00
18	Jun-08	42.62	0.00	626.13	1.92	0.00	5.87	624.22	0.01	0 00:05	0 00:00	0.00	0.00
19	Jun-09	42.27	0.00	623.11	1.91	0.00	7.99	621.21	0.01	0 00:06	0 00:00	0.00	0.00
20	Jun-10	42.25	0.00	622.07	1.91	0.00	7.93	620.17	0.01	0 00:06	0 00:00	0.00	0.00
21	Jun-11	42.19	0.00	620.47	1.91	0.00	9.53	618.57	0.01	0 00:06	0 00:00	0.00	0.00
22	Jun-12	0.04	0.00	631.04	0.04	0.00	0.46	631.00	0.00	0 00:02	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-10	156.29	625.04	0.00	623.97	0.00	1.07	0.6800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-12	571.04	623.40	0.00	621.17	0.00	2.23	0.3900	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
3	Link-13	564.81	623.83	0.00	618.52	0.00	5.31	0.9400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
4	Link-14	367.74	621.17	0.00	617.28	0.00	3.89	1.0600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
5	Link-15	370.53	618.52	0.00	615.77	0.00	2.75	0.7400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
6	Link-16	238.51	615.77	0.00	586.68	0.00	29.09	12.2000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
7	Link-17	256.67	617.28	0.00	586.68	0.00	30.60	11.9200	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
8	Link-18	208.23	617.76	0.00	586.68	0.00	31.08	14.9300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
9	Link-25	74.52	624.25	0.00	624.00	0.00	0.25	0.3400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
10	Link-26	31.56	624.40	0.00	624.25	0.00	0.15	0.4800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
11	Link-31	24.89	629.00	0.00	628.70	0.00	0.30	1.2100	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
12	Link-32	46.93	629.00	0.00	628.70	0.00	0.30	0.6400	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
13	Link-33	39.75	628.50	0.00	628.30	0.00	0.20	0.5000	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No
14	Link-34	16.82	628.50	0.00	628.30	0.00	0.20	1.1900	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
15	Link-35	13.03	627.00	0.00	625.10	0.00	1.90	14.5800	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
16	Link-36	39.45	628.70	0.00	628.30	0.00	0.40	1.0100	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No
17	Link-37	321.03	628.30	0.00	625.10	0.00	3.20	1.0000	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
18	Link-38	86.60	625.10	0.00	624.21	0.00	0.89	1.0300	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
19	Link-39	301.33	624.21	0.00	621.20	0.00	3.01	1.0000	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
20	Link-40	103.44	621.20	0.00	620.16	0.00	1.04	1.0100	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
21	Link-41	160.83	620.16	0.00	618.56	0.00	1.60	0.9900	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
22	Link-42	114.60	618.56	0.00	617.41	0.00	1.15	1.0000	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
23	Link-43	228.38	627.00	0.00	625.70	0.00	1.30	0.5700	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
24	Link-45	443.12	629.00	0.00	631.00	0.00	-2.00	-0.4500	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
25	Link-47	449.96	628.50	0.00	631.00	0.00	-2.50	-0.5600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
26	Link-49	66.34	629.00	0.00	629.00	0.00	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
27	Link-50	68.43	628.50	0.00	628.50	0.00	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
28	PIPE -01	129.85	608.62	0.00	586.68	0.00	21.94	16.9000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
29	PIPE -02	110.00	609.17	-1.42	608.62	0.00	0.55	0.5000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
30	PIPE -03	370.00	611.35	-1.50	610.59	0.00	0.76	0.2100	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
31	PIPE -04	574.21	613.72	-3.69	612.85	0.00	0.87	0.1500	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
32	PIPE -05	76.87	623.56	0.00	617.41	0.00	6.15	8.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
33	PIPE -06	26.63	617.99	0.00	617.41	0.00	0.58	2.1800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
34	PIPE -07	170.54	619.21	0.00	618.70	0.00	0.51	0.3000	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
35	PIPE -08	3.46	620.00	-1.73	619.21	0.00	0.79	22.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
36	PIPE -09	89.00	624.20	0.00	621.73	0.00	2.47	2.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
37	PIPE -10	21.99	624.00	0.00	621.73	0.00	2.27	10.3200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
38	PIPE -11	69.47	624.25	0.00	624.00	0.00	0.25	0.3600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
39	PIPE -12	7.97	624.40	0.00	624.20	0.00	0.20	2.5100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
40	PIPE -13	9.23	624.99	0.00	619.21	0.00	5.78	62.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
41	PIPE -14	9.24	623.83	0.00	617.99	0.00	5.84	63.2200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
42	PIPE -15	75.58	617.56	0.00	617.41	0.00	0.15	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
43	PIPE -16	64.59	617.69	-0.51	617.56	0.00	0.13	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
44	PIPE -17	263.99	619.18	0.00	618.20	0.00	0.98	0.3700	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
45	PIPE -18	155.19	619.77	0.00	619.18	0.00	0.59	0.3800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
46	PIPE -19	75.31	620.08	0.00	619.77	0.00	0.31	0.4100	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
47	PIPE -20	41.17	621.88	0.00	620.08	0.00	1.80	4.3700	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
48	PIPE -21	74.24	625.70	0.00	621.88	0.00	3.82	5.1500	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
49	PIPE -22	17.83	625.04	0.00	619.18	0.00	5.86	32.8900	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
50	PIPE -23	10.57	623.40	0.00	617.56	0.00	5.84	55.2400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
51	PIPE -24	12.60	618.52	0.00	612.85	0.00	5.67	45.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
52	PIPE -25	53.54	621.17	0.00	612.85	0.00	8.32	15.5400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
53	PIPE -26	5.44	615.77	0.00	610.59	0.00	5.18	95.3100	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
54	PIPE -27	60.05	617.28	0.00	610.59	0.00	6.69	11.1400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
55	PIPE -28	61.26	617.76	0.00	617.28	0.00	0.48	0.7800	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
56	PIPE -29	77.56	623.90	0.00	623.56	0.00	0.34	0.4400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
57	PIPE -30	79.15	623.97	0.00	623.56	0.00	0.41	0.5200	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
58	PIPE -31	64.29	618.20	-0.50	617.99	0.00	0.21	0.3300	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-10	2.36	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
2	Link-12	3.60	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
3	Link-13	4.06	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
4	Link-14	2.80	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
5	Link-15	2.39	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
6	Link-16	0.00	0 00:00	0.00	0.00	0.00		0.00	0.00	0.00		
7	Link-17	3.12	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
8	Link-18	1.97	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
9	Link-25	1.74	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
10	Link-26	5.59	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
11	Link-31	3.43	0 00:06	9.99	0.34	5.15	0.08	0.60	0.40	0.00		Calculated
12	Link-32	13.95	0 00:06	28.42	0.49	6.85	0.11	1.24	0.49	0.00		Calculated
13	Link-33	8.44	0 00:05	13.91	0.61	5.67	0.12	1.12	0.56	0.00		Calculated
14	Link-34	1.65	0 00:02	9.93	0.17	5.12	0.05	0.41	0.28	0.00		Calculated
15	Link-35	21.98	0 00:05	135.74	0.16	20.33	0.01	0.68	0.27	0.00		Calculated
16	Link-36	17.33	0 00:06	19.74	0.88	7.11	0.09	1.45	0.73	0.00		Calculated
17	Link-37	24.05	0 00:06	35.49	0.68	7.98	0.67	1.50	0.60	0.00		Calculated
18	Link-38	42.62	0 00:05	58.60	0.73	9.05	0.16	1.90	0.63	0.00		Calculated
19	Link-39	42.27	0 00:06	57.77	0.73	9.08	0.55	1.90	0.63	0.00		Calculated
20	Link-40	42.25	0 00:06	57.96	0.73	8.96	0.19	1.90	0.63	0.00		Calculated
21	Link-41	42.19	0 00:06	57.66	0.73	8.96	0.30	1.91	0.64	0.00		Calculated
22	Link-42	42.15	0 00:06	57.91	0.73	8.96	0.21	1.90	0.63	0.00		Calculated
23	Link-43	0.95	0 00:05	0.00	0.73	0.00		1.90	0.63	0.00		Calculated
24	Link-45	0.04	0 00:02	0.00	0.00	0.00		0.03	0.05	0.00		Calculated
25	Link-47	0.00	0 00:00	0.00	0.00	0.00		0.03	0.05	0.00		Calculated
26	Link-49	3.46	0 00:06	0.00	0.00	0.00		0.03	0.05	0.00		Calculated
27	Link-50	0.14	0 00:05	0.00	0.00	0.00		0.03	0.05	0.00		Calculated
28	PIPE -01	179.87	0 00:06	1070.54	0.17	40.49	0.05	1.39	0.28	0.00		Calculated
29	PIPE -02	179.88	0 00:06	348.54	0.52	17.90	0.10	2.55	0.51	0.00		Calculated
30	PIPE -03	155.01	0 00:06	203.55	0.76	11.55	0.53	3.26	0.65	0.00		Calculated
31	PIPE -04	105.13	0 00:06	232.09	0.45	11.73	0.82	2.36	0.47	0.00		Calculated
32	PIPE -05	14.49	0 00:03	63.99	0.23	16.51	0.08	0.65	0.32	0.00		Calculated
33	PIPE -06	30.80	0 00:04	98.44	0.31	12.31	0.04	1.15	0.38	0.00		Calculated
34	PIPE -07	24.32	0 00:04	22.47	1.08	5.58	0.51	2.50	1.00	1.00		SURCHARGED
35	PIPE -08	21.21	0 00:04	89.61	0.24	41.50	0.00	0.50	0.33	0.00		Calculated
36	PIPE -09	8.06	0 00:05	17.50	0.46	9.73	0.15	0.71	0.48	0.00		Calculated
37	PIPE -10	14.12	0 00:04	33.75	0.42	18.25	0.02	0.68	0.45	0.00		Calculated
38	PIPE -11	6.82	0 00:03	6.30	1.08	6.20	0.19	1.50	1.00	3.00		SURCHARGED
39	PIPE -12	8.10	0 00:05	16.64	0.49	9.35	0.01	0.74	0.49	0.00		Calculated
40	PIPE -13	5.32	0 00:04	83.12	0.06	26.29	0.01	0.26	0.17	0.00		Calculated
41	PIPE -14	12.16	0 00:03	83.52	0.15	33.70	0.00	0.39	0.26	0.00		Calculated
42	PIPE -15	40.22	0 00:05	44.99	0.89	5.31	0.24	2.58	0.74	0.00		Calculated
43	PIPE -16	32.72	0 00:05	100.07	0.33	9.31	0.12	1.38	0.39	0.00		Calculated
44	PIPE -17	32.73	0 00:05	40.58	0.81	6.55	0.67	2.04	0.68	0.00		Calculated
45	PIPE -18	30.63	0 00:05	41.23	0.74	6.54	0.40	1.92	0.64	0.00		Calculated
46	PIPE -19	30.76	0 00:05	42.79	0.72	6.64	0.19	1.88	0.63	0.00		Calculated
47	PIPE -20	30.82	0 00:05	85.76	0.36	16.05	0.04	1.04	0.41	0.00		Calculated
48	PIPE -21	24.92	0 00:06	51.32	0.49	16.39	0.08	0.98	0.49	0.00		Calculated
49	PIPE -22	6.27	0 00:03	129.74	0.05	21.38	0.01	0.30	0.15	0.00		Calculated
50	PIPE -23	10.78	0 00:04	168.14	0.06	29.93	0.01	0.34	0.17	0.00		Calculated
51	PIPE -24	24.41	0 00:06	151.75	0.16	35.43	0.01	0.54	0.27	0.00		Calculated
52	PIPE -25	26.51	0 00:06	89.18	0.30	24.76	0.04	0.75	0.37	0.00		Calculated
53	PIPE -26	11.44	0 00:04	220.85	0.05	37.04	0.00	0.31	0.15	0.00		Calculated
54	PIPE -27	18.89	0 00:05	75.51	0.25	19.99	0.05	0.68	0.34	0.00		Calculated
55	PIPE -28	9.40	0 00:05	20.02	0.47	7.98	0.13	0.96	0.48	0.00		Calculated
56	PIPE -29	5.06	0 00:03	14.98	0.34	5.04	0.26	0.80	0.40	0.00		Calculated
57	PIPE -30	8.37	0 00:03	16.28	0.51	5.35	0.25	1.01	0.51	0.00		Calculated
58	PIPE -31	24.29	0 00:04	70.09	0.35	9.06	0.12	1.22	0.41	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft²)	Grate Clogging Factor (%)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	5.34	617.76	0.00	N/A	0.00
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	6.35	617.28	0.00	N/A	0.00
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	8.38	615.77	0.00	N/A	0.00
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	8.44	618.52	0.00	N/A	0.00
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	5.73	621.17	0.00	N/A	0.00
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	4.43	623.83	0.00	0.00	0.00
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	4.29	624.99	0.00	0.00	0.00
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	5.75	624.00	0.00	0.00	0.00
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	5.77	624.25	0.00	N/A	0.00
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	5.62	624.40	0.00	N/A	0.00
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	5.04	623.40	0.00	0.00	0.00
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	4.33	625.04	0.00	N/A	0.00
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	8.45	621.88	0.00	0.00	0.00
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	4.65	625.70	0.00	0.00	0.00
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	4.97	623.97	0.00	0.00	0.00
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	4.85	623.90	0.00	0.00	0.00
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	5.19	623.56	0.00	0.00	0.00
18	Inlet-19	FHWA HEC-22 GENERIC	N/A	On Grade	1	629.00	634.20	5.20	629.00	0.00	N/A	0.00
19	Inlet-20	FHWA HEC-22 GENERIC	N/A	On Grade	1	629.00	635.10	6.10	0.00	0.00	N/A	0.00
20	Inlet-21	FHWA HEC-22 GENERIC	N/A	On Grade	1	628.50	634.80	6.30	628.50	0.00	N/A	0.00
21	Inlet-22	FHWA HEC-22 GENERIC	N/A	On Grade	1	628.50	634.00	5.50	0.00	0.00	N/A	0.00
22	Inlet-23	FHWA HEC-22 GENERIC	N/A	On Grade	1	627.00	633.00	6.00	627.00	0.00	N/A	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	Inlet-01	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00
2	Inlet-02	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
3	Inlet-03	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
4	Inlet-04	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
5	Inlet-05	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
6	Inlet-06	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
7	Inlet-07	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
8	Inlet-08	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
9	Inlet-09	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
10	Inlet-10	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
11	Inlet-11	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
12	Inlet-12	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
13	Inlet-13	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
14	Inlet-14	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
15	Inlet-15	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
16	Inlet-16	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
17	Inlet-17	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
18	Inlet-19	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
19	Inlet-20	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
20	Inlet-21	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
21	Inlet-22	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
22	Inlet-23	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Inlet-01	11.42	11.42	9.45	1.96	82.79	17.55	623.53	0.43	0 00:05	0.00	0.00
2	Inlet-02	12.59	12.59	9.46	3.13	75.12	16.94	624.05	0.42	0 00:05	0.00	0.00
3	Inlet-03	11.21	11.21	11.21	0.00	100.00	16.14	624.56	0.41	0 00:04	0.00	0.00
4	Inlet-04	26.81	26.81	24.42	2.39	91.10	27.95	627.60	0.64	0 00:06	0.00	0.00
5	Inlet-05	27.98	27.98	25.18	2.80	90.00	28.37	627.55	0.65	0 00:06	0.00	0.00
6	Inlet-06	6.09	6.09	N/A	N/A	N/A	16.80	628.93	0.67	0 00:03	0.00	0.00
7	Inlet-07	5.34	5.34	N/A	N/A	N/A	9.37	629.80	0.52	0 00:04	0.00	0.00
8	Inlet-08	6.85	6.85	N/A	N/A	N/A	20.86	630.50	0.75	0 00:03	0.00	0.00
9	Inlet-09	7.53	7.53	5.80	1.73	76.99	15.56	630.42	0.40	0 00:03	0.17	4.00
10	Inlet-10	13.70	13.70	8.10	5.60	59.14	19.73	630.50	0.48	0 00:05	0.00	0.00
11	Inlet-11	5.40	5.40	N/A	N/A	N/A	15.49	629.08	0.64	0 00:04	0.00	0.00
12	Inlet-12	8.64	8.64	6.28	2.36	72.73	16.44	629.78	0.41	0 00:03	0.00	0.00
13	Inlet-13	14.43	14.43	N/A	N/A	N/A	19.04	631.04	0.71	0 00:05	0.00	0.00
14	Inlet-14	25.04	25.04	N/A	N/A	N/A	16.03	631.00	0.65	0 00:06	0.00	0.00
15	Inlet-15	6.31	6.31	N/A	N/A	N/A	13.49	629.54	0.60	0 00:03	0.00	0.00
16	Inlet-16	5.21	5.21	N/A	N/A	N/A	11.86	629.32	0.57	0 00:03	0.00	0.00
17	Inlet-17	2.50	2.50	N/A	N/A	N/A	9.27	629.27	0.52	0 00:03	0.00	0.00
18	Inlet-19	2.66	2.66	2.63	0.03	98.72	8.86	634.46	0.26	0 00:06	0.00	0.00
19	Inlet-20	17.46	17.46	14.00	3.46	80.18	19.17	635.57	0.47	0 00:06	0.00	0.00
20	Inlet-21	8.64	8.64	8.50	0.14	98.38	14.54	635.17	0.37	0 00:05	0.00	0.00
21	Inlet-22	1.67	1.67	1.67	0.00	100.00	7.20	634.23	0.23	0 00:02	0.00	0.00
22	Inlet-23	22.95	22.95	22.00	0.95	95.86	23.07	633.55	0.55	0 00:05	0.00	0.00

Project Description

File Name	SA Street Existing.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jan 04, 2022	00:00:00
End Analysis On	Jan 05, 2022	00:00:00
Start Reporting On	Jan 04, 2022	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	20
Nodes	36
Junctions	17
Outfalls	2
Flow Diversions	0
Inlets	17
Storage Nodes	0
Links	44
Channels	3
Pipes	41
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	100 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	1.10	0.8600	1.19	1.02	1.12	14.95	0 00:04:30
2	Sub-02	1.25	0.8500	1.19	1.01	1.26	16.79	0 00:04:30
3	Sub-03	1.20	0.8500	1.36	1.16	1.39	15.17	0 00:05:30
4	Sub-04	2.97	0.8500	1.53	1.30	3.85	35.53	0 00:06:30
5	Sub-05	3.10	0.8500	1.53	1.30	4.02	37.08	0 00:06:30
6	Sub-06	0.66	0.8500	1.09	0.93	0.61	9.16	0 00:04:00
7	Sub-07	0.77	0.8500	1.28	1.09	0.84	10.03	0 00:05:00
8	Sub-08	5.12	0.8500	1.53	1.30	6.64	61.25	0 00:06:30
9	Sub-09	1.39	0.8500	1.09	0.93	1.29	19.29	0 00:04:00
10	Sub-10	0.78	0.8500	0.88	0.74	0.58	11.61	0 00:03:00
11	Sub-11	0.57	0.8500	0.88	0.74	0.42	8.49	0 00:03:00
12	Sub-12	0.47	0.8500	0.88	0.74	0.35	7.00	0 00:03:00
13	Sub-13	0.52	0.8500	1.09	0.93	0.48	7.22	0 00:04:00
14	Sub-14	0.21	0.8500	0.63	0.54	0.11	3.38	0 00:02:00
15	Sub-16	0.53	0.8500	1.19	1.01	0.53	7.12	0 00:04:30
16	Sub-17	1.40	0.8500	1.28	1.09	1.52	18.24	0 00:05:00
17	Sub-18	0.55	0.8500	0.88	0.74	0.41	8.19	0 00:03:00
18	Sub-21	2.42	0.8500	1.28	1.09	2.62	31.51	0 00:05:00
19	Sub-22	0.51	0.8500	0.76	0.64	0.33	7.86	0 00:02:30
20	Sub-23	0.24	0.8500	0.50	0.42	0.10	4.09	0 00:01:30

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	Junction	608.62	624.02	608.62	624.02	0.00	186.81	611.23	0.00	12.79	0 00:00	0.00	0.00
2	03	Junction	610.59	624.23	610.59	624.23	0.00	186.83	613.74	0.00	10.49	0 00:00	0.00	0.00
3	04	Junction	612.85	627.93	612.85	627.93	0.00	149.17	616.05	0.00	11.88	0 00:00	0.00	0.00
4	05	Junction	617.41	630.00	617.41	630.00	0.00	102.79	630.00	0.00	0.00	0 00:03	0.16	1.00
5	06	Junction	618.70	630.00	618.70	630.00	0.00	24.31	621.20	0.00	8.80	0 00:00	0.00	0.00
6	07	Junction	619.21	629.28	619.21	629.28	0.00	32.87	629.28	0.00	0.00	0 00:04	0.42	4.00
7	08	Junction	621.73	630.00	621.73	630.00	0.00	25.80	622.51	0.00	7.49	0 00:00	0.00	0.00
8	10	Junction	624.20	630.00	624.20	630.00	0.00	9.40	625.01	0.00	4.99	0 00:00	0.00	0.00
9	11	Junction	617.99	630.00	617.99	630.00	0.00	38.27	619.29	0.00	10.71	0 00:00	0.00	0.00
10	12	Junction	617.56	628.44	617.56	630.00	0.00	57.38	628.44	0.00	0.00	0 00:04	0.38	4.00
11	13	Junction	618.20	630.00	618.20	630.00	0.00	43.90	621.20	0.00	8.80	0 00:00	0.00	0.00
12	14	Junction	619.18	630.00	619.18	629.40	0.00	48.72	630.00	0.00	0.00	0 00:03	0.36	6.00
13	15	Junction	619.77	631.17	619.77	631.17	0.00	46.28	631.17	0.00	0.00	0 00:03	0.17	6.00
14	16	Junction	620.08	631.39	620.08	631.39	0.00	63.98	631.39	0.00	0.00	0 00:06	1.17	5.00
15	Jun-02	Junction	636.00	636.50	0.00	0.00	0.00	31.51	636.42	0.00	0.08	0 00:00	0.00	0.00
16	Jun-03	Junction	634.00	634.50	0.00	0.00	0.00	31.39	634.50	0.00	0.00	0 00:05	0.39	5.00
17	Jun-04	Junction	631.00	631.50	0.00	0.00	0.00	21.61	631.50	0.00	0.00	0 00:00	0.00	0.00
18	01	Outfall	586.68					194.35	588.09					
19	Jun-05	Outfall	610.00					17.18	610.42					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-10	Pipe	Inlet-12	Inlet-15	156.29	625.04	623.97	0.6800	0.000	0.0150	4.20	0.00	0.00	0.00	0.00	0.00	0.00	
2	Link-12	Pipe	Inlet-11	Inlet-05	571.04	623.40	621.17	0.3900	0.000	0.0150	4.81	0.00	0.00	0.00	0.00	0.00	0.00	
3	Link-13	Pipe	Inlet-06	Inlet-04	564.81	623.83	618.52	0.9400	0.000	0.0150	5.45	0.00	0.00	0.00	0.00	0.00	0.00	
4	Link-14	Pipe	Inlet-05	Inlet-02	367.74	621.17	617.28	1.0600	0.000	0.0150	6.62	0.00	0.00	0.00	0.00	0.00	0.00	
5	Link-15	Pipe	Inlet-04	Inlet-03	370.53	618.52	615.77	0.7400	0.000	0.0150	5.91	0.00	0.00	0.00	0.00	0.00	0.00	
6	Link-16	Pipe	Inlet-03	01	238.51	615.77	586.68	12.2000	0.000	0.0150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	Link-17	Pipe	Inlet-02	01	256.67	617.28	586.68	11.9200	0.000	0.0150	5.63	0.00	0.00	0.00	0.00	0.00	0.00	
8	Link-18	Pipe	Inlet-01	01	208.23	617.76	586.68	14.9300	0.000	0.0150	3.94	0.00	0.00	0.00	0.00	0.00	0.00	
9	Link-25	Pipe	Inlet-09	Inlet-08	74.52	624.25	624.00	0.3400	0.000	0.0150	3.20	0.00	0.00	0.00	0.00	0.00	0.00	
10	Link-26	Pipe	Inlet-10	Inlet-09	31.56	624.40	624.25	0.4800	0.000	0.0150	8.83	0.00	0.00	0.00	0.00	0.00	0.00	
11	PIPE -01	Pipe	02	01	129.85	608.62	586.68	16.9000	60.000	0.0130	186.80	1070.54	0.17	40.91	1.41	0.28	0.00	Calculated
12	PIPE -02	Pipe	03	02	110.00	609.17	608.62	0.5000	60.000	0.0130	186.81	348.54	0.54	18.06	2.61	0.52	0.00	Calculated
13	PIPE -03	Pipe	04	03	370.00	611.35	610.59	0.2100	60.000	0.0130	147.12	203.55	0.72	11.37	3.15	0.63	0.00	Calculated
14	PIPE -04	Pipe	05	04	574.21	613.72	612.85	0.1500	42.000	0.0130	96.98	89.66	1.08	11.19	3.18	0.91	0.00	> CAPACITY
15	PIPE -05	Pipe	Inlet-17	05	76.87	623.56	617.41	8.0000	24.000	0.0130	20.55	63.99	0.32	18.17	0.78	0.39	0.00	Calculated
16	PIPE -06	Pipe	11	05	26.63	617.99	617.41	2.1800	36.000	0.0130	38.24	98.44	0.39	13.06	1.30	0.43	0.00	Calculated
17	PIPE -07	Pipe	07	06	170.54	619.21	618.70	0.3000	30.000	0.0130	24.31	22.47	1.08	5.65	2.50	1.00	3.00	SURCHARGED
18	PIPE -08	Pipe	08	07	3.46	620.00	619.21	22.7800	18.000	0.0130	25.80	89.61	0.29	43.82	0.55	0.37	0.00	Calculated
19	PIPE -09	Pipe	10	08	89.00	624.20	621.73	2.7800	18.000	0.0130	9.37	17.50	0.54	10.27	0.78	0.52	0.00	Calculated
20	PIPE -10	Pipe	Inlet-08	08	21.99	624.00	621.73	10.3200	18.000	0.0130	17.45	33.75	0.52	19.25	0.76	0.51	0.00	Calculated
21	PIPE -11	Pipe	Inlet-09	Inlet-08	69.47	624.25	624.00	0.3600	18.000	0.0130	6.81	6.30	1.08	6.59	1.50	1.00	5.00	SURCHARGED
22	PIPE -12	Pipe	Inlet-10	10	7.97	624.40	624.20	2.5100	18.000	0.0130	9.40	16.64	0.57	9.70	0.81	0.54	0.00	Calculated
23	PIPE -13	Pipe	Inlet-07	07	9.23	624.99	619.21	62.6100	18.000	0.0130	7.09	83.12	0.09	28.70	0.30	0.20	0.00	Calculated
24	PIPE -14	Pipe	Inlet-06	11	9.24	623.83	617.99	63.2200	18.000	0.0130	16.33	83.52	0.20	36.68	0.45	0.30	0.00	Calculated
25	PIPE -15	Pipe	12	05	75.58	617.56	617.41	0.2000	42.000	0.0130	48.68	44.99	1.08	5.53	3.50	1.00	3.00	SURCHARGED
26	PIPE -16	Pipe	13	12	64.59	617.69	617.56	0.2000	42.000	0.0130	43.87	100.07	0.44	10.09	1.62	0.46	0.00	Calculated
27	PIPE -17	Pipe	14	13	263.99	619.18	618.20	0.3700	36.000	0.0130	43.90	40.58	1.08	7.14	3.00	1.00	4.00	SURCHARGED
28	PIPE -18	Pipe	15	14	155.19	619.77	619.18	0.3800	36.000	0.0130	44.59	41.23	1.08	6.99	2.78	0.93	0.00	> CAPACITY
29	PIPE -19	Pipe	16	15	75.31	620.08	619.77	0.4100	36.000	0.0130	46.28	42.79	1.08	7.22	3.00	1.00	5.00	SURCHARGED
30	PIPE -20	Pipe	Inlet-13	16	41.17	621.88	620.08	4.3700	30.000	0.0130	63.98	85.76	0.75	19.61	1.61	0.64	0.00	Calculated
31	PIPE -21	Pipe	Inlet-14	Inlet-13	74.24	625.70	621.88	5.1500	24.000	0.0130	55.52	51.32	1.08	19.28	2.00	1.00	1.00	SURCHARGED
32	PIPE -22	Pipe	Inlet-12	14	17.83	625.04	619.18	32.8900	24.000	0.0130	7.40	129.74	0.06	22.40	0.32	0.16	0.00	Calculated
33	PIPE -23	Pipe	Inlet-11	12	10.57	623.40	617.56	55.2400	24.000	0.0130	14.41	168.14	0.09	32.71	0.40	0.20	0.00	Calculated
34	PIPE -24	Pipe	Inlet-04	04	12.60	618.52	612.85	45.0000	24.000	0.0130	29.61	151.75	0.20	37.45	0.60	0.30	0.00	Calculated
35	PIPE -25	Pipe	Inlet-05	04	53.54	621.17	612.85	15.5400	24.000	0.0130	32.25	89.18	0.36	26.10	0.83	0.42	0.00	Calculated
36	PIPE -26	Pipe	Inlet-03	03	5.44	615.77	610.59	95.3100	24.000	0.0130	16.61	220.85	0.08	41.42	0.37	0.19	0.00	Calculated
37	PIPE -27	Pipe	Inlet-02	03	60.05	617.28	610.59	11.1400	24.000	0.0130	25.06	75.51	0.33	21.59	0.79	0.40	0.00	Calculated
38	PIPE -28	Pipe	Inlet-01	Inlet-02	61.26	617.76	617.28	0.7800	24.000	0.0130	11.19	20.02	0.56	8.41	1.07	0.53	0.00	Calculated
39	PIPE -29	Pipe	Inlet-16	Inlet-17	77.56	623.90	623.56	0.4400	24.000	0.0130	6.79	14.98	0.45	5.27	0.94	0.47	0.00	Calculated
40	PIPE -30	Pipe	Inlet-15	Inlet-17	79.15	623.97	623.56	0.5200	24.000	0.0130	12.35	16.28	0.76	5.83	1.29	0.65	0.00	Calculated
41	PIPE -31	Pipe	06	11	64.29	618.20	617.99	0.3300	36.000	0.0130	24.36	70.09	0.35	9.23	1.22	0.41	0.00	Calculated
42	Link-28	Channel	Jun-02	Jun-03	42.99	636.00	634.00	4.6500	6.000	0.0320	31.39	52.98	0.59	7.16	0.42	0.83	0.00	
43	Link-29	Channel	Jun-03	Jun-04	387.37	634.00	631.00	0.7700	6.000	0.0320	21.61	21.61	1.00	4.28	0.50	1.00	2.00	
44	Link-30	Channel	Jun-04	Jun-05	1506.52	631.00	610.00	1.3900	6.000	0.0320	17.18	29.00	0.59	3.43	0.38	0.77	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft²)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	617.76	N/A	15.17	11.23	3.94	74.03	7.00	19.67	623.58
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	617.28	N/A	16.79	11.17	5.62	66.53	7.00	18.84	624.09
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	615.77	N/A	14.95	14.95	0.00	100.00	7.00	18.11	624.60
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	618.52	N/A	35.53	29.62	5.91	83.36	7.00	31.11	627.67
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	621.17	N/A	37.08	30.46	6.62	82.15	7.00	31.59	627.62
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	623.83	0.00	8.19	N/A	N/A	N/A	7.00	20.47	629.00
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	624.99	0.00	7.12	N/A	N/A	N/A	7.00	23.20	630.08
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	624.00	0.00	9.16	N/A	N/A	N/A	7.00	43.87	630.96
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	624.25	N/A	10.03	6.84	3.19	68.19	7.00	17.44	630.45
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	624.40	N/A	18.23	9.42	8.81	51.66	7.00	21.95	630.54
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	623.40	0.00	7.22	N/A	N/A	N/A	7.00	18.77	629.15
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	625.04	N/A	11.61	7.41	4.20	63.83	7.00	18.49	629.82
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	621.88	0.00	19.29	N/A	N/A	N/A	7.00	23.05	631.13
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	625.70	0.00	61.25	N/A	N/A	N/A	7.00	137.60	633.44
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	623.97	0.00	8.49	N/A	N/A	N/A	7.00	16.43	629.60
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	623.90	0.00	7.00	N/A	N/A	N/A	7.00	14.45	629.37
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	623.56	0.00	3.38	N/A	N/A	N/A	7.00	11.34	629.31

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac) 1.10
Weighted Runoff Coefficient 0.8600

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.90	-	0.95
-	0.20	-	0.47
Composite Area & Weighted Runoff Coeff.	1.10		0.86

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.02
Peak Runoff (cfs) 14.95
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8600
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-02

Input Data

Area (ac) 1.25
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.00	-	0.95
-	0.25	-	0.47
Composite Area & Weighted Runoff Coeff.	1.25		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.01
Peak Runoff (cfs) 16.79
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-03

Input Data

Area (ac) 1.20
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.96	-	0.95
-	0.24	-	0.47
Composite Area & Weighted Runoff Coeff.	1.20		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.36
Total Runoff (in) 1.16
Peak Runoff (cfs) 15.17
Rainfall Intensity 14.876
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:30

Subbasin : Sub-04

Input Data

Area (ac) 2.97
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.38	-	0.95
-	0.59	-	0.47
Composite Area & Weighted Runoff Coeff.	2.97		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 35.53
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-05

Input Data

Area (ac) 3.10
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.48	-	0.95
-	0.62	-	0.47
Composite Area & Weighted Runoff Coeff.	3.10		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 37.08
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-06

Input Data

Area (ac) 0.66
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.53	-	0.95
-	0.13	-	0.47
Composite Area & Weighted Runoff Coeff.	0.66		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 9.16
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-07

Input Data

Area (ac) 0.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.15	-	0.47
Composite Area & Weighted Runoff Coeff.	0.77		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 10.03
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-08

Input Data

Area (ac) 5.12
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.10	-	0.95
-	1.02	-	0.47
Composite Area & Weighted Runoff Coeff.	5.12		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 61.25
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-09

Input Data

Area (ac) 1.39
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.11	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.39		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 19.29
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-10

Input Data

Area (ac) 0.78
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.16	-	0.47
Composite Area & Weighted Runoff Coeff.	0.78		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 11.61
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-11

Input Data

Area (ac) 0.57
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.46	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.57		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 8.49
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-12

Input Data

Area (ac) 0.47
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.38	-	0.95
-	0.09	-	0.47
Composite Area & Weighted Runoff Coeff.	0.47		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 7.00
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-13

Input Data

Area (ac) 0.52
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.52		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 7.22
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-14

Input Data

Area (ac) 0.21
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.17	-	0.95
-	0.04	-	0.47
Composite Area & Weighted Runoff Coeff.	0.21		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.63
Total Runoff (in) 0.54
Peak Runoff (cfs) 3.38
Rainfall Intensity 18.947
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-16

Input Data

Area (ac) 0.53
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.53		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.01
Peak Runoff (cfs) 7.12
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-17

Input Data

Area (ac) 1.40
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.12	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.40		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 18.24
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18

Input Data

Area (ac) 0.55
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.44	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.55		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 8.19
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-21

Input Data

Area (ac) 2.42
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.94	-	0.95
-	0.48	-	0.47
Composite Area & Weighted Runoff Coeff.	2.42		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 31.51
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22

Input Data

Area (ac) 0.51
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.41	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.51		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.76
Total Runoff (in) 0.64
Peak Runoff (cfs) 7.86
Rainfall Intensity 18.196
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:30

Subbasin : Sub-23

Input Data

Area (ac) 0.24
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.95
-	0.05	-	0.47
Composite Area & Weighted Runoff Coeff.	0.24		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.50
Total Runoff (in) 0.42
Peak Runoff (cfs) 4.09
Rainfall Intensity 19.781
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:01:30

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	02	608.62	624.02	15.40	608.62	0.00	624.02	0.00	0.00	0.00
2	03	610.59	624.23	13.64	610.59	0.00	624.23	0.00	0.00	0.00
3	04	612.85	627.93	15.08	612.85	0.00	627.93	0.00	0.00	0.00
4	05	617.41	630.00	12.59	617.41	0.00	630.00	0.00	0.00	0.00
5	06	618.70	630.00	11.30	618.70	0.00	630.00	0.00	0.00	0.00
6	07	619.21	629.28	10.07	619.21	0.00	629.28	0.00	0.00	0.00
7	08	621.73	630.00	8.27	621.73	0.00	630.00	0.00	0.00	0.00
8	10	624.20	630.00	5.80	624.20	0.00	630.00	0.00	0.00	0.00
9	11	617.99	630.00	12.01	617.99	0.00	630.00	0.00	0.00	0.00
10	12	617.56	628.44	10.88	617.56	0.00	630.00	1.56	0.00	0.00
11	13	618.20	630.00	11.80	618.20	0.00	630.00	0.00	0.00	0.00
12	14	619.18	630.00	10.82	619.18	0.00	629.40	-0.60	0.00	0.00
13	15	619.77	631.17	11.40	619.77	0.00	631.17	0.00	0.00	0.00
14	16	620.08	631.39	11.31	620.08	0.00	631.39	0.00	0.00	0.00
15	Jun-02	636.00	636.50	0.50	0.00	-636.00	0.00	-636.50	0.00	0.00
16	Jun-03	634.00	634.50	0.50	0.00	-634.00	0.00	-634.50	0.00	0.00
17	Jun-04	631.00	631.50	0.50	0.00	-631.00	0.00	-631.50	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	186.81	0.00	611.23	2.61	0.00	12.79	608.64	0.02	0 00:05	0 00:00	0.00	0.00
2	03	186.83	0.00	613.74	3.15	0.00	10.49	610.61	0.02	0 00:05	0 00:00	0.00	0.00
3	04	149.17	0.00	616.05	3.20	0.00	11.88	612.87	0.02	0 00:04	0 00:00	0.00	0.00
4	05	102.79	0.00	630.00	12.59	0.00	0.00	617.44	0.03	0 00:03	0 00:03	0.16	1.00
5	06	24.31	0.00	621.20	2.50	0.00	8.80	618.71	0.01	0 00:03	0 00:00	0.00	0.00
6	07	32.87	0.00	629.28	10.07	0.00	0.00	619.25	0.04	0 00:02	0 00:04	0.42	4.00
7	08	25.80	0.00	622.51	0.78	0.00	7.49	621.73	0.00	0 00:05	0 00:00	0.00	0.00
8	10	9.40	0.00	625.01	0.81	0.00	4.99	624.20	0.00	0 00:05	0 00:00	0.00	0.00
9	11	38.27	0.00	619.29	1.30	0.00	10.71	618.00	0.01	0 00:03	0 00:00	0.00	0.00
10	12	57.38	0.00	628.44	10.88	0.00	0.00	617.60	0.04	0 00:03	0 00:04	0.38	4.00
11	13	43.90	0.00	621.20	3.00	0.00	8.80	618.22	0.02	0 00:05	0 00:00	0.00	0.00
12	14	48.72	0.00	630.00	10.82	0.00	0.00	619.23	0.05	0 00:03	0 00:03	0.36	6.00
13	15	46.28	0.00	631.17	11.40	0.00	0.00	619.82	0.05	0 00:03	0 00:03	0.17	6.00
14	16	63.98	0.00	631.39	11.31	0.00	0.00	620.13	0.05	0 00:03	0 00:06	1.17	5.00
15	Jun-02	31.51	31.51	636.42	0.42	0.00	0.08	636.00	0.00	0 00:05	0 00:00	0.00	0.00
16	Jun-03	31.39	4.09	634.50	0.50	0.00	0.00	634.00	0.00	0 00:02	0 00:05	0.39	5.00
17	Jun-04	21.61	0.00	631.50	0.50	0.00	0.00	631.01	0.01	0 00:05	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-28	42.99	636.00	0.00	634.00	0.00	2.00	4.6500	User-Defined	0.500	39.000	0.0320	0.1000	0.1000	0.0000	0.00	No
2	Link-29	387.37	634.00	0.00	631.00	0.00	3.00	0.7700	User-Defined	0.500	39.000	0.0320	0.1000	0.1000	0.0000	0.00	No
3	Link-30	1506.52	631.00	0.00	610.00	0.00	21.00	1.3900	User-Defined	0.500	39.000	0.0320	0.1000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-28	31.39	0 00:05	52.98	0.59	7.16	0.10	0.42	0.83	0.00		
2	Link-29	21.61	0 00:05	21.61	1.00	4.28	1.51	0.50	1.00	2.00		
3	Link-30	17.18	0 00:12	29.00	0.59	3.43	7.32	0.38	0.77	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-10	156.29	625.04	0.00	623.97	0.00	1.07	0.6800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-12	571.04	623.40	0.00	621.17	0.00	2.23	0.3900	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
3	Link-13	564.81	623.83	0.00	618.52	0.00	5.31	0.9400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
4	Link-14	367.74	621.17	0.00	617.28	0.00	3.89	1.0600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
5	Link-15	370.53	618.52	0.00	615.77	0.00	2.75	0.7400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
6	Link-16	238.51	615.77	0.00	586.68	0.00	29.09	12.2000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
7	Link-17	256.67	617.28	0.00	586.68	0.00	30.60	11.9200	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
8	Link-18	208.23	617.76	0.00	586.68	0.00	31.08	14.9300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
9	Link-25	74.52	624.25	0.00	624.00	0.00	0.25	0.3400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
10	Link-26	31.56	624.40	0.00	624.25	0.00	0.15	0.4800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
11	PIPE -01	129.85	608.62	0.00	586.68	0.00	21.94	16.9000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
12	PIPE -02	110.00	609.17	-1.42	608.62	0.00	0.55	0.5000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
13	PIPE -03	370.00	611.35	-1.50	610.59	0.00	0.76	0.2100	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
14	PIPE -04	574.21	613.72	-3.69	612.85	0.00	0.87	0.1500	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
15	PIPE -05	76.87	623.56	0.00	617.41	0.00	6.15	8.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
16	PIPE -06	26.63	617.99	0.00	617.41	0.00	0.58	2.1800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
17	PIPE -07	170.54	619.21	0.00	618.70	0.00	0.51	0.3000	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
18	PIPE -08	3.46	620.00	-1.73	619.21	0.00	0.79	22.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
19	PIPE -09	89.00	624.20	0.00	621.73	0.00	2.47	2.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
20	PIPE -10	21.99	624.00	0.00	621.73	0.00	2.27	10.3200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
21	PIPE -11	69.47	624.25	0.00	624.00	0.00	0.25	0.3600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
22	PIPE -12	7.97	624.40	0.00	624.20	0.00	0.20	2.5100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
23	PIPE -13	9.23	624.99	0.00	619.21	0.00	5.78	62.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
24	PIPE -14	9.24	623.83	0.00	617.99	0.00	5.84	63.2200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
25	PIPE -15	75.58	617.56	0.00	617.41	0.00	0.15	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
26	PIPE -16	64.59	617.69	-0.51	617.56	0.00	0.13	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
27	PIPE -17	263.99	619.18	0.00	618.20	0.00	0.98	0.3700	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
28	PIPE -18	155.19	619.77	0.00	619.18	0.00	0.59	0.3800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
29	PIPE -19	75.31	620.08	0.00	619.77	0.00	0.31	0.4100	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
30	PIPE -20	41.17	621.88	0.00	620.08	0.00	1.80	4.3700	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
31	PIPE -21	74.24	625.70	0.00	621.88	0.00	3.82	5.1500	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
32	PIPE -22	17.83	625.04	0.00	619.18	0.00	5.86	32.8900	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
33	PIPE -23	10.57	623.40	0.00	617.56	0.00	5.84	55.2400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
34	PIPE -24	12.60	618.52	0.00	612.85	0.00	5.67	45.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
35	PIPE -25	53.54	621.17	0.00	612.85	0.00	8.32	15.5400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
36	PIPE -26	5.44	615.77	0.00	610.59	0.00	5.18	95.3100	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
37	PIPE -27	60.05	617.28	0.00	610.59	0.00	6.69	11.1400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
38	PIPE -28	61.26	617.76	0.00	617.28	0.00	0.48	0.7800	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
39	PIPE -29	77.56	623.90	0.00	623.56	0.00	0.34	0.4400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
40	PIPE -30	79.15	623.97	0.00	623.56	0.00	0.41	0.5200	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
41	PIPE -31	64.29	618.20	-0.50	617.99	0.00	0.21	0.3300	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-10	4.20	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
2	Link-12	4.81	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
3	Link-13	5.45	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
4	Link-14	6.62	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
5	Link-15	5.91	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
6	Link-16	0.00	0 00:00	0.00	0.00	0.00		0.00	0.00	0.00		
7	Link-17	5.63	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
8	Link-18	3.94	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
9	Link-25	3.20	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
10	Link-26	8.83	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
11	PIPE -01	186.80	0 00:05	1070.54	0.17	40.91	0.05	1.41	0.28	0.00		Calculated
12	PIPE -02	186.81	0 00:05	348.54	0.54	18.06	0.10	2.61	0.52	0.00		Calculated
13	PIPE -03	147.12	0 00:05	203.55	0.72	11.37	0.54	3.15	0.63	0.00		Calculated
14	PIPE -04	96.98	0 00:04	89.66	1.08	11.19	0.86	3.18	0.91	0.00		> CAPACITY
15	PIPE -05	20.55	0 00:03	63.99	0.32	18.17	0.07	0.78	0.39	0.00		Calculated
16	PIPE -06	38.24	0 00:03	98.44	0.39	13.06	0.03	1.30	0.43	0.00		Calculated
17	PIPE -07	24.31	0 00:03	22.47	1.08	5.65	0.50	2.50	1.00	3.00		SURCHARGED
18	PIPE -08	25.80	0 00:04	89.61	0.29	43.82	0.00	0.55	0.37	0.00		Calculated
19	PIPE -09	9.37	0 00:05	17.50	0.54	10.27	0.14	0.78	0.52	0.00		Calculated
20	PIPE -10	17.45	0 00:04	33.75	0.52	19.25	0.02	0.76	0.51	0.00		Calculated
21	PIPE -11	6.81	0 00:08	6.30	1.08	6.59	0.18	1.50	1.00	5.00		SURCHARGED
22	PIPE -12	9.40	0 00:05	16.64	0.57	9.70	0.01	0.81	0.54	0.00		Calculated
23	PIPE -13	7.09	0 00:04	83.12	0.09	28.70	0.01	0.30	0.20	0.00		Calculated
24	PIPE -14	16.33	0 00:03	83.52	0.20	36.68	0.00	0.45	0.30	0.00		Calculated
25	PIPE -15	48.68	0 00:03	44.99	1.08	5.53	0.23	3.50	1.00	3.00		SURCHARGED
26	PIPE -16	43.87	0 00:04	100.07	0.44	10.09	0.11	1.62	0.46	0.00		Calculated
27	PIPE -17	43.90	0 00:04	40.58	1.08	7.14	0.62	3.00	1.00	4.00		SURCHARGED
28	PIPE -18	44.59	0 00:09	41.23	1.08	6.99	0.37	2.78	0.93	0.00		> CAPACITY
29	PIPE -19	46.28	0 00:03	42.79	1.08	7.22	0.17	3.00	1.00	5.00		SURCHARGED
30	PIPE -20	63.98	0 00:06	85.76	0.75	19.61	0.03	1.61	0.64	0.00		Calculated
31	PIPE -21	55.52	0 00:06	51.32	1.08	19.28	0.06	2.00	1.00	1.00		SURCHARGED
32	PIPE -22	7.40	0 00:03	129.74	0.06	22.40	0.01	0.32	0.16	0.00		Calculated
33	PIPE -23	14.41	0 00:04	168.14	0.09	32.71	0.01	0.40	0.20	0.00		Calculated
34	PIPE -24	29.61	0 00:06	151.75	0.20	37.45	0.01	0.60	0.30	0.00		Calculated
35	PIPE -25	32.25	0 00:06	89.18	0.36	26.10	0.03	0.83	0.42	0.00		Calculated
36	PIPE -26	16.61	0 00:04	220.85	0.08	41.42	0.00	0.37	0.19	0.00		Calculated
37	PIPE -27	25.06	0 00:05	75.51	0.33	21.59	0.05	0.79	0.40	0.00		Calculated
38	PIPE -28	11.19	0 00:05	20.02	0.56	8.41	0.12	1.07	0.53	0.00		Calculated
39	PIPE -29	6.79	0 00:03	14.98	0.45	5.27	0.25	0.94	0.47	0.00		Calculated
40	PIPE -30	12.35	0 00:03	16.28	0.76	5.83	0.23	1.29	0.65	0.00		Calculated
41	PIPE -31	24.36	0 00:03	70.09	0.35	9.23	0.12	1.22	0.41	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft²)	Grate Clogging Factor (%)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	5.34	617.76	0.00	N/A	0.00
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	6.35	617.28	0.00	N/A	0.00
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	8.38	615.77	0.00	N/A	0.00
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	8.44	618.52	0.00	N/A	0.00
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	5.73	621.17	0.00	N/A	0.00
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	4.43	623.83	0.00	0.00	0.00
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	4.29	624.99	0.00	0.00	0.00
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	5.75	624.00	0.00	0.00	0.00
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	5.77	624.25	0.00	N/A	0.00
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	5.62	624.40	0.00	N/A	0.00
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	5.04	623.40	0.00	0.00	0.00
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	4.33	625.04	0.00	N/A	0.00
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	8.45	621.88	0.00	0.00	0.00
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	4.65	625.70	0.00	0.00	0.00
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	4.97	623.97	0.00	0.00	0.00
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	4.85	623.90	0.00	0.00	0.00
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	5.19	623.56	0.00	0.00	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	Inlet-01	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00
2	Inlet-02	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
3	Inlet-03	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
4	Inlet-04	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
5	Inlet-05	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
6	Inlet-06	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
7	Inlet-07	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
8	Inlet-08	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
9	Inlet-09	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
10	Inlet-10	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
11	Inlet-11	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
12	Inlet-12	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
13	Inlet-13	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
14	Inlet-14	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
15	Inlet-15	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
16	Inlet-16	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
17	Inlet-17	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Inlet-01	15.17	15.17	11.23	3.94	74.03	19.67	623.58	0.48	0 00:05	0.00	0.00
2	Inlet-02	16.79	16.79	11.17	5.62	66.53	18.84	624.09	0.46	0 00:05	0.00	0.00
3	Inlet-03	14.95	14.95	14.95	0.00	100.00	18.11	624.60	0.45	0 00:04	0.00	0.00
4	Inlet-04	35.53	35.53	29.62	5.91	83.36	31.11	627.67	0.71	0 00:06	0.00	0.00
5	Inlet-05	37.08	37.08	30.46	6.62	82.15	31.59	627.62	0.72	0 00:06	0.00	0.00
6	Inlet-06	8.19	8.19	N/A	N/A	N/A	20.47	629.00	0.74	0 00:03	0.00	0.00
7	Inlet-07	7.12	7.12	N/A	N/A	N/A	23.20	630.08	0.80	0 00:04	0.00	0.00
8	Inlet-08	9.16	9.16	N/A	N/A	N/A	43.87	630.96	1.21	0 00:02	0.00	0.00
9	Inlet-09	10.03	10.03	6.84	3.19	68.19	17.44	630.45	0.43	0 00:02	0.42	6.00
10	Inlet-10	18.23	18.23	9.42	8.81	51.66	21.95	630.54	0.52	0 00:05	0.00	0.00
11	Inlet-11	7.22	7.22	N/A	N/A	N/A	18.77	629.15	0.71	0 00:04	0.00	0.00
12	Inlet-12	11.61	11.61	7.41	4.20	63.83	18.49	629.82	0.45	0 00:03	0.00	0.00
13	Inlet-13	19.29	19.29	N/A	N/A	N/A	23.05	631.13	0.80	0 00:06	0.00	0.00
14	Inlet-14	61.25	61.25	N/A	N/A	N/A	137.60	633.44	3.09	0 00:05	0.00	0.00
15	Inlet-15	8.49	8.49	N/A	N/A	N/A	16.43	629.60	0.66	0 00:03	0.00	0.00
16	Inlet-16	7.00	7.00	N/A	N/A	N/A	14.45	629.37	0.62	0 00:03	0.00	0.00
17	Inlet-17	3.38	3.38	N/A	N/A	N/A	11.34	629.31	0.56	0 00:03	0.00	0.00

Project Description

File Name	SA Street Proposed.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jan 04, 2022	00:00:00
End Analysis On	Jan 05, 2022	00:00:00
Start Reporting On	Jan 04, 2022	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	22
Nodes	46
Junctions	22
Outfalls	2
Flow Diversions	0
Inlets	22
Storage Nodes	0
Links	59
Channels	1
Pipes	58
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	100 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	1.10	0.8600	1.19	1.02	1.12	14.95	0 00:04:30
2	Sub-02	1.25	0.8500	1.19	1.01	1.26	16.79	0 00:04:30
3	Sub-03	1.20	0.8500	1.36	1.16	1.39	15.17	0 00:05:30
4	Sub-04	2.97	0.8500	1.53	1.30	3.85	35.53	0 00:06:30
5	Sub-05	3.10	0.8500	1.53	1.30	4.02	37.08	0 00:06:30
6	Sub-06	0.66	0.8500	1.09	0.93	0.61	9.16	0 00:04:00
7	Sub-07	0.77	0.8500	1.28	1.09	0.84	10.03	0 00:05:00
8	Sub-08	2.77	0.8500	1.53	1.30	3.60	33.18	0 00:06:30
9	Sub-09	1.39	0.8500	1.09	0.93	1.29	19.29	0 00:04:00
10	Sub-10	0.78	0.8500	0.88	0.74	0.58	11.61	0 00:03:00
11	Sub-11	0.57	0.8500	0.88	0.74	0.42	8.49	0 00:03:00
12	Sub-12	0.47	0.8500	0.88	0.74	0.35	7.00	0 00:03:00
13	Sub-13	0.52	0.8500	1.09	0.93	0.48	7.22	0 00:04:00
14	Sub-14	0.21	0.8500	0.63	0.54	0.11	3.38	0 00:02:00
15	Sub-16	0.53	0.8500	1.19	1.01	0.53	7.12	0 00:04:30
16	Sub-17	1.40	0.8500	1.28	1.09	1.52	18.24	0 00:05:00
17	Sub-18	0.55	0.8500	0.88	0.74	0.41	8.19	0 00:03:00
18	Sub-24	0.23	0.8500	0.76	0.64	0.15	3.59	0 00:02:30
19	Sub-25	0.14	0.8500	0.63	0.54	0.08	2.25	0 00:02:00
20	Sub-26	1.89	0.8500	1.45	1.23	2.32	23.17	0 00:06:00
21	Sub-27	0.88	0.8500	1.28	1.09	0.96	11.50	0 00:05:00
22	Sub-28	2.35	0.8500	1.28	1.09	2.55	30.56	0 00:05:00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-10	Pipe	Inlet-12	Inlet-15	156.29	625.04	623.97	0.6800	0.000	0.0150	4.20	0.00	0.00	0.00	0.00	0.00	0.00	
2	Link-12	Pipe	Inlet-11	Inlet-05	571.04	623.40	621.17	0.3900	0.000	0.0150	4.81	0.00	0.00	0.00	0.00	0.00	0.00	
3	Link-13	Pipe	Inlet-06	Inlet-04	564.81	623.83	618.52	0.9400	0.000	0.0150	5.45	0.00	0.00	0.00	0.00	0.00	0.00	
4	Link-14	Pipe	Inlet-05	Inlet-02	367.74	621.17	617.28	1.0600	0.000	0.0150	6.62	0.00	0.00	0.00	0.00	0.00	0.00	
5	Link-15	Pipe	Inlet-04	Inlet-03	370.53	618.52	615.77	0.7400	0.000	0.0150	5.91	0.00	0.00	0.00	0.00	0.00	0.00	
6	Link-16	Pipe	Inlet-03	01	238.51	615.77	586.68	12.2000	0.000	0.0150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	Link-17	Pipe	Inlet-02	01	256.67	617.28	586.68	11.9200	0.000	0.0150	5.63	0.00	0.00	0.00	0.00	0.00	0.00	
8	Link-18	Pipe	Inlet-01	01	208.23	617.76	586.68	14.9300	0.000	0.0150	3.94	0.00	0.00	0.00	0.00	0.00	0.00	
9	Link-25	Pipe	Inlet-09	Inlet-08	74.52	624.25	624.00	0.3400	0.000	0.0150	3.20	0.00	0.00	0.00	0.00	0.00	0.00	
10	Link-26	Pipe	Inlet-10	Inlet-09	31.56	624.40	624.25	0.4800	0.000	0.0150	8.83	0.00	0.00	0.00	0.00	0.00	0.00	
11	Link-31	Pipe	Inlet-19	Jun-02	24.89	629.00	628.70	1.2100	18.000	0.0150	6.54	9.99	0.65	6.05	0.88	0.59	0.00	Calculated
12	Link-32	Pipe	Inlet-20	Jun-02	46.93	629.00	628.70	0.6400	30.000	0.0150	16.53	28.42	0.58	7.43	1.37	0.55	0.00	Calculated
13	Link-33	Pipe	Inlet-21	Jun-06	39.75	628.50	628.30	0.5000	24.000	0.0150	10.55	13.91	0.76	5.98	1.30	0.65	0.00	Calculated
14	Link-34	Pipe	Inlet-22	Jun-06	16.82	628.50	628.30	1.1900	18.000	0.0150	2.23	9.93	0.22	4.55	0.48	0.32	0.00	Calculated
15	Link-35	Pipe	Inlet-23	Jun-07	13.03	627.00	625.10	14.5800	30.000	0.0150	27.12	135.74	0.20	21.59	0.76	0.30	0.00	Calculated
16	Link-36	Pipe	Jun-02	Jun-06	39.45	628.70	628.30	1.0100	24.000	0.0150	21.36	19.74	1.08	7.42	2.00	1.00	1.00	SURCHARGED
17	Link-37	Pipe	Jun-06	Jun-07	321.03	628.30	625.10	1.0000	30.000	0.0150	31.67	35.49	0.89	8.46	1.80	0.72	0.00	Calculated
18	Link-38	Pipe	Jun-07	Jun-08	86.60	625.10	624.21	1.0300	36.000	0.0150	55.18	58.60	0.94	9.48	2.31	0.77	0.00	Calculated
19	Link-39	Pipe	Jun-08	Jun-09	301.33	624.21	621.20	1.0000	36.000	0.0150	54.94	57.77	0.95	9.56	2.32	0.77	0.00	Calculated
20	Link-40	Pipe	Jun-09	Jun-10	103.44	621.20	620.16	1.0100	36.000	0.0150	54.77	57.96	0.94	9.38	2.32	0.77	0.00	Calculated
21	Link-41	Pipe	Jun-10	Jun-11	160.83	620.16	618.56	0.9900	36.000	0.0150	54.63	57.66	0.95	9.40	2.33	0.78	0.00	Calculated
22	Link-42	Pipe	Jun-11	05	114.60	618.56	617.41	1.0000	36.000	0.0150	54.62	57.91	0.94	9.39	2.32	0.77	0.00	Calculated
23	Link-43	Pipe	Inlet-23	Inlet-14	228.38	627.00	625.70	0.5700	0.000	0.0150	3.41	0.00	0.94	0.00	2.32	0.77	0.00	Calculated
24	Link-45	Pipe	Inlet-19	Jun-12	443.12	629.00	631.00	-0.4500	0.000	0.0150	0.28	0.00	0.00	0.00	0.05	0.10	0.00	Calculated
25	Link-47	Pipe	Inlet-22	Jun-12	449.96	628.50	631.00	-0.5600	0.000	0.0150	0.01	0.00	0.00	0.00	0.05	0.10	0.00	Calculated
26	Link-49	Pipe	Inlet-20	Inlet-19	66.34	629.00	629.00	0.0000	0.000	0.0150	6.59	0.00	0.00	0.00	0.05	0.10	0.00	Calculated
27	Link-50	Pipe	Inlet-21	Inlet-22	68.43	628.50	628.50	0.0000	0.000	0.0150	0.89	0.00	0.00	0.00	0.05	0.10	0.00	Calculated
28	PIPE -01	Pipe	02	01	129.85	608.62	586.68	16.9000	60.000	0.0130	223.54	1070.54	0.21	43.08	1.55	0.31	0.00	Calculated
29	PIPE -02	Pipe	03	02	110.00	609.17	608.62	0.5000	60.000	0.0130	223.54	348.54	0.64	18.83	2.91	0.58	0.00	Calculated
30	PIPE -03	Pipe	04	03	370.00	611.35	610.59	0.2100	60.000	0.0130	184.79	203.55	0.91	11.99	3.73	0.75	0.00	Calculated
31	PIPE -04	Pipe	05	04	574.21	613.72	612.85	0.1500	60.000	0.0130	129.14	232.09	0.56	12.45	2.65	0.53	0.00	Calculated
32	PIPE -05	Pipe	Inlet-17	05	76.87	623.56	617.41	8.0000	24.000	0.0130	20.55	63.99	0.32	18.17	0.78	0.39	0.00	Calculated
33	PIPE -06	Pipe	11	05	26.63	617.99	617.41	2.1800	36.000	0.0130	38.24	98.44	0.39	13.06	1.30	0.43	0.00	Calculated
34	PIPE -07	Pipe	07	06	170.54	619.21	618.70	0.3000	30.000	0.0130	24.31	22.47	1.08	5.65	2.50	1.00	3.00	SURCHARGED
35	PIPE -08	Pipe	08	07	3.46	620.00	619.21	22.7800	18.000	0.0130	25.80	89.61	0.29	43.82	0.55	0.37	0.00	Calculated
36	PIPE -09	Pipe	10	08	89.00	624.20	621.73	2.7800	18.000	0.0130	9.37	17.50	0.54	10.27	0.78	0.52	0.00	Calculated
37	PIPE -10	Pipe	Inlet-08	08	21.99	624.00	621.73	10.3200	18.000	0.0130	17.45	33.75	0.52	19.25	0.76	0.51	0.00	Calculated
38	PIPE -11	Pipe	Inlet-09	Inlet-08	69.47	624.25	624.00	0.3600	18.000	0.0130	6.81	6.30	1.08	6.59	1.50	1.00	5.00	SURCHARGED
39	PIPE -12	Pipe	Inlet-10	10	7.97	624.40	624.20	2.5100	18.000	0.0130	9.40	16.64	0.57	9.70	0.81	0.54	0.00	Calculated
40	PIPE -13	Pipe	Inlet-07	07	9.23	624.99	619.21	62.6100	18.000	0.0130	7.09	83.12	0.09	28.70	0.30	0.20	0.00	Calculated
41	PIPE -14	Pipe	Inlet-06	11	9.24	623.83	617.99	63.2200	18.000	0.0130	16.33	83.52	0.20	36.68	0.45	0.30	0.00	Calculated
42	PIPE -15	Pipe	12	05	75.58	617.56	617.41	0.2000	42.000	0.0130	48.68	44.99	1.08	5.51	3.50	1.00	2.00	SURCHARGED
43	PIPE -16	Pipe	13	12	64.59	617.69	617.56	0.2000	42.000	0.0130	43.83	100.07	0.44	10.10	1.62	0.46	0.00	Calculated
44	PIPE -17	Pipe	14	13	263.99	619.18	618.20	0.3700	36.000	0.0130	43.90	40.58	1.08	7.04	2.80	0.93	0.00	> CAPACITY
45	PIPE -18	Pipe	15	14	155.19	619.77	619.18	0.3800	36.000	0.0130	44.60	41.23	1.08	6.96	2.75	0.92	0.00	> CAPACITY
46	PIPE -19	Pipe	16	15	75.31	620.08	619.77	0.4100	36.000	0.0130	45.46	42.79	1.06	7.06	2.71	0.90	0.00	> CAPACITY
47	PIPE -20	Pipe	Inlet-13	16	41.17	621.88	620.08	4.3700	30.000	0.0130	43.18	85.76	0.50	17.55	1.25	0.50	0.00	Calculated
48	PIPE -21	Pipe	Inlet-14	Inlet-13	74.24	625.70	621.88	5.1500	24.000	0.0130	33.68	51.32	0.66	17.46	1.18	0.59	0.00	Calculated
49	PIPE -22	Pipe	Inlet-12	14	17.83	625.04	619.18	32.8900	24.000	0.0130	7.40	129.74	0.06	22.40	0.32	0.16	0.00	Calculated
50	PIPE -23	Pipe	Inlet-11	12	10.57	623.40	617.56	55.2400	24.000	0.0130	14.41	168.14	0.09	32.71	0.40	0.20	0.00	Calculated
51	PIPE -24	Pipe	Inlet-04	04	12.60	618.52	612.85	45.0000	24.000	0.0130	29.61	151.75	0.20	37.45	0.60	0.30	0.00	Calculated
52	PIPE -25	Pipe	Inlet-05	04	53.54	621.17	612.85	15.5400	24.000	0.0130	32.25	89.18	0.36	26.10	0.83	0.42	0.00	Calculated
53	PIPE -26	Pipe	Inlet-03	03	5.44	615.77	610.59	95.3100	24.000	0.0130	16.61	220.85	0.08	41.42	0.37	0.19	0.00	Calculated
54	PIPE -27	Pipe	Inlet-02	03	60.05	617.28	610.59	11.1400	24.000	0.0130	25.06	75.51	0.33	21.59	0.79	0.40	0.00	Calculated
55	PIPE -28	Pipe	Inlet-01	Inlet-02	61.26	617.76	617.28	0.7800	24.000	0.0130	11.19	20.02	0.56	8.41	1.07	0.53	0.00	Calculated
56	PIPE -29	Pipe	Inlet-16	Inlet-17	77.56	623.90	623.56	0.4400	24.000	0.0130	6.79	14.98	0.45	5.27	0.94	0.47	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
57	PIPE -30	Pipe	Inlet-15	Inlet-17	79.15	623.97	623.56	0.5200	24.000	0.0130	12.35	16.28	0.76	5.83	1.29	0.65	0.00	Calculated
58	PIPE -31	Pipe	06	11	64.29	618.20	617.99	0.3300	36.000	0.0130	24.36	70.09	0.35	9.23	1.22	0.41	0.00	Calculated
59	Link-44	Channel	Jun-12	Jun-13	542.82	631.00	610.00	3.8700	6.000	0.0320	0.16	48.31	0.00	3.49	0.05	0.10	0.00	

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac) 1.10
Weighted Runoff Coefficient 0.8600

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.90	-	0.95
-	0.20	-	0.47
Composite Area & Weighted Runoff Coeff.	1.10		0.86

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.02
Peak Runoff (cfs) 14.95
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8600
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-02

Input Data

Area (ac) 1.25
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.00	-	0.95
-	0.25	-	0.47
Composite Area & Weighted Runoff Coeff.	1.25		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.01
Peak Runoff (cfs) 16.79
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-03

Input Data

Area (ac) 1.20
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.96	-	0.95
-	0.24	-	0.47
Composite Area & Weighted Runoff Coeff.	1.20		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.36
Total Runoff (in) 1.16
Peak Runoff (cfs) 15.17
Rainfall Intensity 14.876
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:30

Subbasin : Sub-04

Input Data

Area (ac) 2.97
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.38	-	0.95
-	0.59	-	0.47
Composite Area & Weighted Runoff Coeff.	2.97		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 35.53
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-05

Input Data

Area (ac) 3.10
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	2.48	-	0.95
-	0.62	-	0.47
Composite Area & Weighted Runoff Coeff.	3.10		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 37.08
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-06

Input Data

Area (ac) 0.66
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.53	-	0.95
-	0.13	-	0.47
Composite Area & Weighted Runoff Coeff.	0.66		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 9.16
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-07

Input Data

Area (ac) 0.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.15	-	0.47
Composite Area & Weighted Runoff Coeff.	0.77		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 10.03
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-08

Input Data

Area (ac) 2.77
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	4.10	-	0.95
-	1.02	-	0.47
Composite Area & Weighted Runoff Coeff.	5.12		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.53
Total Runoff (in) 1.30
Peak Runoff (cfs) 33.18
Rainfall Intensity 14.073
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:30

Subbasin : Sub-09

Input Data

Area (ac) 1.39
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.11	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.39		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 19.29
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-10

Input Data

Area (ac) 0.78
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.95
-	0.16	-	0.47
Composite Area & Weighted Runoff Coeff.	0.78		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 11.61
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-11

Input Data

Area (ac) 0.57
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.46	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.57		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 8.49
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-12

Input Data

Area (ac) 0.47
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.38	-	0.95
-	0.09	-	0.47
Composite Area & Weighted Runoff Coeff.	0.47		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 7.00
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-13

Input Data

Area (ac) 0.52
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.10	-	0.47
Composite Area & Weighted Runoff Coeff.	0.52		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.09
Total Runoff (in) 0.93
Peak Runoff (cfs) 7.22
Rainfall Intensity 16.328
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:00

Subbasin : Sub-14

Input Data

Area (ac) 0.21
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.17	-	0.95
-	0.04	-	0.47
Composite Area & Weighted Runoff Coeff.	0.21		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.63
Total Runoff (in) 0.54
Peak Runoff (cfs) 3.38
Rainfall Intensity 18.947
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-16

Input Data

Area (ac) 0.53
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.42	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.53		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.19
Total Runoff (in) 1.01
Peak Runoff (cfs) 7.12
Rainfall Intensity 15.805
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:04:30

Subbasin : Sub-17

Input Data

Area (ac) 1.40
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.12	-	0.95
-	0.28	-	0.47
Composite Area & Weighted Runoff Coeff.	1.40		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 18.24
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18

Input Data

Area (ac) 0.55
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.44	-	0.95
-	0.11	-	0.47
Composite Area & Weighted Runoff Coeff.	0.55		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.88
Total Runoff (in) 0.74
Peak Runoff (cfs) 8.19
Rainfall Intensity 17.516
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:03:00

Subbasin : Sub-24

Input Data

Area (ac) 0.23
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.19	-	0.95
-	0.05	-	0.47
Composite Area & Weighted Runoff Coeff.	0.24		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.76
Total Runoff (in) 0.64
Peak Runoff (cfs) 3.59
Rainfall Intensity 18.196
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:30

Subbasin : Sub-25

Input Data

Area (ac) 0.14
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.11	-	0.95
-	0.03	-	0.47
Composite Area & Weighted Runoff Coeff.	0.14		0.85

Subbasin Runoff Results

Total Rainfall (in) 0.63
Total Runoff (in) 0.54
Peak Runoff (cfs) 2.25
Rainfall Intensity 18.947
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Sub-26

Input Data

Area (ac) 1.89
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.51	-	0.95
-	0.38	-	0.47
Composite Area & Weighted Runoff Coeff.	1.89		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.45
Total Runoff (in) 1.23
Peak Runoff (cfs) 23.17
Rainfall Intensity 14.461
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:06:00

Subbasin : Sub-27

Input Data

Area (ac) 0.88
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.71	-	0.95
-	0.18	-	0.47
Composite Area & Weighted Runoff Coeff.	0.89		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 11.50
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-28

Input Data

Area (ac) 2.35
Weighted Runoff Coefficient 0.8500

Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	1.88	-	0.95
-	0.47	-	0.47
Composite Area & Weighted Runoff Coeff.	2.35		0.85

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 1.09
Peak Runoff (cfs) 30.56
Rainfall Intensity 15.323
Weighted Runoff Coefficient 0.8500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	02	223.54	0.00	611.53	2.91	0.00	12.48	608.64	0.02	0 00:05	0 00:00	0.00	0.00
2	03	223.56	0.00	614.33	3.74	0.00	9.90	610.62	0.03	0 00:06	0 00:00	0.00	0.00
3	04	185.66	0.00	616.60	3.75	0.00	11.33	612.88	0.03	0 00:05	0 00:00	0.00	0.00
4	05	129.20	0.00	620.91	3.50	0.00	9.09	617.43	0.02	0 00:05	0 00:00	0.00	0.00
5	06	24.31	0.00	621.20	2.50	0.00	8.80	618.71	0.01	0 00:03	0 00:00	0.00	0.00
6	07	32.87	0.00	629.28	10.07	0.00	0.00	619.25	0.04	0 00:02	0 00:04	0.42	4.00
7	08	25.80	0.00	622.51	0.78	0.00	7.49	621.73	0.00	0 00:05	0 00:00	0.00	0.00
8	10	9.40	0.00	625.01	0.81	0.00	4.99	624.20	0.00	0 00:05	0 00:00	0.00	0.00
9	11	38.27	0.00	619.29	1.30	0.00	10.71	618.00	0.01	0 00:03	0 00:00	0.00	0.00
10	12	52.52	0.00	628.44	10.88	0.00	0.00	617.60	0.04	0 00:03	0 00:04	0.24	4.00
11	13	43.90	0.00	621.03	2.83	0.00	8.97	618.22	0.02	0 00:07	0 00:00	0.00	0.00
12	14	48.24	0.00	630.00	10.82	0.00	0.00	619.21	0.03	0 00:04	0 00:05	0.12	3.00
13	15	45.46	0.00	631.17	11.40	0.00	0.00	619.80	0.03	0 00:04	0 00:05	0.03	2.00
14	16	43.18	0.00	631.39	11.31	0.00	0.00	620.10	0.02	0 00:05	0 00:05	0.00	0.00
15	Jun-02	23.07	0.00	634.30	5.60	0.00	0.00	628.71	0.01	0 00:05	0 00:06	0.05	2.00
16	Jun-06	30.90	0.00	630.30	2.00	0.00	3.89	628.31	0.01	0 00:06	0 00:00	0.00	0.00
17	Jun-07	56.02	0.00	627.45	2.35	0.00	5.77	625.11	0.01	0 00:05	0 00:00	0.00	0.00
18	Jun-08	55.18	0.00	626.56	2.35	0.00	5.44	624.22	0.01	0 00:05	0 00:00	0.00	0.00
19	Jun-09	54.94	0.00	623.54	2.34	0.00	7.56	621.21	0.01	0 00:06	0 00:00	0.00	0.00
20	Jun-10	54.77	0.00	622.50	2.34	0.00	7.50	620.17	0.01	0 00:06	0 00:00	0.00	0.00
21	Jun-11	54.63	0.00	620.89	2.33	0.00	9.11	618.57	0.01	0 00:06	0 00:00	0.00	0.00
22	Jun-12	0.28	0.00	631.07	0.07	0.00	0.43	631.00	0.00	0 00:02	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-10	156.29	625.04	0.00	623.97	0.00	1.07	0.6800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-12	571.04	623.40	0.00	621.17	0.00	2.23	0.3900	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
3	Link-13	564.81	623.83	0.00	618.52	0.00	5.31	0.9400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
4	Link-14	367.74	621.17	0.00	617.28	0.00	3.89	1.0600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
5	Link-15	370.53	618.52	0.00	615.77	0.00	2.75	0.7400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
6	Link-16	238.51	615.77	0.00	586.68	0.00	29.09	12.2000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
7	Link-17	256.67	617.28	0.00	586.68	0.00	30.60	11.9200	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
8	Link-18	208.23	617.76	0.00	586.68	0.00	31.08	14.9300	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
9	Link-25	74.52	624.25	0.00	624.00	0.00	0.25	0.3400	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
10	Link-26	31.56	624.40	0.00	624.25	0.00	0.15	0.4800	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
11	Link-31	24.89	629.00	0.00	628.70	0.00	0.30	1.2100	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
12	Link-32	46.93	629.00	0.00	628.70	0.00	0.30	0.6400	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
13	Link-33	39.75	628.50	0.00	628.30	0.00	0.20	0.5000	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No
14	Link-34	16.82	628.50	0.00	628.30	0.00	0.20	1.1900	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
15	Link-35	13.03	627.00	0.00	625.10	0.00	1.90	14.5800	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
16	Link-36	39.45	628.70	0.00	628.30	0.00	0.40	1.0100	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No
17	Link-37	321.03	628.30	0.00	625.10	0.00	3.20	1.0000	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000	0.00	No
18	Link-38	86.60	625.10	0.00	624.21	0.00	0.89	1.0300	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
19	Link-39	301.33	624.21	0.00	621.20	0.00	3.01	1.0000	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
20	Link-40	103.44	621.20	0.00	620.16	0.00	1.04	1.0100	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
21	Link-41	160.83	620.16	0.00	618.56	0.00	1.60	0.9900	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
22	Link-42	114.60	618.56	0.00	617.41	0.00	1.15	1.0000	CIRCULAR	36.000	36.000	0.0150	0.5000	0.5000	0.0000	0.00	No
23	Link-43	228.38	627.00	0.00	625.70	0.00	1.30	0.5700	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
24	Link-45	443.12	629.00	0.00	631.00	0.00	-2.00	-0.4500	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
25	Link-47	449.96	628.50	0.00	631.00	0.00	-2.50	-0.5600	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
26	Link-49	66.34	629.00	0.00	629.00	0.00	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
27	Link-50	68.43	628.50	0.00	628.50	0.00	0.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	No
28	PIPE -01	129.85	608.62	0.00	586.68	0.00	21.94	16.9000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
29	PIPE -02	110.00	609.17	-1.42	608.62	0.00	0.55	0.5000	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
30	PIPE -03	370.00	611.35	-1.50	610.59	0.00	0.76	0.2100	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
31	PIPE -04	574.21	613.72	-3.69	612.85	0.00	0.87	0.1500	CIRCULAR	60.000	60.000	0.0130	0.5000	0.5000	0.0000	0.00	No
32	PIPE -05	76.87	623.56	0.00	617.41	0.00	6.15	8.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
33	PIPE -06	26.63	617.99	0.00	617.41	0.00	0.58	2.1800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
34	PIPE -07	170.54	619.21	0.00	618.70	0.00	0.51	0.3000	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
35	PIPE -08	3.46	620.00	-1.73	619.21	0.00	0.79	22.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
36	PIPE -09	89.00	624.20	0.00	621.73	0.00	2.47	2.7800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
37	PIPE -10	21.99	624.00	0.00	621.73	0.00	2.27	10.3200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
38	PIPE -11	69.47	624.25	0.00	624.00	0.00	0.25	0.3600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
39	PIPE -12	7.97	624.40	0.00	624.20	0.00	0.20	2.5100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
40	PIPE -13	9.23	624.99	0.00	619.21	0.00	5.78	62.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
41	PIPE -14	9.24	623.83	0.00	617.99	0.00	5.84	63.2200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000	0.00	No
42	PIPE -15	75.58	617.56	0.00	617.41	0.00	0.15	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
43	PIPE -16	64.59	617.69	-0.51	617.56	0.00	0.13	0.2000	CIRCULAR	42.000	42.000	0.0130	0.5000	0.5000	0.0000	0.00	No
44	PIPE -17	263.99	619.18	0.00	618.20	0.00	0.98	0.3700	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
45	PIPE -18	155.19	619.77	0.00	619.18	0.00	0.59	0.3800	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
46	PIPE -19	75.31	620.08	0.00	619.77	0.00	0.31	0.4100	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No
47	PIPE -20	41.17	621.88	0.00	620.08	0.00	1.80	4.3700	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000	0.00	No
48	PIPE -21	74.24	625.70	0.00	621.88	0.00	3.82	5.1500	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
49	PIPE -22	17.83	625.04	0.00	619.18	0.00	5.86	32.8900	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
50	PIPE -23	10.57	623.40	0.00	617.56	0.00	5.84	55.2400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
51	PIPE -24	12.60	618.52	0.00	612.85	0.00	5.67	45.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
52	PIPE -25	53.54	621.17	0.00	612.85	0.00	8.32	15.5400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
53	PIPE -26	5.44	615.77	0.00	610.59	0.00	5.18	95.3100	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
54	PIPE -27	60.05	617.28	0.00	610.59	0.00	6.69	11.1400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
55	PIPE -28	61.26	617.76	0.00	617.28	0.00	0.48	0.7800	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
56	PIPE -29	77.56	623.90	0.00	623.56	0.00	0.34	0.4400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
57	PIPE -30	79.15	623.97	0.00	623.56	0.00	0.41	0.5200	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00	No
58	PIPE -31	64.29	618.20	-0.50	617.99	0.00	0.21	0.3300	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000	0.00	No

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-10	4.20	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
2	Link-12	4.81	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
3	Link-13	5.45	0 00:03	0.00	0.00	0.00		0.00	0.00	0.00		
4	Link-14	6.62	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
5	Link-15	5.91	0 00:06	0.00	0.00	0.00		0.00	0.00	0.00		
6	Link-16	0.00	0 00:00	0.00	0.00	0.00		0.00	0.00	0.00		
7	Link-17	5.63	0 00:04	0.00	0.00	0.00		0.00	0.00	0.00		
8	Link-18	3.94	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
9	Link-25	3.20	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
10	Link-26	8.83	0 00:05	0.00	0.00	0.00		0.00	0.00	0.00		
11	Link-31	6.54	0 00:06	9.99	0.65	6.05	0.07	0.88	0.59	0.00		Calculated
12	Link-32	16.53	0 00:06	28.42	0.58	7.43	0.11	1.37	0.55	0.00		Calculated
13	Link-33	10.55	0 00:05	13.91	0.76	5.98	0.11	1.30	0.65	0.00		Calculated
14	Link-34	2.23	0 00:02	9.93	0.22	4.55	0.06	0.48	0.32	0.00		Calculated
15	Link-35	27.12	0 00:05	135.74	0.20	21.59	0.01	0.76	0.30	0.00		Calculated
16	Link-36	21.36	0 00:06	19.74	1.08	7.42	0.09	2.00	1.00	1.00		SURCHARGED
17	Link-37	31.67	0 00:06	35.49	0.89	8.46	0.63	1.80	0.72	0.00		Calculated
18	Link-38	55.18	0 00:05	58.60	0.94	9.48	0.15	2.31	0.77	0.00		Calculated
19	Link-39	54.94	0 00:06	57.77	0.95	9.56	0.53	2.32	0.77	0.00		Calculated
20	Link-40	54.77	0 00:06	57.96	0.94	9.38	0.18	2.32	0.77	0.00		Calculated
21	Link-41	54.63	0 00:06	57.66	0.95	9.40	0.29	2.33	0.78	0.00		Calculated
22	Link-42	54.62	0 00:07	57.91	0.94	9.39	0.20	2.32	0.77	0.00		Calculated
23	Link-43	3.41	0 00:05	0.00	0.94	0.00		2.32	0.77	0.00		Calculated
24	Link-45	0.28	0 00:02	0.00	0.00	0.00		0.05	0.10	0.00		Calculated
25	Link-47	0.01	0 00:02	0.00	0.00	0.00		0.05	0.10	0.00		Calculated
26	Link-49	6.59	0 00:06	0.00	0.00	0.00		0.05	0.10	0.00		Calculated
27	Link-50	0.89	0 00:05	0.00	0.00	0.00		0.05	0.10	0.00		Calculated
28	PIPE -01	223.54	0 00:06	1070.54	0.21	43.08	0.05	1.55	0.31	0.00		Calculated
29	PIPE -02	223.54	0 00:05	348.54	0.64	18.83	0.10	2.91	0.58	0.00		Calculated
30	PIPE -03	184.79	0 00:06	203.55	0.91	11.99	0.51	3.73	0.75	0.00		Calculated
31	PIPE -04	129.14	0 00:05	232.09	0.56	12.45	0.77	2.65	0.53	0.00		Calculated
32	PIPE -05	20.55	0 00:03	63.99	0.32	18.17	0.07	0.78	0.39	0.00		Calculated
33	PIPE -06	38.24	0 00:03	98.44	0.39	13.06	0.03	1.30	0.43	0.00		Calculated
34	PIPE -07	24.31	0 00:03	22.47	1.08	5.65	0.50	2.50	1.00	3.00		SURCHARGED
35	PIPE -08	25.80	0 00:04	89.61	0.29	43.82	0.00	0.55	0.37	0.00		Calculated
36	PIPE -09	9.37	0 00:05	17.50	0.54	10.27	0.14	0.78	0.52	0.00		Calculated
37	PIPE -10	17.45	0 00:04	33.75	0.52	19.25	0.02	0.76	0.51	0.00		Calculated
38	PIPE -11	6.81	0 00:08	6.30	1.08	6.59	0.18	1.50	1.00	5.00		SURCHARGED
39	PIPE -12	9.40	0 00:05	16.64	0.57	9.70	0.01	0.81	0.54	0.00		Calculated
40	PIPE -13	7.09	0 00:04	83.12	0.09	28.70	0.01	0.30	0.20	0.00		Calculated
41	PIPE -14	16.33	0 00:03	83.52	0.20	36.68	0.00	0.45	0.30	0.00		Calculated
42	PIPE -15	48.68	0 00:04	44.99	1.08	5.51	0.23	3.50	1.00	2.00		SURCHARGED
43	PIPE -16	43.83	0 00:07	100.07	0.44	10.10	0.11	1.62	0.46	0.00		Calculated
44	PIPE -17	43.90	0 00:07	40.58	1.08	7.04	0.62	2.80	0.93	0.00		> CAPACITY
45	PIPE -18	44.60	0 00:06	41.23	1.08	6.96	0.37	2.75	0.92	0.00		> CAPACITY
46	PIPE -19	45.46	0 00:05	42.79	1.06	7.06	0.18	2.71	0.90	0.00		> CAPACITY
47	PIPE -20	43.18	0 00:05	85.76	0.50	17.55	0.04	1.25	0.50	0.00		Calculated
48	PIPE -21	33.68	0 00:06	51.32	0.66	17.46	0.07	1.18	0.59	0.00		Calculated
49	PIPE -22	7.40	0 00:03	129.74	0.06	22.40	0.01	0.32	0.16	0.00		Calculated
50	PIPE -23	14.41	0 00:04	168.14	0.09	32.71	0.01	0.40	0.20	0.00		Calculated
51	PIPE -24	29.61	0 00:06	151.75	0.20	37.45	0.01	0.60	0.30	0.00		Calculated
52	PIPE -25	32.25	0 00:06	89.18	0.36	26.10	0.03	0.83	0.42	0.00		Calculated
53	PIPE -26	16.61	0 00:04	220.85	0.08	41.42	0.00	0.37	0.19	0.00		Calculated
54	PIPE -27	25.06	0 00:05	75.51	0.33	21.59	0.05	0.79	0.40	0.00		Calculated
55	PIPE -28	11.19	0 00:05	20.02	0.56	8.41	0.12	1.07	0.53	0.00		Calculated
56	PIPE -29	6.79	0 00:03	14.98	0.45	5.27	0.25	0.94	0.47	0.00		Calculated
57	PIPE -30	12.35	0 00:03	16.28	0.76	5.83	0.23	1.29	0.65	0.00		Calculated
58	PIPE -31	24.36	0 00:03	70.09	0.35	9.23	0.12	1.22	0.41	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft²)	Grate Clogging Factor (%)
1	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.76	623.10	5.34	617.76	0.00	N/A	0.00
2	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	617.28	623.63	6.35	617.28	0.00	N/A	0.00
3	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	615.77	624.15	8.38	615.77	0.00	N/A	0.00
4	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Grade	1	618.52	626.96	8.44	618.52	0.00	N/A	0.00
5	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Grade	1	621.17	626.90	5.73	621.17	0.00	N/A	0.00
6	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.83	628.26	4.43	623.83	0.00	0.00	0.00
7	Inlet-07	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.99	629.28	4.29	624.99	0.00	0.00	0.00
8	Inlet-08	FHWA HEC-22 GENERIC	N/A	On Sag	1	624.00	629.75	5.75	624.00	0.00	0.00	0.00
9	Inlet-09	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.25	630.02	5.77	624.25	0.00	N/A	0.00
10	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Grade	1	624.40	630.02	5.62	624.40	0.00	N/A	0.00
11	Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.40	628.44	5.04	623.40	0.00	0.00	0.00
12	Inlet-12	FHWA HEC-22 GENERIC	N/A	On Grade	1	625.04	629.37	4.33	625.04	0.00	N/A	0.00
13	Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	621.88	630.33	8.45	621.88	0.00	0.00	0.00
14	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	625.70	630.35	4.65	625.70	0.00	0.00	0.00
15	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.97	628.94	4.97	623.97	0.00	0.00	0.00
16	Inlet-16	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.90	628.75	4.85	623.90	0.00	0.00	0.00
17	Inlet-17	FHWA HEC-22 GENERIC	N/A	On Sag	1	623.56	628.75	5.19	623.56	0.00	0.00	0.00
18	Inlet-19	FHWA HEC-22 GENERIC	N/A	On Grade	1	629.00	634.20	5.20	629.00	0.00	N/A	0.00
19	Inlet-20	FHWA HEC-22 GENERIC	N/A	On Grade	1	629.00	635.10	6.10	0.00	0.00	N/A	0.00
20	Inlet-21	FHWA HEC-22 GENERIC	N/A	On Grade	1	628.50	634.80	6.30	628.50	0.00	N/A	0.00
21	Inlet-22	FHWA HEC-22 GENERIC	N/A	On Grade	1	628.50	634.00	5.50	0.00	0.00	N/A	0.00
22	Inlet-23	FHWA HEC-22 GENERIC	N/A	On Grade	1	627.00	633.00	6.00	627.00	0.00	N/A	0.00

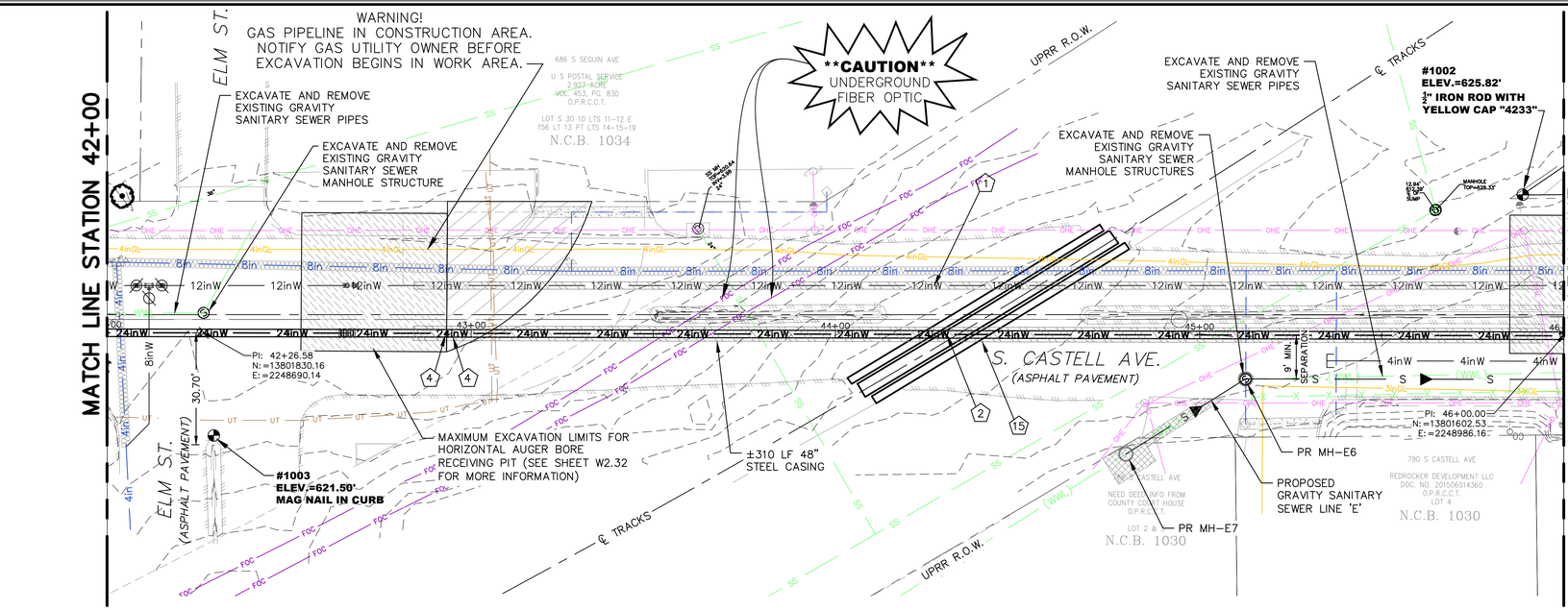
Roadway & Gutter Input

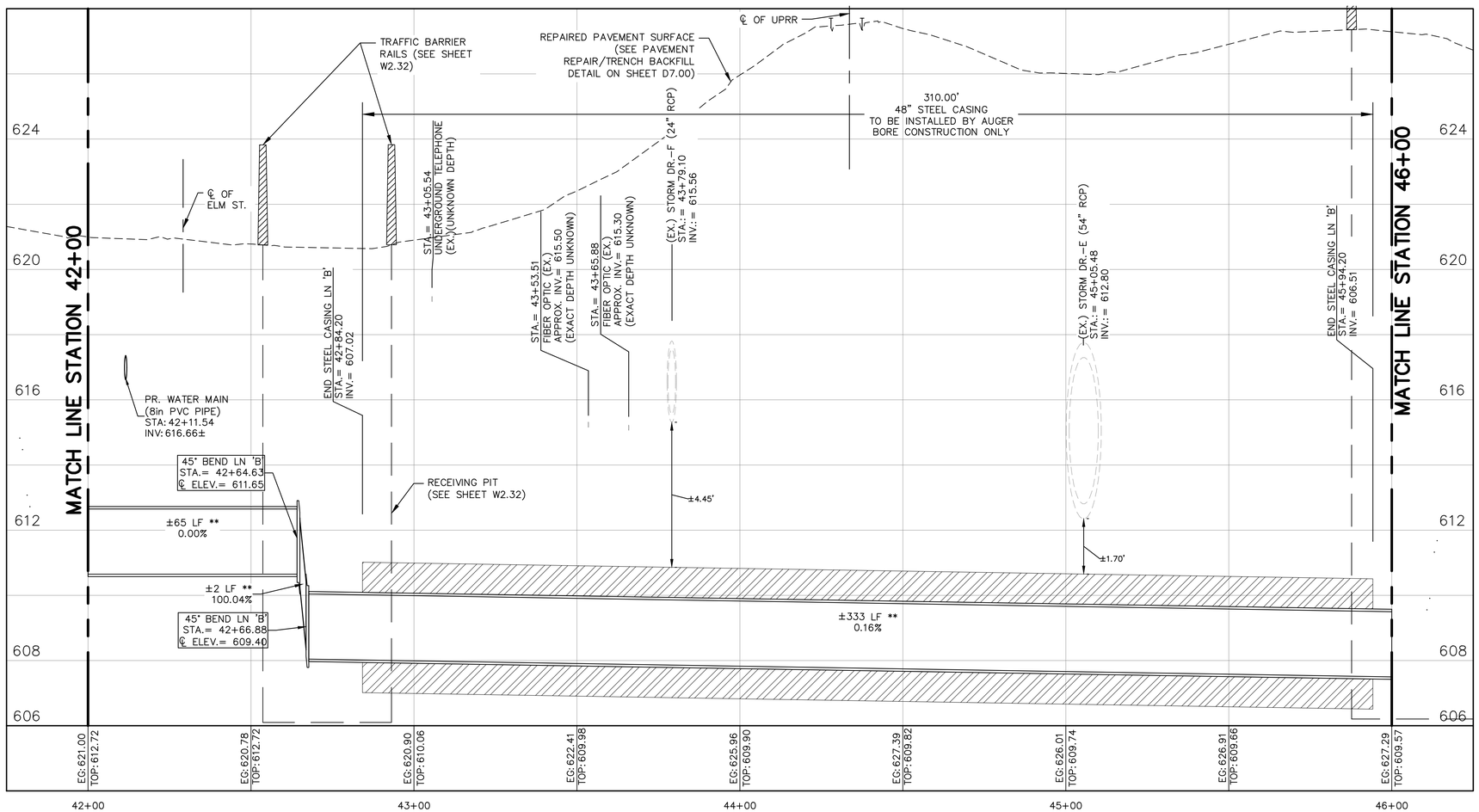
SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	Inlet-01	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00
2	Inlet-02	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
3	Inlet-03	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
4	Inlet-04	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
5	Inlet-05	0.0050	0.0200	0.0160	0.0620	2.00	0.0984	7.00
6	Inlet-06	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
7	Inlet-07	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
8	Inlet-08	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
9	Inlet-09	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
10	Inlet-10	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
11	Inlet-11	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
12	Inlet-12	0.0080	0.0200	0.0160	0.0620	2.00	0.0984	7.00
13	Inlet-13	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
14	Inlet-14	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
15	Inlet-15	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
16	Inlet-16	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
17	Inlet-17	N/A	0.0200	0.0160	0.0620	2.00	0.0984	7.00
18	Inlet-19	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
19	Inlet-20	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
20	Inlet-21	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
21	Inlet-22	0.0150	0.0200	0.0160	0.0620	2.00	0.0984	7.00
22	Inlet-23	0.0100	0.0200	0.0160	0.0620	2.00	0.0984	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Inlet-01	15.17	15.17	11.23	3.94	74.03	19.67	623.58	0.48	0 00:05	0.00	0.00
2	Inlet-02	16.79	16.79	11.17	5.62	66.53	18.84	624.09	0.46	0 00:05	0.00	0.00
3	Inlet-03	14.95	14.95	14.95	0.00	100.00	18.11	624.60	0.45	0 00:04	0.00	0.00
4	Inlet-04	35.53	35.53	29.62	5.91	83.36	31.11	627.67	0.71	0 00:06	0.00	0.00
5	Inlet-05	37.08	37.08	30.46	6.62	82.15	31.59	627.62	0.72	0 00:06	0.00	0.00
6	Inlet-06	8.19	8.19	N/A	N/A	N/A	20.47	629.00	0.74	0 00:03	0.00	0.00
7	Inlet-07	7.12	7.12	N/A	N/A	N/A	23.20	630.08	0.80	0 00:04	0.00	0.00
8	Inlet-08	9.16	9.16	N/A	N/A	N/A	43.87	630.96	1.21	0 00:02	0.00	0.00
9	Inlet-09	10.03	10.03	6.84	3.19	68.19	17.44	630.45	0.43	0 00:02	0.42	6.00
10	Inlet-10	18.23	18.23	9.42	8.81	51.66	21.95	630.54	0.52	0 00:05	0.00	0.00
11	Inlet-11	7.22	7.22	N/A	N/A	N/A	18.77	629.15	0.71	0 00:04	0.00	0.00
12	Inlet-12	11.61	11.61	7.41	4.20	63.83	18.49	629.82	0.45	0 00:03	0.00	0.00
13	Inlet-13	19.29	19.29	N/A	N/A	N/A	23.05	631.13	0.80	0 00:05	0.00	0.00
14	Inlet-14	33.18	33.18	N/A	N/A	N/A	34.48	631.37	1.02	0 00:06	0.00	0.00
15	Inlet-15	8.49	8.49	N/A	N/A	N/A	16.43	629.60	0.66	0 00:03	0.00	0.00
16	Inlet-16	7.00	7.00	N/A	N/A	N/A	14.45	629.37	0.62	0 00:03	0.00	0.00
17	Inlet-17	3.38	3.38	N/A	N/A	N/A	11.34	629.31	0.56	0 00:03	0.00	0.00
18	Inlet-19	3.59	3.59	3.31	0.27	92.36	10.13	634.49	0.29	0 00:06	0.00	0.00
19	Inlet-20	23.17	23.17	16.59	6.58	71.58	21.40	635.61	0.51	0 00:06	0.00	0.00
20	Inlet-21	11.50	11.50	10.61	0.89	92.23	16.28	635.21	0.41	0 00:05	0.00	0.00
21	Inlet-22	2.25	2.25	2.25	0.00	100.00	8.24	634.25	0.25	0 00:02	0.00	0.00
22	Inlet-23	30.56	30.56	27.15	3.41	88.85	25.70	633.60	0.60	0 00:05	0.00	0.00

APPENDIX F – RECORD PLANS





NOTES:

* WATER MAIN
(PVC) (C-900)
(PC 200)(4" TO 24")

** WATER MAIN
(DI)(C-151)
(CL 250)(14" AND LARGER)
(CL 350)(12" AND SMALLER)

KEY NOTE LEGEND:

1. 12" WATER MAIN LINE 'A'
2. 24" WATER MAIN LINE 'B'
3. 24" BUTTERFLY VALVE MJ
4. 24" 45° BEND MJ (398#)
5. 24" 22.5° BEND MJ (333#)
6. 24" 11.25° BEND MJ (304#)
7. 12"x8" REDUCER (57#)
8. 24" TIE-IN MJ
9. 24" END CAP MJ (232#)
10. 8" WATER LINE (PVC; AWWA C-100)
11. 24"x12" TEE MJ (549#)
12. 12" GATE VALVE MJ
13. 2" BLOW OFF ASSEMBLY ON 8" PVC WATER MAIN
14. 48" STEEL PIPE ENCASEMENT, SPACERS, AND BEND SEALS (OPEN CUT OR HORIZ. AUGER BORE INSTALLATION)
15. 48" STEEL PIPE ENCASEMENT, SPACERS, AND BEND SEALS (HORIZONTAL AUGER BORE INSTALLATION)
16. 24"x6" TEE MJ (465#)
17. 24" TEE MJ (844#)
18. 2" AIR RELEASE VALVE, BOX, AND COVER
19. LOW-POINT DRAIN ASSEMBLY
20. 6" 22.5° BEND MJ (31#)

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

UTILITY NOTES:

1. CONTRACTOR AND / OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.
2. NO VALVES, HYDRANTS, CLEANOUTS, ETC. SHALL BE CONSTRUCTED WITHIN CURBS OR DRIVEWAYS.
3. ALL UTILITY TRENCH COMPACTION TESTS WITHIN THE STREET PAVEMENT/SIDEWALK SECTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR'S GEOTECHNICAL ENGINEER. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS NOT TO EXCEED EIGHT INCHES (8") LOOSE. DETERMINE THE MAXIMUM LIFT THICKNESS BASED ON THE ABILITY OF THE COMPACTING OPERATION AND EQUIPMENT USED TO MEET THE REQUIRED DENSITY. EACH LAYER OF MATERIAL SHALL BE COMPACTED TO A MINIMUM 95% DENSITY AND TESTED FOR DENSITY AND MOISTURE IN ACCORDANCE WITH TEST METHODS TEX-113-E, TEX-114-E, TEX-115-E. THE NUMBER AND LOCATION OF REQUIRED TEST SHALL BE DETERMINED BY THE GEOTECHNICAL ENGINEER AND APPROVED BY THE CITY OF NEW BRAUNFELS STREET INSPECTOR. AT A MINIMUM, TESTS SHALL BE TAKEN EVERY 200 LF FOR EACH OF LIFT AND EVERY OTHER SERVICE LINE. UPON COMPLETION OF TESTING THE GEOTECHNICAL ENGINEER SHALL PROVIDE THE CITY OF NEW BRAUNFELS STREET INSPECTOR WITH ALL TESTING DOCUMENTATION AND A CERTIFICATION STATING THAT THE PLACEMENT OF FILL MATERIAL HAS BEEN COMPLETED IN ACCORDANCE WITH THE PLANS. ADDITIONAL DENSITY TEST MAY BE REQUESTED BY THE CITY OF NEW BRAUNFELS INSPECTOR.
4. THIS PROJECT INCLUDES UTILITY INSTALLATIONS GREATER THAN 5-FEET IN DEPTH LOCATED IN A PUBLIC RIGHT-OF-WAY OR EASEMENTS. DEEP TRENCHES POSE COMPACTION TESTING AND CONSTRUCTION CHALLENGES AND CITY METHODS FOR TESTING AND COMPACTION MAY NOT BE ACHIEVABLE. A UTILITY COMPACTION PLAN WILL BE REQUIRED AND MUST BE SUBMITTED FOR APPROVAL TO CITY PRIOR TO UTILITY INSTALLATION.
5. ALL MJ FITTINGS INSTALLED DIRECTLY ADJACENT TO OTHER MJ FITTINGS OR VALVES SHALL BE PROVIDED WITH APPROPRIATELY SIZED BOLT-THROUGH RESTRAINTS ("FOSTER ADAPTORS" AS MANUFACTURED BY THE IN-FACT WATER UTILITY PRODUCTS COMPANY, OR APPROVED EQUIVALENT). THESE ARE NON-SEPARATE PAY ITEMS, AND ARE SUBSIDIARY TO THE INSTALLATION OF WATER MAIN PIPE AND FITTINGS.
6. EXISTING UTILITY MATERIALS OF CONSTRUCTION ARE UNKNOWN.
7. THIS LOCATION IS THE APPROXIMATE CONNECTION POINT BETWEEN THE NORTHWESTERN AND SOUTHEASTERN "LEGS" OF THE PROPOSED 24-INCH WATER TRANSMISSION MAIN AT CASTELL AVENUE. THE NORTHWESTERN SEGMENT OF THE PROJECT WILL BE CONSTRUCTED BY OTHERS. CONTRACTOR SHALL COORDINATE WITH THE OWNER, ENGINEER, AND OTHERS TO DETERMINE THE SPECIFIC DEPTH AND HORIZONTAL ALIGNMENT REQUIRED FOR A SUCCESSFUL CONNECTION OF THE TWO WATER TRANSMISSION MAIN PIPELINE SEGMENTS AT THIS LOCATION.
8. CONTRACTOR SHALL PROVIDE ADEQUATE DEPTH OF THE AIR RELEASE VALVE WITHIN THE BOX SO THAT THE VENT PIPE CAN BE TERMINATED AND SCREEN PROTECTED AT A POINT JUST BELOW THE BOTTOM SURFACE OF THE COVER PLATE (FOR ALL LOCATIONS WHERE THE POST SUPPORTED VENT PIPE CANNOT BE INSTALLED AS SHOWN WITHIN THE NBU STANDARD DETAIL).

Texas811
Know what's below.
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URBAN CIVIL
190 S. SEGUIN AVENUE NEW BRAUNFELS, TEXAS 78130
PHONE (830) 606-3913 FAX (830) 625-2204
TBPE FIRM# 17233 TBPLS FIRM# 10005900

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TEXAS REGISTRATION 81588
DATE: 8/7/20
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WATER LINE 'B' PLAN AND PROFILE
STA: 42+00 TO STA. 46+00
CASTELL AVENUE
WATER AND SEWER REHABILITATION
NEW BRAUNFELS, TEXAS

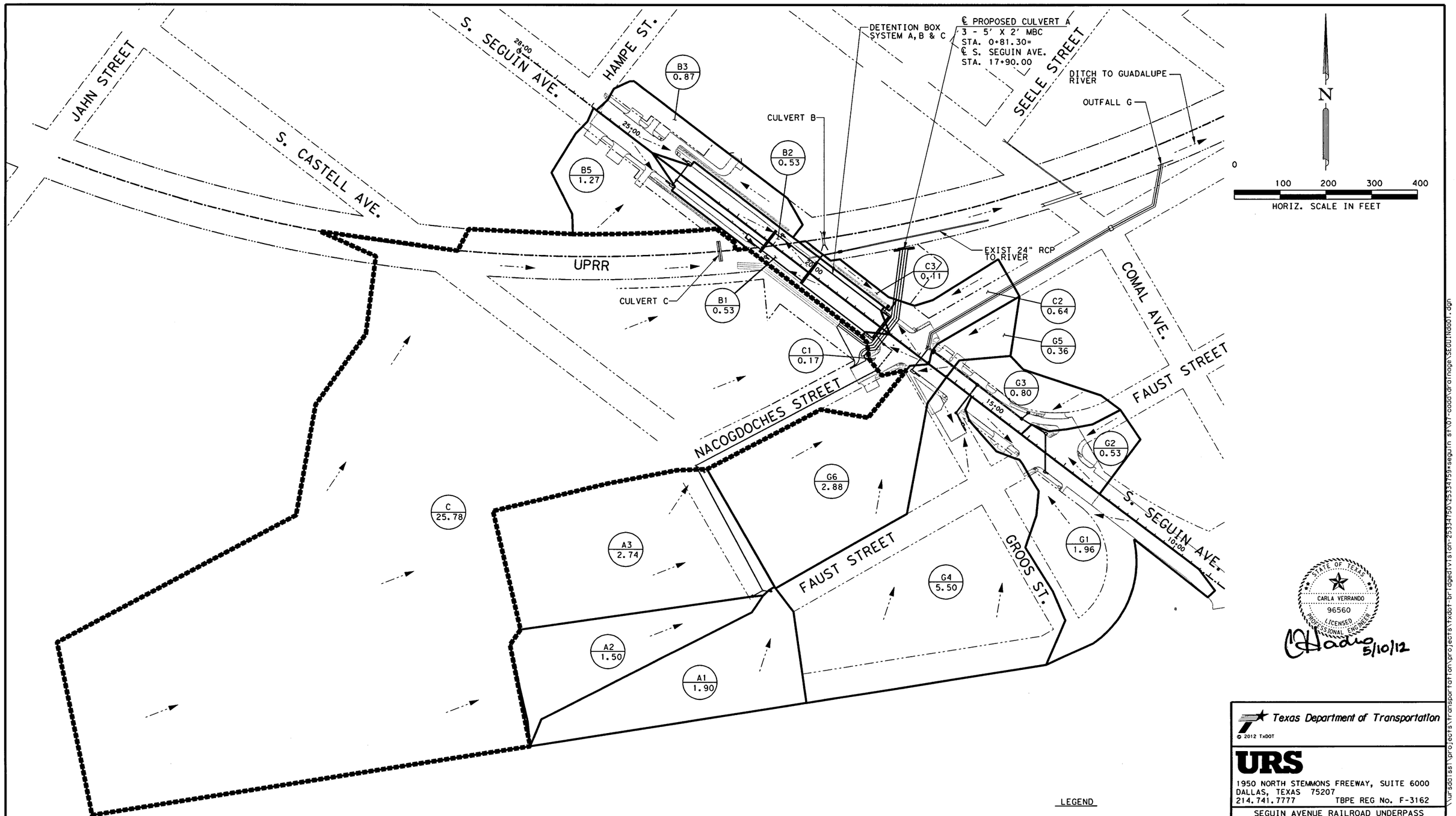
REVISIONS

DATE	DESCRIPTION

DRAWN BY: D.C.
CHECKED BY: S.B.H./C.D.W.
DATE: JUNE 2020
JOB NO.: 1908.06

W2.23

File Name: P:\Engineering\2019\1908\06\DESIGN\DWGS\1908.06_Castel-WW-2.dwg
Friday, August 7, 2020 12:45:04 PM



LEGEND

XX / X.XX	DRAINAGE AREA (ID) / DRAINAGE AREA (ACRES)
———	DRAINAGE AREA
■■■■■■	CULVERT A DRAINAGE DIVIDE
◄- - - -	DRAINAGE FLOW DIRECTION

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER

5/10/12

Texas Department of Transportation

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URS
1950 NORTH STEMMONS FREEWAY, SUITE 6000
DALLAS, TEXAS 75207
214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE AREA MAP

1" = 200'

SHEET 1 OF 1

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			139
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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HYDROLOGY CALCULATIONS

DA No.	AREA acre	RUNOFF COEFFICIENT PAVNT C= 0.95	COMM C= 0.45	RESID. C= 0.40	Cw	T_c min	INTENSITY I2 in/hr	I5 in/hr	I10 in/hr	I25 in/hr	I50 in/hr	I100 in/hr	PEAK FLOWS Q2 cfs	Q5 cfs	Q10 cfs	Q25 cfs	Q50 cfs	Q100 cfs	NOTES
SYSTEM A																			
A1	1.90	0.9	0.00	1.00	0.66	10.00	5.51	7.04	8.10	9.27	10.07	11.55	6.92	8.83	10.16	11.63	12.64	14.49	EXISTING TO DETENTION
A2	1.50	0.5	0.00	1.00	0.58	10.00	5.51	7.04	8.10	9.27	10.07	11.55	4.81	6.14	7.07	8.09	8.79	10.08	
A3	2.74	0.3	0.00	2.44	0.46	12.00	5.08	6.50	7.48	8.57	9.33	10.68	6.40	8.19	9.43	10.81	11.76	13.46	
TOTAL	6.14	1.70	0.00	4.44	0.55	10.67	5.37	6.86	7.89	9.04	9.82	11.26	18.14	23.17	26.66	30.54	33.19	38.04	
SYSTEM B																			
B1	0.53	0.53	0.00	0.00	0.95	10.00	5.51	7.04	8.10	9.27	10.07	11.55	2.75	3.51	4.04	6.74	5.03	5.77	SEGUIN AVE SAG TO DETENTION
B2	0.53	0.53	0.00	0.00	0.95	10.00	5.51	7.04	8.10	9.27	10.07	11.55	2.75	3.51	4.04	6.15	5.03	5.76	
B3	0.87	0.32	0.54	0.00	0.64	10.00	5.51	7.04	8.10	9.27	10.07	11.55	3.05	3.89	4.47	5.12	5.56	6.38	
B5	1.27	0.15	1.12	0.00	0.51	10.00	5.51	7.04	8.10	9.27	10.07	11.55	3.57	4.55	5.24	5.99	6.51	7.47	
TOTAL	3.19	1.52	1.67	0.00	0.69	10.00	5.51	7.04	8.10	9.27	10.07	11.55	12.12	15.47	17.79	24.01	22.14	25.38	
SYSTEM C																			
C1	0.17	0.14	0.03	0.00	0.85	10.00	5.51	7.04	8.10	9.27	10.07	11.55	0.81	1.04	1.19	1.37	1.49	1.70	SEGUIN AVE TO DETENTION
C2	0.64	0.34	0.30	0.00	0.72	10.00	5.51	7.04	8.10	9.27	10.07	11.55	2.52	3.21	3.70	4.23	4.60	5.27	
C3	0.11	0.00	0.11	0.00	0.45	10.00	5.51	7.04	8.10	9.27	10.07	11.55	0.27	0.34	0.39	0.45	0.49	0.56	
TOTAL	0.92	0.48	0.44	0.00	0.71	10.00	5.51	7.04	8.10	9.27	10.07	11.55	3.60	4.59	5.28	6.05	6.57	7.53	
C	25.78	5.90	5.62	14.26	0.54	17.20	4.24	5.45	6.28	7.21	7.87	8.99	58.66	75.42	86.93	104.56	124.46	148.05	CULVERT A
SYSTEM G																			
G1	1.96	0.94	1.02	0.00	0.69	10.00	5.51	7.04	8.10	9.27	10.07	11.55	7.45	9.51	10.95	12.53	13.62	15.61	TO EXISTING 2-42" PIPES TO DITCH
G2	0.53	0.29	0.24	0.00	0.73	10.00	5.51	7.04	8.10	9.27	10.07	11.55	2.10	2.68	3.09	3.53	3.84	4.40	
G3	0.80	0.32	0.48	0.00	0.65	10.00	5.51	7.04	8.10	9.27	10.07	11.55	2.87	3.67	4.22	4.83	5.25	6.02	
G4	5.50	1.03	0.77	3.70	0.51	17.26	4.23	5.44	6.27	7.20	7.86	8.97	11.87	15.26	17.59	20.21	22.05	25.18	
G5	0.36	0.06	0.29	0.00	0.54	10.00	5.51	7.04	8.10	9.27	10.07	11.55	1.06	1.35	1.56	1.78	1.94	2.22	
G6	2.88	0.05	0.30	2.53	0.41	10.00	5.51	7.04	8.10	9.27	10.07	11.55	6.58	8.40	9.66	11.07	12.02	13.78	
TOTAL	12.03	2.69	3.10	6.23	0.54	11.21	5.30	6.77	7.79	8.93	9.70	11.12	31.94	40.88	47.07	53.96	58.72	67.22	

INLET ANALYSIS

INLET NO.	STATION/OFFSET					DESIGN FREQ. (YRS)	INLET CAPACITY (CFS)	DISCHARGE (CFS)	BYPASS FLOW (CFS)	BYPASS TO	INLET CURB LENGTH DESIGN (FT)	GRATE AREA (FT*2)	GRATE PERIMETER (FT)	LONGITUDINAL SLOPE (%)	ALLOWABLE PONDED WIDTH (FT)	ACTUAL PONDED WIDTH (FT)	PONDED DEPTH (FT)	ALLOWABLE HEAD (FT)	ACTUAL HEAD (FT)	REMARKS
B1	SGN	20+97.00	,	30.38	LT	25	12.52	7.63	0		10				17	8.54	0.36	0.5		SAG CURB
B2	SGN	20+97.00	,	30.38	RT	25	12.52	6.91	0		10				17	8.23	0.34	0.5		SAG CURB
B3	SGN	23+54.25	,	30.38	RT	5	3.38	3.89	0.51	B2	20			5.54	17	8.3	0.17	0.5		CURB
B5	SGN	23+54.25	,	30.38	LT	5	3.78	4.56	0.78	B1	20			5.54	17	8.81	0.18	0.5		CURB
C1	SGN	18+17.75	,	30.38	LT	5	2.58	2.68	0.11	B1	20			5.17	17	7.31	0.15	0.50		ON GRADE CURB
C2	SGN	18+17.75	,	30.38	RT	5	3	3.26	0.26	B2	20			5.17	17	7.86	0.16	0.50		ON GRADE CURB
C3	SGN	18+17.75	,	46.08	RT	5	32.8	0.34	0.00			7	14					0.75	0.05	SAG GRATE ON WALL A
C4	UPRR	12064+08	,	33.67	LT	5	29.57	29.57	0			34.2	29.5					0.75	0	SAG GRATE ON DITCH
G1	SGN	13+25.00	,	32.50	LT	5	12.52	9.51	0		10				20	14.8	0.42	0.50		SAG CURB
G2	SGN	13+74.00	,	32.50	RT	5	8.46	2.68	0.00		5.00				20.00	11.18	0.23	0.50		SAG CURB
G3	SGN	14+32.00	,	45.84	RT	5	8.46	3.67	0.00		5.00				8.00	7.66	0.29	0.50		SAG CURB
G4	GROOS	10+61.00	,	19.75	RT	5	15.50	15.26	0.00		15.00				12.00	11.89	0.32	0.50		SAG CURB
G5	SGN	16+78.95	,	28.00	RT	5	1.31	1.35	0.04	C2		34.20	29.50	1.59	20.00	7.06		0.50	0.14	ON GRADE GRATE
G6	SGN	16+88.11	,	33.38	LT	5	6.76	8.4	1.64	C1	20			1.85	20	13.59	0.27	0.5		ON GRADE CURB

STORM SEWER CALCULATIONS

LINE	FROM	TO	FREQ. (YRS)	TIME OF CONCENTRATION (MIN)	INTENSITY (IN/HR)	CUMULATIVE DISCHARGE (CFS)	CAPACITY (CFS)	LENGTH (FT)	SIZE		SLOPE (%)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	ACTUAL VELOCITY (FT/S)	NOTES	100 YR ANALYSIS CUMULATIVE DISCHARGE (CFS)	HGL UPSTREAM (FT)	HGL DOWNSTREAM (FT)	ACTUAL VELOCITY (FT/S)
A	AJ4	A-OUT	5	12.8	0	14.52	24.26	25.97	18"	RCP	3.93	606.24	604.77	11.39	LINE A, CL IV	24.05	606.5	605.25	13.61
B1	B1	B1-OUT	25	0.16	0.00	7.63	7.64	6.17	18"	RCP	0.39	601.13	600.86	4.32	LINE B1, CL IV	13.62	602.73	600.86	7.71
	B2	B2-OUT	25	0.16	0.00	6.91	7.64	6.17	18"	RCP	0.39	601.01	600.86	3.91	LINE B2, CL IV	11.60	602.08	600.86	6.56
B3	B5	BJ3	5	10.11	7	3.78	29.6	14.87	18"	RCP	5.85	608.55	607.03	8.64	LAT B5	5.95	608.92	607.17	9.36
	B3	BJ3	5	10.11	7	3.38	16.86	45.87	18"	RCP	1.9	608.48	607.07	6.85	LAT B3	5.41	608.83	607.22	7.65
	BJ3	B3-OUT	5	10.4	0	7.12	23.4	196.25	18"	RCP	3.65	607.62	600.01	11	LINE B3, CL IV	11.29	607.87	600.19	12.38
C1	C1	C1-OUT	5	10.04	7.02	2.58	38.71	0.92	18"	RCP	10	610.07	608.29	9.76	LINE C1	5.82	610.4	608.48	11.09
C2	C3	C2	5	10.04	7.02	0.34	38.56	11.09	18"	RCP	9.92	613.25	613.25	2	LINE C2	0.7	613.47	613.47	0.39
	C2	C2-OUT	5	10.04	7.02	3.33	38.64	0.9	18"	RCP	9.96	613.25	608.3	12.27	LINE C2	5.63	613.47	608.4	13.82
G	G1	G2	5	10.29	6.95	9.51	14.46	81.4	24"	RCP	0.3	614.74	614.27	3.95	LINE G, CL IV	19.52	616.24	615.73	6.21
	G2	MH-GJ1	5	10.5	6.89	12.05	14.52	57.7	24"	RCP	0.3	614.27	613.91	5.85	LINE G, CL IV	24.8	615.73	615.09	7.9
	G3	MH-GJ1	5	10.5	6.89	3.67	25.19	16.3	18"	RCP	4.23	614.92	613.62	8.07	LAT G1, CL IV	7.52	615.58	613.86	9.28
	GJ1	MH-GJ2	5	17.61	5.38	15.54	26.17	120.13	30"	RCP	0.3	613.62	613.14	5.82	LINE G, CL IV	32.09	615.09	614.45	6.54
	G4	MH-GJ4	5	17.36	5.44	15.26	15.64	29.85	24"	RCP	0.35	614.46	613.7	5.54	LAT G2, CL IV	31.47	617.49	615.73	10.02
	MH-GJ	GJ2	5	17.61	5.38	15.26	15.51	76.61	24"	RCP	0.35	613.7	613.21	6.46	LAT G2, CL IV	31.47	615.73	614.45	10.02
	GJ2	G5	5	17.95	5.33	27.24	42.58	117.94	36"	RCP	0.3	613.14	612.76	6.1	LINE G	56.47	614.45	613.66	8.41
	G5	GJ3	5	17.99	5.32	27.95	42.86	7.24	36"	RCP	0.3	612.76	612.64	6.71	LINE G	58.01	613.66	613.39	9.33
	G6	GJ3	5	17.99	5.32	6.76	22.3	56.94	18"	RCP	3.32	614.91	612.04	10.04	LAT G3, CL IV	10.53	615.72	612.23	11.05

NOTE: LINES A, B1, B3 & C1-C2 OUTFALL IN DETENTION BOXES.
SEE DETENTION CALCULATIONS FOR MORE INFORMATION.

STATE OF TEXAS
CARLA VERRANDO
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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE CALCULATIONS

SHEET 1 OF 1

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			140
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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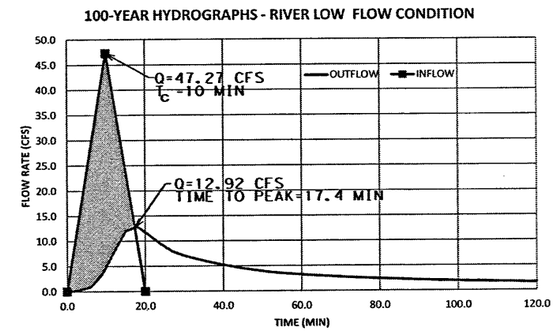
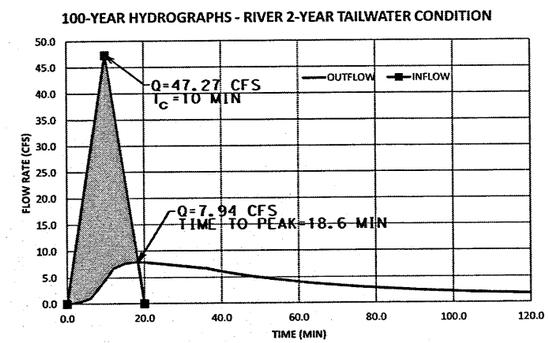
DRAINAGE INFLOW SUMMARY				
DRAINAGE AREA	HYDROGRAPH VOLUME (AC-FT)	TIME TO PEAK (HOURS)	PEAK FLOW (CFS)	NOTES
B1	0.0995	0.167	7.21	
B2	0.0993	0.167	7.20	
B3	0.0557	0.167	4.04	
B5	0.0795	0.167	5.76	
C1	0.0294	0.167	2.13	
C2	0.0909	0.167	6.59	
C3	0.0097	0.167	0.70	
Off-site A1-A3	0.2003	0.167	14.52	THE DISCHARGES FROM THE OFF-SITE BASINS A1, A2 AND A3 FLOW INTO THE PROPOSED BOX CULVERTS THROUGH AN EXISTING 15-INCH PIPE. THE CAPACITY OF THE PIPE, WHICH IS LESS THAN THE PEAK FLOW FROM THE BASINS, IS ACTUALLY USED TO DEFINE THE INFLOW FOR THE BASINS.

DETENTION BOX ELEVATION- VOLUME RELATIONSHIP		
ELEVATION (FT)	VOLUME (AC -FT)	NOTES
599.26	0	
599.46	0.0316	
599.50	0.0433	
600.00	0.1890	
600.50	0.3348	
600.76	0.4106	
601.00	0.4584	
601.26	0.5101	
601.46	0.5499	
601.50	0.5579	VOLUME FOR 2-YEAR TAILWATER CALCULATION

OUTLET CONTROL STRUCTURE			
PIPE SIZE (IN)	SLOPE (%)	LENGTH (FT)	UPSTREAM INVERT ELEVATION (FT)
24	0.12	53	599.26

OUTFLOW HYDROGRAPH- RIVER LOW FLOW CONDITION		OUTFLOW HYDROGRAPH - RIVER 2-YEAR TAILWATER CONDITION	
TIME (MIN)	Q PEAK (CFS)	TIME (MIN)	Q PEAK (CFS)
0	0.00	0	0.00
3	0.23	3	0.26
6	0.91	6	1.02
9	3.48	9	3.71
12	7.86	12	6.72
15	12.01	15	7.65
18	12.86	18	7.93
21	11.20	21	7.80
24	9.41	24	7.59
27	7.94	27	7.35
30	7.09	30	7.11
33	6.45	33	6.89
36	5.88	36	6.67
39	5.37	39	6.24
42	4.91	42	5.85
45	4.50	45	5.49
48	4.14	48	5.16
51	3.82	51	4.85
54	3.56	54	4.57
57	3.38	57	4.31
60	3.21	60	4.06
63	3.06	63	3.84
66	2.92	66	3.63
69	2.78	69	3.43
72	2.66	72	3.26
75	2.55	75	3.09
78	2.44	78	2.94
81	2.35	81	2.80
84	2.26	84	2.67
87	2.17	87	2.55
90	2.09	90	2.44
93	2.02	93	2.34
96	1.96	96	2.24
99	1.90	99	2.16
102	1.84	102	2.08
105	1.79	105	2.00
108	1.74	108	1.93
111	1.69	111	1.87
114	1.65	114	1.81
117	1.61	117	1.76
120	1.57	120	1.71





OUTPUT SUMMARY							
CASE	PEAK INFLOW (CFS)	TOTAL HYDROGRAPH VOLUME (AC-FT)	MAX RELEASED OUTFLOW (CFS)	WATER SURFACE ELEVATION (FT)	MAXIMUM STORAGE VOLUME (AC-FT)	MAXIMUM STORAGE VOLUME (CU-FT)	RIVER TAILWATER ELEVATION (FT)
RIVER LOW FLOW TAILWATER	47.27	2.8578	12.92	601.32	0.5220	22,738	NA
RIVER 2-YEAR TAILWATER	47.27	2.8578	7.94	601.48	0.5541	24,137	598.9

NOTES:

1. THE RESULTS OF DRAINAGE CALCULATIONS PERFORMED FOR THE PROPOSED CONDITIONS WERE USED AS THE INFLOW HYDROGRAPHS OF THE STUDY. THE OUTFLOW HYDROGRAPHS WERE ESTIMATED BY SETTING A 24-INCH PIPE EXTENDED FROM THE EXISTING PIPE AS THE OUTLET STRUCTURE OF THE PROPOSED DETENTION BOX CULVERTS. THE PROPOSED DETENTION STORAGE WAS USED TO ACCOMMODATE THE VOLUME DIFFERENCE BETWEEN THE INFLOW AND OUTFLOW HYDROGRAPHS UNDER THE PROPOSED CONDITIONS.
2. BENTLEY PONDPACK V8i VERSION 2009 WAS UTILIZED IN THE ANALYSIS.

STATE OF TEXAS
JINWEI QUI
105126
LICENSED PROFESSIONAL ENGINEER
5/10/2012

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214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

DETENTION SYSTEM COMPUTATIONS

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			141
CHECK:	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

\\urs001ds1\projects\transportation\projects\TxDOT-BF\DGDUTV\STION-25354750\25354759-SEGUIN-SAT07-DGDUTRAINAGE\SEDUINGD02.DGN 5/11/2012 3:40:46 PM

DRAINAGE INFLOW SUMMARY

DRAINAGE AREA	HYDROGRAPH VOLUME (AC-FT)	TIME TO PEAK (HOURS)	PEAK FLOW (CFS)	NOTES
B1	0.0995	0.167	7.21	
B2	0.0993	0.167	7.20	
B3	0.0557	0.167	4.04	
B5	0.0795	0.167	5.76	
C1	0.0294	0.167	2.13	
C2	0.0909	0.167	6.59	
C3	0.0097	0.167	0.70	
Off-site A1-A3	0.2003	0.167	14.52	THE DISCHARGES FROM THE OFF-SITE BASINS A1, A2 AND A3 FLOW INTO THE PROPOSED BOX CULVERTS THROUGH AN EXISTING 15-INCH PIPE. THE CAPACITY OF THE PIPE, WHICH IS LESS THAN THE PEAK FLOW FROM THE BASINS, IS ACTUALLY USED TO DEFINE THE INFLOW FOR THE BASINS.

DETENTION BOX ELEVATION- VOLUME RELATIONSHIP

ELEVATION (FT)	VOLUME (AC -FT)	NOTES
599.26	0.0000	
599.88	0.1553	
600.00	0.1928	
600.50	0.3494	
600.76	0.4307	
601.00	0.5059	
601.26	0.5415	
601.46	0.5689	MAXIMUM AVAILABLE VOLUME

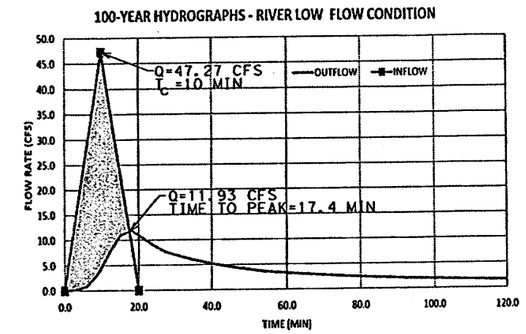
OUTLET CONTROL STRUCTURE

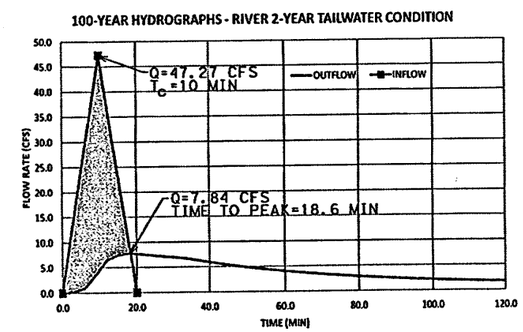
PIPE SIZE (IN)	SLOPE (%)	LENGTH (FT)	UPSTREAM INVERT ELEVATION (FT)
24	0.12	53	599.26

OUTPUT SUMMARY

CASE	PEAK INFLOW (CFS)	TOTAL HYDROGRAPH VOLUME (AC-FT)	MAX RELEASED OUTFLOW (CFS)	WATER SURFACE ELEVATION (FT)	MAXIMUM STORAGE VOLUME (AC-FT)	MAXIMUM STORAGE VOLUME (CU-FT)	RIVER TAILWATER ELEVATION (FT)
RIVER LOW FLOW TAILWATER	47.27	2.8578	11.93	601.21	0.5353	23,318	NA
RIVER 2-YEAR TAILWATER	47.27	2.8578	7.81	601.40	0.5608	24,428	598.9

OUTFLOW HYDROGRAPH- RIVER LOW FLOW CONDITION		OUTFLOW HYDROGRAPH - RIVER 2-YEAR TAILWATER CONDITION	
TIME (MIN)	Q PEAK (CFS)	TIME (MIN)	Q PEAK (CFS)
0	0.00	0	0.00
3	0.22	3	0.24
6	0.87	6	0.97
9	3.33	9	3.54
12	7.30	12	6.44
15	10.96	15	7.41
18	11.90	18	7.81
21	10.56	21	7.59
24	9.04	24	7.37
27	7.76	27	7.16
30	7.05	30	6.96
33	6.45	33	6.76
36	5.92	36	6.44
39	5.44	39	6.07
42	5.00	42	5.71
45	4.61	45	5.39
48	4.26	48	5.08
51	3.95	51	4.80
54	3.66	54	4.54
57	3.47	57	4.30
60	3.30	60	4.07
63	3.14	63	3.86
66	3.00	66	3.65
69	2.86	69	3.46
72	2.74	72	3.28
75	2.62	75	3.12
78	2.51	78	2.97
81	2.41	81	2.83
84	2.32	84	2.70
87	2.23	87	2.58
90	2.15	90	2.47
93	2.08	93	2.37
96	2.01	96	2.27
99	1.94	99	2.19
102	1.89	102	2.11
105	1.83	105	2.03
108	1.78	108	1.96
111	1.73	111	1.90
114	1.69	114	1.84
117	1.65	117	1.79
120	1.61	120	1.74





C.O. #4

NOTES:

1. NO EXISTING DRAINAGE ANALYSIS WAS PERFORMED IN THIS DETENTION STUDY. THE RESULTS OF DRAINAGE CALCULATIONS PERFORMED FOR THE PROPOSED CONDITIONS WERE USED AS THE INFLOW HYDROGRAPHS OF THE STUDY. THE OUTFLOW HYDROGRAPHS WERE ESTIMATED BY SETTING A 24-INCH PIPE EXTENDED FROM THE EXISTING PIPE AS THE OUTLET STRUCTURE OF THE PROPOSED DETENTION BOX CULVERTS. THE PROPOSED DETENTION STORAGE WAS USED TO ACCOMMODATE THE VOLUME DIFFERENCE BETWEEN THE INFLOW AND OUTFLOW HYDROGRAPHS UNDER THE PROPOSED CONDITIONS.
2. BENTLEY PONDPACK V8i VERSION 2009 WAS UTILIZED IN THE ANALYSIS.

REVISION	BY	DATE	DESCRIPTION
1	JQ	09/18/2013	TOTAL OF 55'-4'x1.5' BOX WAS ADDED TO THE SYSTEM

STATE OF TEXAS
JINMEI QIU
105126
LICENSED PROFESSIONAL ENGINEER

Jinmei Qiu
09-19-2013

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214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

DETENTION SYSTEM COMPUTATIONS

SHEET 1 OF 1

DRAWN: EA DATE: 9/19/2013	FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 141 A
CHECK: DATE: 9/19/2013	STATE TEXAS	STATE DIST. NO. SAT	COUNTY COMAL	
REVISED: EA DATE: 9/19/2013	CONTROL NO. 0016	SECTION NO. 10	JOB NO. 022	HIGHWAY NO. BS 46-C

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CULVERT A	MINIMUM (5 YR)		DESIRABLE (10 YR) DESIGN		CHECK FLOOD (100 YR)	
SUMMARY						
COMPUTED HEADWATER	614.83	ft	615.86	ft	618.35	ft
INLET CONTROL HW ELEV	614.42	ft	615.29	ft	616.63	ft
OUTLET CONTROL HW ELEV	614.83	ft	615.86	ft	618.35	ft
HEADWATER DEPTH/HEIGHT	2.79		3.31		4.55	
DISCHARGE	84.07	cfs	99.07	cfs	171.57	cfs
TAILWATER ELEVATION	614.42	ft	615.29	ft	616.63	ft
CONTROL TYPE	OUTLET CONTROL		OUTLET CONTROL		OUTLET CONTROL	
GRADES						
UPSTREAM INVERT	609.25	ft	609.25	ft	609.25	ft
LENGTH	245.00	ft	245.00	ft	245.00	ft
DOWNSTREAM INVERT	608.98	ft	608.98	ft	608.98	ft
CONSTRUCTED SLOPE	0.001100	ft/ft	0.001100	ft/ft	0.001100	ft/ft
HYDRAULIC PROFILE						
PROFILE	PRESSURE PROFILE		PRESSURE PROFILE		PRESSURE PROFILE	
SLOPE TYPE	N/A		N/A		N/A	
FLOW REGIME	N/A		N/A		N/A	
VELOCITY DOWNSTREAM	2.8	ft/s	3.3	ft/s	5.72	ft/s
DEPTH, DOWNSTREAM	5.44	ft	6.31	ft	7.65	ft
NORMAL DEPTH	1.53	ft	N/A	ft	N/A	ft
CRITICAL DEPTH	0.99	ft	1.11	ft	1.6	ft
CRITICAL SLOPE	0.003855	ft/ft	0.003881	ft/ft	0.004070	ft/ft
SECTION						
SECTION SHAPE	BOX		BOX		BOX	
SECTION MATERIAL	CONCRETE		CONCRETE		CONCRETE	
SECTION SIZE	5 X 2	ft	5 X 2	ft	5 X 2	ft
NUMBER SECTIONS	3		3		3	
MANNINGS COEFFICIENT	0.013		0.013		0.013	
SPAN	5.00	ft	5.00	ft	5.00	ft
RISE	2.00	ft	2.00	ft	2.00	ft
OUTLET CONTROL PROPERTIES						
OUTLET CONTROL HW ELEV	614.83	ft	615.86	ft	618.35	ft
Ke	0.50		0.50		0.50	
UPSTREAM VELOCITY HEAD	0.12	ft	0.17	ft	0.51	ft
ENTRANCE LOSS	0.06	ft	0.08	ft	0.25	ft
INLET CONTROL PROPERTIES						
INLET CONTROL HW ELEV.	614.42	ft	615.29	ft	616.63	ft
INLET TYPE	30° to 75° WINGWALL FLARES		30° to 75° WINGWALL FLARES		30° to 75° WINGWALL FLARES	
K	0.02600		0.026		0.026	
M	1.00000		1.00000		1.00000	
C	0.03470		0.03470		0.03470	
Y	0.86000		0.86000		0.86000	
FLOW CONTROL	UNSUBMERGED		UNSUBMERGED		SUBMERGED	
AREA FULL	30.0	ft^2	30.0	ft^2	30.0	ft^2
HDS 5 CHART	8		8		8	
HDS 5 SCALE	1		1		1	
EQUATION FORM	1		1		1	

"RECOMMENDED DESIGN FREQUENCIES"
TABLE - HYDRAULIC DESIGN MANUAL
TXDOT 2004, CHAPTER 5, SECTION 3.

MINOR ARTERIALS AND COLLECTORS

- CULVERTS — MINIMUM 5 YR
  DESIRABLE 10 YR
  CHECK FLOOD 100 YR

CULVERT COMPUTATIONS
BENTLEY CULVERT MASTER ® V3.1

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BENTLEY SYSTEMS, Inc.
HAESTAD METHODS SOLUTION CENTER

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER
5/10/12

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SEGUIN AVENUE RAILROAD UNDERPASS

CULVERT A COMPUTATIONS

SHEET 1 OF 1

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			142
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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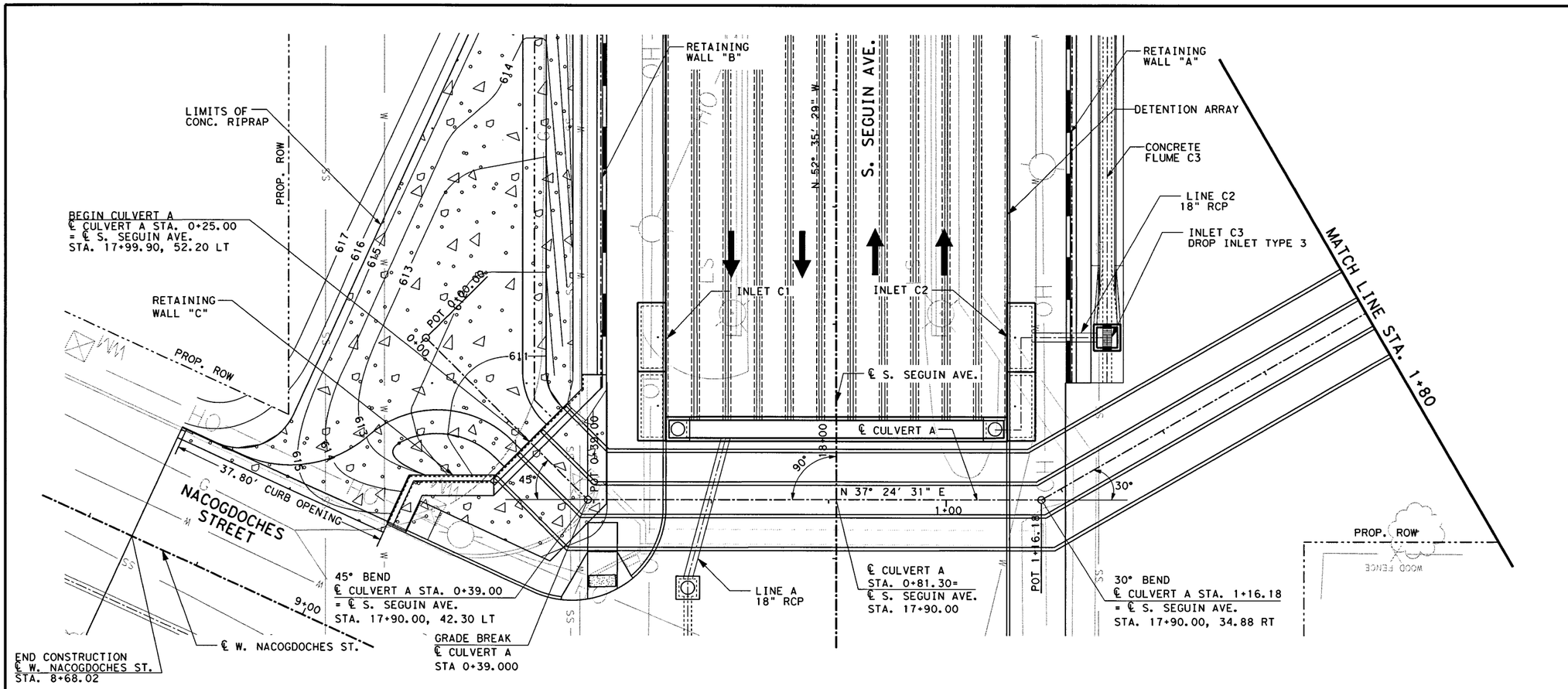
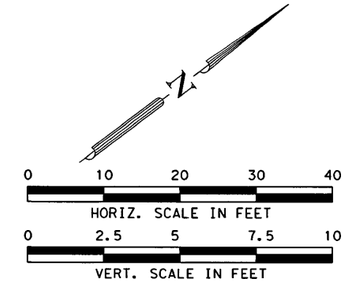
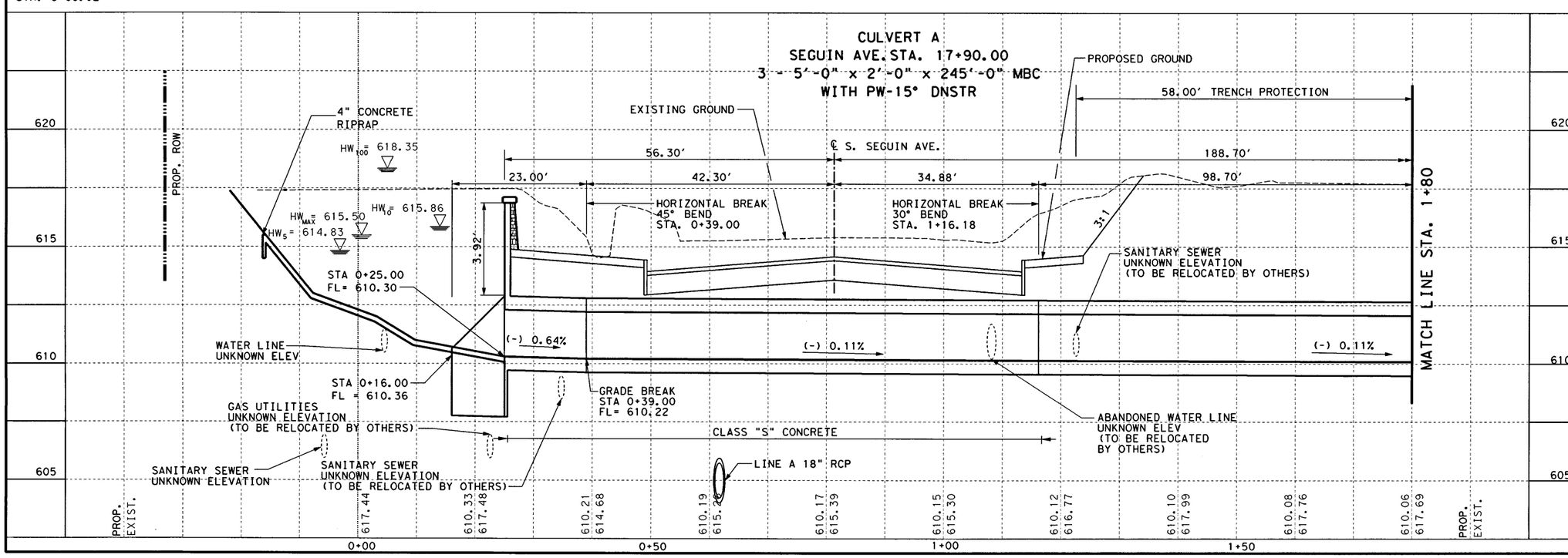




NOTES:
1. SEE NACOGDOCHES STREET INTERSECTION LAYOUT FOR CULVERT "A" RIPRAP GRADING.
2. DIRECT TRAFFIC CULVERT CONCRETE SHALL BE CLASS "S" BETWEEN STA 0+25.00 TO STA 1+16.18. SEE STANDARD MC-5-20.



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CARLA VERRANDO
96560
LICENSED PROFESSIONAL ENGINEER
6/13/12

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SEGUIN AVENUE RAILROAD UNDERPASS

CULVERT LAYOUT

CULVERT A

1" = 20' SHEET 1 OF 2

DRAWN: EA DATE: 6/14/2012	FED. RD. DIV. RD. 6	PROJECT NO.		SHEET NO. 143
CHECK: CV DATE: 6/14/2012	STATE TEXAS	STATE DIST. NO. SAT	COUNTY COMAL	
REVISED: EA DATE: 6/14/2012	CONTROL NO. 0016	SECTION NO. 10	JOB NO. 022	HIGHWAY NO. BS 46-C

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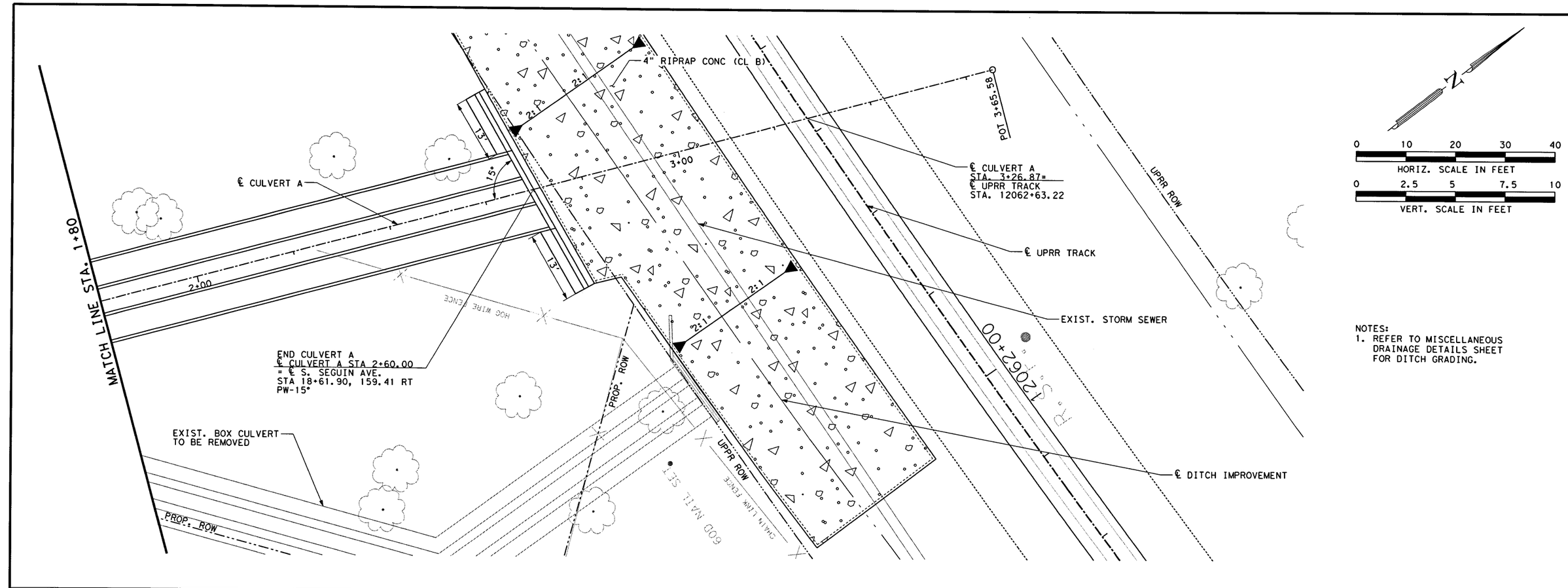
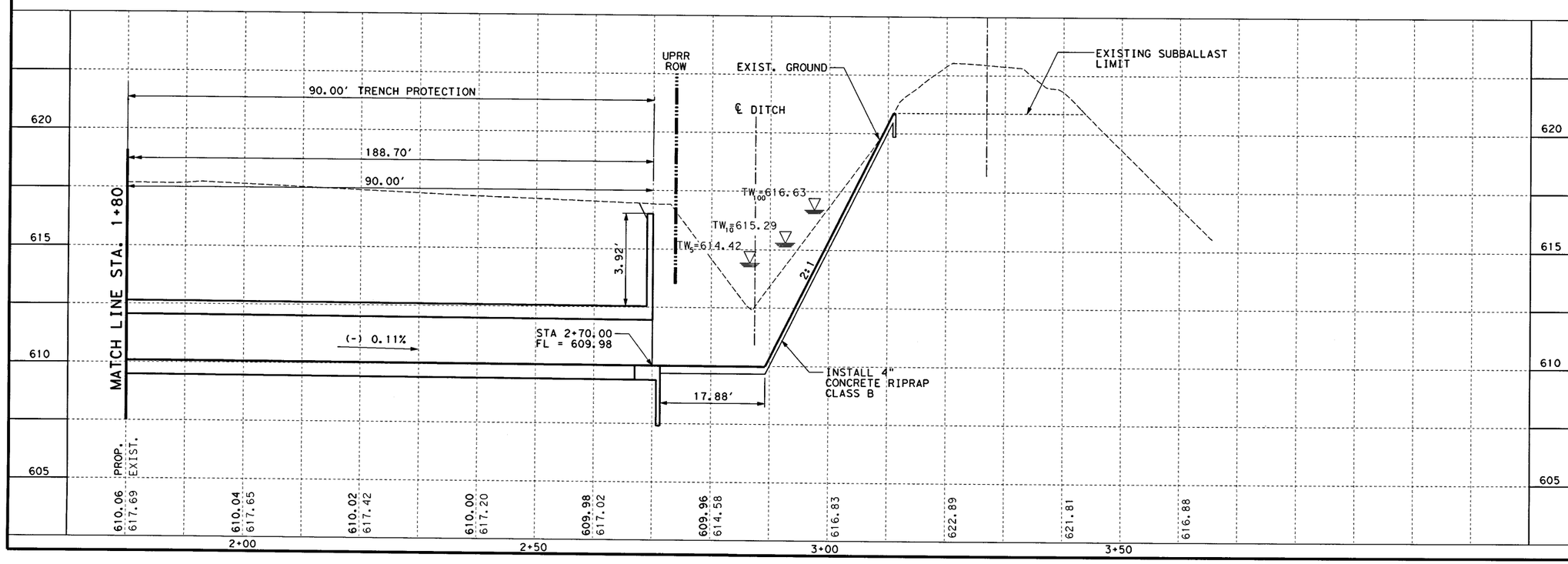


NOTES:
1. REFER TO MISCELLANEOUS DRAINAGE DETAILS SHEET FOR DITCH GRADING.



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5/10/12

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SEGUIN AVENUE RAILROAD UNDERPASS

CULVERT LAYOUT

CULVERT A

1" = 20' SHEET 2 OF 2

DRAWN: EA DATE: 5/11/2012	FED. RD. DIV. RD. 6	PROJECT NO.		SHEET NO. 144
CHECK: CV DATE: 5/11/2012	STATE TEXAS	STATE DIST. NO. SAT	COUNTY COMAL	
REVISED: EA DATE: 5/11/2012	CONTROL NO. 0016	SECTION NO. 10	JOB NO. 022	HIGHWAY NO. BS 46-C

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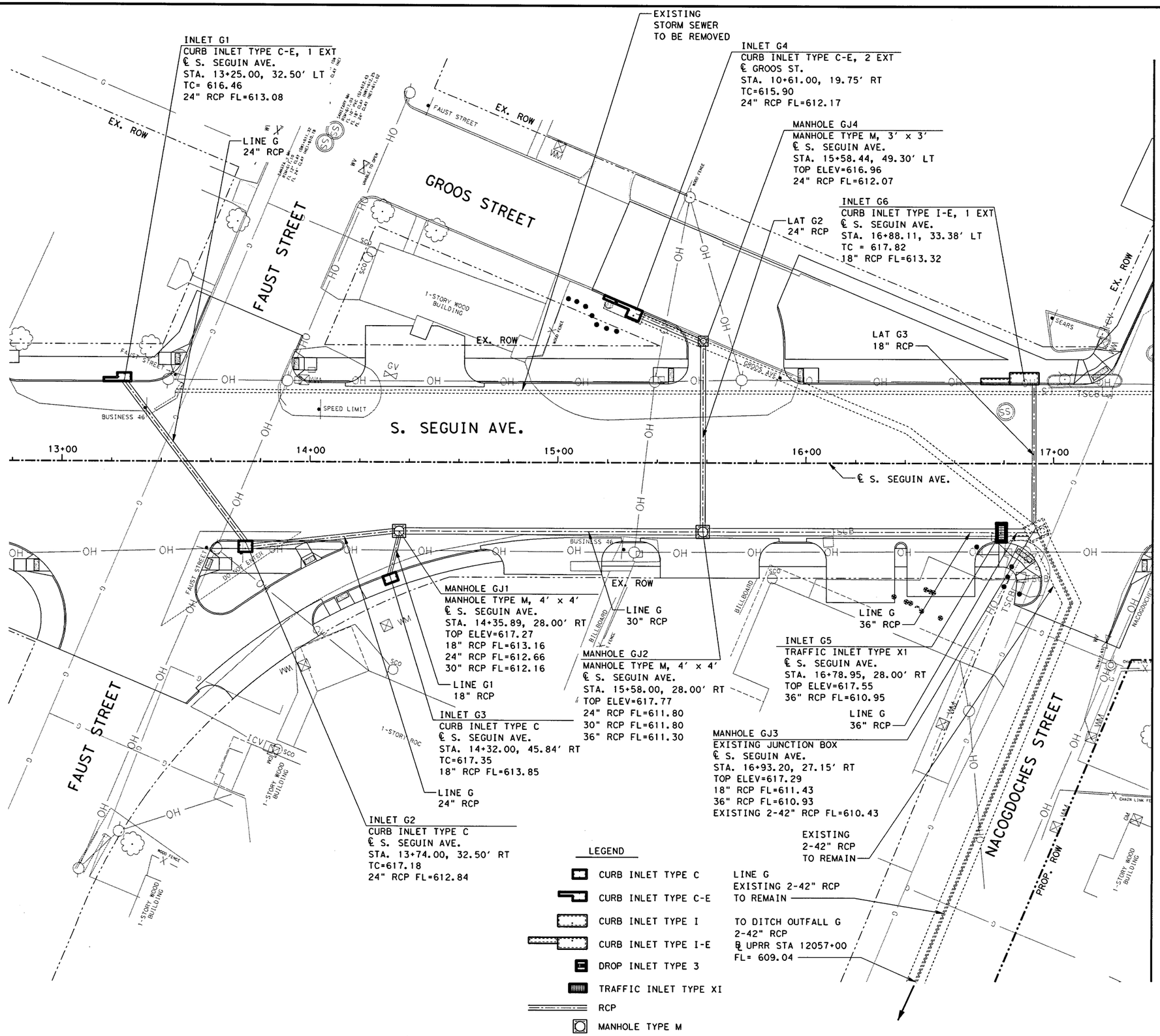

NOTES:

1. CURB INLETS STATION AND OFFSET ARE MEASURED TO THE MIDPOINT OF THE FACE OF THE MAIN INLET. GRATE (DROP) INLET STATION AND OFFSET ARE MEASURED TO THE CENTER OF THE INLET.
2. JUNCTION BOX AND MANHOLE STATION AND OFFSET ARE MEASURED TO THE CENTER OF THE STRUCTURE.
3. REFER TO MISCELLANEOUS DRAINAGE DETAILS FOR MORE INFORMATION.

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER

5/10/12

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE LAYOUT

S. SEGUIN AVE.
STA 12+80.00 TO STA. 17+40.00

1" = 40' SHEET 1 OF 3

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			145
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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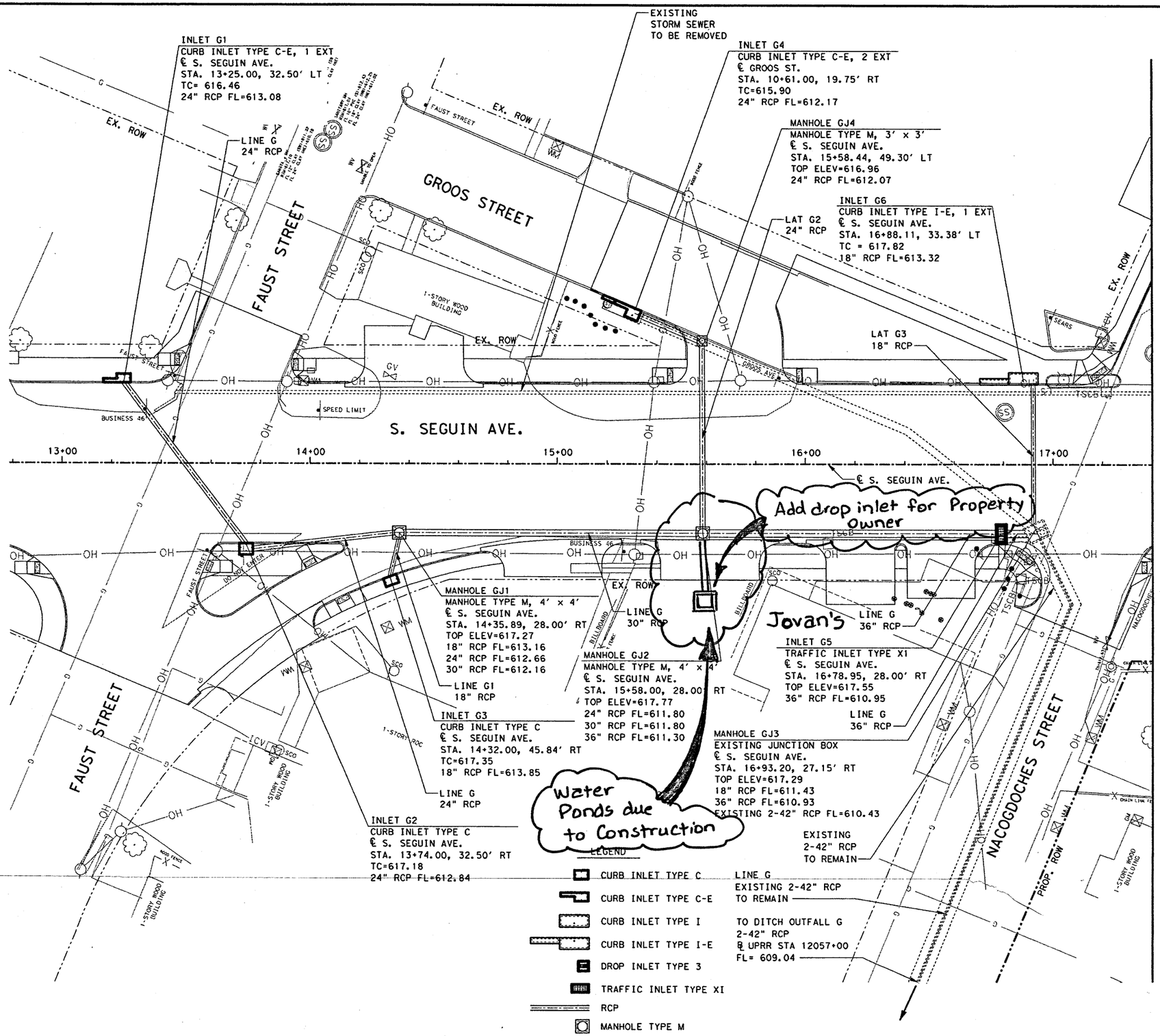

NOTES:
1. CURB INLETS STATION AND OFFSET ARE MEASURED TO THE MIDPOINT OF THE FACE OF THE MAIN INLET. GRATE (DROP) INLET STATION AND OFFSET ARE MEASURED TO THE CENTER OF THE INLET.
2. JUNCTION BOX AND MANHOLE STATION AND OFFSET ARE MEASURED TO THE CENTER OF THE STRUCTURE.
3. REFER TO MISCELLANEOUS DRAINAGE DETAILS FOR MORE INFORMATION.

STATE OF TEXAS
JEROME D. PAVLISKA
76075
REGISTERED PROFESSIONAL ENGINEER

Jerome D. Pavliska P.E 2-14-14
Jerome D. Pavliska, P.E. Date

(For Drop Inlet @ Drvwy # 3)

CHANGE ORDER NO. 4

REVISED SHEET

Texas Department of Transportation
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SEGUIN AVENUE RAILROAD UNDERPASS

S. SEGUIN AVE.
PLAN AND PROFILE
STA. 15+00 TO STA. 21+00

1" = 50'

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: #DATE#	6	C 16-10-22		145A
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: #DATE#	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: #DATE#	0016	10	022	BS 46-C

seguin st\07-cadd\drainage\SEGUINsd01.dgn

EXISTING LINE A
15" RCP @ 0.29%
TO REMAIN

RETAINING WALL "C"

EXIST MANHOLE AJ3
℄ NACOGDOCHES
STA. 20+00.00, 13.83' RT
TOP ELEV=616.16
EXIST 15" RCP FL=609.30

EXISTING LINE A
15" RCP @ 0.29%
TO REMAIN

MANHOLE RISER
JUNCTION C1-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 27.00' LT
TOP ELEV = 613.45
RISER HEIGHT = 7.43'
DETENTION ARRAY FL=599.44

MANHOLE AJ4
MANHOLE TYPE M, 3' x 3'
℄ S. SEGUIN AVE.
STA. 17+75.00, 25.30' LT
TOP ELEV = 614.75
EXIST 15" RCP FL=609.08
18" RCP FL=604.77
(LOCATION OF EXIST
15" RCP TO BE VERIFIED
BY CONTRACTOR)

JUNCTION A-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 18.45' LT
DETENTION ARRAY FL=599.46
18" RCP FL=603.75

MANHOLE RISER
JUNCTION C2-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 27.00' RT
TOP ELEV = 613.45
RISER HEIGHT = 7.43'
DETENTION ARRAY FL=599.44

INLET C2
2 - CURB INLETS TYPE I
℄ S. SEGUIN AVE.
STA. 18+17.75, 30.38' RT
TC=613.07
18" RCP FL=608.07

LINE C2
18" RCP

INLET C3
DROP INLET TYPE 3
℄ S. SEGUIN AVE.
STA. 18+17.75,
46.08' RT
TOP ELEV.=614.17
18" RCP FL=609.17

END CONCRETE
FLUME C3
BEGIN TRANSITION
TO DROP INLET
FL ELEV=614.69

37.80' CURB OPENING
℄ S. SEGUIN AVE.
STA. 17+93.09,
93.89' LT

CONCRETE RIPRAP
LIMITS OF GRADING
TO 4:1 SLOPE

INLET C1
2 - CURB INLETS TYPE I
℄ S. SEGUIN AVE.
STA. 18+17.75,
30.38' LT
TC=613.07
FL=608.07

END 4' GRASSED
FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 18+80.00, 51.39' LT
FL ELEV=613.01

FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 19+00.00, 51.39' LT
FL ELEV=615.16

FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 20+00.00, 51.39' LT
FL ELEV=615.66

DITCH 35° BEND
℄ S. SEGUIN AVE.
STA. 20+89.51,
51.39' LT
FL ELEV=616.11

BEGIN 4' GRASSED
FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 21+34.65, 83.00' LT
FL ELEV=616.30

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 21+13.50, 27.00' LT
TOP ELEV = 601.55
RISER HEIGHT = 0.10'
DETENTION ARRAY FL=599.37

EXISTING
2-36" CMP

PROP. ROW

UPRR ROW

RETAINING WALL "B"

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 20+00.00, 27.00' LT
TOP ELEV = 603.31
RISER HEIGHT = 1.47'
DETENTION ARRAY FL=599.26
EQUALIZER BOX FL=595.26

INLET B1
CURB INLET TYPE C-E, 1 EXT
℄ S. SEGUIN AVE.
STA. 20+97.00, 29.5' LT
TC=601.95
18" RCP FL=599.38

CONCRETE
RIPRAP

BEGIN
CONCRETE FLUME B6
FL ELEV=616.56

JUNCTION B3-OUT
℄ S. SEGUIN AVE.
STA. 21+58.00, 15.50' LT
DETENTION ARRAY FL=599.42
18" RCP FL=599.42

LINE B3 18" RCP

EQUALIZER BOX JC-C
℄ S. SEGUIN AVE.
STA. 201+13.50

DETENTION ARRAY
9-4'x 1.5' BOX

LINE B1
18" RCP

MATCH LINE STA 17+40

MATCH LINE STA 21+80

LINE A
18" RCP

℄ S. SEGUIN AVE.

N 52° 35' 29" W

18+00 19+00 20+00 21+00

S. SEGUIN AVE.

DETENTION ARRAY
2- 4'x 1.5' BOX

EQUALIZER BOX JC-A
℄ S. SEGUIN AVE.
STA. 18+02.08

EQUALIZER BOX JC-B
℄ S. SEGUIN AVE.
STA. 20+00.00

JUNCTION B1-OUT
℄ S. SEGUIN AVE.
STA. 20+97.00, 23.33' LT
DETENTION ARRAY FL=599.36
18" RCP FL=599.36

LINE B2
18" RCP

CONCRETE
FLUME C3

DETENTION ARRAY
7-4'x 2' BOX
4- 4'x 1.5' BOX

RETAINING WALL "A"

CONCRETE
FLUME B4

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 21+13.50, 27.00' RT
TOP ELEV = 601.55
RISER HEIGHT = 0.10'
DETENTION ARRAY FL=599.37

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 20+00.00, 27.00' RT
TOP ELEV = 603.31
RISER HEIGHT = 1.47'
DETENTION ARRAY FL=599.26
EQUALIZER BOX FL=595.26
24" RCP FL=599.26

LAT C4
24" RCP

BEGIN CONCRETE
FLUME C3
FL ELEV=616.02

1-STORY WOOD BUILDING

PROP. ROW

JUNCTION B2-OUT
℄ S. SEGUIN AVE.
STA. 20+97.00, 23.33' RT
DETENTION ARRAY FL=599.36
18" RCP FL=599.36

12064+00

CULVERT A
3-5'X2' MBC

UPRR ROW

INLET B2
CURB INLET TYPE C-E, 1 EXT
℄ S. SEGUIN AVE.
STA. 20+97.00, 29.50' RT
TC=601.95
18" RCP FL=599.38

BEGIN
CONCRETE
FLUME B4
FL ELEV=617.22

12063+00

UPRR ROW

PROP. ROW

℄ UPRR TRACK

℄ UPRR DITCH

CONC. RIPRAP

DETENTION
OUTFLOW
EXISTING
24" RCP
TO REMAIN
OUTFALL AT
GUADALUPE RIVER

INLET C4
TRAFFIC INLET TYPE X1
℄ UPRR STA 12064+18.61
34.08' LT
TOP ELEV= 613.00
24" RCP FL = 599.20
(TO BE VERIFIED
BY CONTRACTOR)

0 20 40 60 80
HORIZ. SCALE IN FEET

NOTES:

1. REFER TO RETAINING WALL LAYOUT SHEETS FOR WALL INFORMATION.
2. REFER TO MISCELLANEOUS DRAINAGE DETAILS FOR MORE INFORMATION.
3. REFER TO CULVERT A DETAIL FOR MORE INFORMATION.

LEGEND

- CURB INLET TYPE C
- CURB INLET TYPE C-E
- CURB INLET TYPE I
- CURB INLET TYPE I-E
- DROP INLET TYPE 3
- TRAFFIC INLET TYPE XI
- RCP
- MANHOLE TYPE M

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER
6/13/12

Texas Department of Transportation
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214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE LAYOUT

S. SEGUIN AVE.
STA 17+40.00 TO STA. 21+80.00

1" = 40' SHEET 2 OF 3

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: 6/19/2012	6			146
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 6/19/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 6/19/2012	0016	10	022	BS 46-C

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EXISTING LINE A
15" RCP @ 0.29%
TO REMAIN

RETAINING WALL "C"

EXIST MANHOLE AJ3
℄ NACOGDOCHES
STA. 20+00.00, 13.83' RT
TOP ELEV=616.16
EXIST 15" RCP FL=609.30

EXISTING LINE A
15" RCP @ 0.29%
TO REMAIN

MANHOLE RISER
JUNCTION C1-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 27.00' LT
TOP ELEV = 613.45
RISER HEIGHT = 7.43'
DETENTION ARRAY FL=599.44

MANHOLE AJ4
MANHOLE TYPE M, 3' x 3'
℄ S. SEGUIN AVE.
STA. 17+75.00, 25.30' LT
TOP ELEV = 614.75
EXIST 15" RCP FL=609.08
18" RCP FL=604.77
(LOCATION OF EXIST
15" RCP TO BE VERIFIED
BY CONTRACTOR)

LINE A
18" RCP

JUNCTION A-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 18.45' LT
DETENTION ARRAY FL=599.46
18" RCP FL=603.75

MANHOLE RISER
JUNCTION C2-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 27.00' RT
TOP ELEV = 613.45
RISER HEIGHT = 7.43'
DETENTION ARRAY FL=599.44

INLET C2
2 - CURB INLETS TYPE I
℄ S. SEGUIN AVE.
STA. 18+17.75, 30.38' RT
TC=613.07
18" RCP FL=608.07

LINE C2
18" RCP

INLET C3
DROP INLET TYPE 3
℄ S. SEGUIN AVE.
STA. 18+17.75,
46.08' RT
TOP ELEV.=614.17
18" RCP FL=609.17

END CONCRETE
FLUME C3
BEGIN TRANSITION
TO DROP INLET
FL ELEV=614.69

37.80' CURB OPENING
℄ S. SEGUIN AVE.
STA. 17+93.09,
93.89' LT

CONCRETE RIPRAP
LIMITS OF GRADING
TO 4:1 SLOPE

INLET C1
2 - CURB INLETS TYPE I
℄ S. SEGUIN AVE.
STA. 18+17.75,
30.38' LT
TC=613.07
FL=608.07

END 4' GRASSED
FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 18+80.00, 51.39' LT
FL ELEV=613.01

FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 19+00.00, 51.39' LT
FL ELEV=615.16

FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 20+00.00, 51.39' LT
FL ELEV=615.66

DITCH 35° BEND
℄ S. SEGUIN AVE.
STA. 20+89.51,
51.39' LT
FL ELEV=616.11

BEGIN 4' GRASSED
FLAT BOTTOM DITCH
3:1 SIDE SLOPES
℄ S. SEGUIN AVE.
STA. 21+34.65, 83.00' LT
FL ELEV=616.30

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 21+13.50, 27.00' LT
TOP ELEV = 601.55
RISER HEIGHT = 0.60'
DETENTION ARRAY FL=599.37

EXISTING
2-36" CMP

PROP. ROW

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 20+00.00, 26.67' LT
TOP ELEV = 603.31
RISER HEIGHT = 1.93'
DETENTION ARRAY FL=599.26
EQUALIZER BOX FL=595.26

RETAINING WALL "B"

INLET B1
CURB INLET TYPE C-E, 1 EXT
℄ S. SEGUIN AVE.
STA. 20+97.00, 29.5' LT
TC=601.95
18" RCP FL=599.38

CONCRETE
RIPRAP

EQUALIZER BOX JC-C
℄ S. SEGUIN AVE.
STA. 201+13.50

BEGIN
CONCRETE FLUME B6
FL ELEV=616.56

JUNCTION B3-OUT
℄ S. SEGUIN AVE.
STA. 21+58.00, 15.50' LT
DETENTION ARRAY FL=599.42
18" RCP FL=599.42

LINE B3 18" RCP

Move Line
B3

DETENTION ARRAY
9-04'x 1.5' BOX

LINE B1
18" RCP

MATCH LINE STA 17+40

MATCH LINE STA 21+90

℄ S. SEGUIN AVE.

N 52° 35' 29" W

EQUALIZER BOX JC-A
℄ S. SEGUIN AVE.
STA. 18+02.08

S. SEGUIN AVE.

EQUALIZER BOX JC-B
℄ S. SEGUIN AVE.
STA. 20+00.00

DETENTION ARRAY
4- 4' x 1.5' BOX

JUNCTION B1-OUT
℄ S. SEGUIN AVE.
STA. 20+97.00, 23.33' LT
DETENTION ARRAY FL=599.36
18" RCP FL=599.36

LINE B2
18" RCP

CONCRETE
FLUME C3

DETENTION ARRAY
7-4'x 2' BOX
4- 4'x 1.5' BOX

RETAINING WALL "A"

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 20+00.00, 26.67' RT
TOP ELEV = 603.31
RISER HEIGHT = 1.93'
DETENTION ARRAY FL=599.26
EQUALIZER BOX FL=595.26
24" RCP FL=599.26

LAT C4
24" RCP

BEGIN CONCRETE
FLUME C3
FL ELEV=616.02

CONCRETE
FLUME B4

MANHOLE RISER
℄ S. SEGUIN AVE.
STA. 21+13.50, 27.00' RT
TOP ELEV = 601.55
RISER HEIGHT = 0.10'
DETENTION ARRAY FL=599.37

1-STORY WOOD
BUILDING

PROP. ROW

JUNCTION B2-OUT
℄ S. SEGUIN AVE.
STA. 20+97.00, 23.33' RT
DETENTION ARRAY FL=599.36
18" RCP FL=599.36

INLET B2
CURB INLET TYPE C-E, 1 EXT
℄ S. SEGUIN AVE.
STA. 20+97.00, 29.50' RT
TC=601.95
18" RCP FL=599.38

CULVERT A
3-5'X2' MBC

UPRR ROW

12064+00

12063+00

BEGIN
CONCRETE
FLUME B4
FL ELEV=617.22

℄ UPRR TRACK

℄ UPRR DITCH

CONC. RIPRAP

DETENTION
OUTFLOW
EXISTING
24" RCP
TO REMAIN
OUTFALL AT
GUADALUPE RIVER

INLET C4
TRAFFIC INLET TYPE X1
℄ UPRR STA 12064+18.61
34.08' LT
TOP ELEV= 613.00
24" RCP FL = 599.20
(TO BE VERIFIED
BY CONTRACTOR)

0 20 40 60 80
HORIZ. SCALE IN FEET

NOTES:

1. REFER TO RETAINING WALL LAYOUT SHEETS FOR WALL INFORMATION.
2. REFER TO MISCELLANEOUS DRAINAGE DETAILS FOR MORE INFORMATION.
3. REFER TO CULVERT A DETAIL FOR MORE INFORMATION.

C.O. #4

LEGEND

- CURB INLET TYPE C
- CURB INLET TYPE C-E
- CURB INLET TYPE I
- CURB INLET TYPE I-E
- DROP INLET TYPE 3
- TRAFFIC INLET TYPE XI
- RCP
- MANHOLE TYPE M

REVISION	BY	DATE	DESCRIPTION
1	CV	08/01/2013	DETENTION SYSTEM DETAIL FOR MANHOLE RISER AND ELEVATION CORRECTED
2	CV	09/18/2013	TOTAL OF 55'-4'x1.5' BOX WAS ADDED TO THE SYSTEM

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER
9/19/13

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE LAYOUT

S. SEGUIN AVE.
STA 17+40.00 TO STA. 21+80.00
1" = 40' SHEET 2 OF 3

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: 9/19/2013	6			146 A
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 9/19/2013	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 9/19/2013	0016	10	022	BS 46-C

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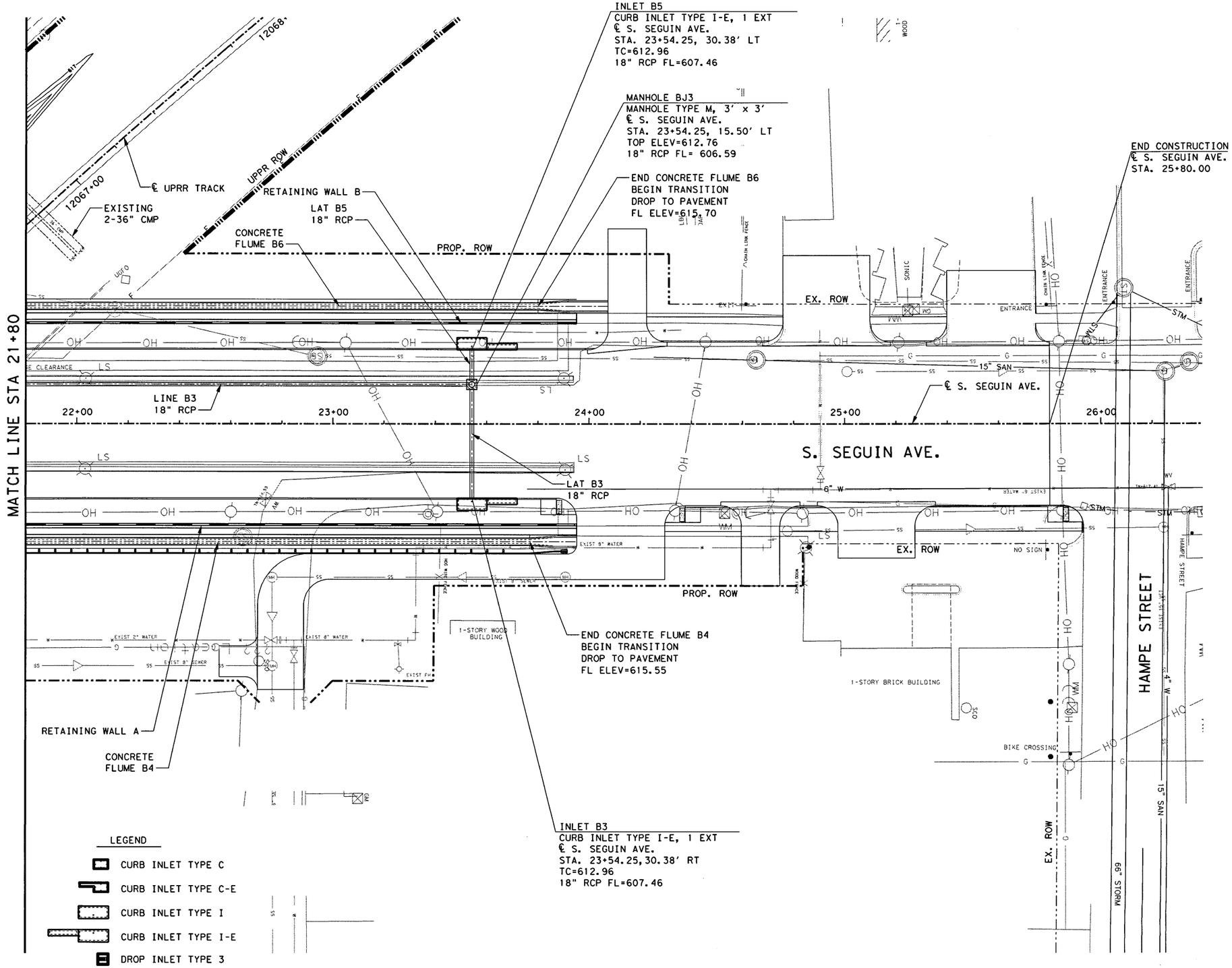
INLET B5
CURB INLET TYPE I-E, 1 EXT
℄ S. SEGUIN AVE.
STA. 23+54.25, 30.38' LT
TC=612.96
18" RCP FL=607.46

MANHOLE BJ3
MANHOLE TYPE M, 3' x 3'
℄ S. SEGUIN AVE.
STA. 23+54.25, 15.50' LT
TOP ELEV=612.76
18" RCP FL= 606.59

END CONCRETE FLUME B6
BEGIN TRANSITION
DROP TO PAVEMENT
FL ELEV=615.70

END CONSTRUCTION
℄ S. SEGUIN AVE.
STA. 25+80.00



LEGEND

- CURB INLET TYPE C
- CURB INLET TYPE C-E
- CURB INLET TYPE I
- CURB INLET TYPE I-E
- DROP INLET TYPE 3
- TRAFFIC INLET TYPE XI
- RCP
- MANHOLE TYPE M

0 20 40 60 80
HORIZ. SCALE IN FEET

NOTES:

1. CURB INLETS STATION AND OFFSET ARE MEASURED TO THE MIDPOINT OF THE FACE OF THE MAIN INLET. GRATE (DROP) INLET STATION AND OFFSET ARE MEASEURED TO THE CENTER OF THE INLET.
2. JUNCTION BOX AND MANHOLE STATION AND OFFSET ARE MEASURED TO THE CENTER OF THE STRUCTURE.
3. REFER TO RETAINING WALL LAYOUT SHEETS FOR WALL INFORMATION.
4. REFER TO MISCELLANEOUS DRAINAGE DETAILS FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE LAYOUT

S. SEGUIN AVE.
STA. 21+80.00 TO 26+40.00

SHEET 3 OF 3

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			147
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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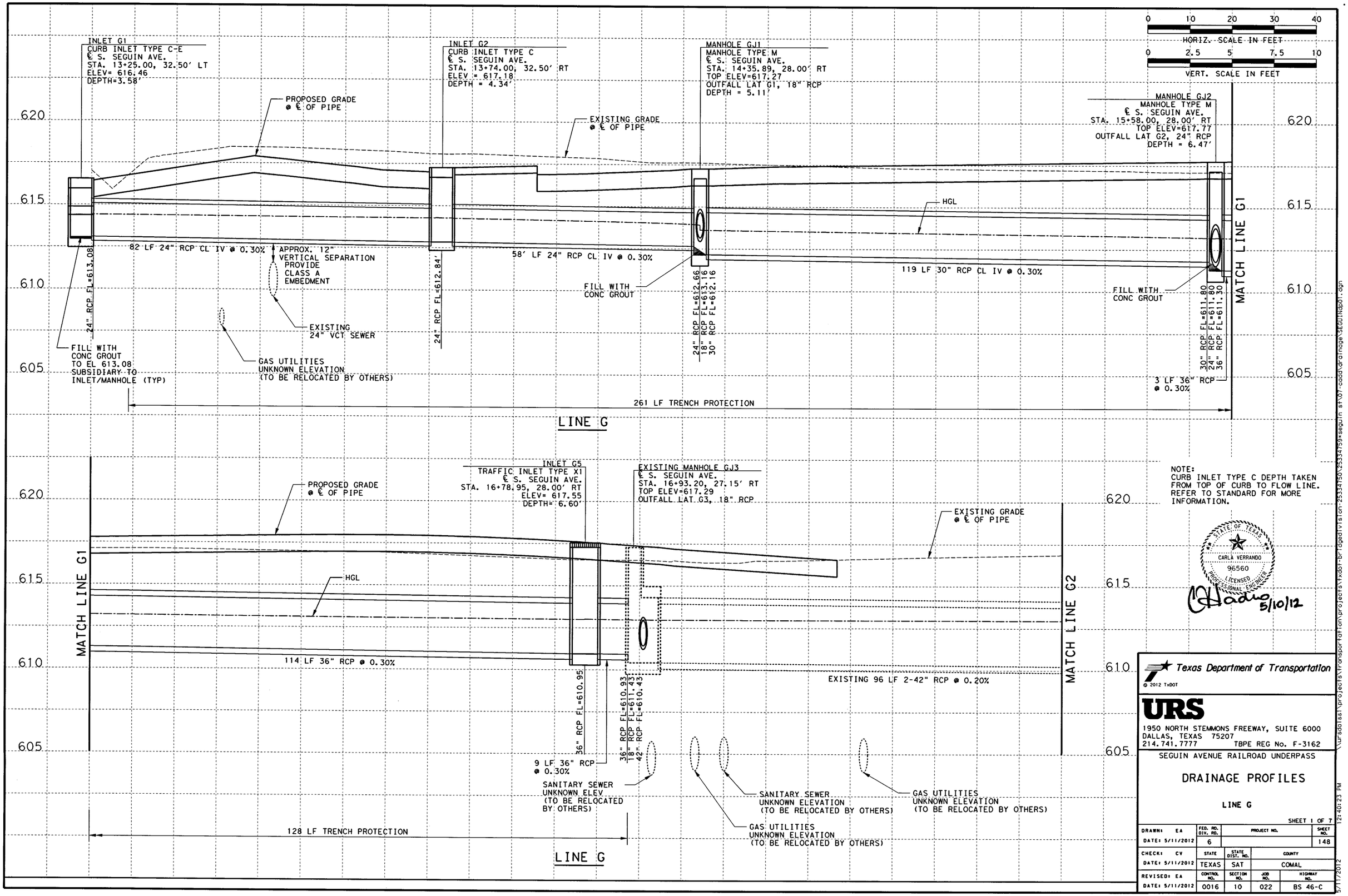

NOTE:
CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE G

SHEET 1 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			148
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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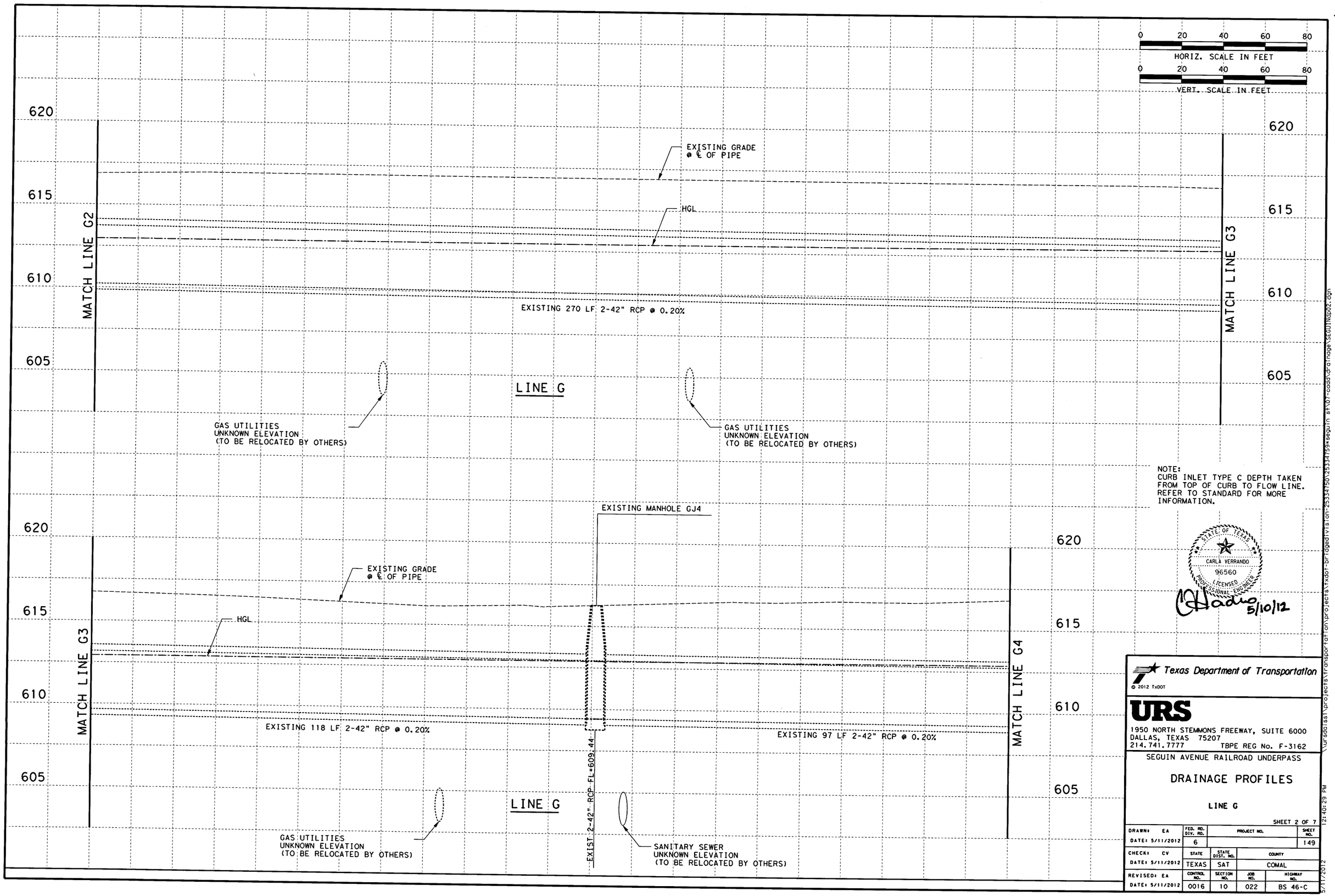

NOTE:
CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE G

SHEET 2 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.	SHEET NO.
DATE: 5/11/2012	6		149
CHECK: CV	STATE	STATE DIST. NO.	COUNTY
DATE: 5/11/2012	TEXAS	SAT	COMAL
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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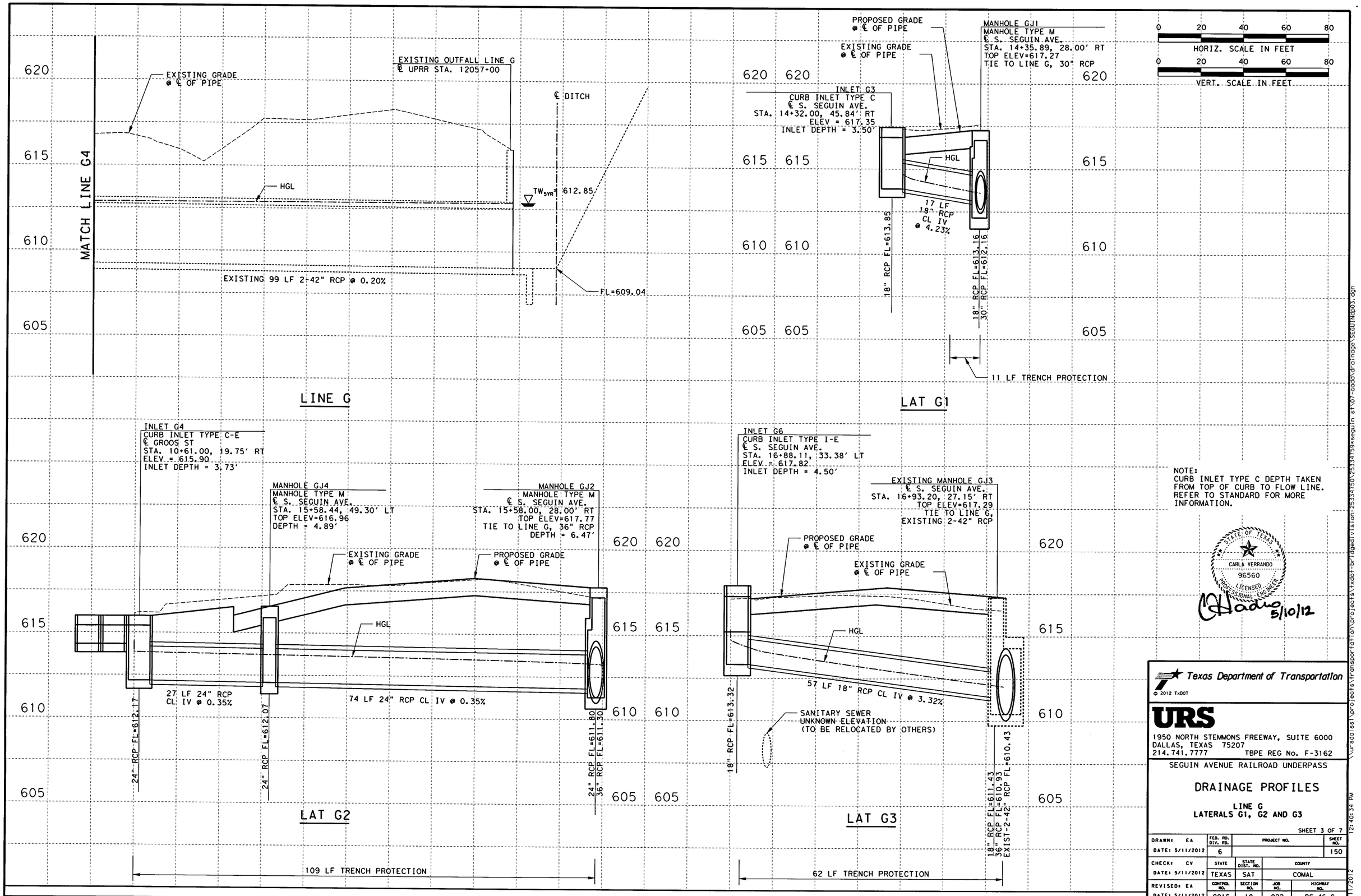

NOTE:
CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE G
LATERALS G1, G2 AND G3

SHEET 3 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.	SHEET NO.
DATE: 5/11/2012	6		150
CHECK: CV	STATE	STATE DIST. NO.	COUNTY
DATE: 5/11/2012	TEXAS	SAT	COMAL
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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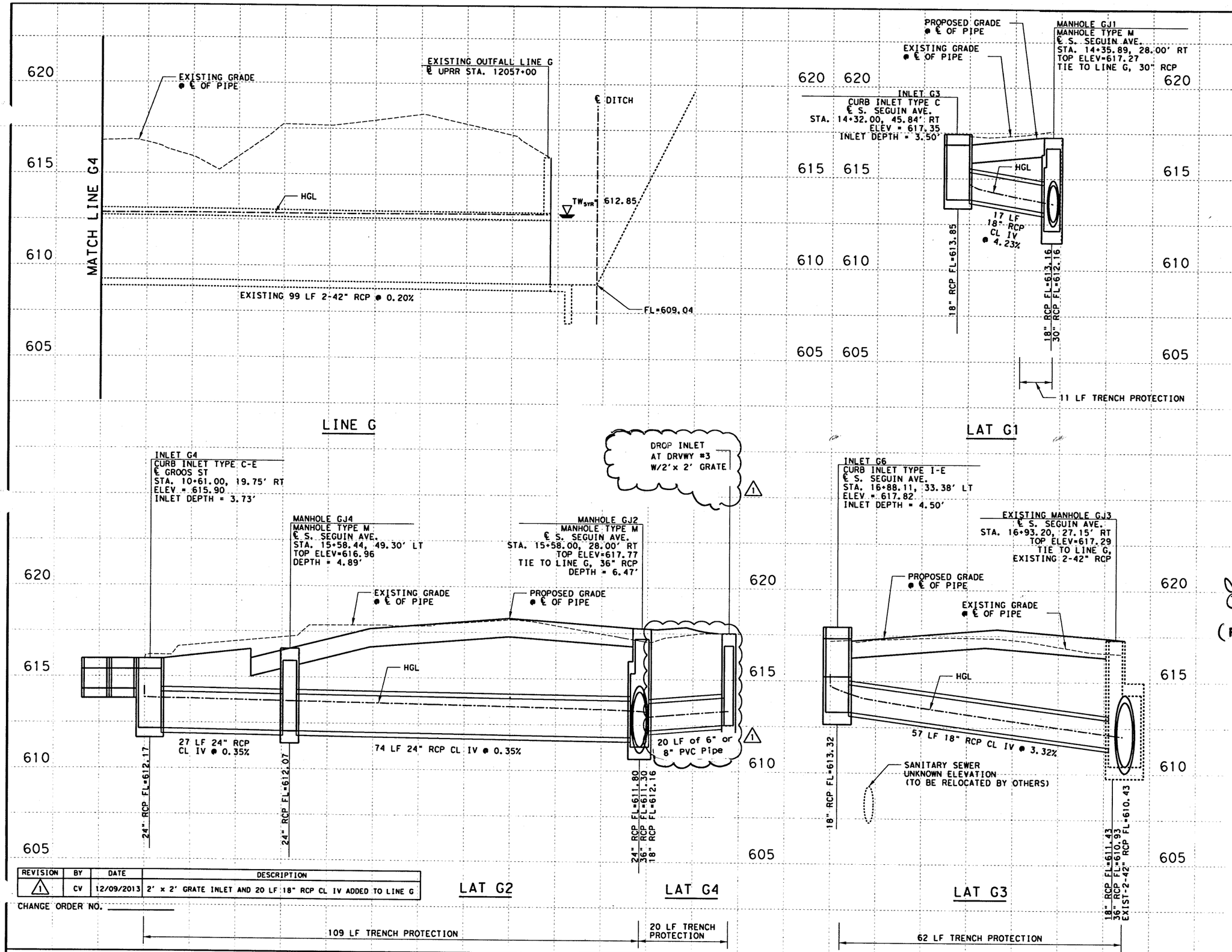

REVISION	BY	DATE	DESCRIPTION
1	CV	12/09/2013	2' x 2' GRATE INLET AND 20 LF 18" RCP CL IV ADDED TO LINE G

CHANGE ORDER NO. _____

STATE OF TEXAS
JEROME D. PAVLISKA
76075
REGISTERED
PROFESSIONAL ENGINEER

Jerome D. Pavliska P.E. 2-14-14
Jerome D. Pavliska, P.E. Date

(For Drop Inlet @ Drvwy #3)

CHANGE ORDER NO. 4

REVISED SHEET

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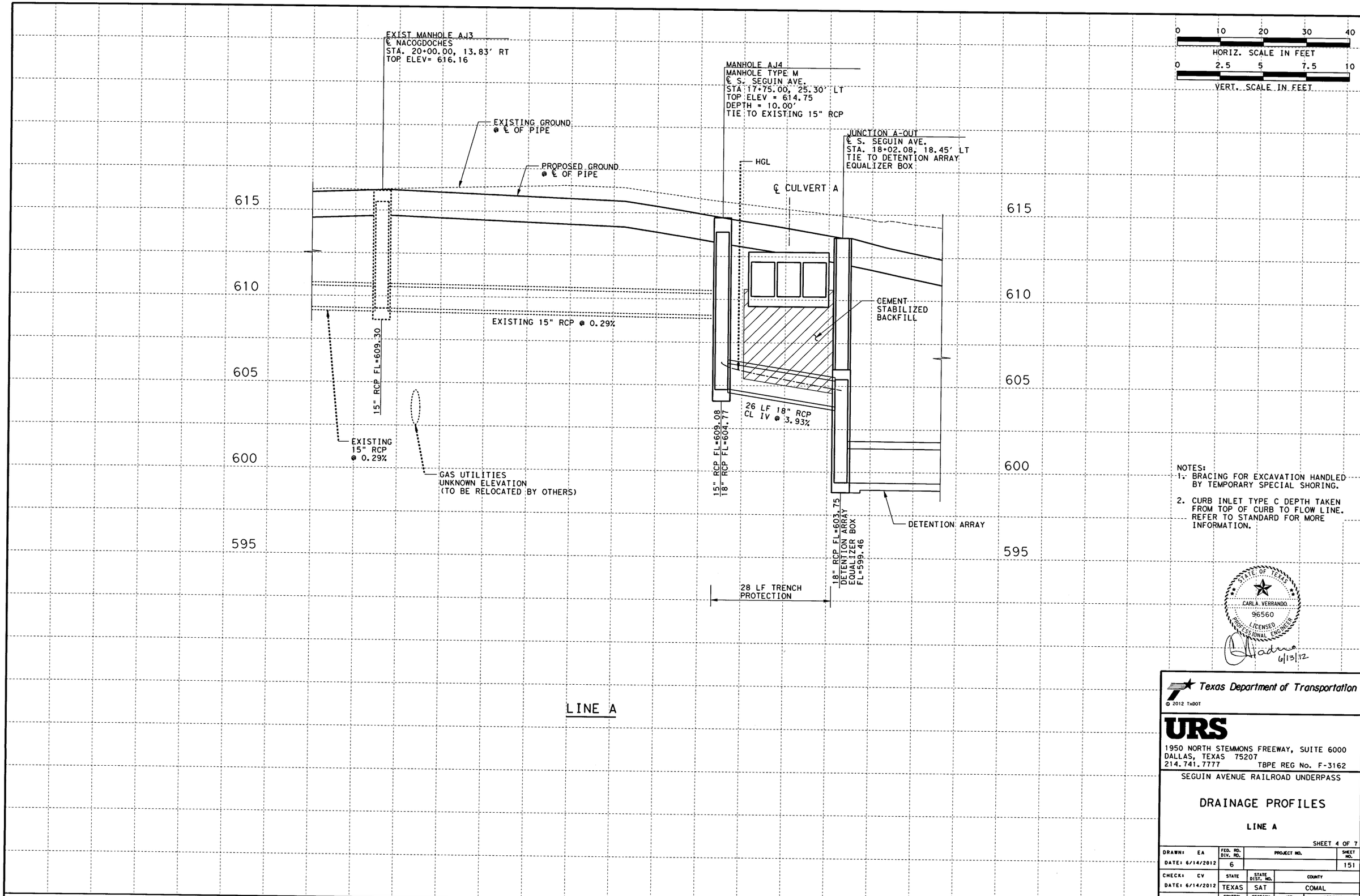
SEGUIN AVENUE RAILROAD UNDERPASS

S. SEGUIN AVE.

1" = 50'

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: ⊕DATE⊕	6	C 16-10-22		150A
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: ⊕DATE⊕	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: ⊕DATE⊕	0016	10	022	BS 46-C



NOTES:

1. BRACING FOR EXCAVATION HANDLED BY TEMPORARY SPECIAL SHORING.
2. CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

STATE OF TEXAS
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6/13/12

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE A

SHEET 4 OF 7

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: 6/14/2012	6			151
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 6/14/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 6/14/2012	0016	10	022	BS 46-C

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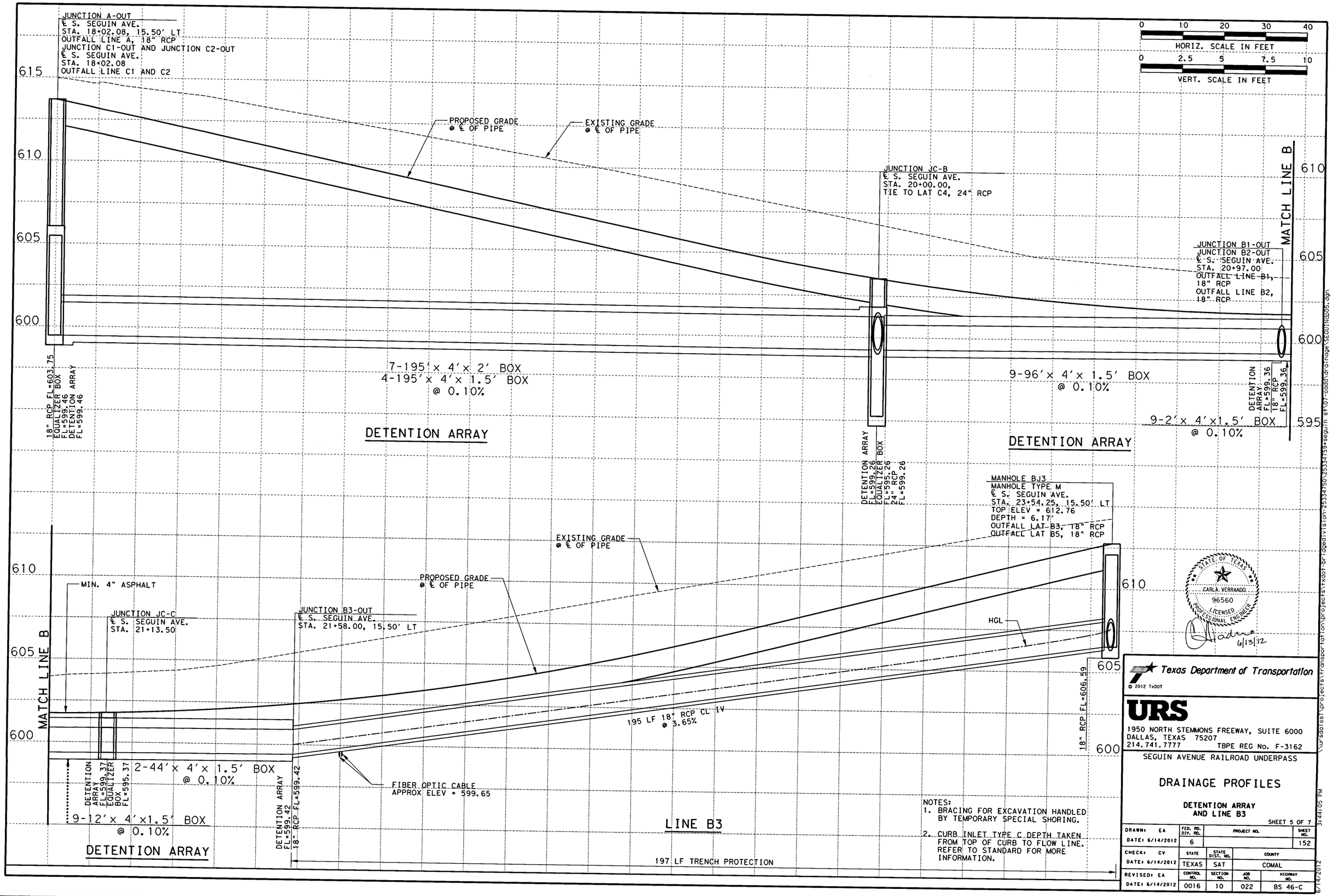

NOTES:
1. BRACING FOR EXCAVATION HANDLED BY TEMPORARY SPECIAL SHORING.
2. CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

DETENTION ARRAY AND LINE B3

SHEET 5 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.	SHEET NO.
DATE: 6/14/2012	6		152
CHECK: CV	STATE	STATE DIST. NO.	COUNTY
DATE: 6/14/2012	TEXAS	SAT	COMAL
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 6/14/2012	0016	10	022	BS 46-C

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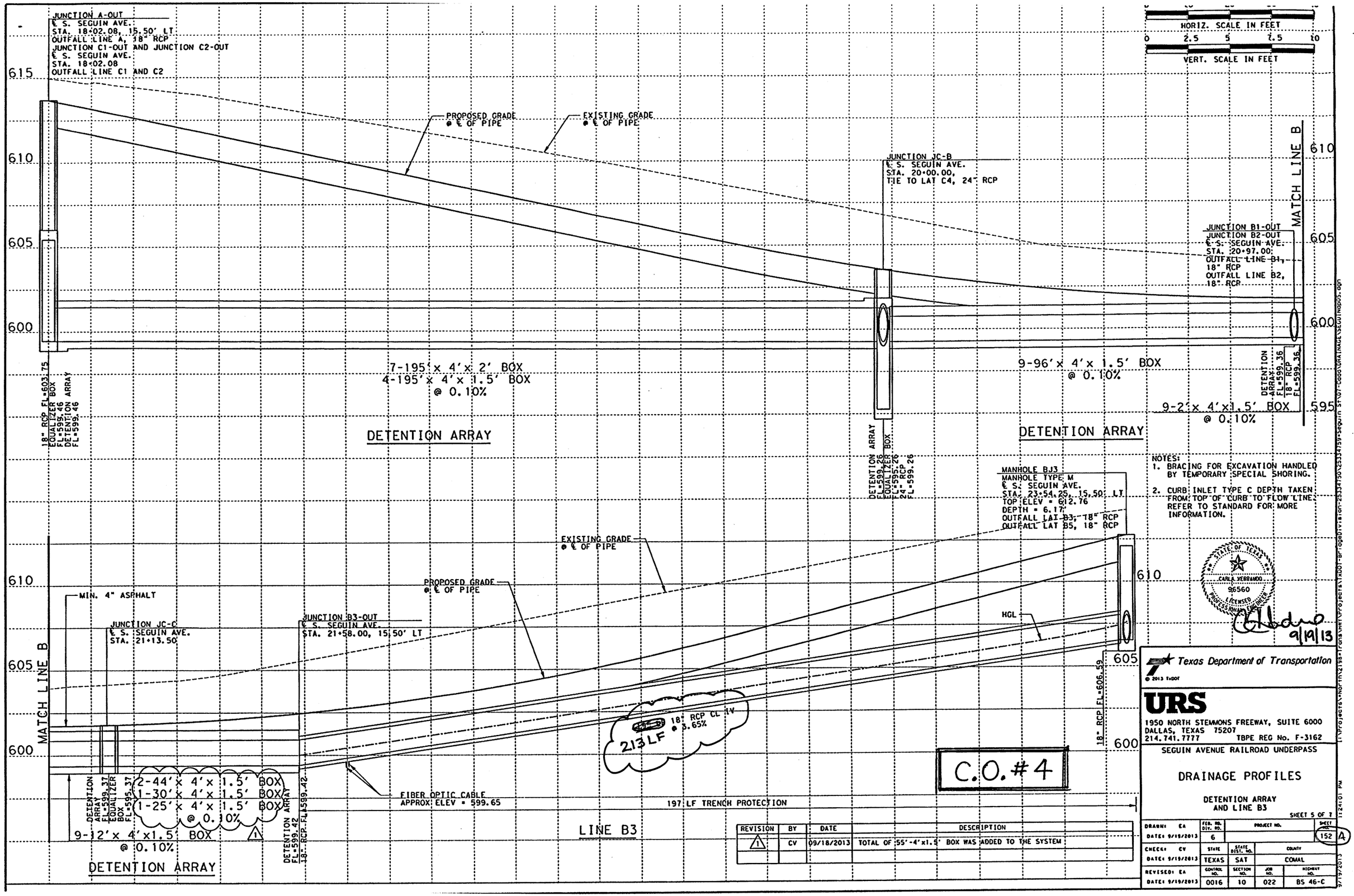
JUNCTION A-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08, 15.50' LT
OUTFALL LINE A, 18" RCP
JUNCTION C1-OUT AND JUNCTION C2-OUT
℄ S. SEGUIN AVE.
STA. 18+02.08
OUTFALL LINE C1 AND C2
HORIZ. SCALE IN FEET
0 2.5 5 7.5 10
VERT. SCALE IN FEET
PROPOSED GRADE @ ℄ OF PIPE
EXISTING GRADE @ ℄ OF PIPE
JUNCTION JC-B
℄ S. SEGUIN AVE.
STA. 20+00.00,
TIE TO LAT C4, 24" RCP
MATCH LINE B
JUNCTION B1-OUT
JUNCTION B2-OUT
℄ S. SEGUIN AVE.
STA. 20+97.00
OUTFALL LINE B1, 18" RCP
OUTFALL LINE B2, 18" RCP
615
610
605
600
595
18" RCP FL=603.75
EQUALIZER BOX FL=599.46
DETENTION ARRAY FL=599.46
7-195' x 4' x 2' BOX
4-195' x 4' x 1.5' BOX
@ 0.10%
DETENTION ARRAY
DETENTION ARRAY FL=599.26
EQUALIZER BOX FL=595.26
24" RCP FL=599.26
9-96' x 4' x 1.5' BOX
@ 0.10%
DETENTION ARRAY FL=599.36
18" RCP FL=599.36
9-2' x 4' x 1.5' BOX
@ 0.10%
DETENTION ARRAY
MANHOLE BJ3
MANHOLE TYPE M
℄ S. SEGUIN AVE.
STA. 23+54.25, 15.50' LT
TOP ELEV = 612.76
DEPTH = 6.17'
OUTFALL LAT B3, 18" RCP
OUTFALL LAT B5, 18" RCP
NOTES:
1. BRACING FOR EXCAVATION HANDLED BY TEMPORARY SPECIAL SHORING.
2. CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.
EXISTING GRADE @ ℄ OF PIPE
PROPOSED GRADE @ ℄ OF PIPE
MIN. 4" ASPHALT
JUNCTION JC-C
℄ S. SEGUIN AVE.
STA. 21+13.50
JUNCTION B3-OUT
℄ S. SEGUIN AVE.
STA. 21+58.00, 15.50' LT
HGL
18" RCP FL=606.59
18" RCP CL IV @ 3.65%
213 LF
C.O.#4
FIBER OPTIC CABLE APPROX. ELEV = 599.65
197 LF TRENCH PROTECTION
DETENTION ARRAY FL=599.37
EQUALIZER BOX FL=595.37
2-44' x 4' x 1.5' BOX
1-30' x 4' x 1.5' BOX
1-25' x 4' x 1.5' BOX
@ 0.10%
9-12' x 4' x 1.5' BOX
@ 0.10%
1
DETENTION ARRAY FL=599.42
18" RCP FL=599.42
DETENTION ARRAY
LINE B3
STATE OF TEXAS
CARLA VERDANO
96560
LICENSED
PROFESSIONAL ENGINEER
9/19/13
Texas Department of Transportation
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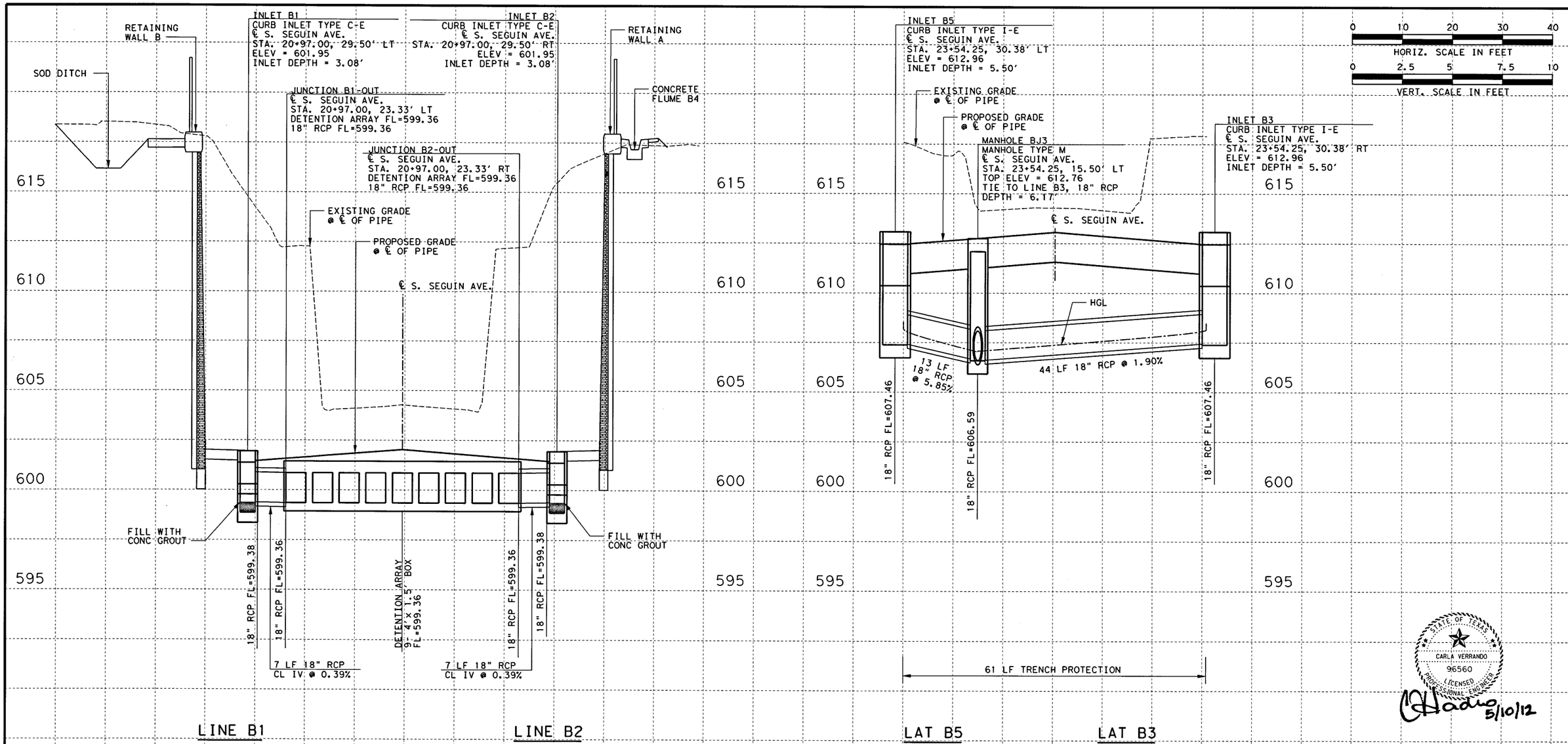
1950 NORTH STEMMONS FREEWAY, SUITE 6000
DALLAS, TEXAS 75207
214.741.7777 TBPE REG No. F-3162
SEGUIN AVENUE RAILROAD UNDERPASS
DRAINAGE PROFILES
DETENTION ARRAY AND LINE B3
SHEET 5 OF 7
DRAWN: EA
DATE: 9/19/2013
FED. RD. DIV. NO. 6
PROJECT NO.
SHEET NO. 152 A
CHECK: CV
DATE: 9/19/2013
STATE TEXAS
STATE DIST. NO. SAT
COUNTY COMAL
REVISED: EA
DATE: 9/19/2013
CONTROL NO. 0016
SECTION NO. 10
JOB NO. 022
HIGHWAY NO. BS 46-C
REVISION 1
BY CV
DATE 09/18/2013
DESCRIPTION TOTAL OF 55'-4'x1.5' BOX WAS ADDED TO THE SYSTEM



STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED
PROFESSIONAL ENGINEER
5/10/12

NOTES:
1. BRACING FOR EXCAVATION HANDLED BY TEMPORARY SPECIAL SHORING.
2. CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE B1 AND B2
LAT B3 AND B5

SHEET 6 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			153
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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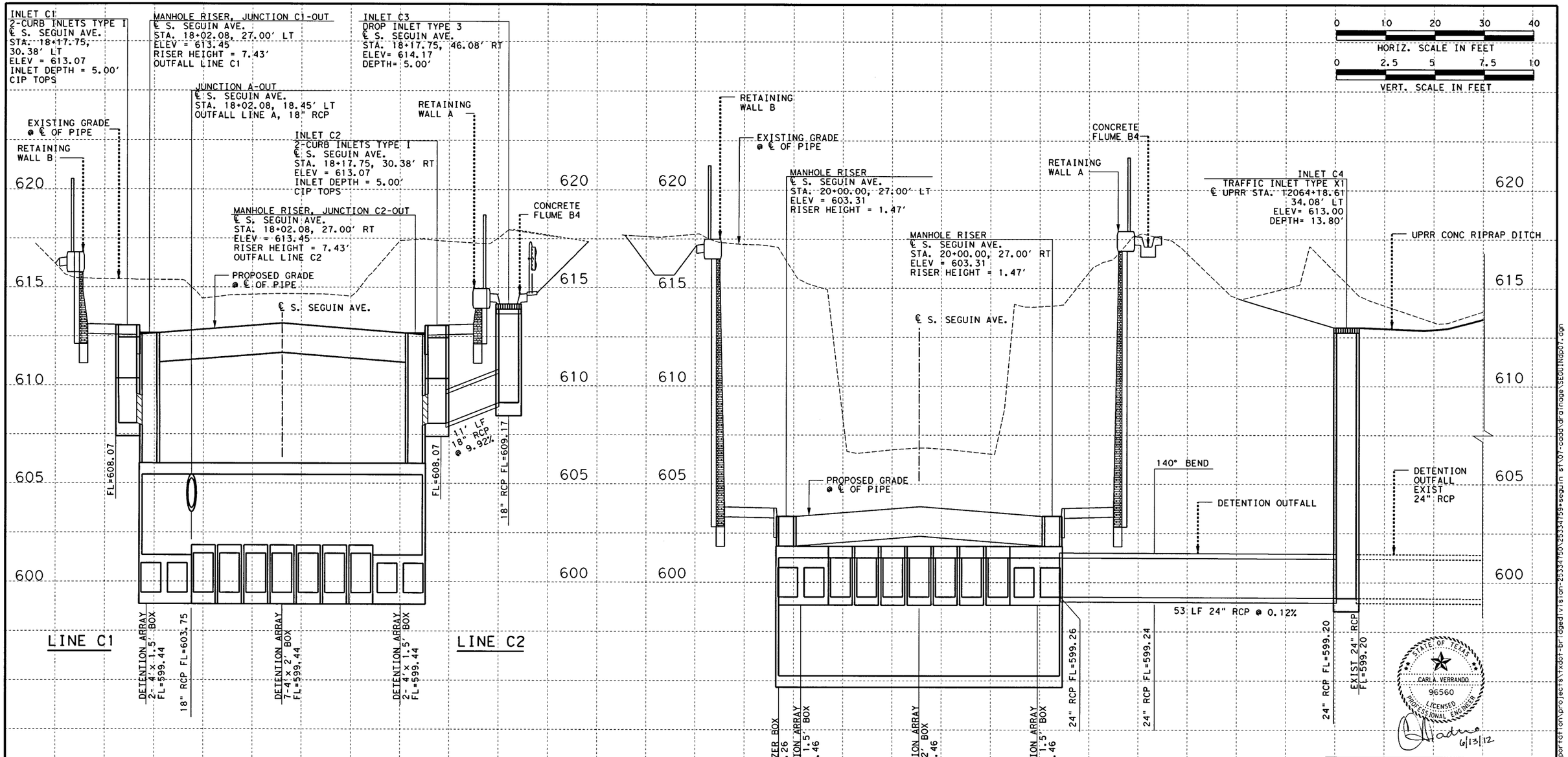

NOTES:
1. BRACING FOR EXCAVATION HANDLED BY TEMPORARY SPECIAL SHORING.
2. CURB INLET TYPE C DEPTH TAKEN FROM TOP OF CURB TO FLOW LINE. REFER TO STANDARD FOR MORE INFORMATION.

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SEGUIN AVENUE RAILROAD UNDERPASS

DRAINAGE PROFILES

LINE C1, C2 AND LAT C4

SHEET 7 OF 7

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 6/14/2012	6			154
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 6/14/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 6/14/2012	0016	10	022	BS 46-C

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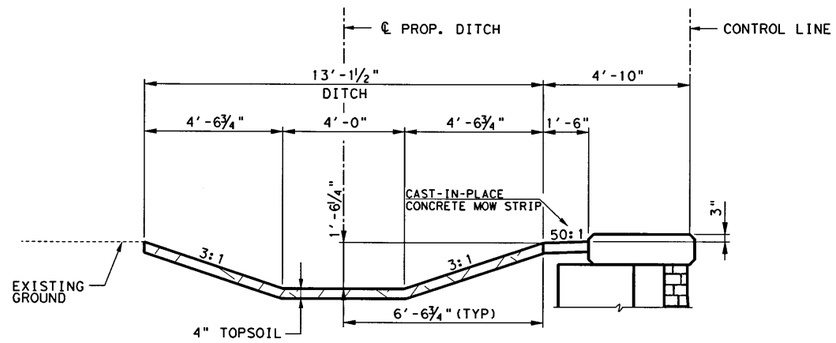

GRASSED 4'-0" FLAT BOTTOM DITCH

NOTE:

1. SEE SEGUIN AVE. STORM SEWER LAYOUT SHEET 2 OF 3 FOR FLAT BOTTOM DITCH.

STATE OF TEXAS
CARLA VERRANDO
96560
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PROFESSIONAL ENGINEER

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SEGUIN AVENUE RAILROAD UNDERPASS

MISCELLANEOUS
DRAINAGE DETAILS

SHEET 1 OF 3

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			155
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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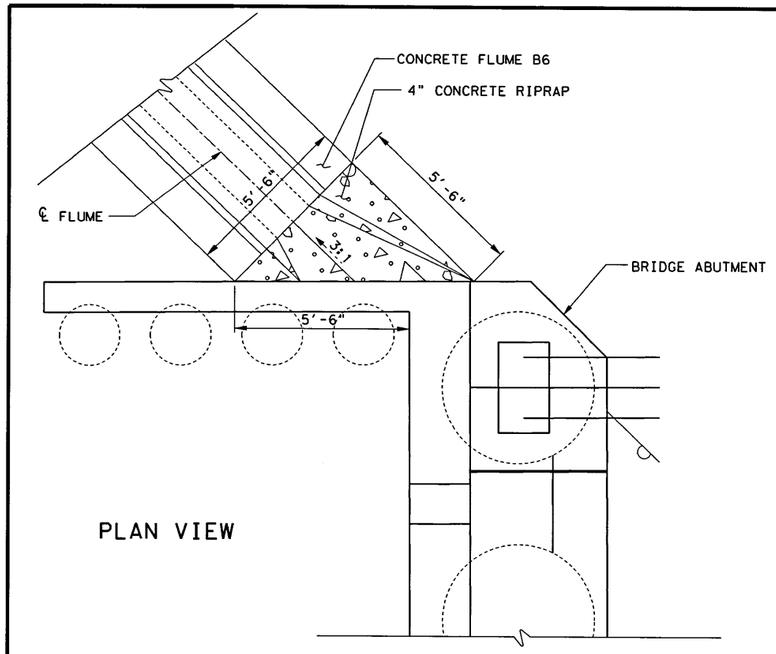
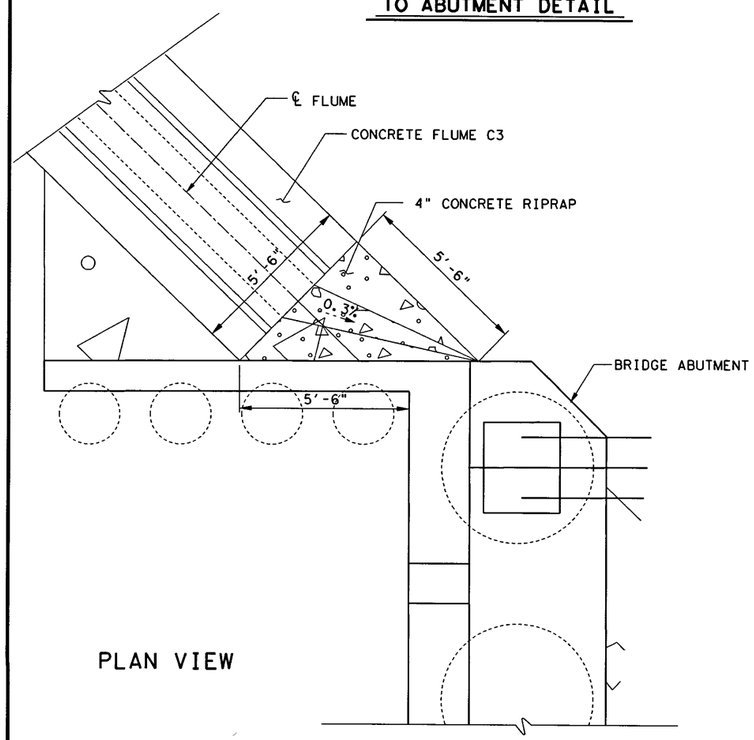
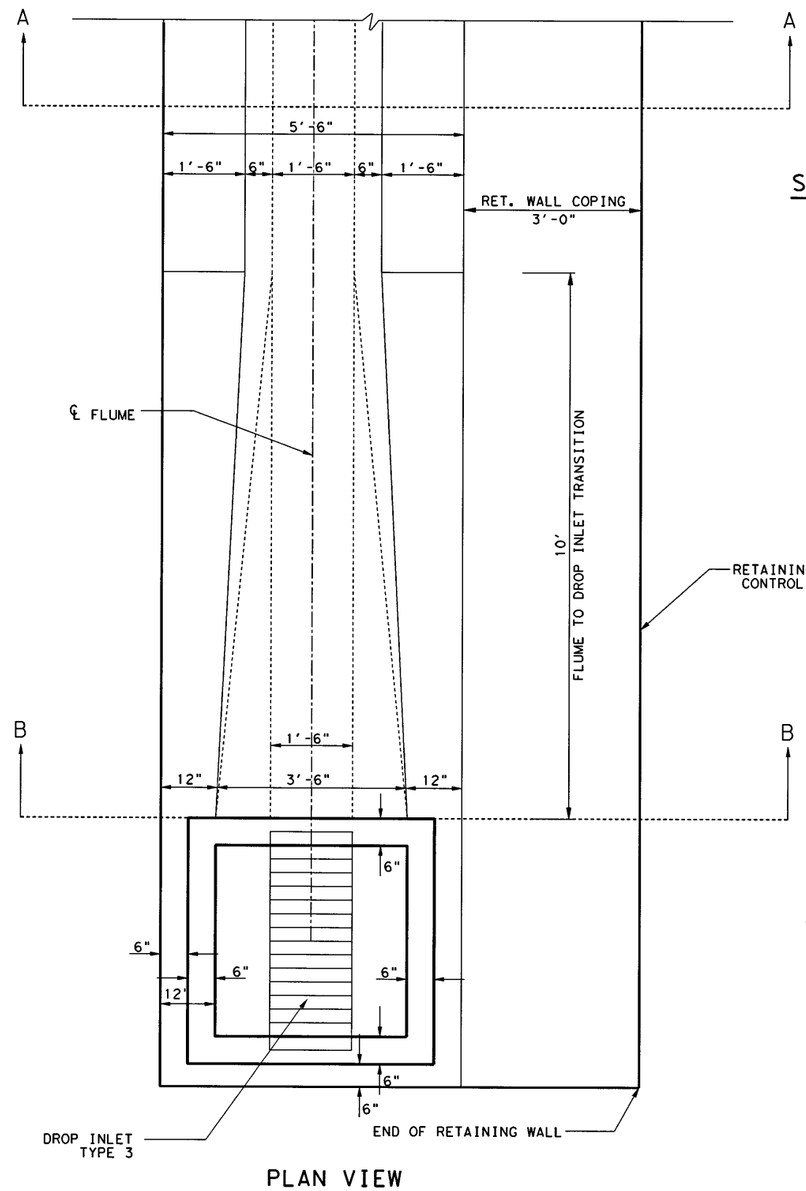
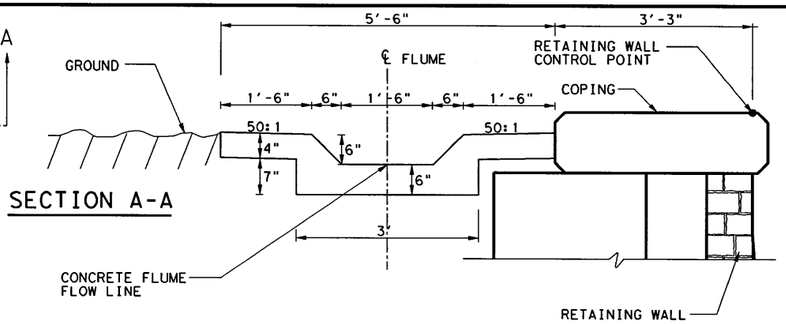


CONCRETE FLUME RIPRAP TRANSITION TO ABUTMENT DETAIL

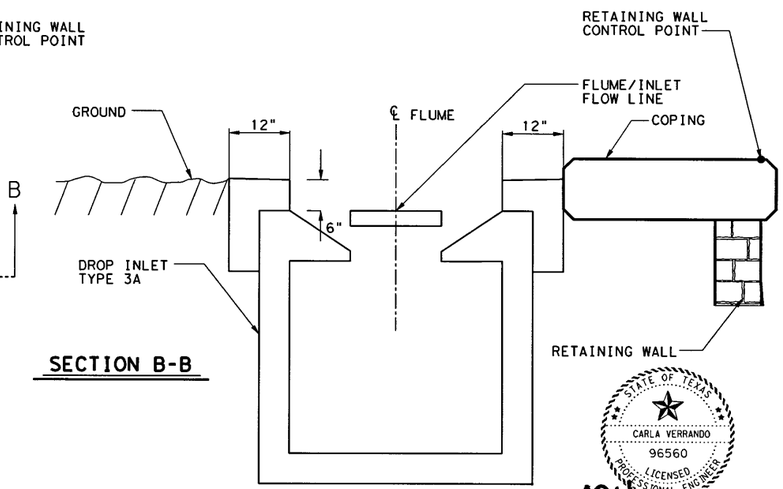


CONCRETE FLUME RIPRAP TRANSITION TO ABUTMENT DETAIL





SECTION A-A



SECTION B-B

STATE OF TEXAS
CARLA VERRANDO
96560
LICENSED PROFESSIONAL ENGINEER
5/10/12

FLUME TO DROP INLET TRANSITION DETAIL

Texas Department of Transportation

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DALLAS, TEXAS 75207
214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

MISCELLANEOUS DRAINAGE DETAILS

SHEET 2 OF 3

DRAWN: EA	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			156
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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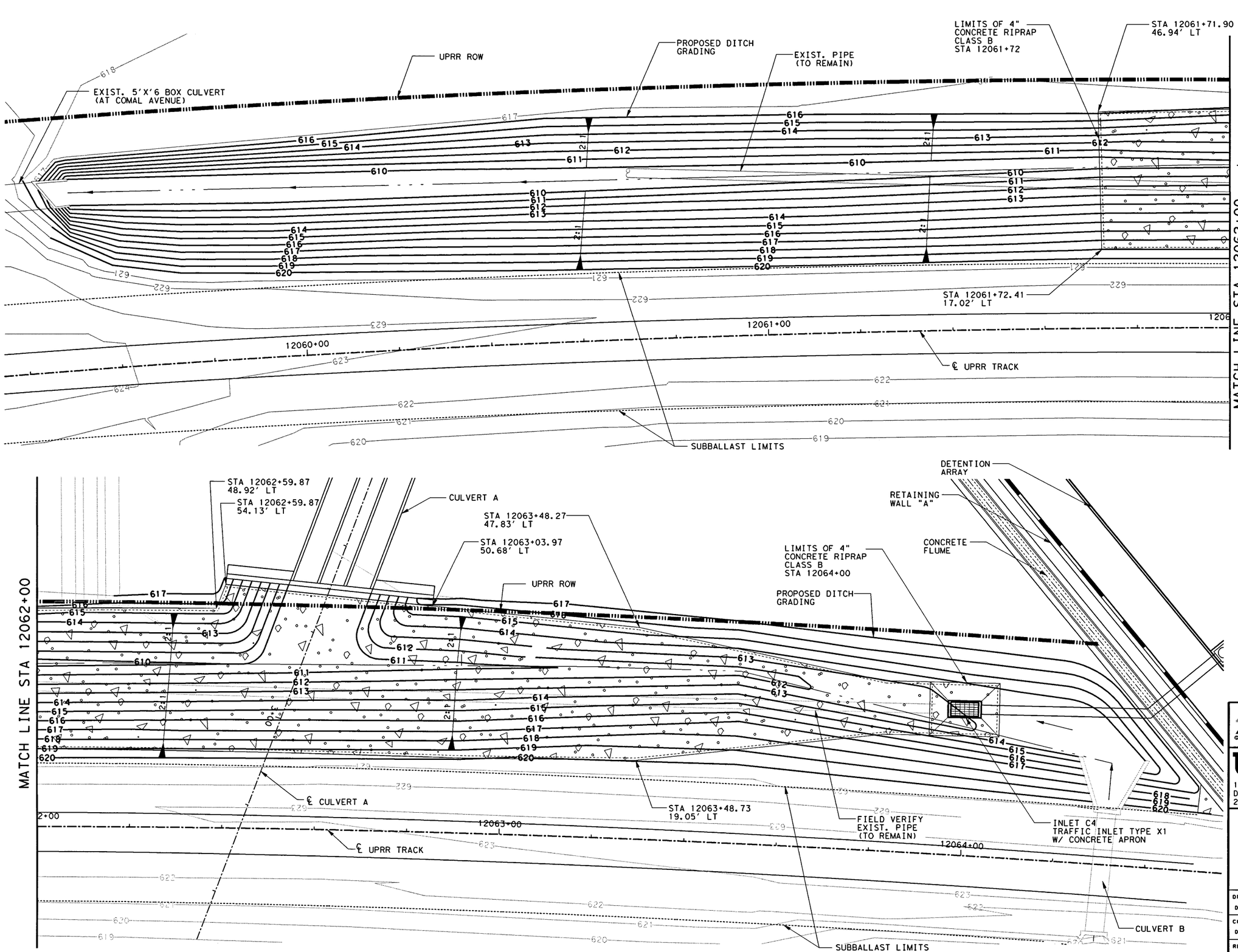

NOTES:
1. DITCH GRADING REQUIRED FROM 4'x7' BOX CULVERT OUTFALL TO 5'x6' BOX CULVERT INLET AT COMAL.
2. SEE DRAINAGE PROFILE SHEETS FOR INLET D1.

STATE OF TEXAS
CARLA VERRANDO
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5/10/12

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214.741.7777 TBPE REG No. F-3162

SEGUIN AVENUE RAILROAD UNDERPASS

MISCELLANEOUS DRAINAGE DETAILS

SHEET 3 OF 3

DRAWN: EA	FED. RD. DIV. RD.	PROJECT NO.		SHEET NO.
DATE: 5/11/2012	6			157
CHECK: CV	STATE	STATE DIST. NO.	COUNTY	
DATE: 5/11/2012	TEXAS	SAT	COMAL	
REVISED: EA	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
DATE: 5/11/2012	0016	10	022	BS 46-C

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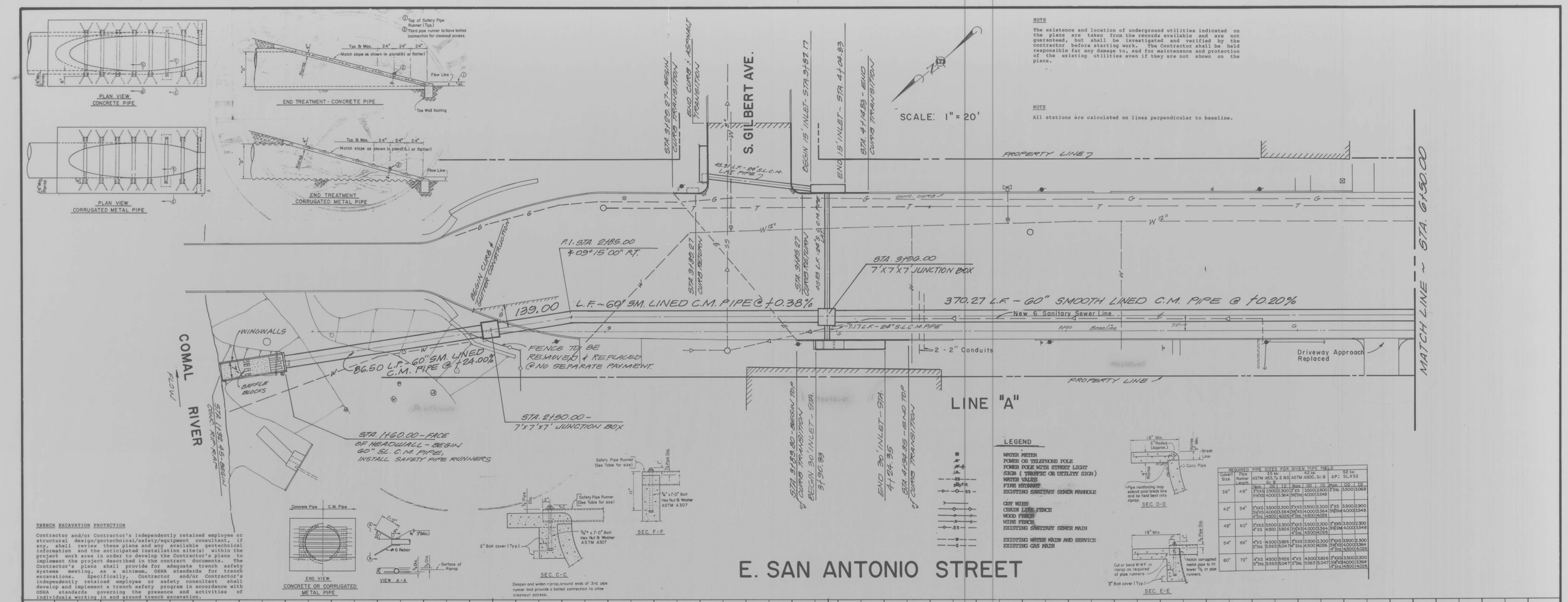

TRENCH EXCAVATION PROTECTION

Contractor and/or Contractor's independently retained employee or structural design/geotechnical/safety/equipment consultant, if any, shall review these plans and any available geotechnical information and the anticipated installation site(s) within the project work area in order to develop the Contractor's plans to implement the project described in the contract documents. The Contractor's plans shall provide for adequate trench safety systems meeting, as a minimum, OSHA standards for trench excavations. Specifically, Contractor and/or Contractor's independently retained employee or safety consultant shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation.

NOTE

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NOTE

All stations are calculated on lines perpendicular to baseline.

LEGEND

WATER METER
POWER OR TELEPHONE POLE
POWER POLE WITH STREET LIGHT
SIGN (TRAFFIC OR UTILITY SIGN)
WATER VALVE
FIRE HYDRANT
EXISTING SANITARY SEWER MANHOLE
GUY WIRE
CHAIN LINK FENCE
WOOD FENCE
WIRE FENCE
EXISTING SANITARY SEWER MAIN
EXISTING WATER MAIN AND SERVICE
EXISTING GAS MAIN

REQUIRED PIPE SIZES FOR GIVEN PIPE YIELD

Culvert Size	Pipe Runner Length	36 ga. ASTM A53, Tp E & S Nom.	OD	ID	42 ga. ASTM A500, Gr. B Nom.	OD	ID	API 5L X52 Nom.	OD	ID
36"	48"	3"XXS	3.500	2.300	3"XS	3.500	2.900	3"Std.	3.500	3.068
		3½"XS	4.000	3.364	3½"Std.	4.000	3.548			
42"	54"	3"XXS	3.500	2.300	3"XS	3.500	2.300	3"XS	3.500	2.900
		3½"XS	4.000	3.364	3½"XS	4.000	3.364	3½"Std.	4.000	3.548
		4"Std.	4.500	4.026	4"Std.	4.500	4.026			
48"	60"	3"XXS	3.500	2.300	3"XS	3.500	2.300	3"XXS	3.500	2.300
		4"XS	4.500	3.826	3½"XS	4.000	3.364	3½"Std.	4.000	3.548
					4"Std.	4.500	4.026			
54"	66"	4"XS	4.500	3.826	3"XXS	3.500	2.300	3"XXS	3.500	2.300
		5"Std.	5.563	5.047	4"Std.	4.500	4.026	3½"XS	4.000	3.364
								4"Std.	4.500	4.026
60"	72"	4"XS	4.500	3.826	4"XS	4.500	3.826	3"XXS	3.500	2.300
		5"Std.	5.563	5.047	5"Std.	5.563	5.047	3½"XS	4.000	3.364
								4"Std.	4.500	4.026

JOB NO.:	0511-04-18
DATE:	JAN. 1990
DRAWN BY:	A.M.O.
DESIGNED BY:	M.W.C.
CHECKED BY:	M.W.C.

MAIN PLAZA

DRAINAGE IMPROVEMENTS

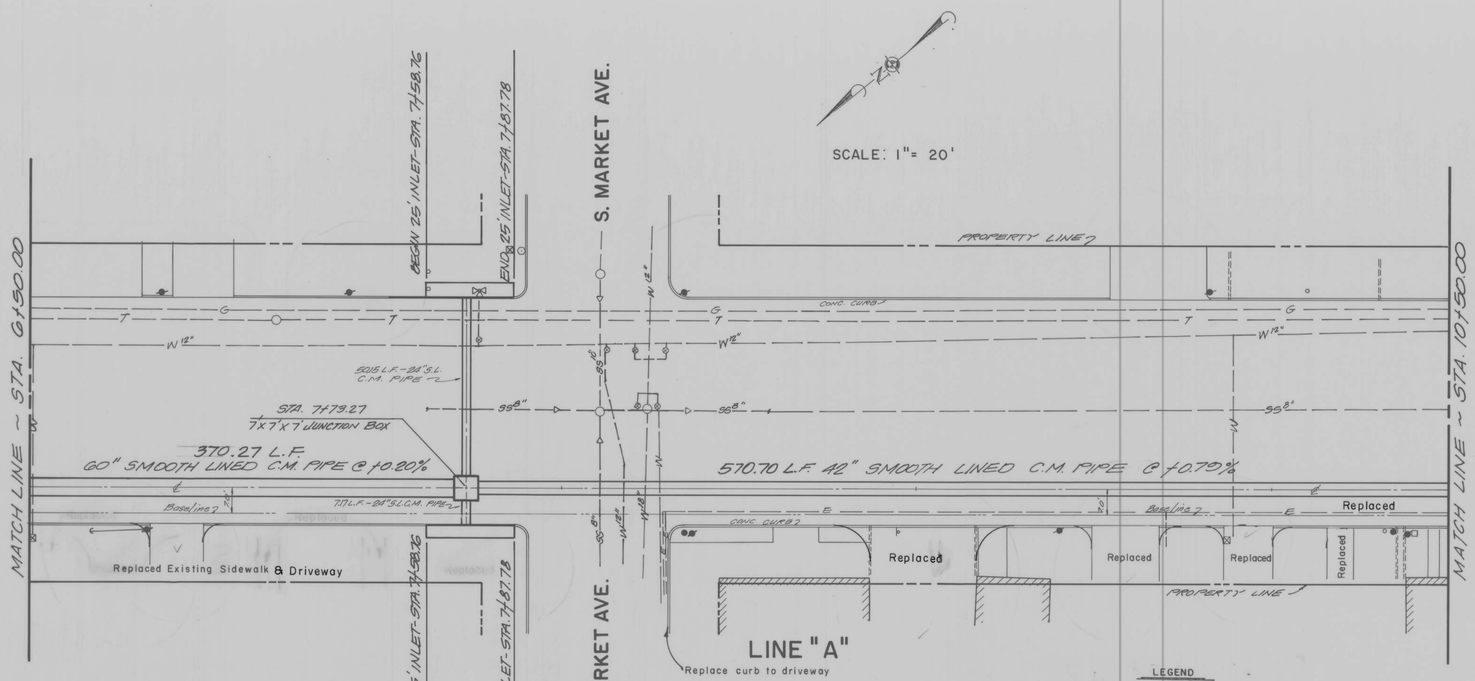
M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

REVISIONS

DATE	DESCRIPTION

SHEET 3 of 13



E. SAN ANTONIO STREET

LEGEND

- WATER METER
- POWER OR TELEPHONE POLE
- POWER POLE WITH STREET LIGHT
- SIGN (TRAFFIC OR UTILITY SIGN)
- WATER VALVE
- FIRE HYDRANT
- EXISTING SANITARY SEWER MANHOLE
- GUY WIRE
- CHAIN LINK FENCE
- WOOD FENCE
- WIRE FENCE
- EXISTING SANITARY SEWER MAIN
- EXISTING WATER MAIN AND SERVICE
- EXISTING GAS MAIN

TRENCH EXCAVATION PROTECTION

Contractor and/or Contractor's independently retained employee or structural design/geotechnical/safety/equipment consultant, if any, shall review these plans and any available geotechnical information and the anticipated installation site(s) within the project work area in order to develop the Contractor's plans to implement the project described in the contract documents. The Contractor's plans shall provide for adequate trench safety systems meeting, as a minimum, OSHA standards for trench excavations. Specifically, Contractor and/or Contractor's independently retained employee or safety consultant shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation.

NOTE

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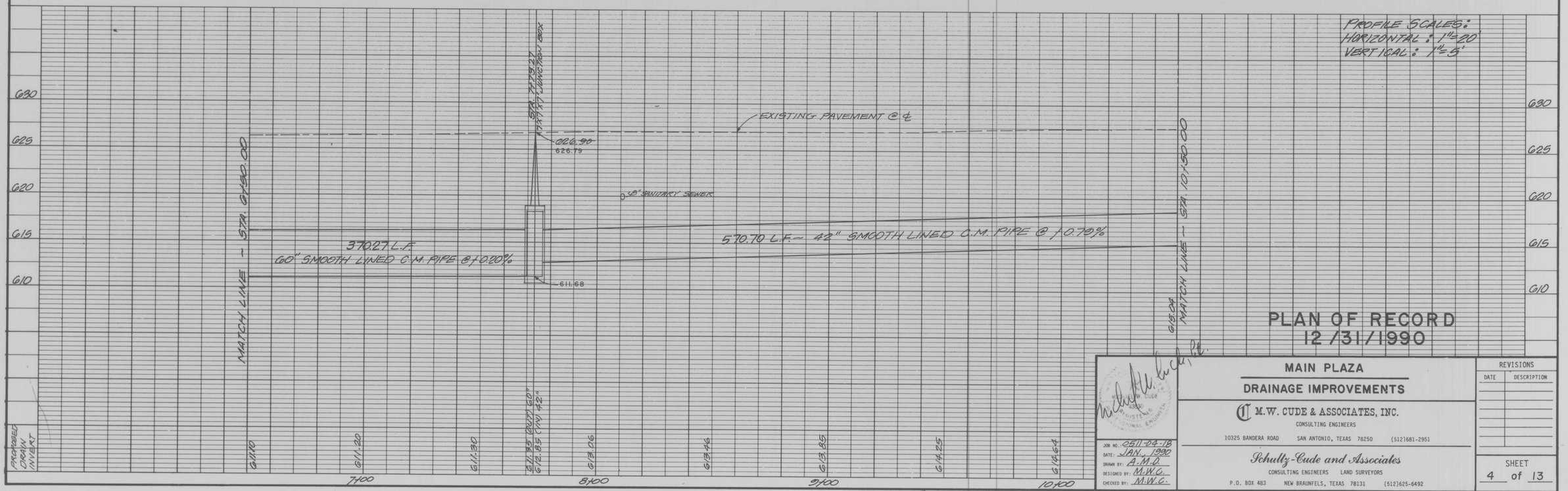
NOTE

All stations are calculated on lines perpendicular to baseline.

PROFILE SCALES:
HORIZONTAL: 1"=20'
VERTICAL: 1"=5'



PLAN OF RECORD
12/31/1990

JOB NO. 0511-04-18
DATE: JAN., 1990
DRAWN BY: A.M.O.
DESIGNED BY: M.W.C.
CHECKED BY: M.W.C.

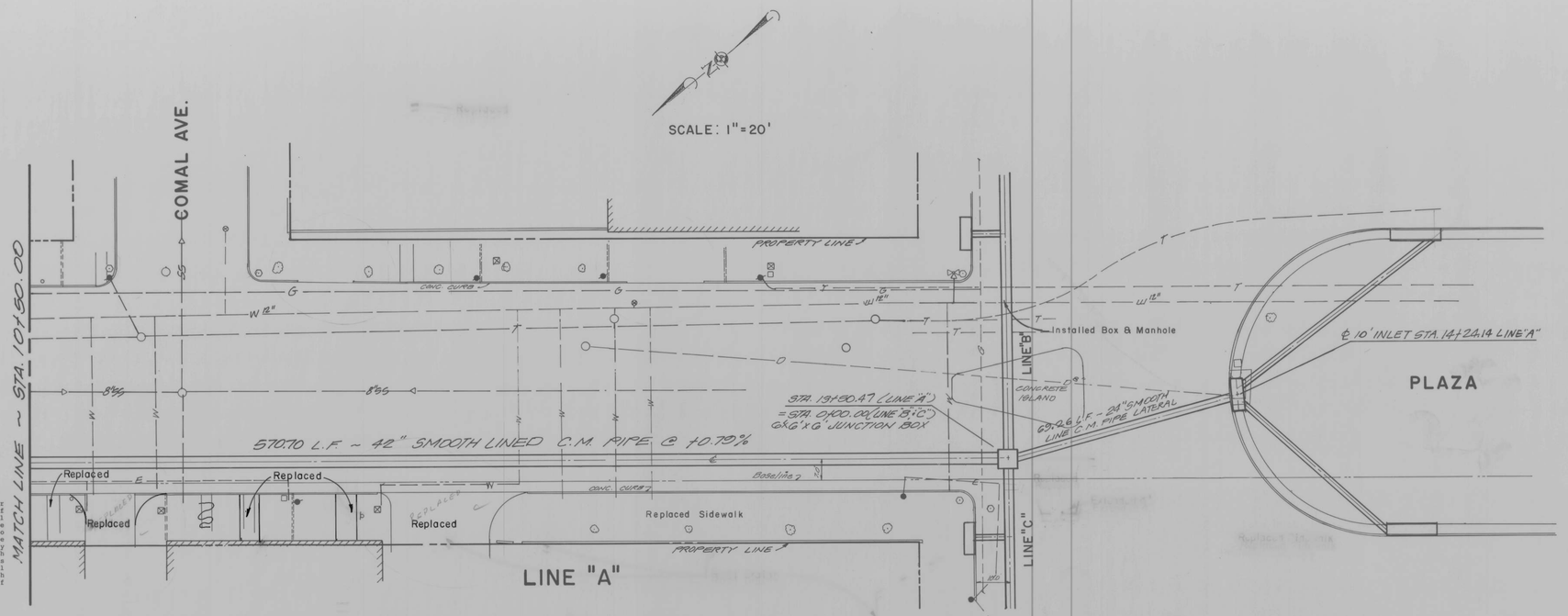
MAIN PLAZA
DRAINAGE IMPROVEMENTS

M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

REVISIONS	
DATE	DESCRIPTION

SHEET 4 of 13



TRENCH EXCAVATION PROTECTION

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NOTE

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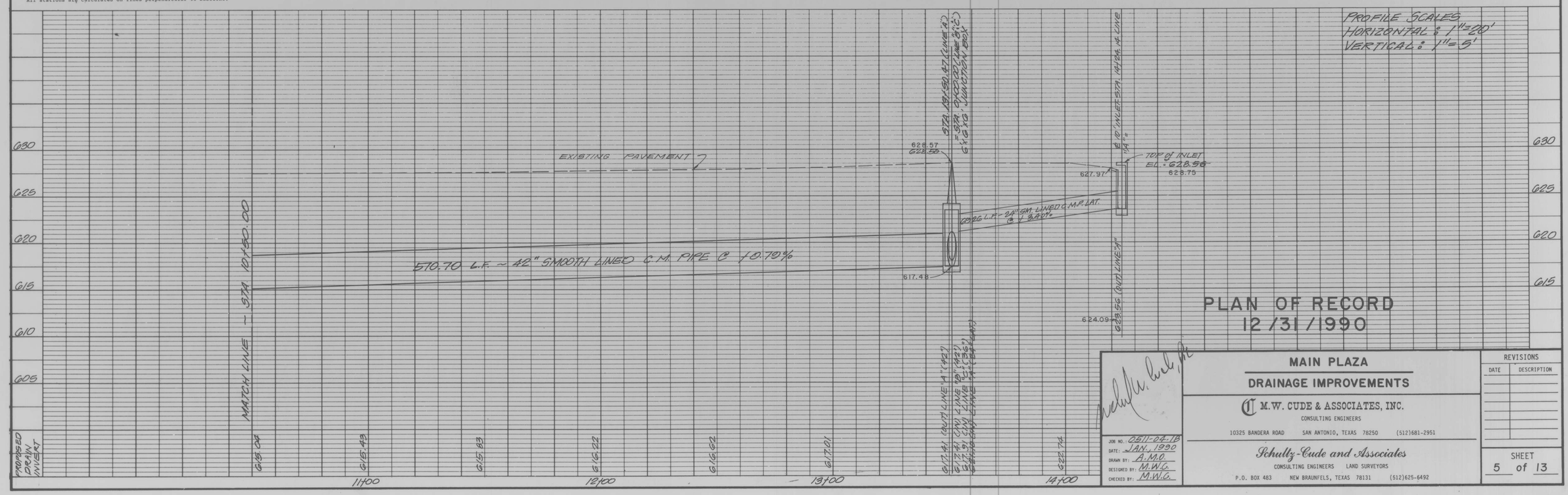
LEGEND

	WATER METER
	POWER OR TELEPHONE POLE
	POWER POLE WITH STREET LIGHT
	SIGN (TRAFFIC OR UTILITY SIGN)
	WATER VALVE
	FIRE HYDRANT
	EXISTING SANITARY SEWER MANHOLE
	GUY WIRE
	CHAIN LINK FENCE
	WOOD FENCE
	WIRE FENCE
	EXISTING SANITARY SEWER MAIN
	EXISTING WATER MAIN AND SERVICE
	EXISTING GAS MAIN

E. SAN ANTONIO STREET

PLAZA



MAIN PLAZA

DRAINAGE IMPROVEMENTS

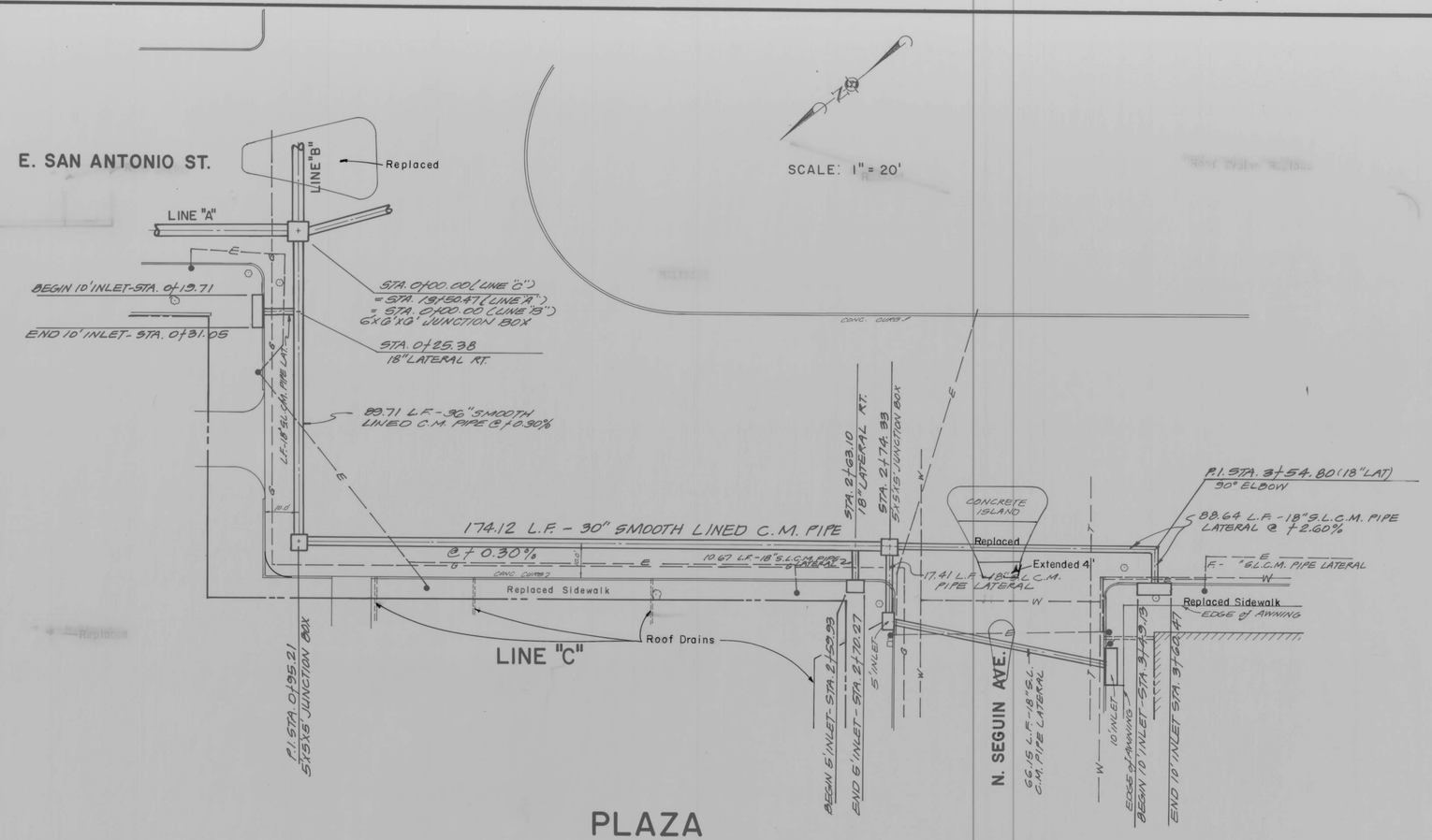
M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

JOB NO.: 0511-04.18
DATE: JAN. 1990
DRAWN BY: A.M.O.
DESIGNED BY: M.W.G.
CHECKED BY: M.W.G.

REVISIONS	
DATE	DESCRIPTION

SHEET 5 of 13



TRENCH EXCAVATION PROTECTION

Contractor and/or Contractor's independently retained employee or structural design/geotechnical/safety/equipment consultant, if any, shall review these plans and any available geotechnical information and the anticipated installation site(s) within the project work area in order to develop the Contractor's plans to implement the project described in the contract documents. The Contractor's plans shall provide for adequate trench safety systems meeting, as a minimum, OSHA standards for trench excavations. Specifically, Contractor and/or Contractor's independently retained employee or safety consultant shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation.

NOTE

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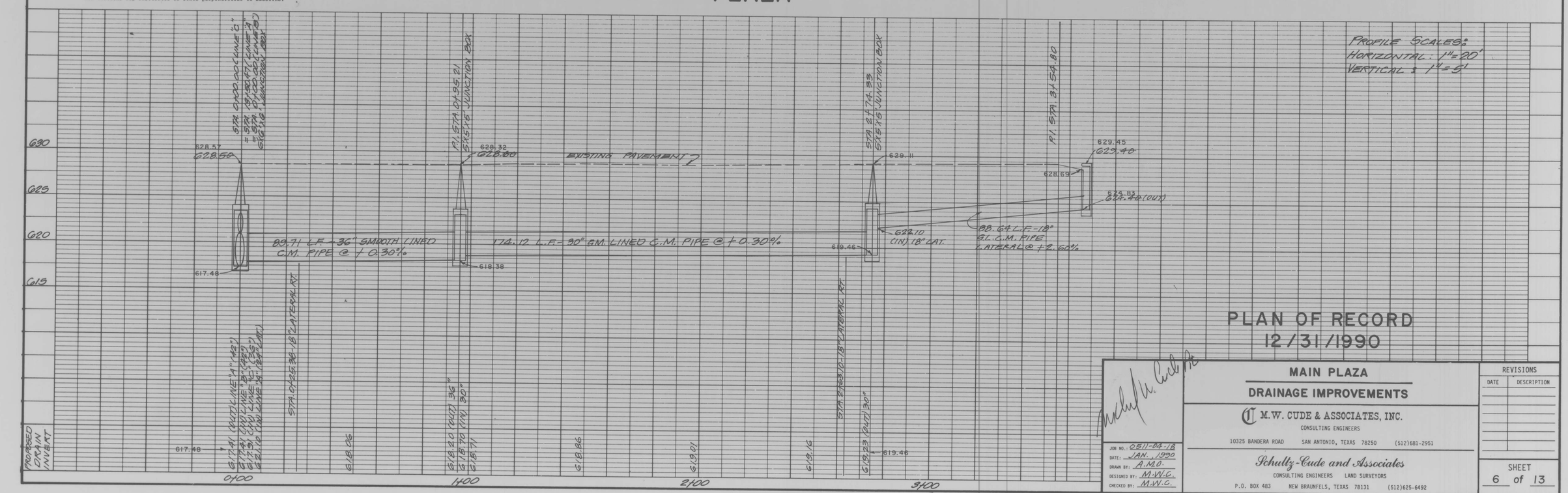
NOTE

All stations are calculated on lines perpendicular to baseline.

LEGEND

- WATER METER
- POWER OR TELEPHONE POLE
- POWER POLE WITH STREET LIGHT
- SIGN (TRAFFIC OR UTILITY SIGN)
- WATER VALVE
- FIRE HYDRANT
- EXISTING SANITARY SEWER MANHOLE
- GUY WIRE
- CHAIN LINK FENCE
- WOOD FENCE
- WIRE FENCE
- EXISTING SANITARY SEWER MAIN
- EXISTING WATER MAIN AND SERVICE
- EXISTING GAS MAIN



PLAN OF RECORD
12/31/1990

JOB NO.:	0511-04-18
DATE:	JAN., 1990
DRAWN BY:	A.M.O.
DESIGNED BY:	M.W.C.
CHECKED BY:	M.W.C.

MAIN PLAZA

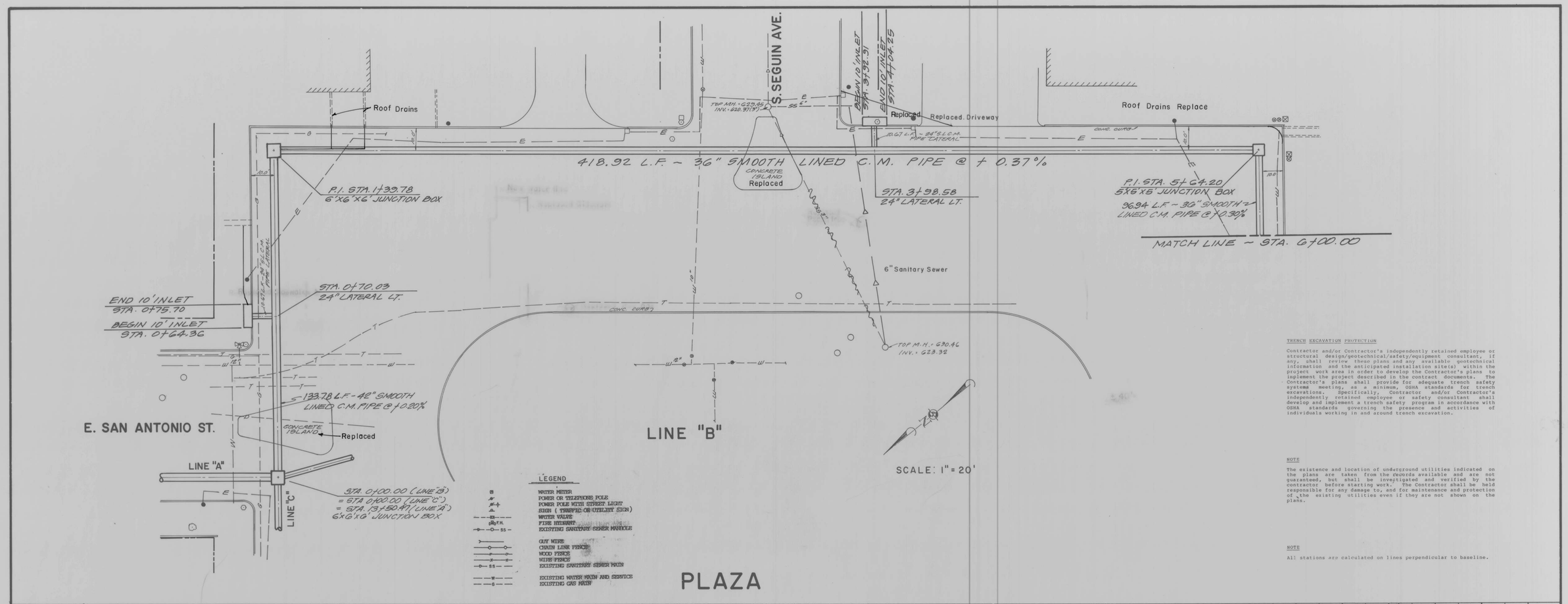
DRAINAGE IMPROVEMENTS

M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

REVISIONS	
DATE	DESCRIPTION

SHEET 6 of 13



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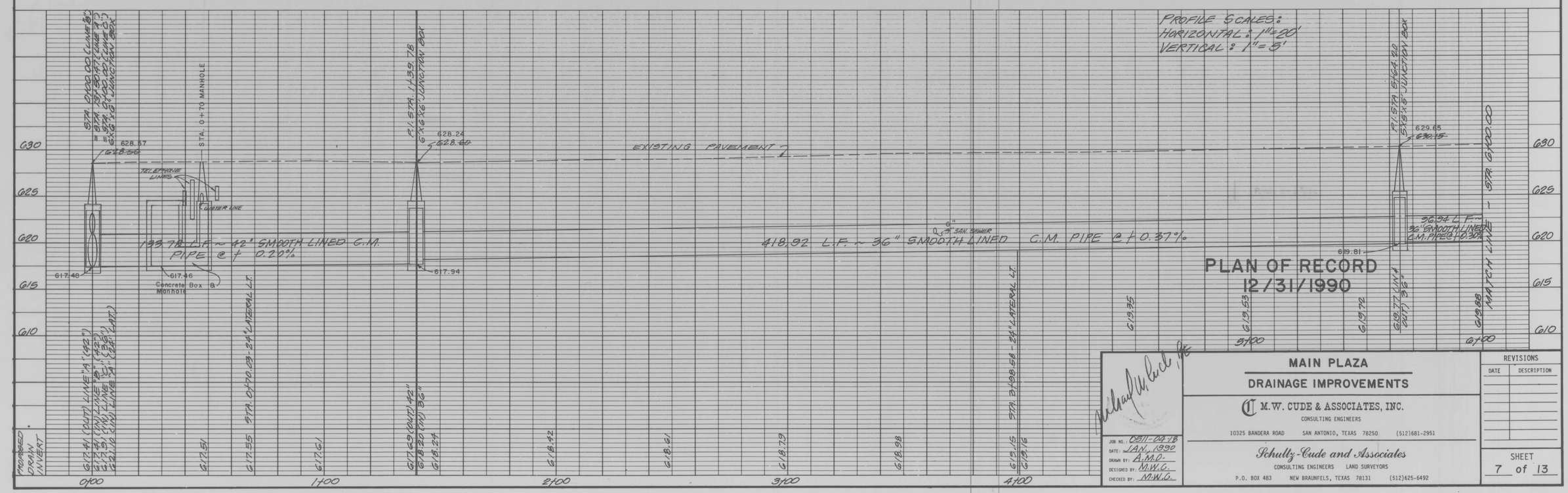

REVISIONS	
DATE	DESCRIPTION

MAIN PLAZA

DRAINAGE IMPROVEMENTS

M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

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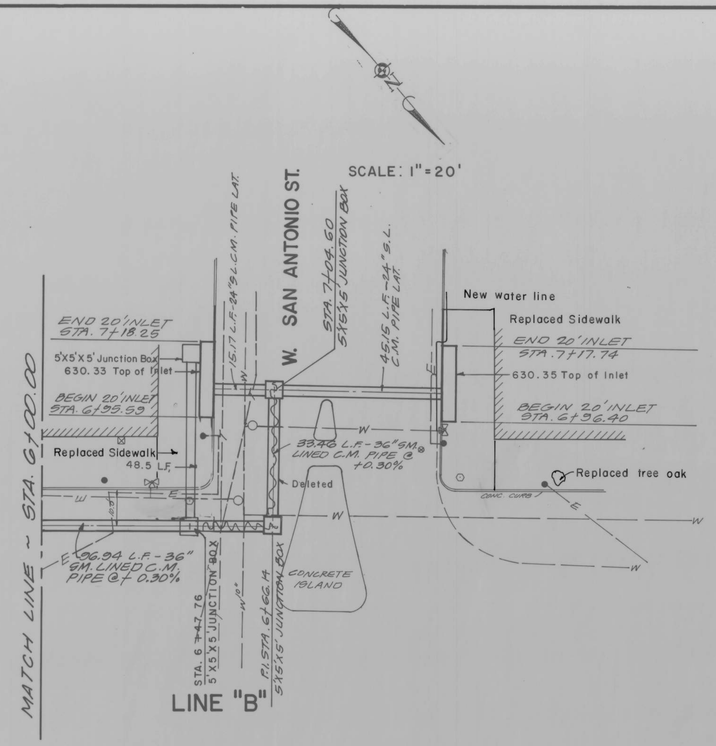
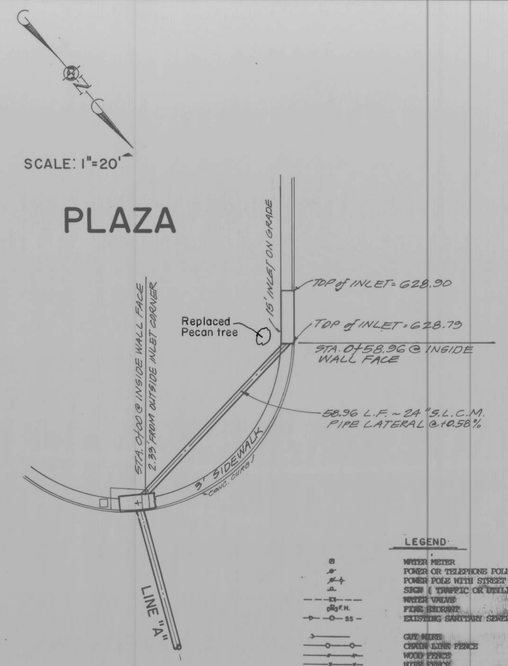
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

JOB NO.: 0311-04-18
DATE: JAN. 1990
DRAWN BY: A.M.C.
DESIGNED BY: M.W.C.
CHECKED BY: M.W.C.

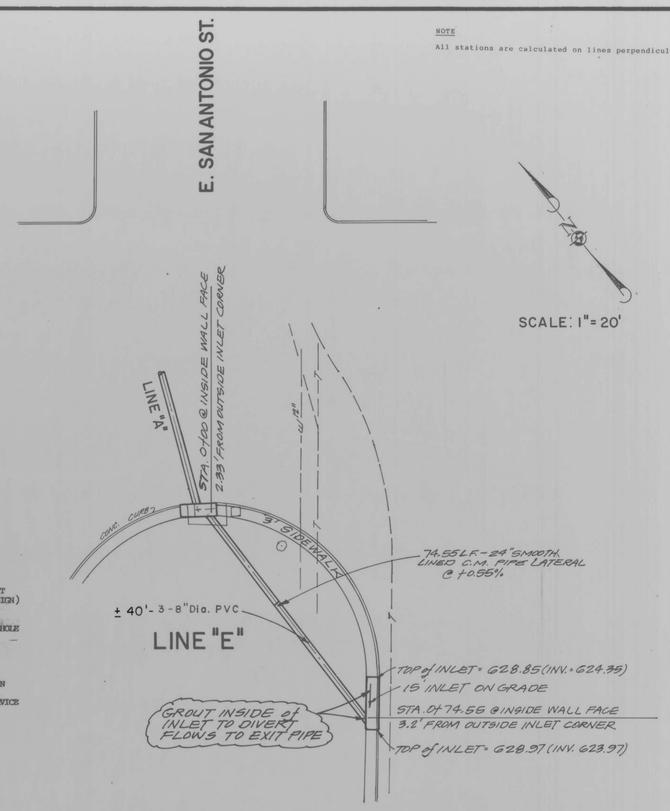
SHEET 7 of 13





LEGEND

	WATER METER
	POWER OR TELEPHONE POLE
	POWER POLE WITH STREET LIGHT
	SIGN (TRAFFIC OR UTILITY SIGN)
W	WATER VALVE
FH	FIRE HYDRANT
SS	EXISTING SANITARY SEWER MANHOLE
	CUT MUSS
	CHAIN LINK FENCE
	WOOD FENCE
	WIRE FENCE
SS	EXISTING SANITARY SEWER MAIN
W	EXISTING WATER MAIN AND SERVICE
G	EXISTING GAS MAIN



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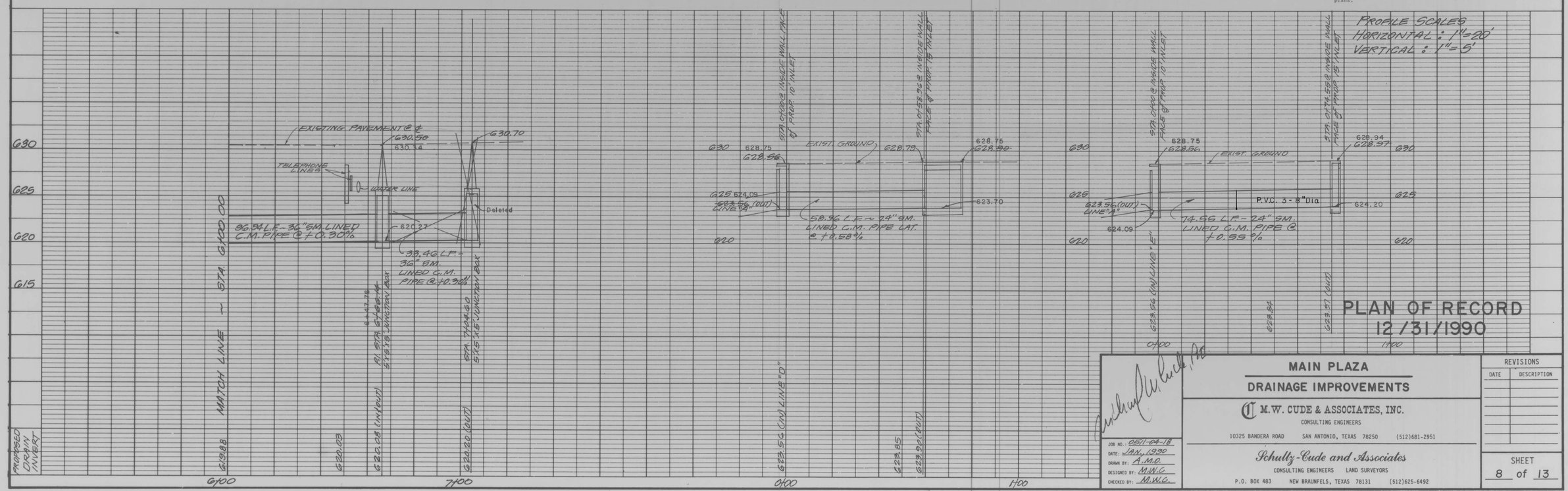


PLAN OF RECORD
12/31/1990

JOB NO.:	0511-04-18
DATE:	JAN. 1990
DRAWN BY:	A.M.O.
DESIGNED BY:	M.W.C.
CHECKED BY:	M.W.C.

MAIN PLAZA
DRAINAGE IMPROVEMENTS

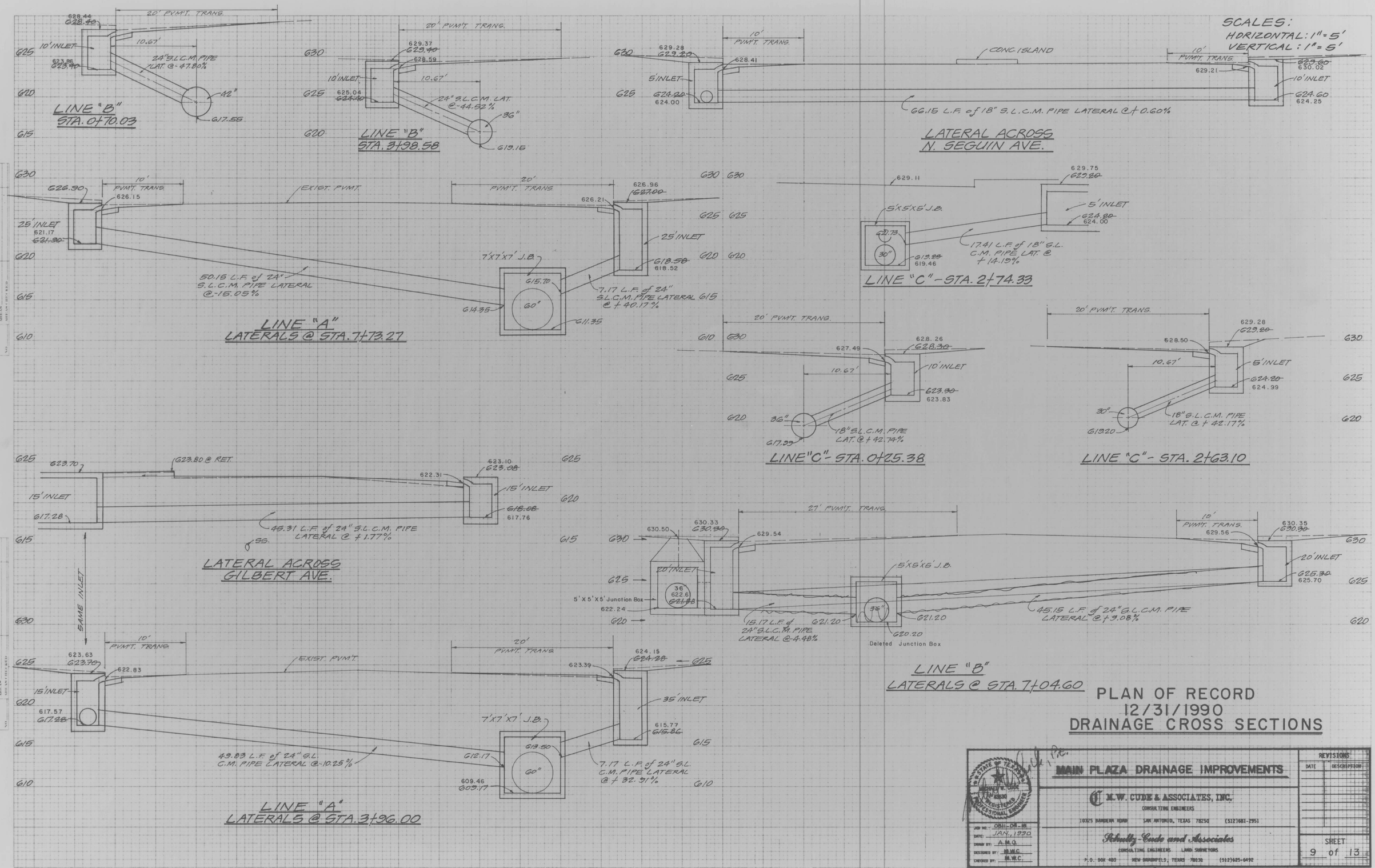
M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78131 (512)625-6492

REVISIONS

DATE	DESCRIPTION

SHEET 8 of 13



PLAN OF RECORD
12/31/1990
DRAINAGE CROSS SECTIONS

MAIN PLAZA DRAINAGE IMPROVEMENTS

M.W. CUDE & ASSOCIATES, INC.
CONSULTING ENGINEERS
10325 BANDERA ROAD SAN ANTONIO, TEXAS 78250 (512)681-2951

Schultz-Cude and Associates
CONSULTING ENGINEERS LAND SURVEYORS
P.O. BOX 483 NEW BRAUNFELS, TEXAS 78130 (512)625-6492

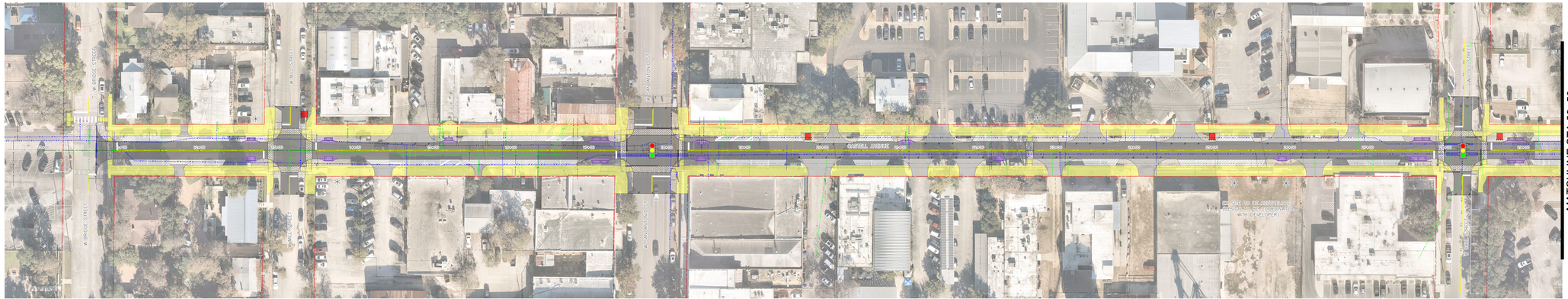
JOB NO.: 0511-04-18
DATE: JAN., 1990
DRAWN BY: A.M.Q.
DESIGNED BY: M.W.C.
CHECKED BY: M.W.C.

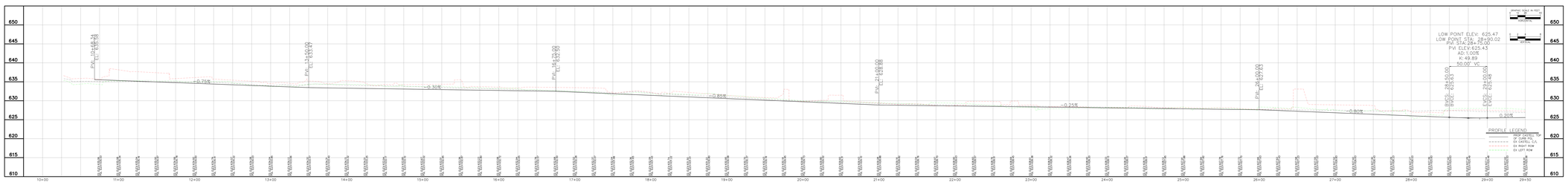
REVISIONS

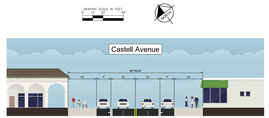
DATE	DESCRIPTION

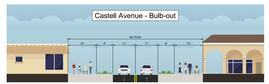
SHEET 9 of 13

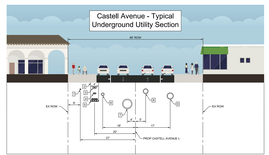
Appendix F: Preliminary Corridor Plan & Profile Layout











UTILITY TYPE	USE AND MATERIAL OWNER		NOTES
EXISTING GAS LINE	2" PLASTIC	CENTERPOINT	CURRENT CENTERPOINT ONELINE
PROP ELECTRICAL DUCT	4" ABS	NBU	CONSTRUCTION PROJECT
PROP SECONDARY ELECTRIC	1" PVC	NBU	
PROP SECONDARY ELECTRIC		NBU	
EXPRESS LANTERS INC FIBER	750	NBU	
EXISTING ELECTRIC			
PROP PRIMARY ELECTRIC	750	NBU	
EXI WATER LINE	8" PVC	CNB	LOCATION VARIES
EXI WATER LINE	2" PVC SCR	CNB	DR. OPAS
EXI WATER LINE	2"	CNB	
EXI SANITARY SEWER	10" PVC	CNB	

LEGEND

- CONCRETE DRIVEWAY
- ON STREET PARKING MATERIAL
- ASPHALT PAVEMENT
- COLORED CONCRETE PAVEMENT
- STAMPED ASPHALT PAVEMENT
- ROCK STAMPED CONCRETE PAVEMENT
- MOUNTABLE TRUCK APRON
- CONCRETE SIDEWALK
- EXISTING ROW
- PROPOSED ROW
- EXISTING PROPERTY BOUNDARY
- PROPOSED DRIVEWAY CLOSURE
- EXISTING/PROPOSED TRAFFIC SIGNAL

City of New Braunfels

Kimley»Horn
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
10101 REDLAND RD.
AUSTIN, TEXAS 78726
PHONE: 512-418-1771
FAX:
WWW.KIMLEY-HORN.COM
TBPE FIRM # 10032401

NO.	DATE	DESCRIPTION	BY
1	09/13/2021	90% SUBMITTAL	CJ

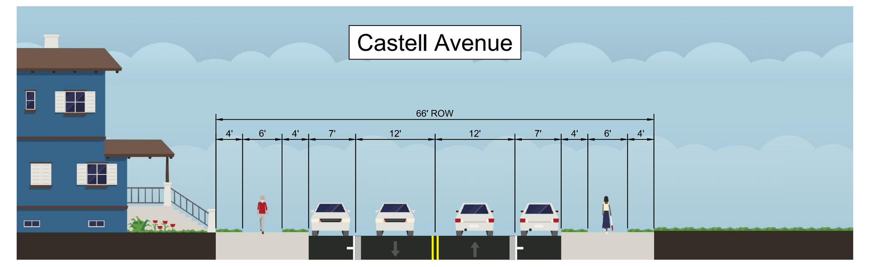
THIS DOCUMENT IS INTENDED ONLY FOR THE PURPOSE AND USE IN FOLLOWING THE PROJECT DESIGN, BIDDING OR CONSTRUCTION OF THIS PROJECT.
TRACKING NUMBER: 069101000
DATE: SEPTEMBER, 2021

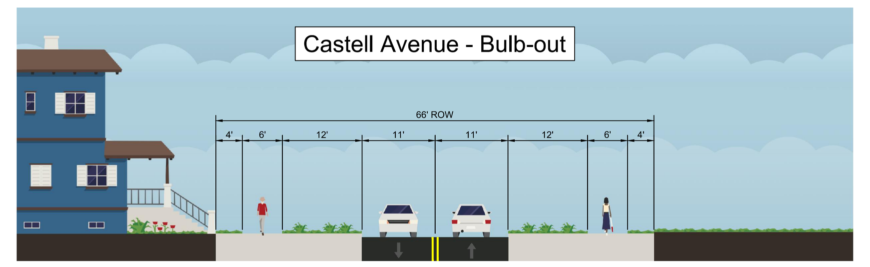
CITY OF NEW BRAUNFELS, TX
CASTELL AVENUE
RECONSTRUCTION

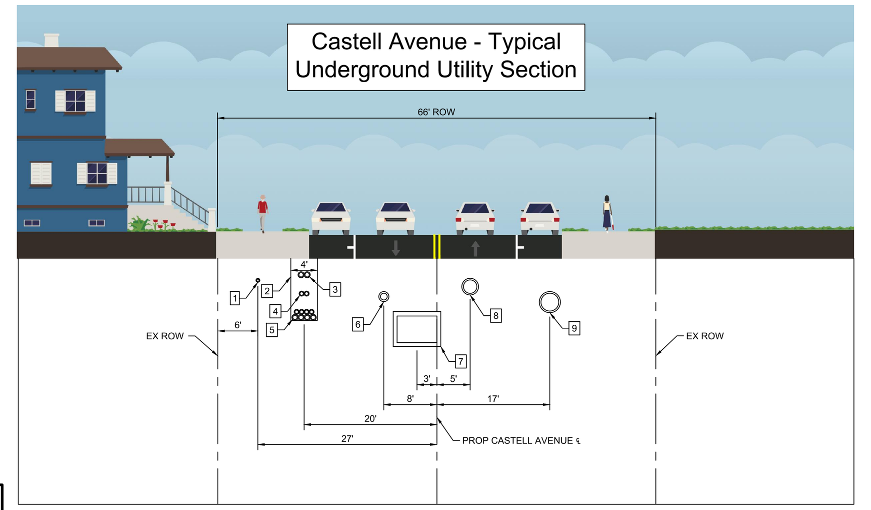
PRELIMINARY PLAN & PROFILE

DESIGN:	CJ
DRAWN:	CJ
CHECKED:	JAW
PROJECT MGR:	GR/DRDC

SHEET
1 OF 3







CALLOUT	UTILITY TYPE	SIZE AND MATERIAL	OWNER	NOTES
1	EXISITNG GAS LINE	2" PLASTIC	CENTERPOINT	CURRENT CENTERPOINT GASLINE CONSTRUCTION PROJECT
2	PROP ELECTRICAL DUCT	4' WIDTH	NBU	
3	PROP COMMUNICATION CABLES	TBD	VARIOUS	
4	PROP SECONDARY ELECTRIC, STREET LIGHTING AND FIBER OPTIC LINES	TBD	NBU	
5	PROP PRIMARY ELECTRIC	TBD	NBU	
6	EX WATERLINE	12" PVC/DI	CONB	
7	PROP STORM LINE	BOX CULVERT	CONB	SIZE VARIES
8	EX WATERLINE	24" DI	CONB	
9	EX SANITARY SEWER	16" PVC	CONB	

LEGEND

- CONCRETE DRIVEWAY
- ON STREET PARKING MATERIAL
- ASPHALT PAVEMENT
- COLORED CONCRETE PAVEMENT
- STAMPED ASPHALT PAVEMENT
- ROCK STAMPED CONCRETE PAVEMENT
- MOUNTABLE TRUCK APRON
- CONCRETE SIDEWALK
- EXISTING ROW
- PROPOSED ROW
- EXISTING PROPERTY BOUNDARY
- PROPOSED DRIVEWAY CLOSURE
- EXISTING/PROPOSED TRAFFIC SIGNAL

City of New Braunfels

Kimley»Horn
10101 REUNION PLACE, SUITE 400, SAN ANTONIO, TX 78216
TBPE No. 928
P: 210-541-9166
F: 210-541-8699

No.	Revision	By	Date

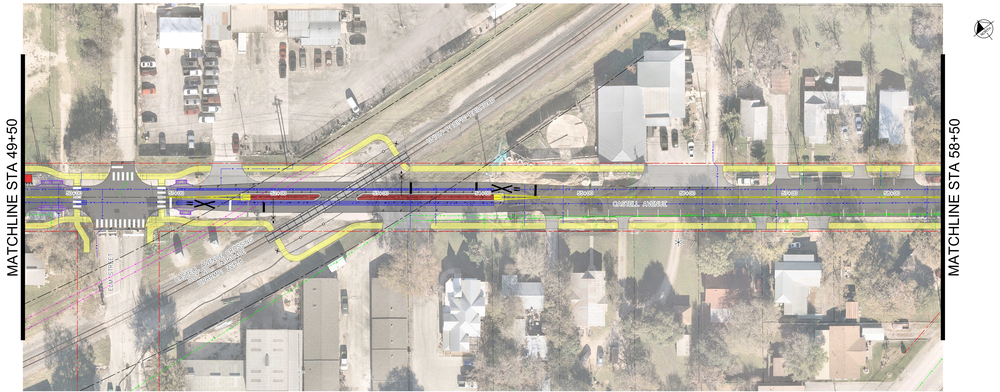
THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.
NOLAN PIERCE P.E.
SERIAL NO. 130905
DATE: SEPTEMBER 2022

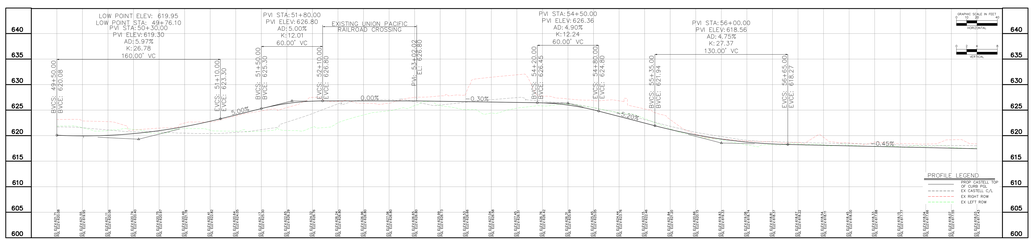
CITY OF NEW BRAUNFELS, TX
CASTELL AVENUE RECONSTRUCTION

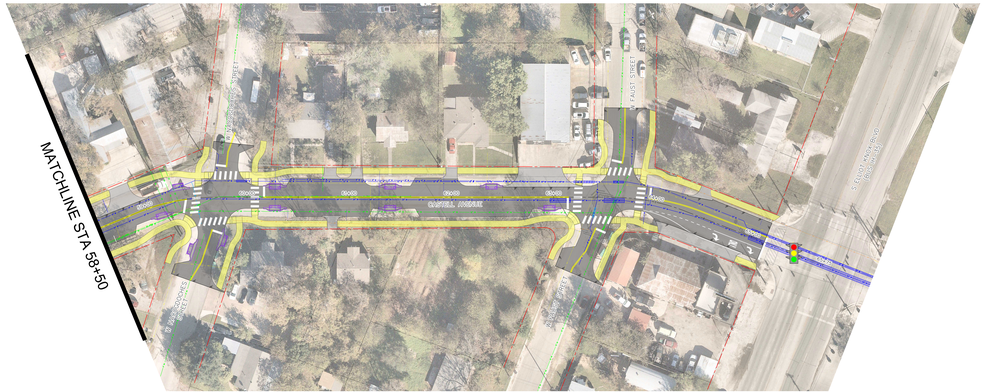
PRELIMINARY PLAN & PROFILE

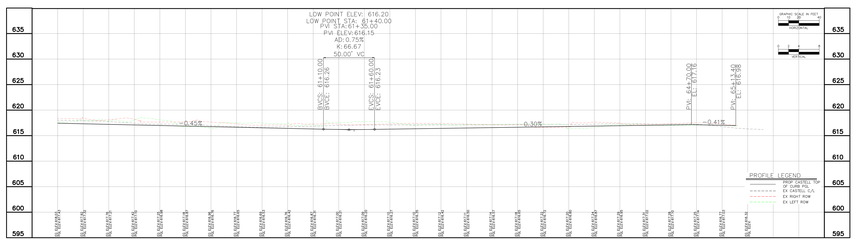
DATE:	SEPTEMBER 2022
DESIGN:	NWP
DRAWN:	TLH
CHECKED:	JAW
KHA NO.:	061200015

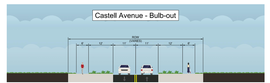
SHEET
2 OF 3

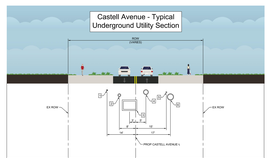












ENGINEERING DETAIL TYPE	TYPE AND MATERIAL CHOICE	NOTES
EX1 CURB & GUTTER	CONCRETE	EXISTING
EX2 WATERLINE	DIP PVC	CLASS
EX3 WATERLINE	DIP PVC	CLASS, SIZE VARIES
EX4 WATER VALVE	DIP	CLASS
EX5 SANITARY SEWER	VCP, PVC	CLASS, DIAMETER
EX6 SANITARY SEWER	DIP, PVC	CLASS, LOCATION VARIES

LEGEND

- CONCRETE DRIVEWAY
- ON STREET PARKING MATERIAL
- ASPHALT PAVEMENT
- COLORED CONCRETE PAVEMENT
- STAMPED ASPHALT PAVEMENT
- ROCK STAMPED CONCRETE PAVEMENT
- MOUNTABLE TRUCK APRON
- CONCRETE SIDEWALK
- EXISTING ROW
- PROPOSED ROW
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- PROPOSED DRIVEWAY CLOSURE
- EXISTING/PROPOSED TRAFFIC SIGNAL

City of New Braunfels

Kimley»Horn
Texas Registration No. F-928
10101 Reunion Place, Suite 600
San Antonio, TX 78216
P: 210-541-9166

NO.	DATE	REVISION
1	09/13/2022	90% PLAN SET
2	10/21/2022	100% PLAN SET

THIS DOCUMENT IS INTENDED TO BE VIEWED ON 24" X 36" PAPER. THE GRAPHIC SCALES SHOWN APPLY ONLY TO THIS SIZE PAPER.
TRACKING NUMBER: 069614000
DATE: SEPTEMBER, 2022

CITY OF NEW BRAUNFELS, TX
CASTELL AVENUE
RECONSTRUCTION

PRELIMINARY PLAN & PROFILE

DATE:	SEPTEMBER 2022
DESIGNED:	TCD
DRAWN:	JHM
REVIEWED:	JHM
APPROVED:	CM

SHEET
3 OF 3

Appendix G: Opinion of Probable Construction Cost

Kimley-Horn and Associates, Inc. **Opinion of Probable Construction Cost**

Client: City of New Braunfels
Project: Castell Avenue from Bridge Street to BUS 35
KHA No: 061200015

Summary of Costs

Description - Limits	Roadway Construction	ROW Cost	Easement Cost	Construction Contingency (+/-):	Inflation Costs	Total Construction Cost	Materials Testing (+/-)	Engineering & Design Cost	Total Project Cost
Offsite Drainage Improvements	$ 3,430,000.00	$ -	$ -	$ 690,000.00	$ 330,000.00	$ 4,450,000.00	$ 135,000.00	$ 445,000.00	$ 5,030,000.00
Castell Ave - Bridge to Coll	$ 7,060,000.00	$ -	$ -	$ 1,420,000.00	$ 1,020,000.00	$ 9,500,000.00	$ 290,000.00	$ 950,000.00	$ 10,740,000.00
Castell Ave - Coll to Garden	$ 4,570,000.00	$ -	$ -	$ 920,000.00	$ 660,000.00	$ 6,150,000.00	$ 185,000.00	$ 615,000.00	$ 6,950,000.00
Castell Ave - Garden to Jahn	$ 3,630,000.00	$ -	$ -	$ 730,000.00	$ 530,000.00	$ 4,890,000.00	$ 150,000.00	$ 490,000.00	$ 5,530,000.00
Castell Ave - Jahn to Elm	$ 3,015,000.00	$ 5,000.00	$ -	$ 610,000.00	$ 580,000.00	$ 4,210,000.00	$ 130,000.00	$ 430,000.00	$ 4,770,000.00
Castell Ave - Elm to BUS 35	$ 3,460,000.00	$ -	$ -	$ 700,000.00	$ 840,000.00	$ 5,000,000.00	$ 150,000.00	$ 500,000.00	$ 5,650,000.00
Total Cost	$ 25,165,000.00	$ 5,000.00	$ -	$ 5,070,000.00	$ 3,960,000.00	$ 34,200,000.00	$ 1,040,000.00	$ 3,430,000.00	$ 38,670,000.00

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

City of New Braunfels *Kimley-Horn and Associates, Inc.*

Castell Avenue updated: 9/23/2022

Conceptual Level Project Cost Projection

Project Information:

Name: Coll Street
Limits: Offsite Drainage Improvements
Street Character Zone: N/A
Right-of-Way Width (LF): N/A
Length (LF): 1900
Proposed Lane Configuration: N/A

Description:

Reconstruction and improvement of existing underground drainage structures along Coll Street.
RE: Drainage Report Alternative 3

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 257,000.00	$257,000
2	Erosion Control (Plans, SWPPP, etc.)	1	LS	$ 10,000.00	$10,000
3	10ft Recessed Curb Inlet	3	EA	$ 8,000.00	$24,000
4	Manhole Riser with Interior Box Access Improvements	8	EA	$ 5,000.00	$40,000
5	10ft x 8ft Concrete Box Culvert	1,900	LF	$ 950.00	$1,805,000
6	24" Class 3 RCP	100	LF	$ 125.00	$12,500
7	Plane Asphalt Pavement	4,250	SY	$ 3.50	$14,875
8	Trench Excavation Protection	2,000	LF	$ 2.00	$4,000
9	Type D Asphalt Pavement	750	TON	$ 140.00	$105,000
10	Pavement Repair	2,200	SY	$ 80.00	$176,000
11	Riprap (Stone Protection)	100	CY	$ 150.00	$15,000
12	Soil Retention Blanket	150	SY	$ 2.00	$300
13	Inlet 45 Deg Skewed Headwall With Wingwall	1	LS	$ 45,000.00	$45,000
14	Outfall Structure and Erosion Control	1	LS	$ 250,000.00	$250,000
15	River Bank Armor/Gabion Mattress	200	CY	$ 300.00	$60,000
				Paving Construction Cost Subtotal:	**$2,820,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals	To include existing storm material removal and disposal	8%	$ 230,000
☑	Pavement Markings/Markers/Signs/Posts	Pavement Marking Replacement, as needed	1%	$ 30,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	5%	$ 145,000
☐	Illumination	No improvements offsite	25%	$ -
☐	Landscape	No improvements offsite	2%	$ -
☐	Irrigation Systems	No improvements offsite	10%	$ -
☑	Staking and Construction Survey		2%	$ 60,000
☑	Traffic Control Plan		5%	$ 145,000
☑	Coll Street Surface Drainage	Along Coll Streeet (Curb Inlets, Laterals, etc)	5%	$ 145,000
			Allowance Subtotal:	**$ 610,000**
			Construction Costs Subtotal	**$ 3,430,000**

ROW Costs:	SF ROW:	0	$/SF	$20	**$ -**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 690,000**
Estimated Years until Construction:		2	**Inflation Rate**	**4%**	**$ 330,000**
				TOTAL Construction Cost:	**$ 4,450,000**
			Materials Testing (+/-):	**3%**	**$ 135,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 445,000**
				TOTAL Project Cost	**$ 5,030,000**

City of New Braunfels — *Kimley-Horn and Associates, Inc.*

Castell Avenue — updated: 9/23/2022

Conceptual Level Project Cost Projection

Project Information:

Name: Castell Avenue
Limits: Bridge Street to Coll Street
Street Character Zone: Downtown
Right-of-Way Width (LF): 65
Length (LF): 1900
Proposed Lane Configuration: (2) 11' Travel Lanes w/ 8' Parallel Parking

Description:

Reconstruction from right-of-way edge to right-of-way edge including: paving, sidewalk, storm drain, utility relocations and adjustments, enhanced illumination and urban downtown design elements, & a full traffic signal replacement.

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 380,000	$ 380,000
2	Earthwork	10,700	CY	$ 25.00	$ 267,500
3	6" Lime Stabilized Subgrade	6,500	SY	$ 10.00	$ 65,000
4	4" Flexible Base, Type A, Grade 2	2,700	SY	$ 20.00	$ 54,000
5	11" Flexible Base, Type A, Grade 2	6,500	SY	$ 30.00	$ 195,000
6	2" Typ D HMAC Pavement	6,300	SY	$ 15.00	$ 94,500
7	4" Typ B HMAC Pavement	6,300	SY	$ 30.00	$ 189,000
8	7" Concrete Pavement	1,100	SY	$ 95.00	$ 104,500
9	Stamped Asphalt Crosswalk	360	SY	$ 100.00	$ 36,000
10	Prime Coat	1,250	GAL	$ 16.00	$ 20,000
11	Tack Coat	1,250	GAL	$ 16.00	$ 20,000
12	4" Concrete Sidewalk	4,790	SY	$ 72.00	$ 344,880
13	Barrier Free Pedestrian Ramp	30	EA	$ 2,500.00	$ 75,000
14	4" Integral Colored and Stamped Concrete	60	SY	$ 125.00	$ 7,500
15	Residential 6" Concrete Driveway	20	SY	$ 90.00	$ 1,800
16	Commercial 8" Concrete Driveway	1,200	SY	$ 100.00	$ 120,000
17	6" Concrete Curb	60	LF	$ 35.00	$ 2,100
18	6" Concrete Curb with 12" Gutter	3,000	LF	$ 35.00	$ 105,000
19	4" Solid Yellow Pavement Marking	3,963	LF	$ 1.50	$ 5,945
20	4" Solid White Pavement Marking	750	LF	$ 1.50	$ 1,125
21	8" Solid White Pavement Marking	250	LF	$ 2.50	$ 625
22	18" Solid White Pavement Marking	130	LF	$ 8.00	$ 1,040
23	24" Solid White Pavement Marking	240	LF	$ 10.00	$ 2,400
24	Solid White Pavement Marking - Arrow - Through	3	EA	$ 300.00	$ 900
25	Furnish and Install Sign Post and Panel	21	EA	$ 700.00	$ 14,700
26	Furnish and Install Sign Panel	25	EA	$ 250.00	$ 6,250
				Roadway Construction Cost Subtotal:	**$ 2,120,000**

Drainage Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
27	10' Standard Recessed Curb Inlet	3	EA	$ 7,000.00	$ 21,000
28	20' Standard Recessed Curb Inlet	5	EA	$ 10,000.00	$ 50,000
29	10' Underslung Recessed Curb Inlet	7	EA	$ 10,000.00	$ 70,000
30	20' Underslung Recessed Curb Inlet	1	EA	$ 15,000.00	$ 15,000
31	24" Class 3 RCP	200	LF	$ 125.00	$ 25,000
32	30" Class 3 RCP	500	LF	$ 150.00	$ 75,000
33	36" Class 3 RCP	400	LF	$ 200.00	$ 80,000
34	48" Class 3 RCP	700	LF	$ 250.00	$ 175,000
35	4ft x 4ft Junction Box	1	EA	$ 5,500.00	$ 5,500
36	5ft x 5ft Junction Box	2	EA	$ 6,500.00	$ 13,000
37	6ft x 6ft Junction Box	1	EA	$ 11,000.00	$ 11,000
38	Manhole Riser with Interior Box Access Improvements	1	EA	$ 5,000.00	$ 5,000
39	6ft x 4ft Concrete Box Culvert	100	LF	$ 550.00	$ 55,000
				Drainage Construction Cost Subtotal:	**$ 610,000**

NBU Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
40	NBU Padmount Transformers - Single Phase	1	EA	$ 1,000.00	$ 1,000
41	NBU Padmount Transformers - Three Phase	9	EA	$ 2,000.00	$ 18,000
42	NBU Main Riser	1	EA	$ 10,000.00	$ 10,000
43	NBU Fused Riser	2	EA	$ 10,000.00	$ 20,000
44	NBU Deadend	2	EA	$ 10,000.00	$ 20,000
45	NBU Electrical Bank Duct	3,000	LF	$ 400.00	$ 1,200,000
46	NBU Standard Bollards	16	EA	$ 1,000.00	$ 16,000
47	NBU Engineering/Admin.	1	LS	$ 133,000.00	$ 133,000
				NBU Construction Cost Subtotal:	**$ 1,420,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals		12%	$ 255,000
☑	Traffic Control	Maintain Existing Traffic, Temp Signal Mods	10%	$ 215,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	6%	$ 130,000
☑	Illumination	Enhanced Street Lights	20%	$ 425,000
☑	Landscape	Topsoil, Sod, Low Height Plantings, Trees	8%	$ 170,000
☑	Irrigation Systems		2%	$ 45,000
☑	SWPPP		2%	$ 45,000
☑	Staking and Construction Survey		2%	$ 45,000
Other:				
☑	Urban Design Elements	Greenscape, Hardscape, & Furniture	LS	$ 550,000
☑	Traffic Signal	At San Antonio St & Coll Street	LS	$ 1,000,000
☑	Sidewalk Retaining Walls	At multiple hard corners	LS	$ 30,000
			Allowance Subtotal:	**$ 2,910,000**
			Construction Costs Subtotal	**$ 7,060,000**

ROW Costs:	SF ROW:	0	$/SF	$20	**$ -**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 1,420,000**
Estimated Years until Construction:		3	**Inflation Rate**	**4%**	**$ 1,020,000**
				TOTAL Construction Cost:	**$ 9,500,000**
			Materials Testing (+/-):	**3%**	**$ 290,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 950,000**
				TOTAL Project Cost	**$ 10,740,000**

City of New Braunfels

Kimley-Horn and Associates, Inc.

Castell Avenue

updated: 9/23/2022

Conceptual Level Project Cost Projection

Project Information:

Name: Castell Avenue
Limits: Coll Street to Garden Street
Street Character Zone: Downtown
Right-of-Way Width (LF): 65
Length (LF): 1750
Proposed Lane Configuration: (2) 11' Travel Lanes w/ 8' Parallel Parking

Description:

Reconstruction from right-of-way edge to right-of-way edge including: paving, sidewalk, storm drain, utility relocations and adjustments, enhanced illumination and urban downtown design elements, & a full traffic signal replacement.

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 205,000.00	$ 205,000
2	Earthwork	6,400	CY	$ 25.00	$ 160,000
3	6" Lime Stabilized Subgrade	2,600	SY	$ 10.00	$ 26,000
4	4" Flexible Base, Type A, Grade 2	2,700	SY	$ 20.00	$ 54,000
5	11" Flexible Base, Type A, Grade 2	200	SY	$ 30.00	$ 6,000
6	2" Typ D HMAC Pavement	160	SY	$ 15.00	$ 2,400
7	4" Typ B HMAC Pavement	160	SY	$ 30.00	$ 4,800
8	7" Concrete Pavement	180	SY	$ 95.00	$ 17,100
9	10" Concrete Pavement - Plaza	2,100	SY	$ 125.00	$ 262,500
10	Prime Coat	40	GAL	$ 16.00	$ 640
11	Tack Coat	40	GAL	$ 16.00	$ 640
12	4" Concrete Sidewalk	3,600	SY	$ 72.00	$ 259,200
13	Commercial 8" Concrete Driveway	30	SY	$ 100.00	$ 3,000
14	6" Concrete Curb with 12" Gutter	400	LF	$ 35.00	$ 14,000
15	4" Solid Yellow Pavement Marking	400	LF	$ 1.50	$ 600
16	4" Solid White Pavement Marking	50	LF	$ 1.50	$ 75
17	24" Solid White Pavement Marking	10	LF	$ 10.00	$ 100
18	Furnish and Install Sign Post and Panel	1	EA	$ 700.00	$ 700
				Roadway Construction Cost Subtotal:	**$ 1,020,000**

Drainage Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
19	20' Standard Recessed Curb Inlet	2	EA	$ 10,000.00	$ 20,000
20	12" Class 3 RCP	100	LF	$ 100.00	$ 10,000
21	30" Class 3 RCP	30	LF	$ 150.00	$ 4,500
22	6ft x 4ft Concrete Box Culvert	550	LF	$ 550.00	$ 302,500
23	Grate Inlet	840	LF	$ 400.00	$ 336,000
				Drainage Construction Cost Subtotal:	**$ 680,000**

NBU Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
24	NBU Padmount Transformers - Single Phase	1	EA	$ 1,000.00	$ 1,000
25	NBU Padmount Transformers - Three Phase	4	EA	$ 2,000.00	$ 8,000
26	NBU Electrical Bank Duct	1,500	LF	$ 400.00	$ 600,000
27	NBU Engineering/Admin.	1	LS	$ 63,000.00	$ 63,000
				NBU Construction Cost Subtotal:	**$ 680,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals		12%	$ 125,000
☑	Traffic Control	Maintain Existing Traffic, Temp Signal Mods	10%	$ 105,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	6%	$ 65,000
☑	Illumination	Enhanced Street Lights	20%	$ 205,000
☑	Landscape	Topsoil, Sod, Low Height Plantings, Trees	8%	$ 85,000
☑	Irrigation Systems		2%	$ 25,000
☑	SWPPP		2%	$ 25,000
☑	Staking and Construction Survey		2%	$ 25,000
Other:				
☑	Urban Design Elements	Plaza Improvements, Greenscape, Hardscape, & Furniture	LS	$ 1,000,000
☑	Traffic Signal	At Garden Street	LS	$ 500,000
☑	Sidewalk Retaining Walls	At multiple hard corners	LS	$ 30,000
			Allowance Subtotal:	**$ 2,190,000**
			Construction Costs Subtotal	**$ 4,570,000**

ROW Costs:	SF ROW:	0	$/SF	$20	**$ -**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 920,000**
Estimated Years until Construction:		3	**Inflation Rate**	**4%**	**$ 660,000**
				TOTAL Construction Cost:	**$ 6,150,000**
			Materials Testing (+/-):	**3%**	**$ 185,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 615,000**
				TOTAL Project Cost	**$ 6,950,000**

City of New Braunfels

Castell Avenue

Conceptual Level Project Cost Projection

Kimley-Horn and Associates, Inc.

updated: 9/23/2022

Project Information:

Name: Castell Avenue
Limits: Garden Street to Jahn Street
Street Character Zone: Municipal
Right-of-Way Width (LF): 65
Length (LF): 1100
Proposed Lane Configuration: (2) 11' Travel Lanes w/ 8' Parallel Parking

Description:

Reconstruction from right-of-way edge to right-of-way edge including: paving, sidewalk, storm drain, utility relocations and adjustments, enhanced illumination and urban street plaza elements, historical decorative landscaping elements, and traffic signal replacement.

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 250,000.00	$ 250,000
2	Earthwork	5,100	CY	$ 25.00	$ 127,500
3	6" Lime Stabilized Subgrade	2,900	SY	$ 10.00	$ 29,000
4	4" Flexible Base, Type A, Grade 2	1,600	SY	$ 20.00	$ 32,000
5	11" Flexible Base, Type A, Grade 2	2,900	SY	$ 30.00	$ 87,000
6	2" Typ D HMAC Pavement	2,700	SY	$ 15.00	$ 40,500
7	4" Typ B HMAC Pavement	2,700	SY	$ 30.00	$ 81,000
8	7" Concrete Pavement	900	SY	$ 95.00	$ 85,500
9	Stamped Asphalt Crosswalk	100	SY	$ 100.00	$ 10,000
10	Prime Coat	600	GAL	$ 16.00	$ 9,600
11	Tack Coat	600	GAL	$ 16.00	$ 9,600
12	4" Concrete Sidewalk	2,220	SY	$ 72.00	$ 159,840
13	Barrier Free Pedestrian Ramp	8	EA	$ 2,500.00	$ 20,000
14	4" Integral Colored and Stamped Concrete	20	SY	$ 125.00	$ 2,500
15	Residential 6" Concrete Driveway	200	SY	$ 90.00	$ 18,000
16	Commercial 8" Concrete Driveway	250	SY	$ 100.00	$ 25,000
17	6" Concrete Curb with 12" Gutter	1,300	LF	$ 35.00	$ 45,500
26	4" Solid Yellow Pavement Marking	1,700	LF	$ 1.50	$ 2,550
27	4" Solid White Pavement Marking	300	LF	$ 1.50	$ 450
28	24" Solid White Pavement Marking	40	LF	$ 10.00	$ 400
29	Furnish and Install Sign Post and Panel	3	EA	$ 700.00	$ 2,100
30	Furnish and Install Sign Panel	9	EA	$ 250.00	$ 2,250
				Roadway Construction Cost Subtotal:	**$ 1,050,000**

Drainage Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
18	10' Standard Recessed Curb Inlet	7	EA	$ 7,000.00	$ 49,000
19	20' Standard Recessed Curb Inlet	3	EA	$ 10,000.00	$ 30,000
20	12" Class 3 RCP	220	LF	$ 100.00	$ 22,000
21	24" Class 3 RCP	120	LF	$ 125.00	$ 15,000
22	30" Class 3 RCP	100	LF	$ 150.00	$ 15,000
23	4ft x 4ft Junction Box	1	EA	$ 5,500.00	$ 5,500
24	Manhole Riser with Interior Box Access Improvements	1	EA	$ 5,000.00	$ 5,000
24	6ft x 4ft Concrete Box Culvert	900	LF	$ 550.00	$ 495,000
25	Grate Inlet	1,200	LF	$ 400.00	$ 480,000
				Drainage Construction Cost Subtotal:	**$ 1,120,000**

NBU Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
31	NBU Padmount Transformers - Single Phase	4	EA	$ 1,000.00	$ 4,000
32	NBU Padmount Transformers - Three Phase	3	EA	$ 2,000.00	$ 6,000
33	NBU Electrical Bank Duct	1,300	LF	$ 400.00	$ 520,000
34	NBU Standard Bollards	8	EA	$ 1,000.00	$ 8,000
35	NBU Engineering/Admin.	1	LS	$ 56,000.00	$ 56,000
				NBU Construction Cost Subtotal:	**$ 600,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals		12%	$ 130,000
☑	Traffic Control	Street Closure & One-Way Traffic, Temp Signal Mod	10%	$ 105,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	6%	$ 65,000
☑	Illumination	Enhanced Street Lights	20%	$ 210,000
☑	Landscape	Topsoil, Sod, Low Height Plantings, Trees	2%	$ 20,000
☑	Irrigation Systems		1%	$ 10,000
☑	SWPPP		2%	$ 20,000
☑	Staking and Construction Survey		2%	$ 20,000
Other:				
☑	Urban Design Elements	Greenscape, Hardscape, & Furniture	LS	$ 250,000
☑	Sidewalk Retaining Walls	At multiple hard corners	LS	$ 30,000
			Allowance Subtotal:	**$ 860,000**
			Construction Costs Subtotal	**$ 3,630,000**

ROW Costs:	SF ROW:	0	$/SF	$20	**$ -**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 730,000**
Estimated Years until Construction:		3	**Inflation Rate**	**4%**	**$ 530,000**
				TOTAL Construction Cost:	**$ 4,890,000**
			Materials Testing (+/-):	**3%**	**$ 150,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 490,000**
				TOTAL Project Cost	**$ 5,530,000**

City of New Braunfels — *Kimley-Horn and Associates, Inc.*

Castell Avenue — updated: 9/23/2022

Conceptual Level Project Cost Projection

Project Information:

Name: Castell Avenue
Limits: Jahn Street to Elm Street
Street Character Zone: Municipal
Right-of-Way Width (LF): 65
Length (LF): 1100
Proposed Lane Configuration: (2) 11' Travel Lanes w/ 8' Parallel Parking

Description:

Reconstruction from right-of-way edge to right-of-way edge including: paving, sidewalk, storm drain, utility relocations and adjustments, enhanced illumination and urban street plaza elements, historical decorative landscaping elements, and traffic signal replacement.

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 210,000.00	$ 210,000
2	Earthwork	4,600	CY	$ 25.00	$ 115,000
3	6" Lime Stabilized Subgrade	3,700	SY	$ 10.00	$ 37,000
4	4" Flexible Base, Type A, Grade 2	600	SY	$ 20.00	$ 12,000
5	11" Flexible Base, Type A, Grade 2	3,700	SY	$ 30.00	$ 111,000
6	2" Typ D HMAC Pavement	3,500	SY	$ 15.00	$ 52,500
7	4" Typ B HMAC Pavement	3,500	SY	$ 30.00	$ 105,000
11	Prime Coat	700	GAL	$ 16.00	$ 11,200
12	Tack Coat	700	GAL	$ 16.00	$ 11,200
13	4" Concrete Sidewalk	960	SY	$ 72.00	$ 69,120
14	Barrier Free Pedestrian Ramp	16	EA	$ 2,500.00	$ 40,000
15	4" Integral Colored and Stamped Concrete	10	SY	$ 125.00	$ 1,250
16	10" Integral Colored and Stamped Concrete Truck Apron	110	SY	$ 275.00	$ 30,250
17	Residential 6" Concrete Driveway	330	SY	$ 90.00	$ 29,700
18	Commercial 8" Concrete Driveway	160	SY	$ 100.00	$ 16,000
19	3" Mountable Concrete Curb	130	LF	$ 55.00	$ 7,150
21	6" Concrete Curb with 12" Gutter	1,400	LF	$ 35.00	$ 49,000
22	8" Concrete Curb with 12" Gutter	410	LF	$ 40.00	$ 16,400
23	12"x16" Concrete Retaining Wall (Central Island Curb)	60	LF	$ 50.00	$ 3,000
24	Residential Fencing	20	LF	$ 50.00	$ 1,000
41	4" Solid Yellow Pavement Marking	1,400	LF	$ 1.50	$ 2,100
42	4" Solid White Pavement Marking	110	LF	$ 1.50	$ 165
44	8" Solid White Pavement Marking	100	LF	$ 2.50	$ 250
46	18" Broken White Pavement Marking	40	LF	$ 8.00	$ 320
47	24" Solid White Pavement Marking	450	LF	$ 10.00	$ 4,500
48	Solid White Pavement Marking - Arrow - Through	4	EA	$ 300.00	$ 1,200
49	Solid White Pavement Marking - Word - Yield	4	EA	$ 200.00	$ 800
50	Furnish and Install Sign Post and Panel	20	EA	$ 700.00	$ 14,000
51	Furnish and Install Sign Panel	16	EA	$ 250.00	$ 4,000
				Roadway Construction Cost Subtotal:	**$ 960,000**

Drainage Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
26	10' Standard Recessed Curb Inlet	3	EA	$ 7,000.00	$ 21,000
27	20' Standard Recessed Curb Inlet	3	EA	$ 10,000.00	$ 30,000
28	10' Underslung Recessed Curb Inlet	4	EA	$ 10,000.00	$ 40,000
29	20' Underslung Recessed Curb Inlet	2	EA	$ 15,000.00	$ 30,000
30	12" Class 3 RCP	110	LF	$ 100.00	$ 11,000
31	24" Class 3 RCP	280	LF	$ 125.00	$ 35,000
32	30" Class 3 RCP	60	LF	$ 150.00	$ 9,000
37	4ft x 4ft Junction Box	1	EA	$ 5,500.00	$ 5,500
38	Manhole Riser with Interior Box Access Improvements	1	EA	$ 5,000.00	$ 5,000
38	5ft x 4ft Concrete Box Culvert	480	LF	$ 500.00	$ 240,000
39	6ft x 4ft Concrete Box Culvert	270	LF	$ 550.00	$ 148,500
40	Grate Inlet	480	LF	$ 400.00	$ 192,000
				Drainage Construction Cost Subtotal:	**$ 770,000**

NBU Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
52	NBU Padmount Transformers - Single Phase	2	EA	$ 1,000.00	$ 2,000
53	NBU Fused Riser	2	EA	$ 10,000.00	$ 20,000
54	NBU Deadend	2	EA	$ 10,000.00	$ 20,000
55	NBU Electrical Bank Duct	1,100	LF	$ 400.00	$ 440,000
56	NBU Standard Bollards	8	EA	$ 1,000.00	$ 8,000
57	NBU Engineering/Admin.	1	LS	$ 49,000.00	$ 49,000
				NBU Construction Cost Subtotal:	**$ 540,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals		12%	$ 120,000
☑	Traffic Control	Street Closure & One-Way Traffic, Temp Signal Mod	7%	$ 70,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	6%	$ 60,000
☑	Illumination	Enhanced Street Lights	18%	$ 175,000
☑	Landscape	Topsoil, Sod, Low Height Plantings, Trees	5%	$ 50,000
☑	Irrigation Systems		1%	$ 10,000
☑	SWPPP		2%	$ 20,000
☑	Staking and Construction Survey		2%	$ 20,000
Other:				
☑	Urban Design Elements	Greenscape, Hardscape, & Furniture	LS	$ 200,000
☑	Round-a-bout Central Island	Landscaping, Hardscaping, Decorative Features	LS	$ 20,000
			Allowance Subtotal:	**$ 745,000**
			Construction Costs Subtotal	**$ 3,015,000**

ROW Costs:	SF ROW:	120	$/SF	$20	**$ 5,000**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 610,000**
Estimated Years until Construction:		4	**Inflation Rate**	**4%**	**$ 580,000**
				TOTAL Construction Cost:	**$ 4,210,000**
			Materials Testing (+/-):	**3%**	**$ 130,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 430,000**
				TOTAL Project Cost	**$ 4,770,000**

City of New Braunfels
Castell Avenue
Conceptual Level Project Cost Projection

Kimley-Horn and Associates, Inc.
updated: 9/23/2022

Project Information:

Name: Castell Avenue
Limits: Elm Street to BUS 35
Street Character Zone: Neighborhood Mixed
Right-of-Way Width (LF): 60-65
Length (LF): 2700
Proposed Lane Configuration: (2) 12' Travel Lanes w/ 8' Parallel Parking

Description:
Reconstruction from right-of-way edge to right-of-way edge including: paving, sidewalk, storm drain, utility relocations and adjustments, illumination, railroad crossing improvements, and landscaping elements.

Roadway Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Mobilization	1	LS	$ 210,000.00	$ 210,000
2	Earthwork	7,500	CY	$ 25.00	$ 187,500
3	6" Lime Stabilized Subgrade	5,900	SY	$ 10.00	$ 59,000
4	4" Flexible Base, Type A, Grade 2	1,100	SY	$ 20.00	$ 22,000
5	11" Flexible Base, Type A, Grade 2	5,900	SY	$ 30.00	$ 177,000
6	2" Typ D HMAC Pavement	5,700	SY	$ 15.00	$ 85,500
7	4" Typ B HMAC Pavement	5,700	SY	$ 30.00	$ 171,000
11	Prime Coat	1,200	GAL	$ 16.00	$ 19,200
12	Tack Coat	1,200	GAL	$ 16.00	$ 19,200
13	4" Concrete Sidewalk	1,730	SY	$ 72.00	$ 124,560
14	Barrier Free Pedestrian Ramp	14	EA	$ 2,500.00	$ 35,000
15	4" Integral Colored and Stamped Concrete	130	SY	$ 125.00	$ 16,250
17	Residential 6" Concrete Driveway	230	SY	$ 90.00	$ 20,700
18	Commercial 8" Concrete Driveway	670	SY	$ 100.00	$ 67,000
21	6" Concrete Curb with 12" Gutter	2,200	LF	$ 35.00	$ 77,000
25	Pipe Fence	80	LF	$ 80.00	$ 6,400
41	4" Solid Yellow Pavement Marking	2,700	LF	$ 1.50	$ 4,050
42	4" Solid White Pavement Marking	320	LF	$ 1.50	$ 480
43	4" Broken White Pavement Marking	40	LF	$ 1.50	$ 60
47	24" Solid White Pavement Marking	480	LF	$ 10.00	$ 4,800
49	Solid White Pavement Marking - Arrow - Right	2	EA	$ 300.00	$ 600
50	Solid White Pavement Marking - Word - Only	1	EA	$ 200.00	$ 200
52	Furnish and Install Sign Post and Panel	7	EA	$ 700.00	$ 4,900
53	Furnish and Install Sign Panel	18	EA	$ 250.00	$ 4,500
				Roadway Construction Cost Subtotal:	**$ 1,320,000**

Drainage Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
26	10' Standard Recessed Curb Inlet	5	EA	$ 7,000.00	$ 35,000
31	10' Underslung Recessed Curb Inlet	7	EA	$ 10,000.00	$ 70,000
31	24" Class 3 RCP	700	LF	$ 125.00	$ 87,500
35	5ft x 5ft Junction Box	1	EA	$ 6,500.00	$ 6,500
				Drainage Construction Cost Subtotal:	**$ 200,000**

NBU Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
56	NBU Main Riser	1	EA	$ 10,000.00	$ 10,000
57	NBU Fused Riser	1	EA	$ 10,000.00	$ 10,000
58	NBU Deadend	1	EA	$ 10,000.00	$ 10,000
59	NBU Electrical Bank Duct	100	LF	$ 400.00	$ 40,000
61	NBU Engineering/Admin.	1	LS	$ 7,000.00	$ 7,000
				NBU Construction Cost Subtotal:	**$ 80,000**

Union Pacific Construction Cost Projection

No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Rail Mast Arm Flashers	2	EA	$ 30,000.00	$ 60,000
2	Rail Flashing Ped Beacons	2	EA	$ 20,000.00	$ 40,000
3	Track Card Cable	1	EA	$ 13,000.00	$ 13,000
4	Semi-Bi Coupler	2	EA	$ 900.00	$ 1,800
5	Dax Cable	2	EA	$ 6,500.00	$ 13,000
6	Track Circuit	1	EA	$ 12,000.00	$ 12,000
7	Boring	1	LS	$ 10,000.00	$ 10,000
8	Existing Gate Removal	2	EA	$ 1,000.00	$ 2,000
9	UPRR At-Grade Signal Cabinet	1	EA	$ 70,000.00	$ 70,000
10	Rail Ped Fence	130	LF	$ 60.00	$ 7,800
11	8' Concrete Rail Crossing Panel	160	LF	$ 1,500.00	$ 240,000
12	Monolithic Median Nose	2	EA	$ 1,500.00	$ 3,000
13	Pedestrian Detectable Warning Surface	50	SF	$ 40.00	$ 2,000
14	Solid White Pavement Marking - Railroad Crossing	2	EA	$ 500.00	$ 1,000
15	Furnish and Install Sign Post and Railroad Signage	12	EA	$ 1,000.00	$ 12,000
16	UPRR Labor Allowance	1	LS	$ 135,000.00	$ 135,000
17	UPRR Engineering	1	LS	$ 7,600.00	$ 7,600
18	UPRR Coordination	1	LS	$ 25,000.00	$ 25,000
				Railroad Crossing Construction Cost Subtotal:	**$ 660,000**

Major Construction Component Allowances:

	Item Description	Notes	Allowance	Item Cost
☑	Site Preparation/Removals		12%	$ 240,000
☑	Traffic Control	Maintain Existing Traffic	10%	$ 200,000
☑	Water/Sewer Utility Adjustments	Local lowerings, valve adjustments, manhole adjustments	6%	$ 120,000
☑	Illumination	City Standard Street Lights	12%	$ 240,000
☑	Landscape	Topsoil, Sod, Low Height Plantings, Trees	8%	$ 160,000
☑	Irrigation Systems		3%	$ 60,000
☑	SWPPP		2%	$ 40,000
☑	Staking and Construction Survey		2%	$ 40,000
Other:				
☑	Urban Design Elements	Greenscape, Hardscape, & Furniture	LS	$ 100,000
			Allowance Subtotal:	**$ 1,200,000**
			Construction Costs Subtotal	**$ 3,460,000**

ROW Costs:	SF ROW:	0	$/SF	$20	**$ -**
Easement Costs	SF ESMT	0	$/SF	$10	**$ -**
Construction Year: 2025			**Construction Contingency (+/-):**	**20%**	**$ 700,000**
Estimated Years until Construction:		5	**Inflation Rate**	**4%**	**$ 840,000**
				TOTAL Construction Cost:	**$ 5,000,000**
			Materials Testing (+/-):	**3%**	**$ 150,000**
			Engineering & Design Cost (+/-):	**10%**	**$ 500,000**
				TOTAL Project Cost	**$ 5,650,000**

NOTE TO REVIEWER:
OPCC INCLUDES CONSTRUCTION COSTS ONLY.
ITEMS NOT INCLUDED: ROW ACQUISTION, MATERIAL TESTING, INFLATION, OR ENGINEERING AND DESIGN.

RHSI ENGINEERING & PROJECT MANAGEMENT

Client:	**City of New Braunfels**	**Date:**	**9/22/2022**
Project:	**New Braunfels Bond - S Castell Ave**	**Prepared By:**	**JS/KP**
		Checked By:	**KP**

Title: **New Braunfels - S. Castell Ave Corridor (Bridge St to IH 35)**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
1	MOBILIZATION	1	LS	$ 2,250,000.00	$ 2,250,000.00
2	PREP ROW	1	LS	$ 775,000.00	$ 775,000.00
3	REMOVING CONC (DRIVEWAYS)	19,250	SF	$ 5.00	$ 96,250.00
4	REMOVING CONC (CURB/CURB & GUTTER)	13,625	LF	$ 9.00	$ 122,625.00
5	REMOVING CONC (SIDEWALK)	38,150	SF	$ 5.00	$ 190,750.00
6	REMOVING CONC (ADA RAMPS)	32	EA	$ 700.00	$ 22,400.00
7	SALVAGING, HAULING & STOCKPILING ASPHALTIC PAVEMENT	14,400	SY	$ 9.50	$ 136,800.00
8	EXCAVATION (ROADWAY)	10,900	CY	$ 25.00	$ 272,500.00
9	LIME (HYDRATED LIME) (DRY)	760	TON	$ 325.00	$ 247,000.00
10	LIME TRT (SUBGRADE) (8")	18,700	SY	$ 10.00	$ 187,000.00
11	FLEXIBLE BASE (14")	18,700	SY	$ 15.00	$ 280,500.00
12	PRIME COAT	3,740	GAL	$ 8.00	$ 29,920.00
13	TACK COAT	1,870	GAL	$ 12.00	$ 22,440.00
14	HMAP TY B (3")	16,920	SY	$ 38.00	$ 642,960.00
15	HMAP TY D (2")	16,920	SY	$ 22.00	$ 372,240.00
16	CONC PVMT (CONT REINF - CRCP 9") (CIVIC PLAZA)	10,550	SF	$ 45.00	$ 474,750.00
17	CONC SIDEWALKS/WALKWAYS (DECORATIVE)(PLAZA)	32,750	SF	$ 65.00	$ 2,128,750.00
18	CONC CURB/CURB & GUTTER	13,350	LF	$ 18.00	$ 240,300.00
19	DRIVEWAYS (CONC)	26,120	SF	$ 9.50	$ 248,140.00
20	SIDEWALKS (CONC)	51,890	SF	$ 7.00	$ 363,230.00
21	SIDEWALK (DECORATIVE CONC)	50,360	SF	$ 21.00	$ 1,057,560.00
22	CONC MEDIAN	940	SF	$ 35.00	$ 32,900.00
23	STAMPED ASPHALT PAVEMENT (PAVERS/CONC)	3,260	SF	$ 65.00	$ 211,900.00
24	ON STREET PARKING MATERIAL (PAVERS)	20,530	SF	$ 65.00	$ 1,334,450.00
25	COLORED CONCRETE PAVEMENT (JAHN)	1,950	SF	$ 60.00	$ 117,000.00
26	ROCK STAMPED CONCRETE PAVEMENT (JAHN)	640	SF	$ 60.00	$ 38,400.00
27	STAMPED ASPHALT PAVEMENT (CROSSWALKS)	1,620	SF	$ 95.00	$ 153,900.00
28	RAILROAD INSURANCE/FLAGMAN/SIGNALS	1	ALLOW	$ 900,000.00	$ 900,000.00
29	DRAINAGE IMPROVEMENTS (OFFSITE - 2 LOCATIONS)	1	LS	$ 3,000,000.00	$ 3,000,000.00
30	18" REINFORCED CONCRETE PIPE	325	LF	$ 120.00	$ 39,000.00
31	24" REINFORCED CONCRETE PIPE	610	LF	$ 75.00	$ 45,750.00
32	36" REINFORCED CONCRETE PIPE	1,125	LF	$ 150.00	$ 168,750.00
33	48" REINFORCED CONCRETE PIPE	700	LF	$ 150.00	$ 105,000.00
34	5' X 5' BOX CULVERTS	2,625	LF	$ 850.00	$ 2,231,250.00
35	10' X 8' BOX CULVERTS	850	LF	$ 2,550.00	$ 2,167,500.00
36	JUNCTION BOX MH (4 FT DIA)	10	LF	$ 28,000.00	$ 280,000.00
37	JUNCTION BOX MH (5 FT DIA)	8	LF	$ 31,000.00	$ 248,000.00
38	JUNCTION BOX MH (6 FT DIA)	14	LF	$ 35,000.00	$ 490,000.00
39	TRENCH DRAINS (INCL CIVIC PLAZA)	2,600	LF	$ 125.00	$ 325,000.00
40	10' INLETS	34	LF	$ 10,000.00	$ 340,000.00
41	20' INLETS	16	LF	$ 20,000.00	$ 320,000.00
42	ELECTRICAL DUCTBANK AND LIGHTING	1	ALLOW	$ 2,500,000.00	$ 2,500,000.00
47	MISC METALS (BOLLARDS,GATES, BENCHES, TRASH CANS, ETC)	1	ALLOW	$ 475,000.00	$ 475,000.00
49	TRAFFIC SIGNAGE STRIPING	1	ALLOW	$ 350,000.00	$ 350,000.00
50	TRAFFIC SIGNAL (3 EA)	1	ALLOW	$ 1,425,000.00	$ 1,425,000.00
51	SWPPP	1	LS	$ 125,000.00	$ 125,000.00
52	LANDSCAPING (TREES, PLANTER BOXES, PLANTS, ETC)	1	ALLOW	$ 650,000.00	$ 650,000.00
					$ 28,234,915
		Contingency (30%)			$ 8,470,000
		Total (Rounded)			**$ 36,704,915**