CONDITION REMEDIATION ALTERNATIVES ANALYSIS

Project Scoping Report
Multiple Sewershed Package 12

PREPARED FOR: San Antonio Water System

PREPARED BY: Jose Maldonado

DATE: July 13, 2018

TASK ORDER # AND NAME: Task Order 35: Technical Support Services

1	7/13/18	Final Submittal	Jose Maldonado
0	6/19/18	Draft Submittal	Jose Maldonado
Revision	**Date**	**Revision Description**	**Approved By**

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Appendix A: CCTV Survey Data, As-Builts, Block Maps (electronic format)

Executive Summary

San Antonio Water System (SAWS) entered into a Consent Decree (CD) with the United States Environmental Protection Agency (EPA) on July 23, 2013. As part of the CD, SAWS is required to assess the condition of approximately 2,100 miles of gravity sewer mains and identify condition remedial measures on pipes with a "Very Poor" condition rating. This report presents the results of condition remedial measures alternatives analysis for approximately 3,504 linear feet of selected gravity sewer lines in the Central and East Sewershed service areas.

This report provides recommendations for project packaging based on replacement technologies selected to remediate these pipe segments. These assets have been selected due to the replacement recommendation and not geographic location.

For this area, only replacement was recommended. **Table ES-1** summarizes the proposed construction projects. The recommendations in this report may be further modified during subsequent design and construction phases, as appropriate, based on additional data and findings.

Table ES-1: Summary of Recommendations

Type of Work	Length (ft)	Line Size Range (in)	Estimated Construction Cost
Replacement	3,504	8-12	$1,319,000
Total	3,504		$1,319,000

1.0 Introduction

SAWS entered into a CD with the US EPA on July 23, 2013. As part of the CD, SAWS is required to assess the condition of approximately 2,100 miles of gravity sewer mains. Condition assessment results in an A to E rating for pipes with an "A" rating indicating very good condition and an "E" rating indicating very poor condition. **Table 1-1** lists the five condition assessment rating outcomes along with a definition and description for each outcome.

Once the condition of pipe segments are assessed, pipes with an "E" rating are selected for high priority condition remedial measures alternatives analysis. Pipe segments with a "D" rating that adjoin "E" pipes, referred to as "Opportunity Ds" are also selected to undergo high priority remedial measures alternatives analysis under the assumption that this will improve the ability of SAWS to coordinate with street restoration projects and will minimize the number of gravity sewer remediation projects within localized areas.

Table 1-1: PACP Condition Grades

Condition Category	Definition	Description
A	Very Good Condition	Minor defects
B	Good Condition	Defects that have not begun to deteriorate significantly
C	Fair Condition	Moderate defects that may continue to deteriorate
D	Poor Condition	Major defects that may become Category E defects within the foreseeable future
E	Very Poor Condition	Defects requiring near-term attention

The condition remedial measures alternatives analysis follows standard guidelines to select a remedial measure alternative for addressing condition-related deficiencies in pipe segments. SAWS has implemented condition analytics software to support review of available GIS and CCTV data to determine a preliminary alternatives analysis outcome for all "E" and "Opportunity D" pipe segments. SAWS then performs a review of the preliminary alternatives analysis outcome to validate or modify the outcome based on additional considerations as described in Section 3.1.

Once the condition remedial measure alternative is selected, pipe segments are packaged into a Project Scoping Report and associated project data is assembled in preparation for delivery to a Project Design Consultant. The Project Design

Consultant will provide engineering and construction phase services for the rehabilitation and replacement of the pipe segments included in the Project Scoping Report. The recommendations in the Project Scoping Report may be further modified during the subsequent design and construction phases, as appropriate, based on additional data and findings. Such additional data can include field determinations, review of proximity to utilities (gas, water, telephone, etc.), and construction access.

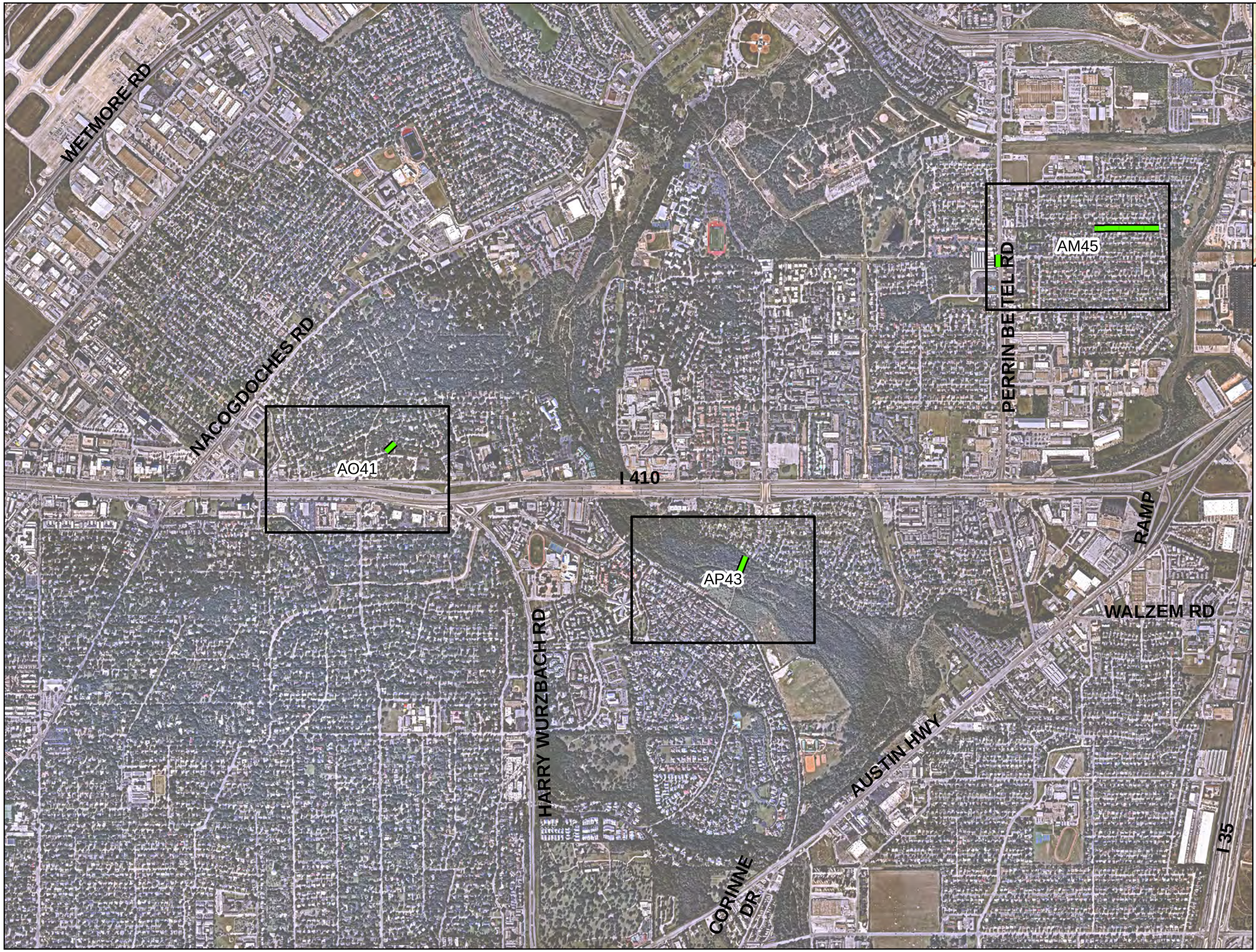
2.0 Evaluation Scope and Project Area

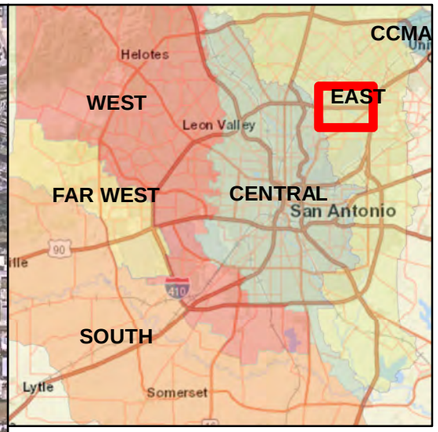
This report presents CCTV inspection findings and recommendations for continued maintenance or corrective actions of selected large diameter gravity sewer lines in the Central and East Sewersheds. The location maps of the area are presented in **Figures 2-1** to **2-4**.

The number of segments, length, and range of pipe sizes for lines addressed in this report are as follows:

- Pipeline segments evaluated = 15
- Approximate pipe length = 3,504 feet
- Range of sewer line sizes: 8 inches to 12 inches

Tables 2-1, 2-2, and **2-3** present the sewer line lengths based on pipe size, pipe material and year constructed, respectively. **Table 5-1** provides additional information for each pipe.





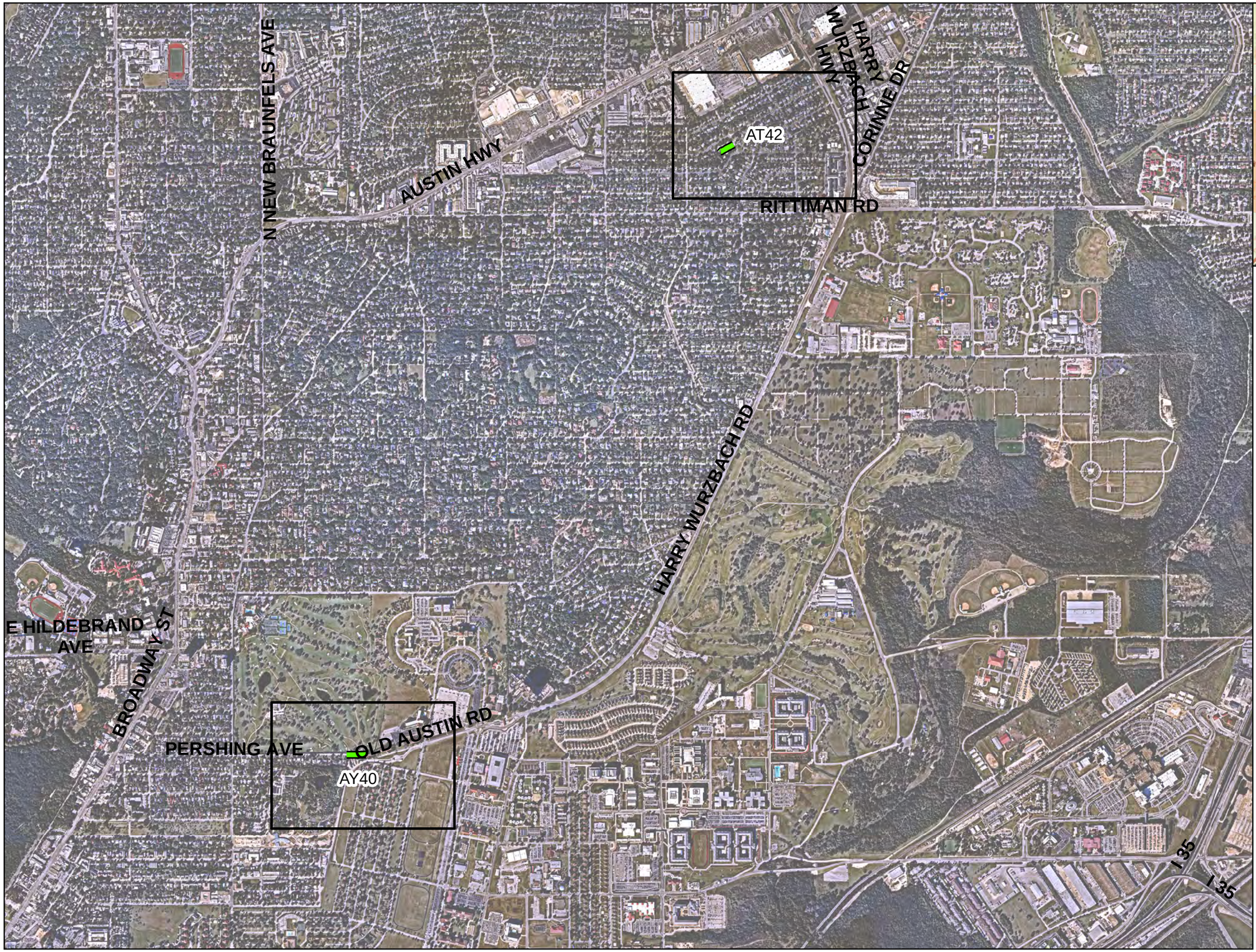
Legend

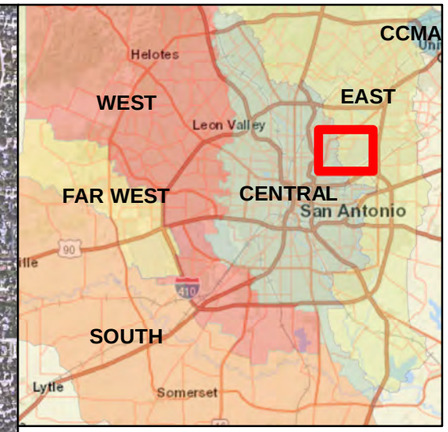
- Index Page
- Pipe Bursting
- Replacement

San Antonio Water System

FIGURE 2-1:
LAYOUT MAP

Multiple Sewershed - Package 12





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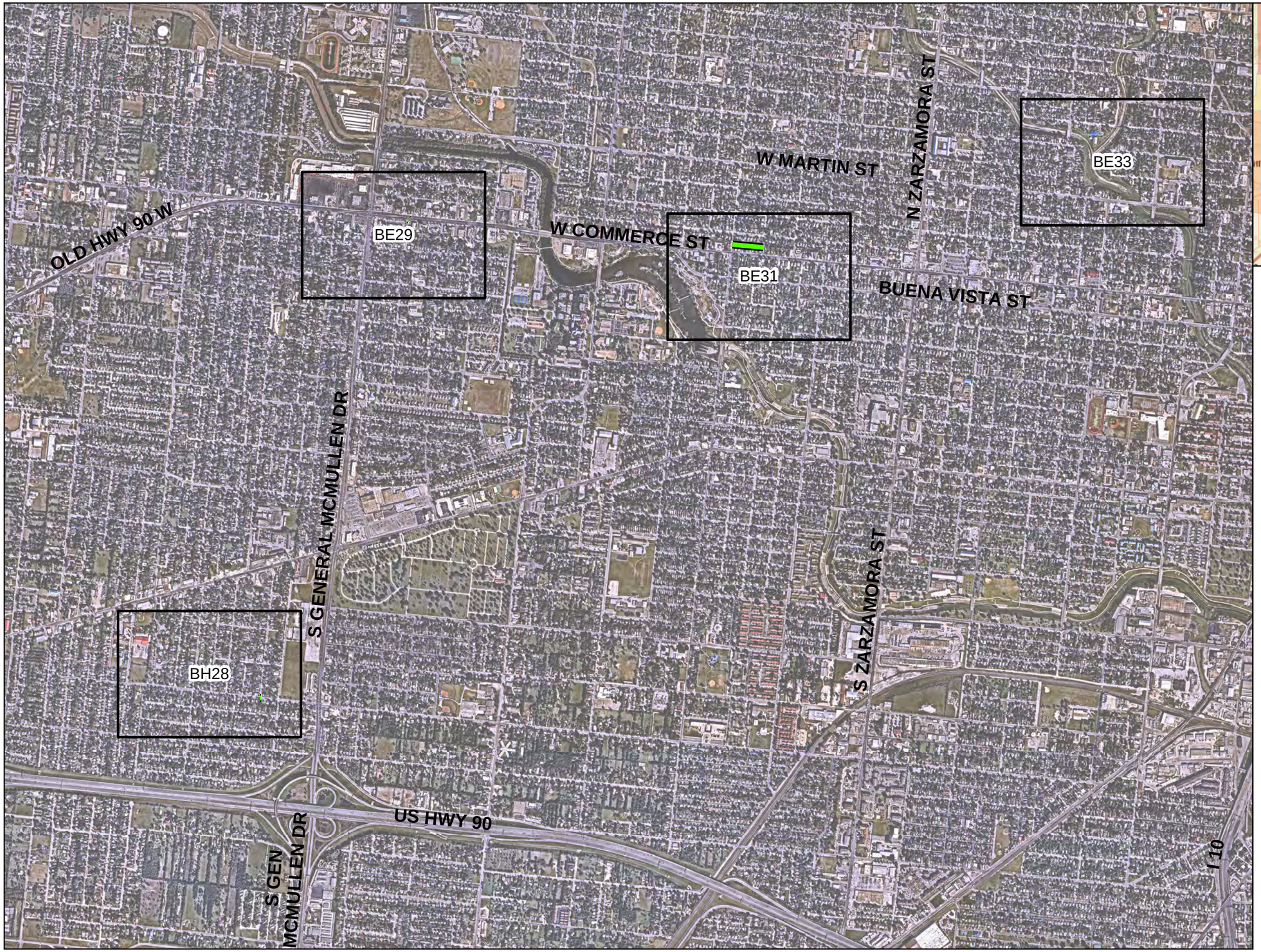
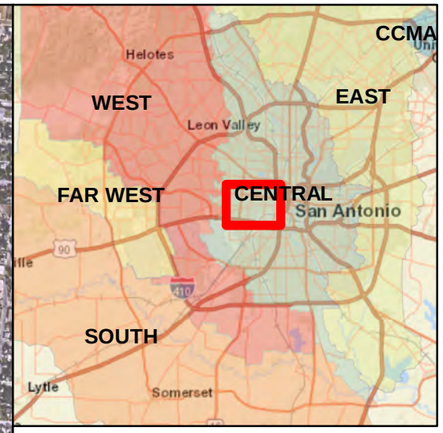
San Antonio Water System

FIGURE 2-2:
LAYOUT MAP

Multiple Sewershed -
Package 12





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San Antonio Water System

FIGURE 2-3:
LAYOUT MAP

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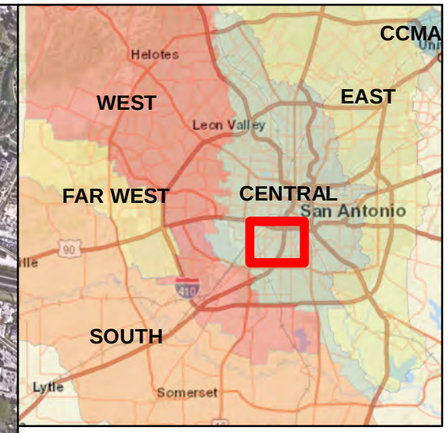

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- Index Page
- Pipe Bursting
- Replacement

San Antonio Water System

FIGURE 2-4:
LAYOUT MAP

Multiple Sewershed -
Package 12

Table 2-1: Sewer Lengths by Pipe Size

Diameter (in)	Length (ft)	Percentage of Total
8	3,902	88%
10	181	5%
12	231	7%
Total	3,504	100%

Note: Pipe sizes area based on CCTV inspections and lengths based on GIS data.

Table 2-2: Sewer Lengths by Pipe Material

Material	Length (ft)	Percentage of Total
Unreinforced Concrete Pipe (CP)	2,874	82%
Ductile Iron Pipe (DIP)	630	18%
Total	3,504	100%

Note: Pipe material is based on CCTV inspections and lengths based on GIS data.

Table 2-3: Sewer Lengths by Construction Year

Year Constructed	Length (ft)	Percentage of Total
<1959	1,663	48%
1959-1969	1,795	51%
1969-1979	46	1%
Total	3,504	100%

Note: Year constructed and lengths based on GIS data.

3.0 Methodology

3.1 General

The preliminary alternatives analysis outcome is reviewed to validate or modify the outcome based on additional considerations as described below.

- Review of CCTV data to validate preliminary condition remediation decision alignment with condition remediation guidelines

- High-level review of feasibility and appropriateness of preliminary condition remediation alternative given available data (e.g., aerial imagery) and project-level considerations. For example:
    - potential use of similar rehabilitation or replacement technology solution on adjoining segments
    - location of pipe relative to structures
    - ability to reduce number of point repairs by use pipe bursting
    - accessibility of pipe
- Removal of pipe segments selected for a known capacity remediation capital improvement project. These pipe segments will be addressed by a separate SSO Reduction Program planning process. Refer to Section 3.2
- Consideration of City of San Antonio (CoSA) street improvement data to support coordination of SSORP remediation with street restoration projects. Refer to Section 3.3
- Consideration of past history of pipe failure and pipe criticality

The pipe segments are packaged into construction based on a project-level review of condition remediation outcomes and determine final planning-level condition remediation alternative analysis outcome. The projects within this package recommendation will be grouped geographically to help reduce disturbances to residents thus helping reduce the potential for complaints. It is also anticipated that the geographic grouping will contribute to more competitive construction unit bid pricing due to efficiencies in doing work in close proximity to other similar work being performed.

3.2 Capacity Remediation Capital Improvement Projects

These pipe segments are not be included as part of any capacity projects.

3.3 Street Projects

CoSA provides an ArcGIS layer of street projects throughout the City. **Table 3-1** below lists the pipes that are located near or within identified street projects. This information has also been overlaid into the detailed location maps provided in the Exhibits section. It is our understanding that the actual dates of the projects are subject to change. It is recommended that SAWS coordinate with CoSA to determine the timing of the street projects. Please note that pipes may be required to be moved into current IDIQ contracts to expedite the construction where street projects are forthcoming.

Table 3-1: Pipes Located on CoSA Improvement Project

Index Page	CompKey	Street Location	Type of Project
AO41	1057967	Chisolm Trl	5 Year Pavement Preservation
AY40	976999	Pershing Ave	5 Year Street Maintenance
BE29	2758473	W. Commerce St	5 Year Street Maintenance
BE31	1048481	NW. 19th St	5 Year Street Maintenance
BN31	975893	Centennial Blvd	5 Year Street Maintenance
BP30	973088	W. Southcross Blvd	5 Year Pavement Preservation

3.4 Sanitary Sewer Overflow (SSO) Locations

The known SSO locations are provided in the detailed maps in the Exhibits section and listed in the Comments column of **Table 5-1**.

3.5 Reference Information

The Appendix section includes the CCTV data, block maps, and as-builts related to the pipes included in this report. The data has been provided in electronic format in the SAWS server.

3.6 Other Considerations

Upon further review, the following assets were removed from this package. The assets are included in the CoSA Probandt Bond Project.

- 982740
- 982749

4.0 Rehabilitation Alternatives

4.1 General

Wastewater lines throughout the SAWS service area are located within residential streets, major thoroughfares, in areas with limited accessibility, or at such depths and in locations which are likely to cause constructability or permitting concerns when construction is performed by open cut methods. In these locations, trenchless construction methods offer an alternative solution to reduce construction impact, cost, and minimize public inconvenience. Two trenchless rehabilitation methods were included as alternatives: cured-in-place pipe (CIPP) and pipe bursting.

Please note that the remediation recommendations are based on the review of items noted in Section 3. The Design Consultant will use additional design

information to make the final recommendation for rehabilitation or replacement. Sliplining was not a rehabilitation alternative that was included due to the capacity considerations. The Design Consultant may also review this additional alternative for large diameter pipes if there are no capacity constraints. These efforts should be coordinated with SAWS.

4.2 Cured-in-Place Pipe (CIPP)

CIPP involves installing a new liner through the existing pipe. Prior to inserting the liner, the existing line is cleaned with high pressure hydro-jetting to remove debris, roots, and grease. Once cleaned the liner is installed and allowed to cure. The cured liner serves as a new jointless pipe. In some cases the existing pipe is too damaged to receive the CIPP liner; in these cases, point repairs will be required. If there are several point repairs required, it is typically more cost effective to utilize other replacement methods. CIPP can be installed on pipes sizes ranging from 6-inch to 96-inch in diameter. Service lines can be reconnected internally with robotic devices or externally by excavation (the selected method is determined based on the condition and location of the connection).

4.3 Pipe Bursting

Pipe bursting is a rehabilitation method used when the existing host pipe material can be expanded internally to burst it to allow for the installation of a new pipe of similar size or one that is one to two nominal pipe sizes larger than the existing pipe. The increase in size is beneficial for systems that require an increase in flow capacity. Besides the host pipe material, other factors that can affect the ability to pipe burst are pipe backfill/trench conditions and pull lengths, especially for pipes larger than 18-inch. Because the existing pipe is expanded, it can impact adjacent utilities and surface features. These impacts must be taken into account when selecting pipe bursting as a rehabilitation method.

Pipe bursting is performed by first feeding a cable through the existing wastewater line from an upstream access point to a downstream point. There are two types of pipe bursting systems, pneumatic and static pull. The most typical is the pneumatic system where a bursting head is pulled by the cable with a hydraulic winch or pneumatic hammer bursting the old pipe. The static pull system does not use a hammering action. Instead, large pull force is applied to the expansion head through a pulling rod assembly or cable inserted through the existing pipe. The static pull can be used for handling metal pipes or to avoid vibrations when working near structures.

In both systems, a new pipe segment is pulled immediately behind the bursting head. Typical pipe bursting applications utilize fusible HDPE or PVC that provides for jointless replaced pipe segments. Point repairs or obstruction removals are used to repair most line sags; however, minor sags and dips in grade can often be straightened out by the pipe bursting process. Pipe bursting is typically available for pipe sizes ranging from 6-inch to 36-inch in diameter but construction costs increase drastically beyond 18-inch. Service laterals are reconnected externally by excavating.

4.4 Pipe Replacement

Trenchless methods are a viable option for most of the wastewater mains; however, these methods do not address sags or vertical grade issues which may exist within the pipe. Point repairs can be used in combination with trenchless methods to repair sags and grade issues. Should existing wastewater lines require too many point repairs, it is typically more feasible and less costly to utilize conventional open-cut methods, such as removal and replacement or parallel pipe by. Additionally, where open-cut is not feasible due to major road crossings or railroad crossings, boring or tunneling may be necessary. The final replacement recommendation will be made by the Project Design Consultant.

5.0 Planning Recommendation

5.1 General

Table 5-1 provides a summary of the preliminary remediation method for each pipeline included in this package based on the methodology noted in Section 4.0. The detailed location maps are provided in the Exhibits section of this report.

Please reference **Figures 2-1** to **2-4** for the Sheet Index Layout.

Table 5-1: Recommendation Summary

Index Page	Compkey	As-built No.	Block Map No.	Install Year	Dia. (in.)	Material	Avg. Depth (feet)	Length (feet)	Verified Cond. Rating	Preliminary Remediation Method	Decision Notes and Design Considerations
AM45	999338	DJ-3221	186614	1967	10	CP	8	181	E	Replace	This asset was included in a previous package. The consultant recommended replacement due to utility conflicts.
AM45	998900	79-02	188616	1979	8	CP	6	46	E	Replace	This asset was included in a previous package. The consultant recommended replacement due to gas line conflicts.
AM45	998068	DJ-4074	188616	1965	8	CP	6	354	E	Replace	This asset was included in a previous package. The consultant recommended replacement due to gas line conflicts.
AM45	1000254	DJ-4074	188616	1965	8	CP	5	400	D	Replace	This asset was included in a previous package. The consultant recommended replacement due to gas line conflicts.
AM45	1011040	DJ-4074	188616	1965	8	CP	6	87	E	Replace	This asset was included in a previous package. The consultant recommended replacement due to gas line conflicts.
AM45	998711	DJ-4074	188616	1965	8	CP	7	143	E	Replace	This asset was included in a previous package. The consultant recommended replacement due to gas line conflicts.

Index Page	Compkey	As-built No.	Block Map No.	Install Year	Dia. (in.)	Material	Avg. Depth (feet)	Length (feet)	Verified Cond. Rating	Preliminary Remediation Method	Decision Notes and Design Considerations
AO41	1057967	OM-4844	176612	1958	8	CP	4	167	D	Replace	This asset was included in a previous package. The consultant recommended replacement due to the depth of line.
AP43	1000092	DJ-1095	182610	1963	8	DIP	10	630	E	Replace	The majority of the survey is missing. An additional manhole may be needed.
AT42	997434	OM-2711	178600	1952	8	CP	7	228	E	Replace	The pipe includes projecting aggregate and missing pipe. There is also a possible sag.
AY40	976999	OM-4334	172592	1927	8	CP	9	305	E	Replace	There are several sections of crushed pipe. Based on SAWS review, the pipe is under a home.
BE29	2758473	OM-186	142580	1950	8	CP	8	10	E	Replace	There is large void behind the missing pipe.
BE31	1048481	OM-2238	148580	1928	8	CP	6	485	E	Replace	The pipe includes projecting aggregate, missing pipe, and roots. The pipe is close to (or under) buildings.
BH28	1048916	OM-753	140572	1956	12	CP	7	7	E	Replace	There are voids behind the missing pipe.
BN31	975893	OM-507	146560	1951	8	CP	5	237	E	Replace	The line segment may require a relocation due to a building above the pipe.
BP30	973088	OM-5008	144558	1935	12	CP	6	224	E	Replace	The line segment may require a relocation due to a building above the pipe.

6.0 Planning Budget

The planning budget provided below is based on general project unit pricing based on the Cost Estimating Metrics and Guidelines Technical Memorandum (TM) dated June 16, 2014 and recent construction bids for SAWS. The TM provides cost estimating metrics for the different methods of sewer pipeline rehabilitation and replacement (CIPP, pipe bursting, pipe replacement) for the typical sewer pipe sizes. The unit pricing includes costs for typical associated work items related to the different methods. Such items can include mobilization, CCTV, site restoration, service line replacement, testing, manhole rehabilitation, etc. The planning budget will revised by the Project Design Consultant during the design based on design recommendations and updated unit pricing.

There is only one construction methodology recommended for this package.

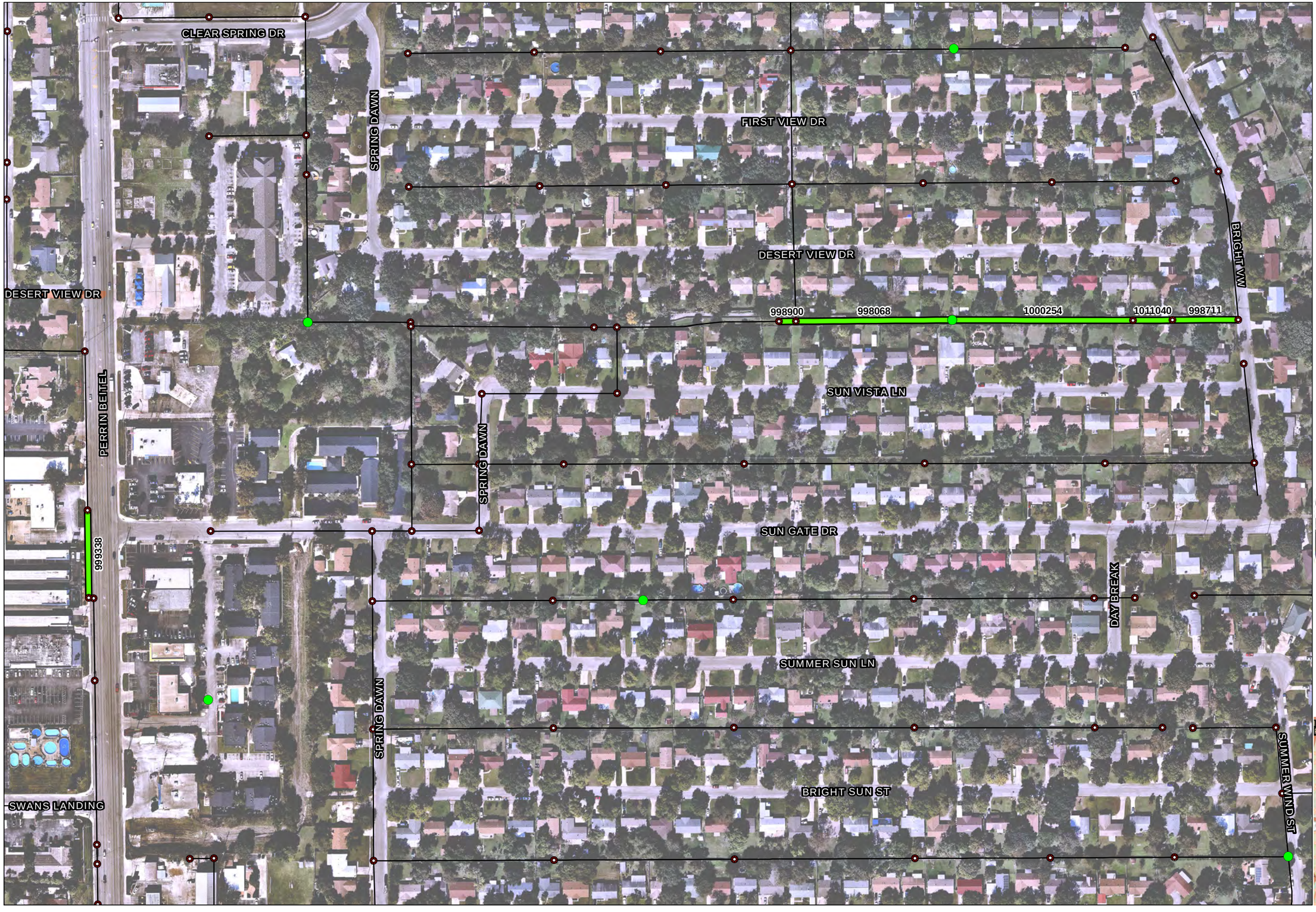
6.1 Replacement

Description	Quantity	Unit	Unit Price	Total
8-inch Replacement	3,092	LF	$360	$1,113,000
10-inch Replacement	181	LF	$450	$81,000
12-inch Replacement	231	LF	$540	$125,000
			Total	**$1,319,000**

* Total amounts have been rounded to nearest $1000.

EXHIBITS

Detailed Maps



Legend

SSO History

Location and Number of SSO

- 1-4
- 5-9
- 10 and greater
- Manhole
- Pipe Bursting
- CIPP
- Replacement
- 100Yr Floodplains 2010
- 2017 To 2022 Bond Projects
- 5yr Alley Maintenance
- 5yr Pavement Pres.
- 5yr Street Maint.

1 inch = 200 feet

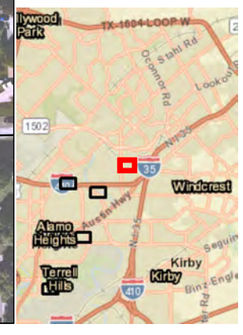
0 100 200

Feet

San Antonio Water System

Multiple Sewershed - Package 12

Sheet AM45



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0 100 200

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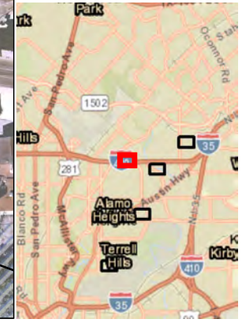
San Antonio Water System

Multiple Sewershed - Package 12

Sheet AO41



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0 100 200

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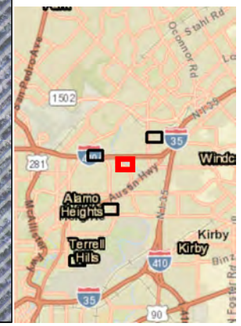
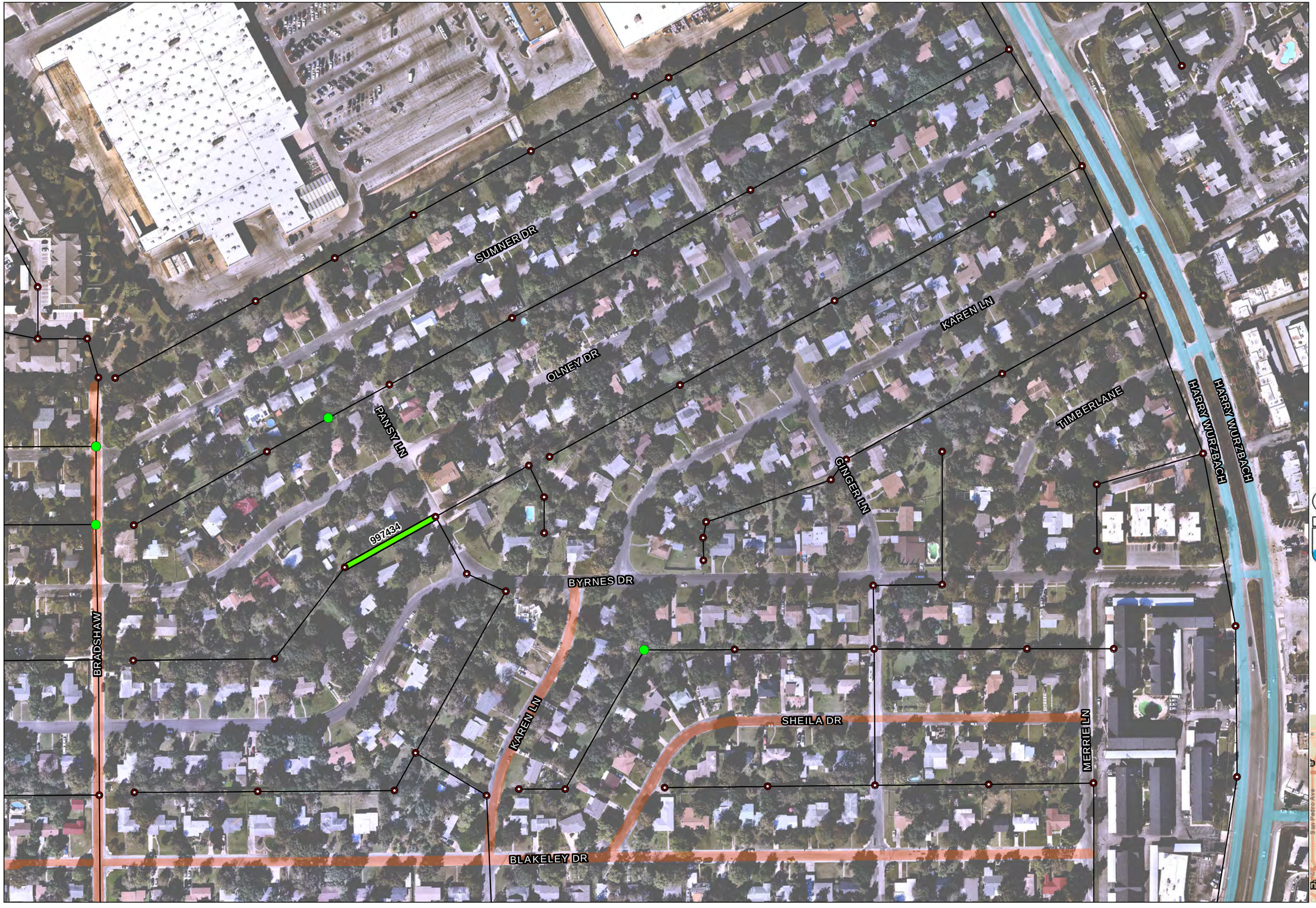
San Antonio Water System

Multiple Sewershed - Package 12

Sheet AP43





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0 100 200

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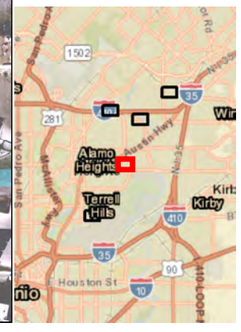
San Antonio Water System

Multiple Sewershed - Package 12

Sheet AT42



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1 inch = 200 feet

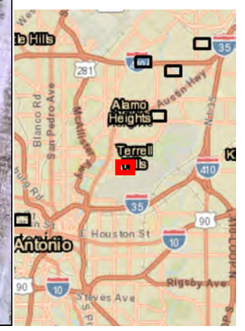
0 100 200

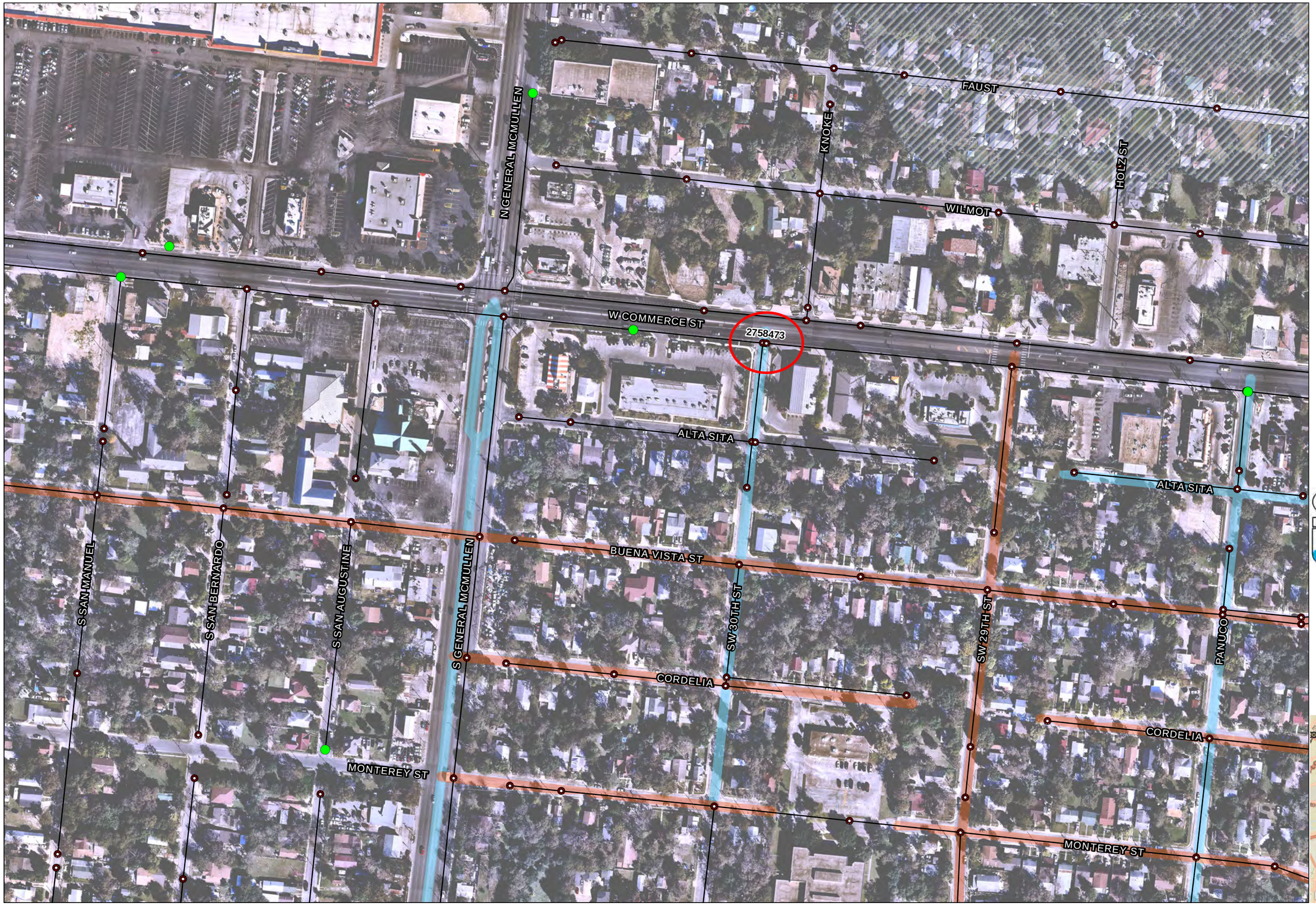
Feet

San Antonio Water System

Multiple Sewershed - Package 12

Sheet AY40





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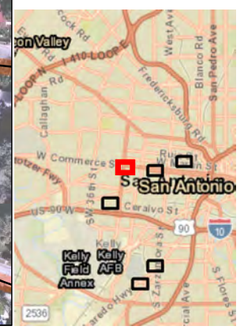
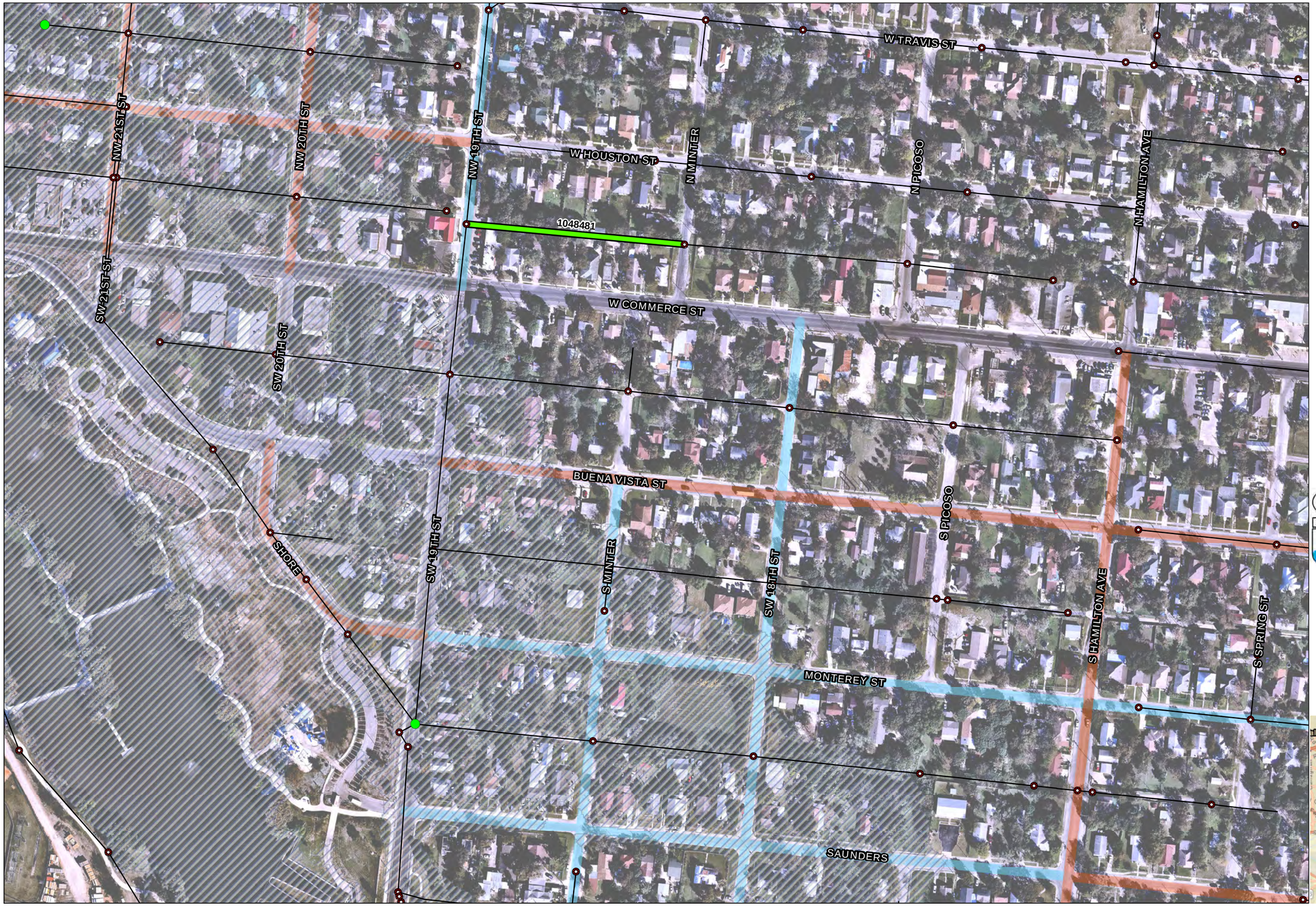
San Antonio Water System

Multiple Sewershed - Package 12

Sheet BE29





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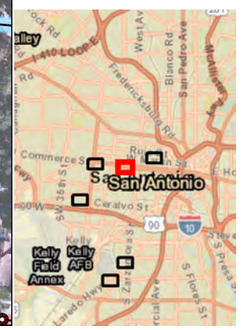
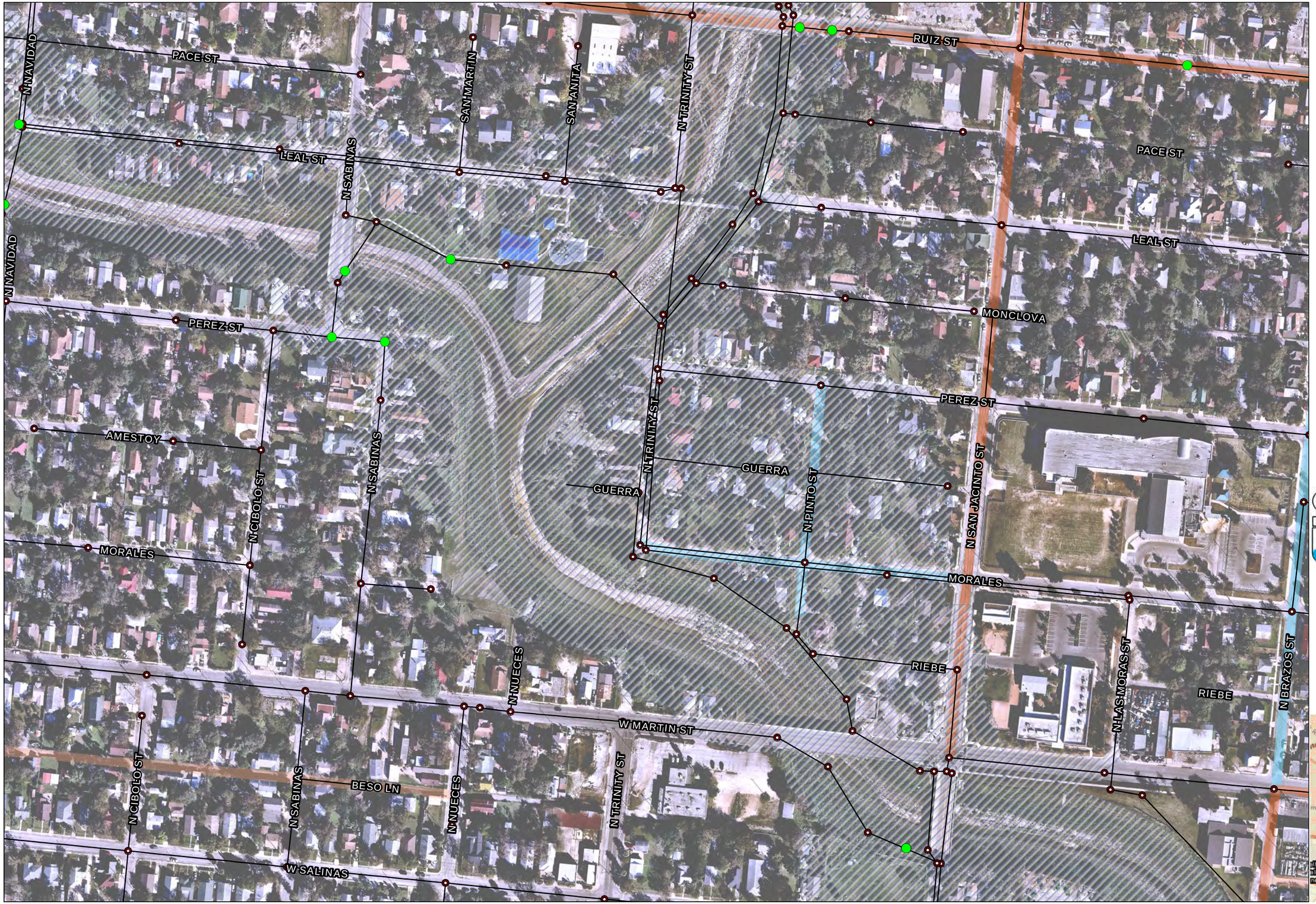
Sheet BE31





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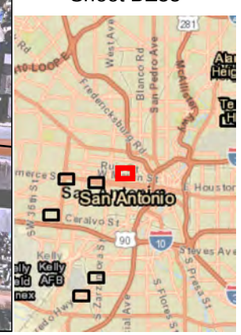
Multiple Sewershed - Package 12

Sheet BE33



Legend

SSO History

Location and Number of SSO

- 1-4
- 5-9
- 10 and greater
- Manhole
- Pipe Bursting
- CIPP
- Replacement
- 100Yr Floodplains 2010
- 2017 To 2022 Bond Projects
- 5yr Alley Maintenance
- 5yr Pavement Pres.
- 5yr Street Maint.

1 inch = 200 feet

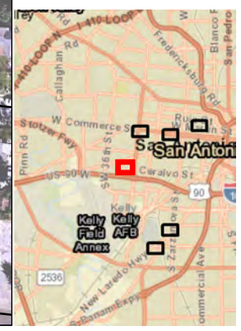
0 100 200

Feet

San Antonio Water System

Multiple Sewershed - Package 12

Sheet BH28



HOSACK AVE
RIFE AVE
BLOOM
AMES AVE
VERMONT
CHALMERS AVE
BURGESS
SZARZAMORA ST
NOGALITOS ST
CRYSTAL
CENTENNIAL BLVD
975893
KEATS AVE
PACKARD ST
BRIGHTON AVE
NEW LAREDO HWY
FLANDERS AVE

Legend

SSO History

Location and Number of SSO

- 1-4
- 5-9
- 10 and greater
- Manhole
- Pipe Bursting
- CIPP
- Replacement
- 100Yr Floodplains 2010
- 2017 To 2022 Bond Projects
- 5yr Alley Maintenance
- 5yr Pavement Pres.
- 5yr Street Maint.

1 inch = 200 feet

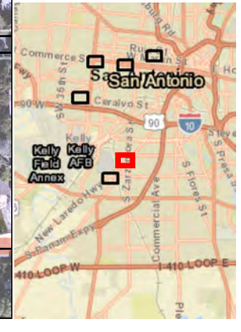
0 100 200

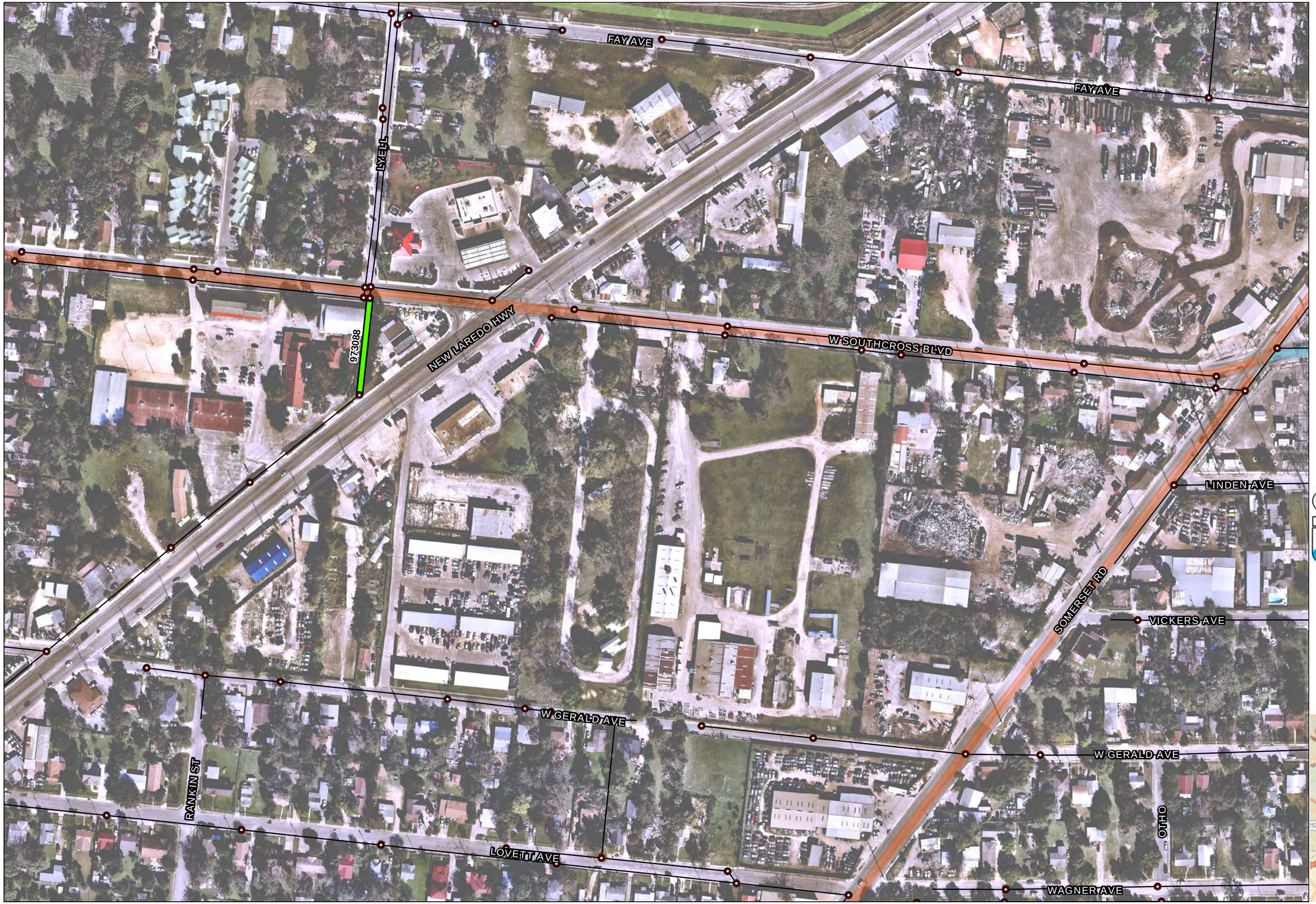
Feet

San Antonio Water System

Multiple Sewershed - Package 12

Sheet BN31





Legend

SSO History

Location and Number of SSO

- 1-4
- 5-9
- 10 and greater
- Manhole
- Pipe Bursting
- CIPP
- Replacement
- 100Yr Floodplains 2010
- 2017 To 2022 Bond Projects
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- 5yr Pavement Pres.
- 5yr Street Maint.

1 inch = 200 feet

0 100 200

Feet

San Antonio Water System

Multiple Sewershed - Package 12

Sheet BP30