



# Downtown Utility Analysis

Overhead to Underground Utility Relocations



Final Report: November 2021



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# Executive Summary

## INTRODUCTION

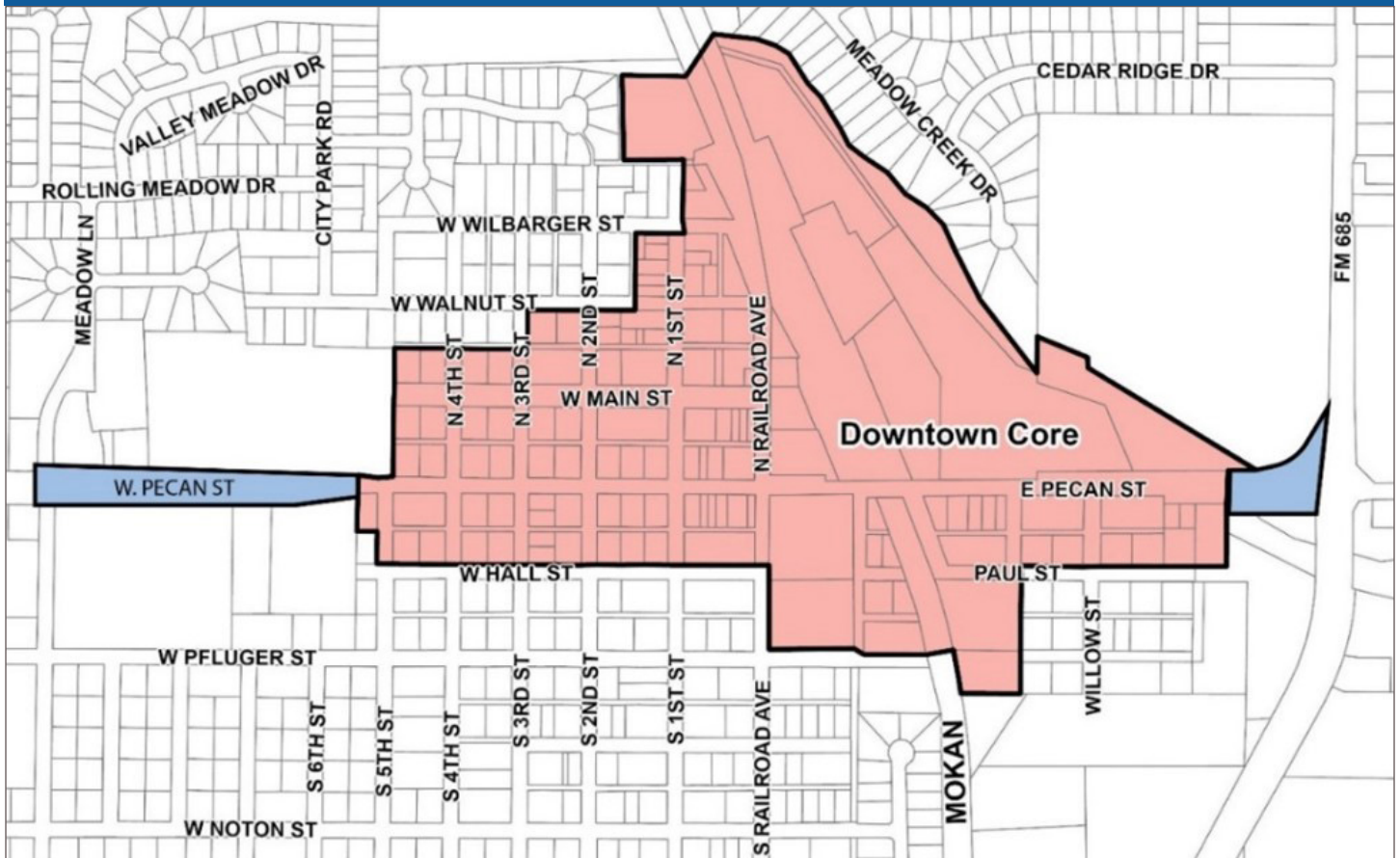
The City of Pflugerville Downtown Utility Analysis: Overhead to Underground Utility Relocations was performed by Cobb, Fendley & Associates, Inc. (CobbFendley) for planning purposes to assist the City in identifying the costs associated with relocating overhead utilities underground. The study focused on the Downtown Core and areas along west and east Pecan Street, as shown in **Figure 1**. The study included a record research (Subsurface Utility Engineering Level D) for existing utilities, data collection with field audits of existing telecommunication / electric poles, and conceptual overhead to underground design analysis in order to produce cost estimates based upon high-level material costs. From such design analysis, eight (8) potential phases for the relocation of these facilities underground were developed based on aesthetics and the functionality of the system. The water and wastewater systems in the area were also analyzed at a schematic level to determine if concurrent construction would be a benefit to the City and determine if further investigation of the water and wastewater systems was needed.

## BENEFITS OF UNDERGROUND ELECTRIC AND TELECOMMUNICATION SERVICES

Underground electric and telecommunication services have two main benefits: reliability and aesthetics. Due to the inherent shielding of the lines in underground conduit, they are not as impacted by the most common form of outages – severe weather. This is not to state that they are immune to severe weather, but incidences of damage caused by tree limbs are reduced greatly when the overhead lines are not near tree branches that are impacted by high winds and snow/ice loading. Underground cables are also more shielded from vehicular damage, birds, squirrels, and snakes.

Many cities have begun relocating overhead utilities underground for the aesthetic impact on the streetscape. By removing these overhead appurtenances, it allows more use of the common area for pedestrian-friendly elements, including seating, shared use paths, art, and retail/dining areas that extend into the walkways.

**Figure 1: Downtown Core and Pecan Street within Downtown District Overlay - City of Pflugerville**





## PHASES

Prior to the underground utility analysis portion of this project, a preliminary phasing plan was developed in order to establish goals and guidelines for the design analysis and ensure the long-range goal of undergrounding these facilities were more manageable from a financial perspective. Multiple phases were developed based on the following prioritization factors:

- Visibility
- Development Opportunity
- Planned Public Projects
- Vehicular and Pedestrian Activity

After the design analysis was complete, the preliminary phases were modified based on the functionality of the overall system and to provide the best value to the City. Value was determined by ease of removal, lowest possibility of future rework, City priority of removals, future expansion of streets in the Downtown Core, and potential costs of the removals.

The identified phases can be seen in **Figure 2**.

## COST ESTIMATES BY PHASE

A detailed budget of the opinion of probable construction costs (OPCC) for each phase of the project is provided within the Methodology section of this report.

The estimated costs per phase are summarized below.

- Phase 1 – \$5,917,686
- Phase 2 – \$1,180,000
- Phase 3 – \$4,805,086
- Phase 4 – \$4,664,127
- Phase 5 – \$3,506,035
- Phase 6 – \$2,991,680
- Phase 7 – \$4,562,909
- Phase 8 – \$1,886,116

Figure 2: Phase Map





## COST ESTIMATES

The following overall cost estimate is a budget of the opinion of probable construction costs (OPCC) for the overall project. The OPCC includes a miscellaneous 10% site contingency to account for unknown conditions beyond the level of detail within this study, a professional design and support services fee of 10% of the total construction costs to account for engineering support services, and a 25% construction contingency to account for any unknowns that may be encountered.

The cost estimate includes all civil infrastructure, equipment, and cable needed to remove the overhead facilities. The estimate also includes potential easement costs and costs required to retrofit existing overhead meters and telecommunication terminal blocks attached to buildings.

Cost estimates were completed at the time of this report. It should be noted that at the time of this report, material and commodity prices were at or near record highs.

These items include copper, aluminum, reinforcing steel, concrete, and conduit. Material shortages have also been prevalent throughout the utility industry due to factory shutdowns related to the COVID-19 pandemic.



Overall Cost Estimate			
Item Description		Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$14,594,310
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$4,511,245
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$209,949
4	Easement Acquisition	LS	\$559,000
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$1,987,451
Subtotal			\$21,861,955
Professional Design and Support Services (10% of Construction Costs)			\$2,186,194
Construction Contingency (25%)			\$5,465,490
<b>Total</b>			<b>\$29,513,639</b>

### Assumptions

- 1) All Opinion of Probable Costs (OPCC) represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.
- 2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)
- 3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.
- 4) Projection of future construction costs should include a 5-10% annual increase at a minimum.
- 5) Non-customary design services and permitting services are not included as part of this OPCC.

## RECOMMENDATIONS FOR FURTHER ANALYSIS

As phases are adjusted, approved, and implemented for detailed design, further analysis will be needed to finalize the designs. A thorough SUE investigation of the project area will be required, including Quality Level C, B, and A in areas where potential conflicts may occur. Definitions of these Quality Levels can be found in the Methodology section of this report. Additionally, a survey will need to be performed to accurately map surface topography and features, building service locations, property lines, and manhole inverts. This will provide the detailed design team the information required to accurately design the civil infrastructure and size any needed easements.

Prior to any detailed design of these overhead to underground phases as individual projects, it is recommended that City identify other necessary and desired improvements within the Downtown study area that may be constructed with the relocation of the overhead lines underground, such as Main Street extension. Other improvements may include streetscaping, sidewalks, pedestrian and accessibility improvements, drainage, water and wastewater utilities, streets, and alleys. Based on a preliminary analysis of water and wastewater utilities in the Downtown area, there appear to be some opportunities for water and wastewater improvements; therefore, a full water and wastewater system analysis is recommended. If any improvements to these systems are necessary, concurrent design and construction can lead to greater design cohesion, lower prices from contractors, and fewer interruptions to the general public and adjacent property owners.

## STEPS PFORWARD

1. Identify other desired improvements within the study area that may be coupled with the overhead to underground project phases (e.g., streetscape, pedestrian, street, drainage, utilities, and alley improvements).
2. Conduct further detailed water and wastewater systems analysis within Downtown.
3. Once funding is secured, pursue detailed design and a thorough SUE investigation.

## BEFORE AND AFTER PHOTOGRAPHS



*Existing conditions at Pecan Street and Railroad Avenue*



*Anticipated conditions at Pecan Street and Railroad Avenue*

# Methodology

Downtown Utility Analysis





# Methodology

## DATA COLLECTION

The American Society of Civil Engineers (ASCE) Standard 38-02 recognizes four levels of quality for underground utility information: Quality Level D through A (QL-D to QL-A). Specifications of each quality level are defined below:

### Four Quality Levels of SUE Services

- D** Compile a drawing of all utilities based on the records.
- C** Visit site to refine with visible utility features.
- B** Non-destructive designating of all underground utilities.
- A** Expose utilities underground to obtain horizontal and vertical location.

As part of the existing utility research of the study area, the Subsurface Utility Engineering (SUE) team performed QL-D to create the underground utility layout of the base map. The main challenge to using QL-D data is its accuracy. Many utility service providers only notate utilities as a simple line on a Geographic Information System (GIS) background, with little regard to actual alignment. However, for a planning study such as this,

QL-D is sufficient to inform the City of potential conflicts in the area and facilities that need to be relocated.

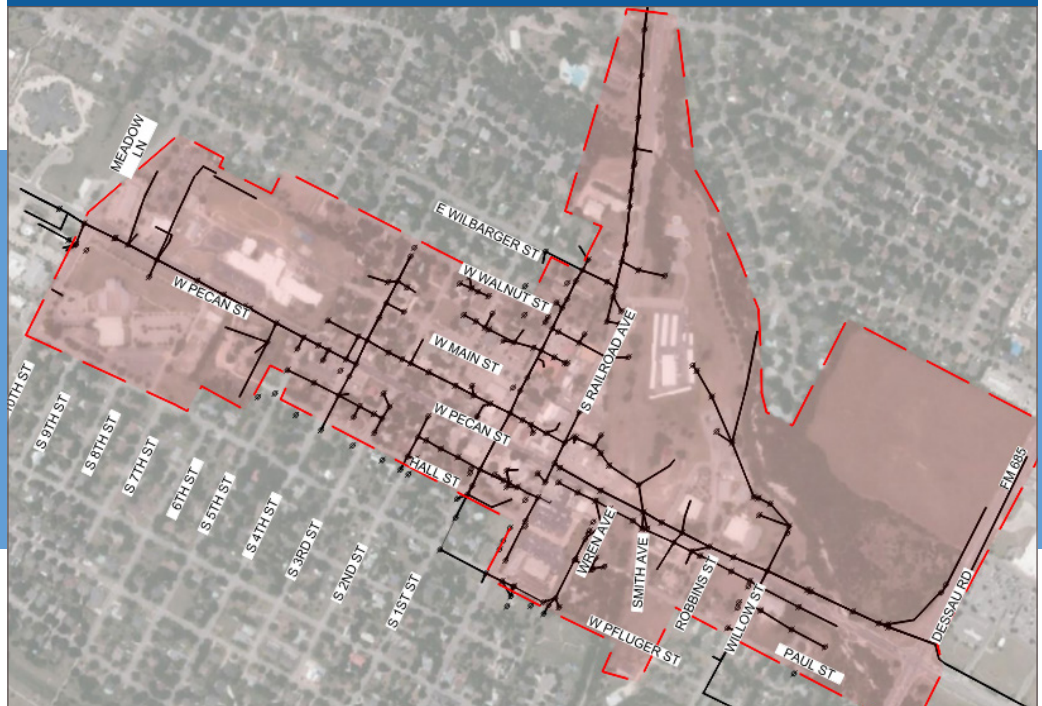
The data used for this project was gathered from information provided by the City, Travis County Central Appraisal District, and Utility Owners' record drawings. All data was compiled into a single computer aided drafting (CAD) base map, which was then used to perform the overhead to underground analysis of the study area. This data was also used to study the existing conditions of the water and wastewater system. The results of this study can be found in the Water and Wastewater Analysis section of this report.

A pole audit of the area shown in **Figure 1** was conducted to ensure all existing overhead facilities were identified and accounted for in this analysis. This audit located each existing pole in the study area and recorded the following information:

- Latitude and Longitude
- Photographs
- Installed electric facilities
- Service installations to customers
- Communication utilities attached to the pole

This information was used in the design analysis to verify utility routing and conduit configurations. The information was also provided to the City in a GIS format. An overview map of existing overhead facilities can be seen in **Figure 3**.

Figure 3: Existing Overhead Electric and Telecom Facilities



## Data Sources

- Electric Distribution Facilities - Google KMZ, Sent 10/27/2020
- AT&T – PDF files, Sent 11/5/2020
- Charter – PDF file, Sent 11/5/2020
- Grande – PDF file, Sent 10/21/2020
- Suddenlink – PDF file, Sent 10/28/2020
- Verizon/MCI – PDF file, Sent 11/19/2020
- Zayo – PDF file, Sent 10/12/2020
- Atmos Gas – PDF file, Sent 10/21/2020
- Existing Easements – GIS file from City of Pflugerville, Sent 05/13/2021
- Pavement/Sidewalk – Estimated based on aerial imaging data

## OVERHEAD TO UNDERGROUND ANALYSIS METHODOLOGY

The objective of this analysis was to recreate the overhead line connectivity in an underground format with two purposes:

1. It ensured that each utility owner would be able to replace the existing system in a comparable (like-for-like) underground format, and
2. It provided built-in flexibility for future expansion to the system by providing additional conduits for all routings.

During future detailed design, the utility owners will be able to make decisions impacting service connections, transformer sizing, cable sizing, and cable routing that can influence conduit locations, duct configurations, and equipment selections. Therefore, the analysis focused on a simple, like-for-like replacement, knowing future detailed design may discover cost savings dependent on utility needs.

The following assumptions were made in determining the conduit configurations within the design analysis:

- Typical conduit configurations included:
  - 2-6" PVC for ONCOR 12.5kV Cable
  - 1-4" PVC for ONCOR <600V Cable (Services)
  - 2-4" PVC/HDPE for Charter/Spectrum
  - 2-4" PVC/HDPE for AT&T
  - 2-4" PVC/HDPE for Suddenlink
  - 2-4" PVC/HDPE for Verizon
  - 3-1 ¼" PVC/HDPE for Zayo Communications
- Each overhead utility owner was given a single conduit and spare for each line installed overhead. For example, ONCOR requests 1-6" Polyvinyl Chloride (PVC) conduit per high voltage line with

a spare conduit for future expansion and reliability purposes.

- Per ONCOR duct details, the electric conduits were placed in the bottom of the trench profile with a minimum of 12" of spacing to the telecommunication conduits above. See **Figure 4** below from ONCOR's standard details.

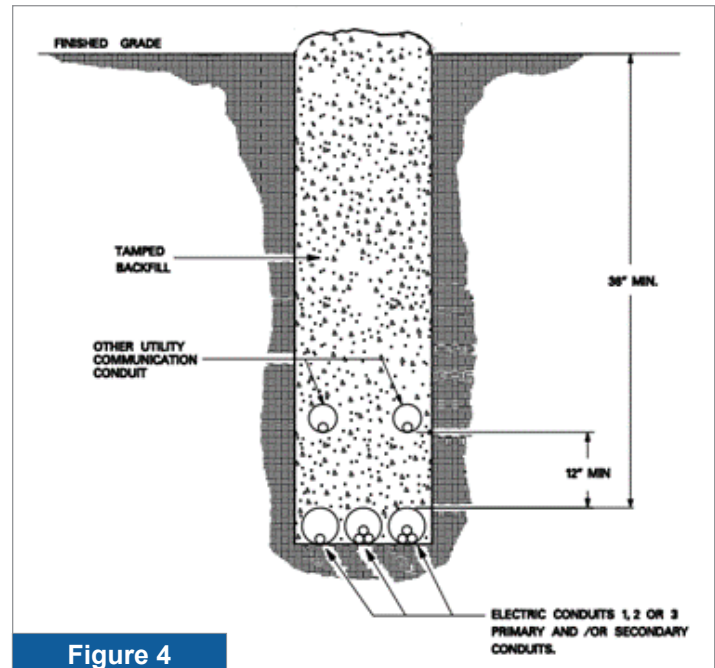


Figure 4

Each utilities' cable type and size were selected based on typical layouts and similar projects completed. Final cable types, sizes, and configurations will be determined during detailed design.

Conduit routing and equipment locations were determined by high-level aerial images, conflicts with existing utilities based on the base map created early in the project, and potential impact on the surrounding area. Where potential easements would need to be granted, the study proposed a location, size, and cost to acquire. Easement sizes and locations are schematic in nature and should not be interpreted as final. Easement needs would be finalized during future detailed design.

The study also analyzed areas where facilities could be installed by open trench versus common boring methods, such as horizontal directional drilling (HDD) or jack and bore. Open trench is generally the lowest cost option available by a factor of two. However, open trench may not be feasible in certain areas, including water crossings, high traffic areas, and locations with existing vegetation that would be severely impacted by exposing the critical root zone. Therefore, the study proposed an HDD to cross Gilleland Creek on Pecan Street just west



of FM 685. Due to its potential size, two bores may be recommended during detailed design to reduce the bend radius in the casing. Additionally, large diameter bores require much greater staging areas, further complicating the installation.

During future detailed design, additional conduit installations may be proposed by bore dependent on existing conditions, including the other Pecan Street crossings.

While the study mainly focused on overhead facilities in the rights-of-way, the service lines to individual

businesses and residents must also be removed to complete the relocations. In the design analysis, each structure received underground conduit for both electric and telecommunication installations. The expected fee for this type of conversion was also included in the cost estimate. Unlike the rights-of-way, service lines typically are not placed in formal easements. Generally, the use of land is in the utility companies' use of service requirements.

### PHOTOGRAPHS OF COMMON SCENARIOS



*Facing north along N. 1st Street at the intersection of the alley between Main Street and Pecan Street*



*Overhead utility lines traversing the City Hall site and the Best Little Plaza in Texas*



*Facing east along E. Pecan Street near the intersection of Railroad Avenue*



*Facing south at the intersection of 4th Street and W. Pecan Street*



## PHASING CONSIDERATIONS

Due to the cost and available funding sources, the relocation of overhead lines underground is anticipated to be a long-range project for the City. Therefore, special consideration to the phasing of the improvements in the analysis was prudent. During the initial phasing analysis, four prioritization factors were identified: Visibility, Development Opportunities, Planned Public Projects, Vehicular and Pedestrian Activity.

### 1. Visibility

Beautifying the Downtown area is one of the primary motivations for this project. The City's goal is to focus on the areas that have the most significant visible impact. These are the gateway areas and primary corridors that receive the most views of Downtown.

### 2. Development Opportunities

Being attractive for business is a top 10 desired characteristic of Downtown as stated in the Old Town Pflugerville Vision Report and Downtown Action Plan. Locations within the Downtown area that have development or redevelopment potential were considered when creating the phases. Future investment can be leveraged with tools such as Tax Increment Reinvestment Zones or 380 Agreements to assist in paying for future overhead to underground projects.

### 3. Public Projects

The City should consider pairing any potential overhead to underground utility projects with an existing or planned construction project in the Downtown core area, should the opportunity arise, in order to potentially save on construction costs and eliminate unnecessary future construction nuisance. There is also a desire to prevent avoidable reconstruction and potential waste.

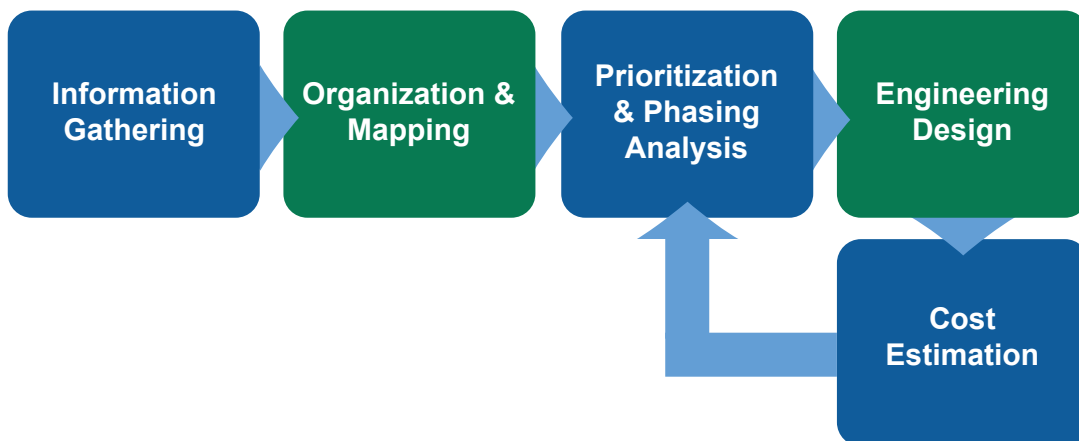
### 4. Activity (Vehicular & Pedestrian)

Several of the desired characteristics of Downtown listed in the Old Town Pflugerville Vision Report and Downtown Action Plan include having an active and vibrant downtown. This priority factor provides an emphasis on areas that are currently active with vehicular and pedestrian passersby. This is similar to the visibility factor but puts additional importance on pedestrian areas.

The prioritization factors were used in developing an initial phase map that was later modified through an iterative process to ensure both the functionality of the system and the prioritization factors were maintained. The development of the phasing plan contemplated how certain segments of overhead removals would impact other parts of that system. For instance, a phase would be developed to allow the complete removal of a line instead of ending prematurely and leaving short sections of line overhead. If the installation of a large amount of duct was required to remove a single overhead service, the cost and benefit were discussed with the City Planning and Development Services Department to verify the direction before proceeding.

When removing the overhead electric system, special care must be taken to remove the facilities in a way that will not negatively impact future phases or development. In the conceptual design analysis, equipment, including transformers and ground boxes, was placed in areas where development had already occurred or was unlikely to occur in the near future. With future detailed design, these locations can be shifted based on current or planned developments in the study area.

**The identified phases are described in more detail on the following pages, including phase area, potential utility relocations underground, objective, and potential challenges of these relocations.**



## Phase 1 - Downtown Commercial Core

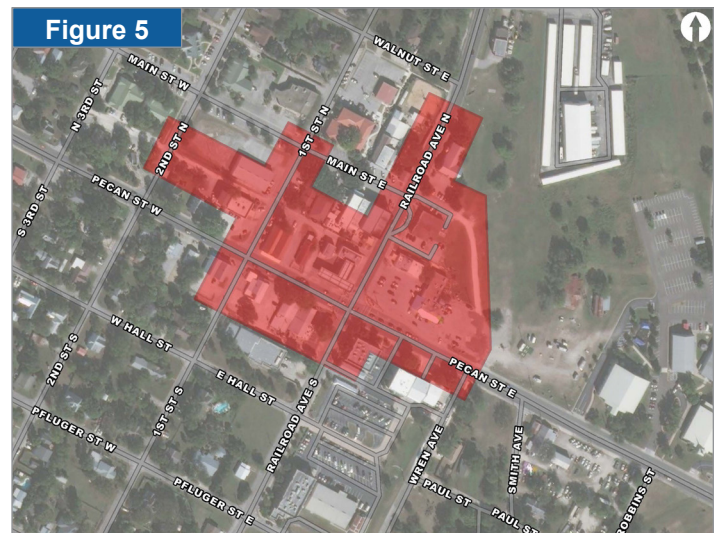
Phase 1 includes the intersection of Railroad Avenue and Pecan Street, a segment of the alley north of Pecan Street, the overhead crossing at 1st Street and Pecan, and a segment of the alley south of Pecan Street, as shown in **Figure 5**. This intersection acts as a gateway into the Downtown Commercial Core, and includes historic buildings, restaurants, bars, commercial spaces, and areas that have redevelopment potential. There is an opportunity for this project to be paired with the extension of Main Street and streetscape improvements along Pecan Street and Railroad Avenue, both of which are projects identified in the Downtown Action Plan. Phase 1 borders both Phase 2 and Phase 3, allowing continued expansion into those phases if funding becomes available.

Utilities in this area include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MCI.

One of the primary objectives of this phase is to address the substantial amount of overhead utilities at the intersection of Pecan Street and Railroad Avenue. To completely remove the overhead lines at this intersection, a segment of the alley south of Pecan Street between S. 1st Street and Railroad Avenue needed to be included within this phase to ensure system functionality. The alley

north of Pecan Street is included in this phase due to the high visibility from Railroad Avenue, opportunities for redevelopment west of N. 1st Street, and potential cost savings from minimizing rework between phases.

Potential challenges in this phase will include the utility congestion in the alleys immediately north and south of Pecan Street, and the need for easements required along Pecan Street and Railroad Avenue to facilitate the removals.



Phase 1			
Item Description	Units	Unit Price	
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$2,854,690
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$940,435
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$60,749
4	Easement Acquisition	LS	\$129,100
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$398,497
Subtotal			\$4,383,471
Professional Design and Support Services (10% of Construction Costs)			\$438,347
Construction Contingency (25%)			\$1,095,868
<b>Total</b>			<b>\$5,917,686</b>
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)			
3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.			
4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

## PHASE I BEFORE AND AFTER PHOTOGRAPHS



*Existing conditions at N. Railroad Avenue north of intersection at Pecan Street*



*Anticipated conditions at N. Railroad Avenue after the overhead utilities are placed underground*



*Existing conditions at Alley at N. Railroad Avenue*



*Anticipated conditions at Alley at N. Railroad Avenue after the overhead utilities are placed underground*



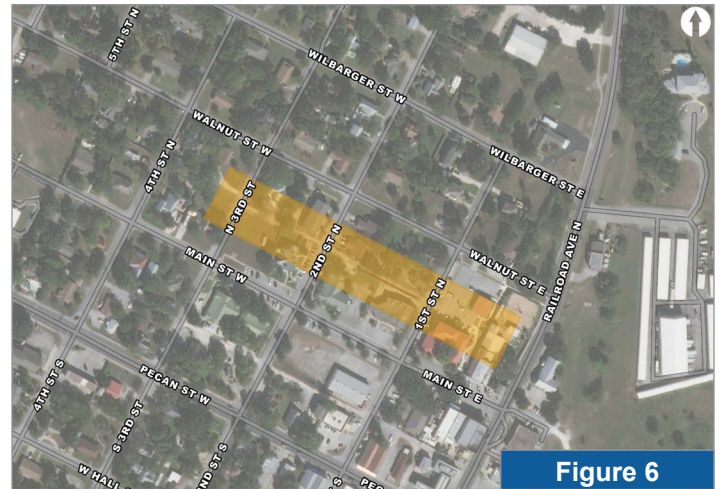
## Phase 2 - Northern Main Street Alley

Phase 2 includes a relatively short extension of overhead utilities within the alley north of Main Street, from N. 1st Street to N. 3rd Street, as shown in **Figure 6**. There are residential uses on the north side of the alley and predominantly offices on the south side of the alley. While this area is not necessarily as visible to the public as what you would find in Phases 1, 3, and 4, there is an opportunity to combine Phase 1 and 2. Phase 2 includes the area for the existing City Hall and the expansion of city offices in the building previously owned by Comerica Bank. Therefore, some of these sites may have redevelopment potential.

Combining Phase 2 with Phase 1 would provide some economies of scale during construction and lessen the overall impact to the central portion of the Downtown Core by creating a single construction project instead of two scheduled consecutively.

The City may also be required to assign public utility easements on portions of city-owned properties. Unlike Phase 1, underground utility congestion in the alley is not expected to be as significant of a concern.

Utilities in this area include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MC.



Phase 2			
Item	Description	Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$670,930
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$99,580
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$12,503
4	Easement Acquisition <sup>1</sup>	LS	\$11,600
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$79,461
Subtotal			\$874,074
Professional Design and Support Services (10% of Construction Costs)			\$87,407
Construction Contingency (25%)			\$218,518
<b>Total</b>			<b>\$1,180,000</b>
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
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4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

<sup>1</sup>Proposed easements are currently shown on city-owned properties; therefore, the easement cost may not apply if properties remain City-owned.

### Phase 3 - East Pecan Street

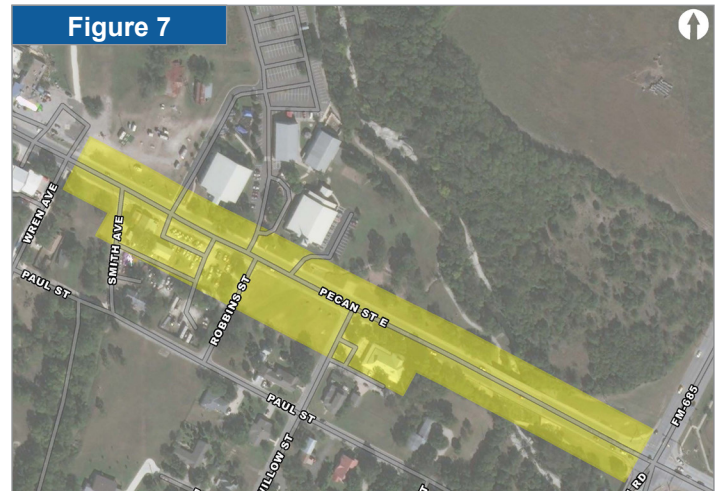
Phase 3 extends along East Pecan Street, generally from Smith Ave to the intersection of F.M. 685 and Dessau Road, as shown in **Figure 7**. This phase includes crossing Gilleland creek via boring, which adds significant costs to this phase. If the City decides to forego the creek crossing and terminate this phase segment just west of the creek on Pecan, there may be a cost savings of approximately \$250,000.

Currently, there are overhead lines on both the north and south sides East Pecan Street. Phase 3 consolidates both lines to an underground duct on the north side of Pecan Street. Utilities in this area include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MCI.

Phase 3 also replaces the overhead connections with underground services to the properties on the south side of Pecan Street from Wren Avenue to Willow Street.

Unlike most of the other identified phases, the Texas Department of Transportation (TxDOT) will have permitting authority in this area. This can prove more challenging as requirements for construction, lane closures, and standards can be different than the City's requirements. Additionally, easements will need to be acquired in several areas to place ONCOR equipment.

Improvements to this section of Pecan Street are discussed in the Downtown Action Plan, including potential right-of-way acquisition and pedestrian, streetscaping, street, and drainage improvements. Constructing these improvements concurrently can lead to overall cost savings for the project.



Phase 3			
Item	Description	Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$2,230,775
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$615,690
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$26,283
4	Easement Acquisition	LS	\$363,000
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$323,575
Subtotal			\$3,559,323
Professional Design and Support Services (10% of Construction Costs)			\$355,932
Construction Contingency (25%)			\$889,831
<b>Total</b>			<b>\$4,805,086</b>

#### Assumptions

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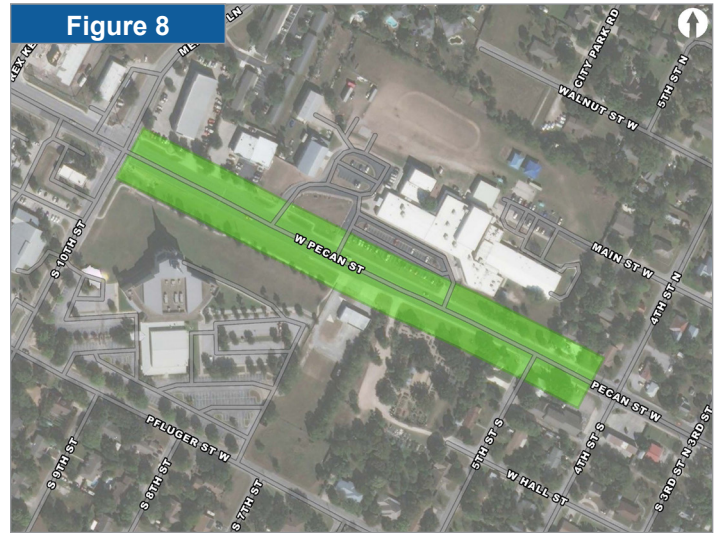
## Phase 4 - West Pecan Street Gateway

Phase 4 includes a segment of West Pecan Street from the intersection of Meadow Lane / 10th Street to 4th Street and represents the western gateway into Downtown, as shown in **Figure 8**.

Most of the overhead utilities in Phase 4 are located on the north side of Pecan Street. Utilities in this phase include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MCI.

Similar to Phase 3, TxDOT will be an additional challenge on this roadway due to working in their right-of-way. Easement acquisition along this stretch could also be difficult. Several easements will be required along this stretch of Pecan Street on privately-owned land. To reserve utility customers on the south side of Pecan Street, additional conduit crossings will be required. These crossings can be trenched or bored, but require TxDOT permitting and road or lane closures.

Like Phase 3, improvements to the section of Pecan Street are discussed in the Downtown Action Plan, including potential right-of-way acquisition and pedestrian, streetscaping, street, and drainage improvements. Constructing these improvements concurrently can lead to overall cost savings for the project.



Phase 4		
Item Description	Units	Unit Price
1 Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$2,251,095
2 Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$847,380
3 Telecommunication Infrastructure (Cable, Pedestals)	LS	\$26,351
4 Easement Acquisition	LS	\$16,000
5 Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$314,083
<b>Subtotal</b>		<b>\$3,454,909</b>
Professional Design and Support Services (10% of Construction Costs)		\$345,491
Construction Contingency (25%)		\$863,727
<b>Total</b>		<b>\$4,664,127</b>

### Assumptions

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## Phase 5 - North Railroad Gateway

A portion of this phase includes the northernmost extent of the Downtown district and represents another primary gateway into Downtown along North Railroad Avenue, as shown in **Figure 9**. This phase also consists of a commercially zoned block north of City Hall that may have redevelopment potential. Currently, the lots on this block have existing single-family residential uses as well as unimproved lots.

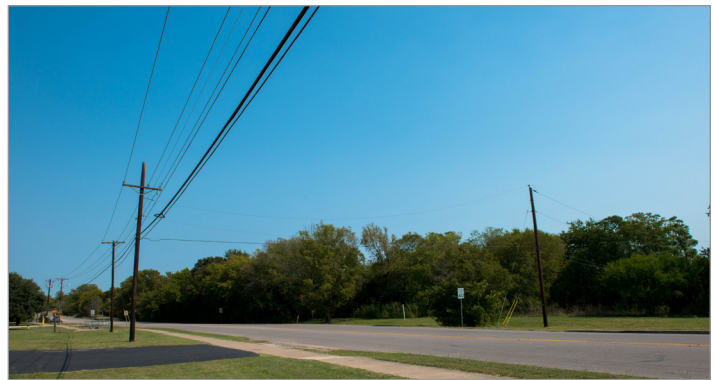
Phase 5 includes overhead electric and telecommunication lines from ONCOR, Grande, Suddenlink, Charter/Spectrum, and Zayo. It is connected on N. 1st Street to the overhead lines from Phase 2, so a small portion of work will need to be completed twice if phasing order is maintained.

A potential gateway into Downtown is envisioned along Railroad Avenue in the Downtown Action Plan. Combining the overhead relocation with the streetscape improvements proposed in the gateway could provide cost savings to the City if construction and design is performed concurrently.

Generally, potential challenges include the acquiring of easements along Wilbarger Street to install both electric and telecommunication equipment and utility crossings in Railroad Avenue that can impact traffic flow.



**Figure 9**



Phase 5			
Item	Description	Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$1,766,150
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$571,815
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$23,001
4	Easement Acquisition	LS	\$0
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$236,097
Subtotal			\$2,597,063
Professional Design and Support Services (10% of Construction Costs)			\$259,706
Construction Contingency (25%)			\$649,266
<b>Total</b>			<b>\$3,506,035</b>
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)			
3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.			
4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

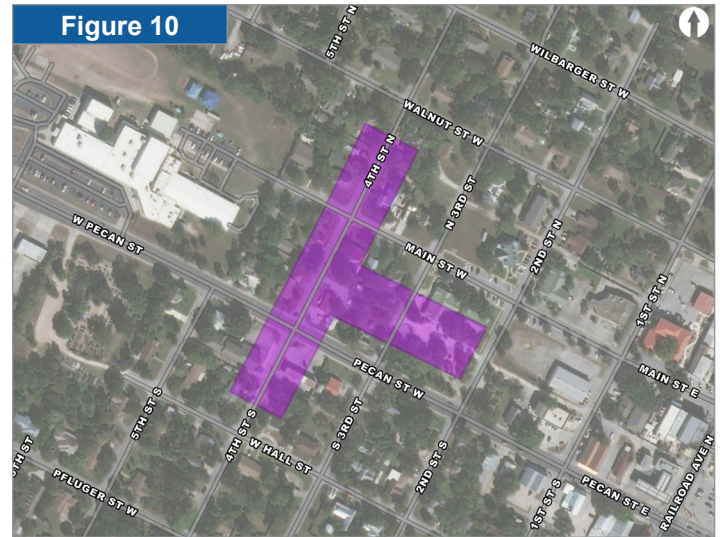
## Phase 6 - Western Downtown Core

Phase 6 is generally located on the northwestern edge of the Downtown Core, as shown in **Figure 10**. The land uses consist primarily of residential properties; however, the main objective with this phase is to address the overhead lines that cross West Pecan Street at the intersection of 4th Street. Based on how the existing system is laid out in the area, to relocate the lines crossing Pecan Street, this phase requires the relocation of some of the lines north of Pecan Street within the alley and along N. 4th Street.

Utilities in this phase include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MCI.

By replacing the overhead lines underground in this area, Pecan Street from F.M. 685 to 10th Street will be free of all overhead lines, setting the overall aesthetic for the community as they enter the Downtown Core.

Similar to Phase 3 and Phase 4, a portion of this work will be done in TxDOT right-of-way, creating an additional layer of complexity for the project. The City will need to determine if they would like to trench or bore the Pecan Street roadway to install the conduit needed to remove the overhead lines. Additionally, equipment will need to be installed in City right-of-way or in new public utility easements, potentially complicating streetscape improvements.



Phase 6			
Item Description	Units	Unit Price	
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$1,472,330
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$490,905
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$27,564
4	Easement Acquisition	LS	\$23,800
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$201,460
Subtotal		\$2,216,059	
Professional Design and Support Services (10% of Construction Costs)		\$221,606	
Construction Contingency (25%)		\$554,015	
<b>Total</b>		<b>\$2,991,680</b>	
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)			
3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.			
4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

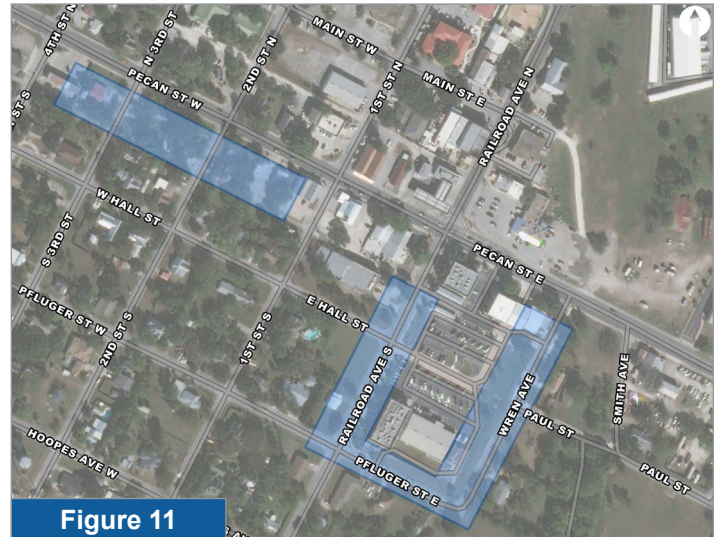


## Phase 7 - Downtown Core South

Phase 7 includes the remaining properties south of Pecan Street, which are not included within the other phases, as shown in **Figure 11**. The properties fronting Pecan Street are commercial properties, and the remaining properties with no frontage on Pecan Street are a mixture of commercial and residential uses. For the area along W. Pecan Street, most of the overhead electric and telecommunication utility lines are located within the alley south of W. Pecan Street. Generally, the alley segments will likely be some of the more challenging locations for the relocation of the overhead lines underground due to the presence of existing underground utility lines and the required utility spacing requirements. Fortunately, the overhead lines within the alley are not as visible to Pecan Street.

Utilities in this phase include ONCOR, AT&T, Charter/Spectrum, Grande, Suddenlink, and Verizon/MCI.

Potential challenges include easement acquisition along private properties in the alley. Space is already at a premium in this area and procuring easements could prove difficult.



**Figure 11**



Phase 7			
Item	Description	Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$2,477,340
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$553,675
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$26,151
4	Easement Acquisition	LS	\$15,500
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$307,267
Subtotal			\$3,379,933
Professional Design and Support Services (10% of Construction Costs)			\$337,993
Construction Contingency (25%)			\$844,983
<b>Total</b>			<b>\$4,562,909</b>
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)			
3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.			
4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

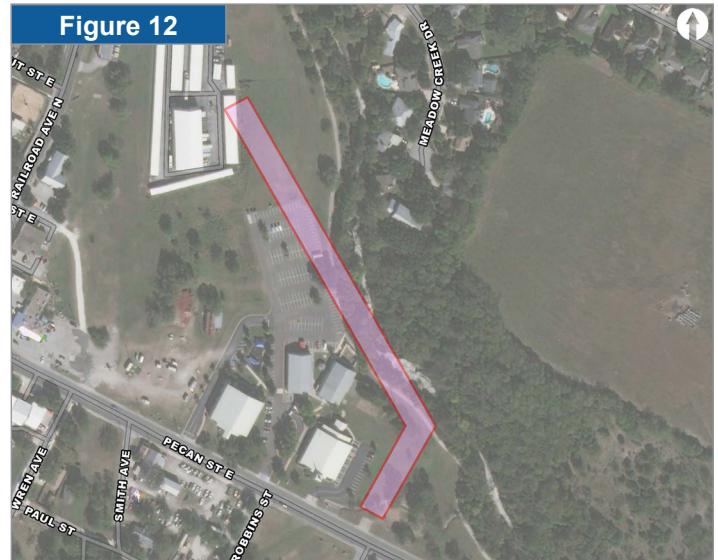


## Phase 8 - Main Street Extension / Gilleland Creek

Phase 8 includes overhead lines generally located north of East Pecan Street and east of the MoKan right-of-way and traverse the First United Methodist Church property that provides service to the church, the MoKan Storage facility, and the Willow Creek Subdivision, as shown in **Figure 12**. This phase serves as an opportunity to underground overhead utility lines, wholly or partially, with the Main Street extension project and Phase 3 shown along E. Pecan Street east of the MoKan right-of-way. The opinion of probable construction costs represents the full extent of Phase 8 with a contingency. However, costs may be significantly reduced if only a portion of the overhead lines is relocated underground within the extent of the future Main Street right-of-way and proximity to the respective roadways, including E. Pecan Street.

Utilities in this phase include Oncor and AT&T.

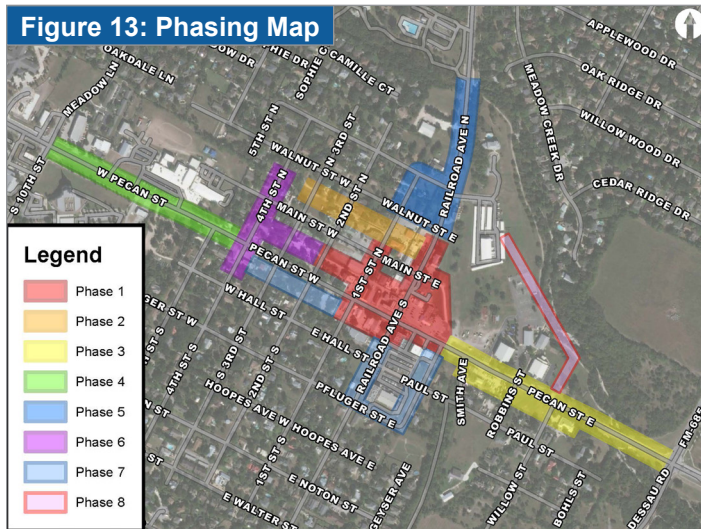
Potential challenges include easement acquisition traversing private properties and a service crossing into the Willow Creek subdivision. This study left the creek crossing as-is, as the expense of a creek crossing by bore would be expensive for little benefit to the overall project.



Phase 8			
Item Description		Units	Unit Price
1	Civil Infrastructure (Conduit, Concrete Pads, Backfill, Manholes, Pavement Repair)	LS	\$871,000
2	Electric Infrastructure (Cable, Transformers, Switchgear, Service Upgrades)	LS	\$391,765
3	Telecommunication Infrastructure (Cable, Pedestals)	LS	\$7,347
4	Easement Acquisition	LS	\$0
5	Misc. Site Contingency (10%): (Mobilization, Traffic Control, Erosion and Sedimentation Control, etc.)	LS	\$127,011
Subtotal			\$1,397,123
Professional Design and Support Services (10% of Construction Costs)			\$139,712
Construction Contingency (25%)			\$349,281
<b>Total</b>			<b>\$1,886,116</b>
Assumptions			
1) All OPCC represent the Consultants best judgement as professionals familiar with the construction industry and current available unit pricing. Consultant does not guarantee that proposals, bids, or actual Project Construction Costs will not vary from this opinion. Quantities are estimates only and the actual amount of work and/or materials are contingent upon final existing conditions survey and design of these improvements.			
2) Pricing is based on average costs and does not account for any site specific determinates that would effect cost of construction (soil conditions, etc.)			
3) Roadway improvements are not included in this OPCC other than minimal work for roadway repair after trench installation.			
4) Projection of future construction costs should include a 5-10% annual increase at a minimum.			
5) Non-customary design services and permitting services are not included as part of this OPCC.			

## WATER AND WASTEWATER ANALYSIS

As part of this study, a preliminary analysis of water and wastewater infrastructure in Downtown has been performed and documented to identify opportunities for water and wastewater improvements that may be constructed concurrently with the relocation of overhead lines within certain phases. The area of study is based on seven phases as shown in the phasing map in **Figure 13**.



Opportunities for upsizing and relocation of water and wastewater utilities have been identified within each of the overhead to underground utility phases based on the following evaluation criteria:

1. Pipe sizes
2. Age
3. Material
4. Texas Commission on Environmental Quality (TCEQ) clearance requirements
5. Review of the City's Water and Wastewater Master Plan

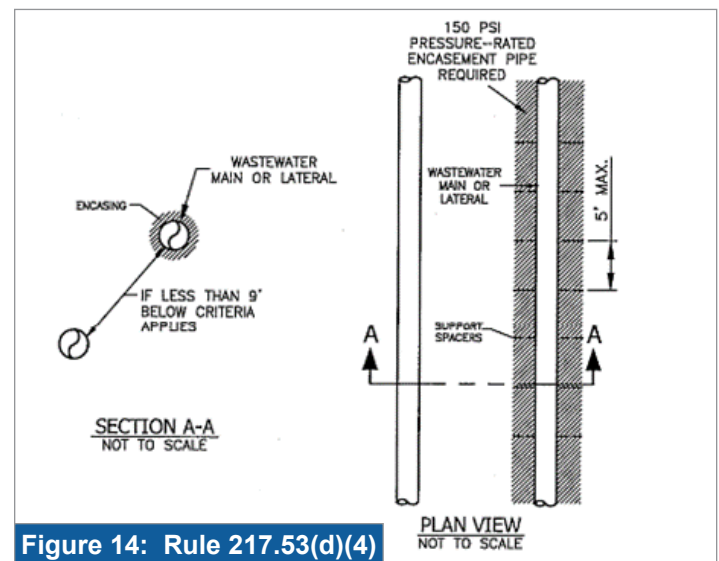
The City of Pflugerville design standards state that public water and wastewater lines shall be at least eight (8) inches in diameter. In this analysis, opportunities for operational improvements by upsizing pipes to meet this standard have been identified. While specific locations for upsizing of water pipes have been identified in this analysis, the same has not been done for the wastewater pipes. This is because most, if not all, of the wastewater lines in the study area are 6-inch in diameter. The City could consider upsizing these to 8-inch pipes to meet their standards.

For age and material, information acquired from the City's GIS online portal was used. Most of the water and wastewater pipes throughout the study area were installed

with polyvinyl chloride (PVC) material. Some pipes were installed in the 1970s, 1980s, and 1990s, but age is unknown for most of the pipes. For further analysis of age, investigation of the City's record drawings, interviews with City operations and maintenance staff, and non-destructive testing (NDT) of the pipes is recommended.

TCEQ separation criteria were a key determinant in identifying opportunities for water and/or wastewater line relocations. Texas Administration Code (TAC) Title 30, Part 1, Chapter 217, Subchapter C, Rule 217.53(d)(3) states that "wherever possible, collection system pipes and manholes must be located at least nine feet from all water supply pipes." For parallel water and wastewater lines, the following criteria govern if nine feet of separation cannot be maintained:

- Rule 217.53(d)(4) – If a collection system pipe is located above a water supply pipe and runs parallel to the water supply pipe, each portion of the collection system pipe within nine feet of the water supply pipe must be encased. The casing pipe must be constructed of at least 150 per square inch (psi) pressure class pipe that:
  - (A) encases the entire length of collection system pipe that is within nine feet of the water supply pipe;
  - (B) is sealed at both ends with cement grout or a manufactured seal;
  - (C) is at least two nominal sizes larger than the wastewater collection pipe;
  - (D) is supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.



**Figure 14: Rule 217.53(d)(4)**

- Rule 217.53(d)(6) – If a collection system pipe is located below a water supply pipe and runs parallel to the water supply pipe, each portion of the collection

system pipe within nine ft of the water supply pipe must either be constructed using at least 150 psi pressure class pipe according to subparagraph (A) of this paragraph, or must be encased in a casing pipe according to subparagraph (B) of this paragraph.

(A) A collection system pipe that runs parallel to and below a water supply pipe must be constructed of at least 150 psi pressure class, corrosion-resistant, non-brittle pipe that:

- i. is located at least two vertical feet below the water supply pipe;
- ii. is located at least four horizontal feet away from the water supply pipe; and
- iii. includes joints that are designed to seal at atmospheric pressure.

(B) A casing pipe for a collection system pipe that runs parallel below a water supply pipe must be constructed of at least 150 psi pressure class pipe that:

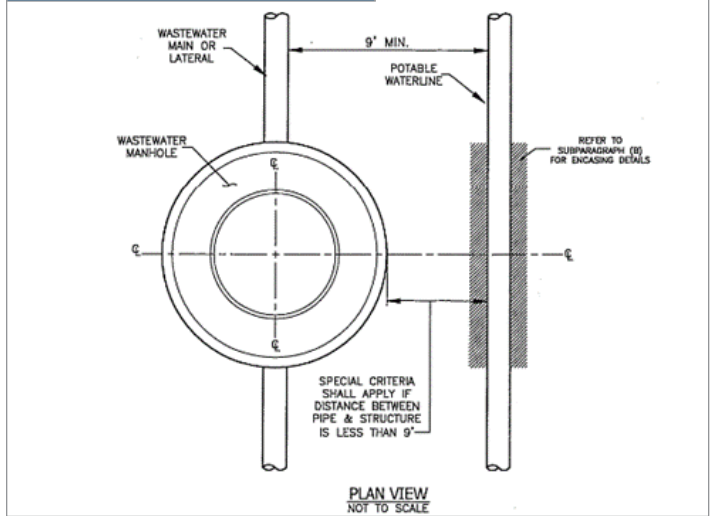
- i. is sealed at both ends with cement grout or a manufactured seal;
- ii. is at least two nominal sizes larger than the wastewater collection pipe; and
- iii. is supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

one foot of cement stabilized sand that meets the requirements of paragraph (7)(D)(i) and (ii) of this subsection.

\* (7)(D)(i) – (D) Cement-stabilized sand for encasing collection system pipes must:

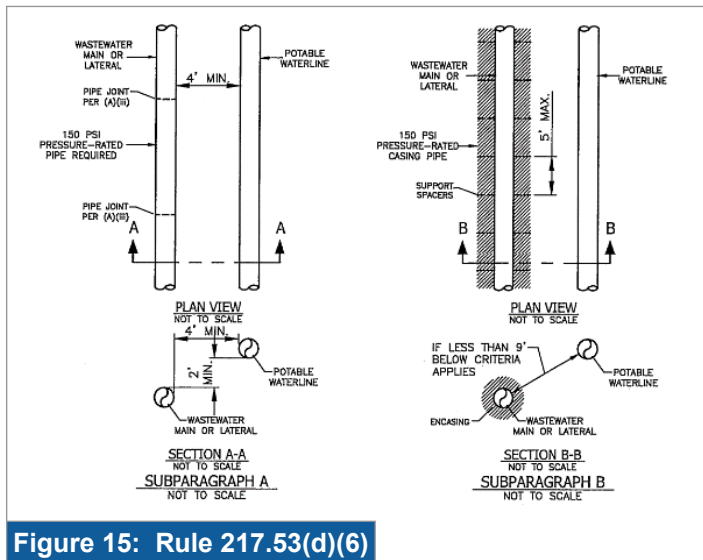
- i. include at least 160 pounds of cement for every cubic yard of sand;
- ii. be installed beginning one-quarter pipe diameter below the centerline of the collection system pipe.

**Figure 16: Rule 217.53(d)(8)**



This high-level water and wastewater utilities analysis was performed based on Subsurface Utility Engineering SUE Level D and information provided by the City on the location of these utilities in the study area. The utility locations within the Downtown area are based on previous GPS fieldwork performed by the City identifying all visible utility appurtenances (e.g., manholes, valves, etc.). Further water and wastewater analysis based on SUE Level A and B should be conducted to determine the horizontal and vertical locations, age, condition, and size of the utilities and to determine if existing lines meet separation distance criteria established by TCEQ.

**The potential water and wastewater improvements are described in more detail on the following pages, including phase area and recommendations for further analysis.**



**Figure 15: Rule 217.53(d)(6)**

- Rule 217.53(d)(8) – If a nine-foot separation distance between a manhole and a water supply pipe cannot be achieved, the manhole must either:
  - (A) have no measurable leakage during a leakage test conducted according to the requirements in §217.58 of this title (relating to Testing Requirements for Manholes); or
  - (B) have all portions of the manhole within nine feet of a water supply pipe encased in at least



### Phase 1 – Downtown Commercial Core

Phase 1 encompasses work in the following areas: the alley between Main Street and Pecan Street from N. 2nd Street to N. Railroad Avenue; 1st Street from Main Street to Hall Street; Railroad Avenue from Walnut Street to Hall Street; and the alley between Pecan Street and Hall Street from S. 1st Street to S. Railroad Avenue. In Phase 1, there are a few opportunities for relocations based on TCEQ separation criteria. Along the alley between Main Street and Pecan Street from N. 1st Street to N. Railroad Avenue the existing 4-inch water line and 6-inch wastewater line appear to be overlapping one another, showing a horizontal separation distance of less than 9 ft . Upon further SUE level A and B to confirm the horizontal and vertical locations of these utilities, the City could consider relocating the existing 4-inch water line to provide nine feet of separation from the wastewater line and upsizing the water line to a minimum of 8-inch diameter. This will eliminate the 8-inch-to-4-inch bottleneck in the distribution system since the water lines on N. 1st Street and N. Railroad Avenue are both 8-inch in diameter. This will help to maintain even water pressure and flow rates throughout the system in this area. Similarly, along the alley between Pecan Street and Hall Street from South. 1st Street to S. Railroad Avenue, there appears to be only 7 ft of separation between the existing 8-inch water line and 6-inch wastewater line. The water and wastewater lines along this alley appear to be in conflict up to 4th Street, affecting Phase 7 as well.

Phase 1				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Alley between Main St and Pecan St, from 1st St to Railroad Ave	4" PVC Water 6" PVC WW	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater 3) Water line is 4" dia. 4) Age of material unknown	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of wastewater pipe 3) Upsize water line to 8" dia. minimum 4) Review as-builts from City
2	Alley between Pecan St and Hall St from 1st St to Railroad Ave	8" PVC Water 6" PVC WW	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater 3) Age of material unknown	1) SUE Level B and A to verify horizontal and vertical locations; 2) CCTV to assess condition of wastewater pipe; 3) review as-builts from City

### Phase 2 – Northern Main Street Alley

Phase 2 encompasses work along the alley between Walnut Street and Main Street from N. 3rd Street to N. Railroad Avenue. The 8" waterline and 6" wastewater line appear to be less than 9 ft apart in this area. Upon further SUE level A and B investigation to confirm the horizontal and vertical locations of these utilities, the City could consider relocating the 8-inch water line at this intersection to meet separation criteria.

Phase 2				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Alley between Walnut St and Main St at 1st St	8" PVC Water 6" PVC WW	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater 3) Age of material unknown	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of wastewater pipe 3) Review as-builts from City

### Phase 3 – East Pecan Street

Phase 3 encompasses work along Pecan Street from Smith Avenue to the intersection of F.M. 685 and Dessau Road. The City of Pflugerville Wastewater Master Plan issued in 2020 identifies a project in this phase area that could be constructed concurrently with the overhead to underground relocation. The project, the 15" Gilleland Creek Interceptor, would upgrade the existing 12" wastewater line to a 15" to meet projected peak flows. While this wastewater line improvement lies largely outside of the Downtown Core project area, incorporating its upsizing into Phase 3 could benefit the City of Pflugerville by reducing design, bid, and construction fees associated with a standalone project.



Figure 17: Excerpts from Wastewater Master Plan (2020)

City of Pflugerville		FREESE & NICHOLS		where quality meets life PFLUGERVILLE TEXAS	
Capital Improvement Cost Estimate			Date of Estimate: 12/20/2019		
Construction Project Number: 10			Phase: 2019-2023		
Project Name: 15-inch Gilleland Creek Interceptor					
Project Description: 15-inch interceptor along Gilleland Creek replacing an existing 12-inch interceptor.					
Project Drivers: insufficient interceptor capacity to meet projected peak flows.					
Opinion of Probable Construction Cost					
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe > 16 feet deep	2,700	LF	\$ 225	\$ 607,500
2	60" Diameter Manhole	6	EA	\$ 10,000	\$ 60,000
3	Pavement Repair	100	LF	\$ 80	\$ 8,000
				<b>SUBTOTAL:</b>	<b>\$ 675,500</b>
				CONTINGENCY	30%
				<b>SUBTOTAL:</b>	<b>\$ 878,200</b>
				ENG/SURVEY	18%
				<b>SUBTOTAL:</b>	<b>\$ 1,036,300</b>
Estimated Project Total (2019 Dollars):					\$ 1,036,300

Phase 3				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Pecan St east of Robbins St	8" PVC Water 12" PVC WW	1) Identified Wastewater CIP project, 15" Gilleland Creek Interceptor, opportunity to combine with this project. Planned for FY 2022-2023 2) Age of material unknown	1) Investigate whether City would be interested in pursuing a joint project 2) Review as-builts from City

#### Phase 4 – West Pecan Street Gateway

Phase 4 encompasses work along Pecan Street from Meadow Lane/10th Street and 4th Street. There appears to be less than 9 ft of separation between an existing 8-inch wastewater line and a 12-inch water line. If further SUE level A and B investigation are conducted and finds that adequate separation has not been provided, the City could consider relocating the 8-inch wastewater line a minimum of 9 ft from the 12-inch water line.

Phase 4				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Pecan St at Meadow Ln and 10th St	12" DI Water (1985) 8" PVC WW (1982)	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of pipe
2	Pecan St at Meadow Ln and east to 5th St	2" PVC	1) Water line is 2" dia.; it appears PACE School may be served off this line this line dead ends at Meadow Ln and connects to an 8" water line at 5th St. 2) Age of material unknown	1) Recommend upsizing to 8" dia. minimum 2) Review as-builts from City
3	Pecan St at Meadow Ln	12" DI (1985) 6" PVC (1999) 8" PVC (1982)	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of wastewater pipe

System improvement opportunities have been identified along Pecan Street east of Meadow Lane and at 5th Street.

The existing 2-inch water line could be upsized to a minimum of 8-inch diameter so that future connections can come from this system. Also, this new 8-inch line could be connected to the existing 12-inch water line on Meadow Lane and to the 8-inch water line on 5th Street to allow for a looped system. The benefit of a looped system is being able to minimize impacts to customers when shutouts for maintenance are needed.

**Phase 5 – North Railroad Gateway**

Phase 5 encompasses the area within the Downtown Core along N. Railroad Avenue from Gilleland Creek to Walnut Street, Wilbarger Street from N. Railroad Avenue to N. 1st Street, N. 1st Street from Wilbarger Street to Walnut Street, and along Walnut Street from N. 1st Street. There are operational improvement opportunities along Wilbarger Street between N. Railroad Avenue and N. 1st Street, and along N. 1st Street between Wilbarger Street and Walnut Street. The City could consider upsizing these existing 4-inch water lines to 8-inch minimum diameter pipe. If the City decides to upsize the 4-inch water line along Wilbarger Street, then the City could consider connecting the upsized 8-inch water line along 1st Street to the 8-inch water line along Wilbarger Lane to eliminate a bottleneck in the system created by reducers.

Phase 5				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Wilbarger St at 1st St	4" DI Water 6" PVC WW	1) Water line is 4" dia. 2) Age of material unknown	1) Recommend upsizing to 8" dia. minimum 2) Review as-builts from City
2	1st St from Wilbarger St to Walnut St	4" DI Water 6" PVC WW	1) Water line is 4" dia. 2) Age of material unknown	1) Recommend upsizing to 8" dia. minimum and connect to proposed 8" pipe on Wilbarger St and existing 8" pipe on Walnut St, eliminating bottleneck in system 2) Review as-builts from City

**Phase 6 – Western Downtown Core**

Phase 6 encompasses the area within the Downtown Core along the alley between Main Street and Pecan Street from N. 2nd Street to N. 4th Street and N. and S. 4th Street between the alley north of Main Street and the alley south of Pecan Street. In this phase, there are opportunities for operational and separation improvements. For TCEQ separation, the water and wastewater line appear to be less than 9 ft apart. Upon further SUE level A and B investigation confirming a separation issue, the City should consider relocating the 4-inch PE water line to meet separation requirements. Additionally, the 4-inch PE waterline along the alley between Main Street and Pecan Street from 3rd Street to 4th Street could be upsized to 8-inch and connected to the 8-inch waterline on 4th Street to improve system pressures and looping.

Phase 6				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Alley between Main and Pecan St, from 3rd St to 4th St	4" PE Water 8" PVC Water 6" PVC WW	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater 3) Water line is 4" dia. 4) Age of material unknown	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of pipe 3) Recommend upsizing to 8" dia. minimum and connect to existing 8" pipe on 4th St, eliminating bottleneck in system 4) Review as-builts from City
2	3rd St at Alley between Main and Pecan St	4" PVC Water 6" PVC WW	1) Water line is 4" dia. 2) Age of material unknown	1) Recommend upsizing to 8" dia. minimum and connect to existing 8" pipe on Pecan St, eliminating bottleneck in system 2) Review as-builts from City



### Phase 7 –Downtown Core South

Phase 7 includes the remaining areas of improvements in the study area outside of the other phases. The existing 8-inch water line and 6-inch wastewater line appear to be within 4 ft of each other in the alley between Pecan Street and Hall Street. Upon further SUE level A and B investigation confirming a separation issue, the City could consider relocating the wastewater line and may consider constructing this wastewater improvement in conjunction with any proposed overhead to underground improvements for the purposes of economy of scale.

Phase 7				
ID	Location	Utilities	Reason(s) for Further Investigation	Investigation Recommendations
1	Alley between Pecan and Hall St, from 4th St to 1st St	8" PVC Water 6" PVC WW	1) TCEQ 9' separation criteria not met - verify horizontal location 2) TCEQ 4' horizontal, 2' vertical criteria - verify wastewater not leaking, verify water is 2' above wastewater 3) Age of material unknown	1) SUE Level B and A to verify horizontal and vertical locations 2) CCTV to assess condition of pipe 3) Review as-builts from City

### Phase 8 – Main Street Extension / Gilleland Creek

No water or wastewater improvements were identified for this phase within this analysis.

### EQUIPMENT PHOTOGRAPHS

Typical equipment used in overhead to underground relocations can be seen below (types and size may vary).



Switchgear



Transformer



Communication Pedestal



Pole with Riser