DISTRIBUTION MAIN ASSET MANAGEMENT PLAN

SACRAMENTO SUBURBAN WATER DISTRICT

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DISTRIBUTION MAIN ASSET MANAGEMENT PLAN

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF CHARTS

LIST OF EQUATIONS

LIST OF ABBREVIATIONS

$\%Age_x$	Percentage of Pipe Age "x" within Main Replacement Area "i"
$\%_x$	Percentage of pipe material "x" within Main Replacement Area "i"
AC	Asbestos Cement
ASCE	American Society of Civil Engineers
AWD	Arcade Water District
CA_i	Commercial Accounts by Main Replacement Area "i"
CC	Concrete Cylinder
CCS_i	Creek Crossings Score by Main Replacement Area "i"
CI	Cast Iron
CIP	Capital Improvement Program
COF	Consequence of Failure
COF_i	Consequence of Failure by Main Replacement Area "i"
$\sum$COF Criteria Score$_i$	Sum of all the COF Criteria Scores per Main Replacement Area "i"
CONC	Concrete
C_{UL}	Criteria Upper Limit
CV_i	Crossings Value by Main Replacement Area "i
DI	Ductile Iron
EPA	Effective Pipe Age
EPM	Effective Pipe Material
$FWCS_i$	Freeway Crossings Score by Main Replacement Area "i"
GIS	Geographic Information System
l_{ix}	Length of respective material "x" within Main Replacement Area "i"
L_i	Total length of Main within Main Replacement Area "i"
LOF	Likelihood of Failure
LOF_i	Likelihood of Failure by Main Replacement Area "i"
$\sum$LOF Criteria Score$_i$	Sum of all the LOF Criteria Scores per Main Replacement Area "i"
Max($\sum$COF Criteria Score)	Maximum COF score possible
Max($\sum$LOF Criteria Score)	Maximum LOF score possible
MLS	Mortar Lined Steel
NWD	Northridge Water District
NSA	North Service Area

ODS	Outside Diameter Steel
PC_i	Percent Commercial by Main Replacement Area “i”
$PDaS_i$	Pipe Damage Score by Main Replacement Area “i”
$PDaS_{ix}$	Score of respective Pipe Damage “x” within Main Replacement Area “i”
$PDiS_i$	Pipe Diameter Score by Main Replacement Area “i”
$PDiS_{ix}$	Score of respective Pipe Diameter “x” within Main Replacement Area “i”
PVC	Polyvinyl Chloride
RFPP	Requests for Price Proposals
ROF	Risk of Failure
ROF_i	Risk of Failure by Main Replacement Area “I”
$RRCS_i$	Railroad Crossings Score by Main Replacement Area “i”
SC_i	Sum of Crossings by Main Replacement Area “i”
$Score_x$	Corresponding Pipe Material Score
$Score_y$	Corresponding Pipe Age Score
SF	Safety Factor
SS	Safety Score
SSA	South Service Area
TA_i	Total Accounts by Main Replacement Area “i”
UNK	Unknown
V_i	Valves by Main Replacement Area “i”
$V_{500'i}$	Valve Spacing per Main Replacement Area “i”

Section 1

INTRODUCTION

The *Distribution Main Asset Management Plan* (Plan) provides a direction and strategy for the replacement of distribution mains and is intended to be used as a tool for ongoing communication between Sacramento Suburban Water District's (SSWD's) staff and the Board of Directors (Board) to prioritize distribution main replacement projects. Furthermore, it is to be used as a planning tool during Capital Improvement Program (CIP) budget discussions with the Board. The Plan does not represent a financial commitment by the Board, but instead provides a planning prioritization for replacement of distribution mains, which will be updated over time.

The purpose and goals of the Plan are to:

- Provide a reliable distribution system.
- Provide a perpetual distribution main replacement prioritization that is adaptable to new information, evolving technologies, management practices, and SSWD needs.
- Prioritize distribution mains replacement based on objective criteria according to greatest need.
- Coordinate with SSWD's long-term CIP.
- Coordinate with SSWD's Meter Retrofit Program to ensure compliance with the State's requirement to have all services metered by January 1, 2025.
- Provide direction for future Plan revisions.

A program to replace distribution mains that reach the end of their useful life is necessary to maintain system reliability and drinking water supply safety for SSWD and its customers.

For the purpose of this Plan, distribution mains are defined as a water pipe between 4- and 14-inches in diameter providing service to commercial, industrial, public, and residential properties. An exception was made for approximately 3,000 feet of 16-inch diameter pipe where service

connections exist, most of which is located within McClellan Park (Park). This Plan does not include transmission mains.

Section 2

BACKGROUND

2.1 Overview of Need for Distribution Main Replacement

SSWD has a responsibility to provide its customers with a reliable distribution system. The Plan sets forth a strategy to replace aging and deteriorating distribution mains throughout SSWD with an outlined project priority for the next 10 to 20 years. The Plan is based on a ranking matrix derived from various criteria that identify areas in greatest need of distribution main replacement. Of particular concern for SSWD are older portions of the distribution system that date back prior to the 1920's. SSWD has been successful in replacing the majority of distribution main that was installed prior to the 1920's, and less than one-quarter mile exist today.

Water utilities throughout the United States are facing the challenge of extensive rehabilitation and replacement of aging and deteriorating distribution mains. SSWD is no different in this regard. In 2010, the American Society of Civil Engineers (ASCE) published a "Report Card" on America's infrastructure which gave drinking water systems a grade of "D-". The 2017 update assigned a grade of "D" and estimated the 25-year funding requirement for drinking water infrastructure in the United States at $1 trillion (American Society of Civil Engineers, 2017).

The formation of the former Arcade Water District (AWD) and Northridge Water District (NWD) date back to the 1950's. The distribution mains in SSWD's South Service Area (SSA), (formerly part of AWD) were constructed during the building boom following World War II. The most common pipe material used in the 1950's and 1960's was tar coated steel pipe, known as "Outside Diameter Steel" (ODS). In place now for over 60 years, ODS typically has frequent leaks (the highest leak rate in SSWD) resulting in service outages and heavy impact on operations and maintenance efforts. Hence, ODS has become unreliable and ranks highest in priority for replacement.

A significant portion of aging distribution mains are located in back yard and side yard areas where access to perform repairs is difficult and must be made across the customer's property. As a result, the service and repair work is inconvenient to customers and costly for SSWD.

Today's construction standard for distribution mains is to install the main in the public rights-of-way fronting customer properties. Access for service and repairs is significantly more convenient for the customer and more efficient for SSWD's Operations staff. However, Sacramento County regulations continue to change and these often result in additional constraints on construction within the right-of-way. Changes include inability to use bridge structures to cross water ways, and more stringent restoration of existing right-of-way improvements (e.g., pavement, curbs, ramps, etc.).

2.2 Distribution System Status Summary

There is approximately 627 miles of distribution main (sizes 4- to 14-inches in diameter) in SSWD, of which approximately 110 miles have been replaced within the last 25 years. There are approximately 126 miles of backyard distribution main remaining in SSWD. For the remainder of the ODS pipe, there is approximately 1.4 miles left in service of which all are located in backyard. The integrity of the ODS has been weakened by the deterioration of its protective coating, causing the corrosion of the steel which has resulted in the highest maintenance requirements of any distribution main type in SSWD.

Replacement of aging and deteriorating distribution mains for the next 10 to 20 years will be based on criteria detailed in Section 4 of this plan.

2.3 Plan History

The Board adopted a *Water Main Replacement Plan* on November 21, 2005. It was anticipated that the Plan would be amended periodically in the future as it was recognized that new information would be made available that might influence the ranking of project areas and alter priority. The Plan was updated in 2008, 2011, and most recently in 2014.

In the 2008 and 2011 updates, additional criteria were added called “Hydraulic Factors” and “Risk of Failure”.

With the 2011 update the Plan’s title was changed to *Distribution Main Asset Management Plan* to distinguish between the *Water Transmission Main Asset Management Plan*.

The 2014 update added pipe size as a specific rating criterion to better understand firefighting capacity of the existing distribution system.

Additionally, the number of Main Replacement Areas has changed since the original Plan due to the larger main replacement areas being subdivided for a more manageable construction project size. In the 2014 Plan update, there were 191 Main Replacement Areas. Thenceforth, SSWD subdivided the main replacement areas further, with a focus on creating areas of 8-miles or less of distribution main. In this Plan update, 197 main replacement areas were analyzed. The current main replacement areas are shown in Figure 1 (Page 2-7).

2.4 Distribution Main Project Approach

The planning for a distribution main project incorporates the examination from the 2017 Water System Master Plan (Master Plan). As stated in the Master Plan, the average assumed useful life for distribution mains are 80 years old. Useful life approximations depend on the pipe material, soil conditions, water quality, construction methods, and several other factors (Brown and Caldwell, 2017). A priority, or “Rank”, of SSWD’s distribution main areas, shown in Appendix A, is the compiled list for each main replacement area. Rank 1 identifies the main replacement area with the highest priority for replacement. Main replacement areas are assigned a calculated Total Score and Rank based on the evaluations described in Section 4.1 – Indirect Method, however, actual projects and the sequencing of those projects will depend on the evaluation done in Section 4.2 – Direct Method, project size, available budget, and other factors (e.g., Economic or Regulatory Factors).

The Plan proposes to replace backyard distribution mains with distribution mains located in the public rights-of-way, usually along the frontage of the properties served, to the extent practical. New hydrants, valves, and other water system appurtenances will be installed as required with new distribution mains. A new water service line will be installed in the public right-of-way from the new distribution main to either the existing or new meter. SSWD will coordinate with customers as to suitable locations for new water meters. This coordination with customers encompasses SSWD's Value to "Conduct business through open and transparent governance, communication, and conduct" (Sacramento Suburban Water District, 2019).

2.5 Distribution Main Replacement History

The former Arcade Water District (AWD) had a program to replace aging backyard distribution mains. AWD replaced about 14 miles of backyard distribution main with distribution mains located in the public right-of-way. It is unknown whether the former Northridge Water District (NWD) had a main replacement program to replace backyard distribution mains.

SSWD initiated a Distribution Main Replacement Program in 2004, which through 2018 has replaced nearly 110 miles of distribution main with a focus on ODS pipe located in backyards. SSWD continues to use Ductile Iron (DI) pipe for new distribution mains. SSWD selected DI as the primary pipe material type because it has a design life expectancy of "at least 105 years" (Ductile Iron Pipe Research Association, 2016). However, since DI is a newer product (in use since the 1950's), an industry standard of useful life has not been determined. Distribution Main Replacements completed from 1993 through 2018 are summarized in Table 1.

Table 1. Completed Distribution Main Replacement – (1993 – 2018)

Year Period	Main Installed [miles]	Average Main Replaced [miles/year]	Customer Services Switched to New Mains
* 1993 – 2001	13.5	1.5	1,140
2004 – 2007	12.3	3.1	1,183
2008 – 2011	33.4	8.3	2,344
2012 – 2014	24.7	8.2	2,110
2015 – 2017	20.3	6.8	1,400
2018	4.8	4.8	478
Total	**109**	**5.5**	**8,655**

*Arcade Water District (AWD)

Based on the 105-year life expectancy of DI pipe, SSWD would require the replacement rate of approximately 0.95% (6 miles) of the distribution main every year for perpetuity to prevent any main from exceeding its useful life. Since there is a variety of material in SSWD with a lower useful life, SSWD strives to replace distribution main at a rate of 1% per year (approximately 6.3 miles per year). The historical replacement rate per period in relation to this goal is shown in Chart 1 (Page 2-5).

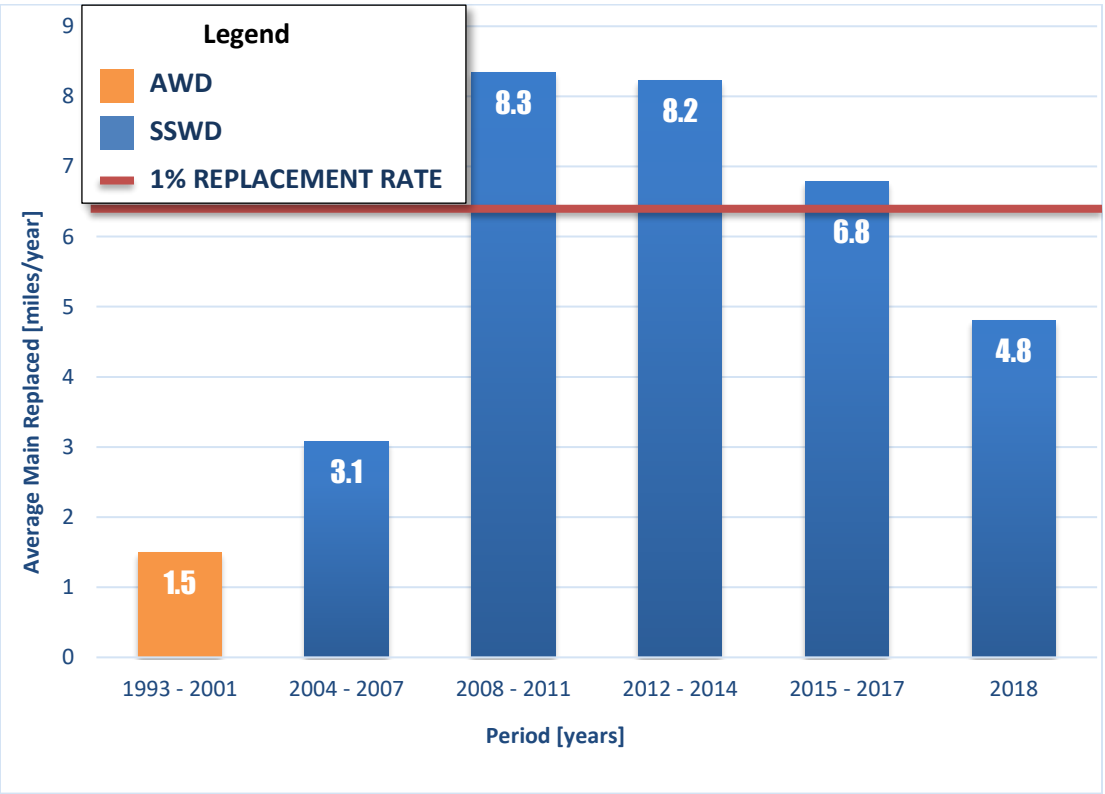


Chart 1. Average Length of Main Replaced per Period

2.6 Active Distribution Main Inventory

SSWD has approximately 627 miles of active distribution mains. A breakdown by material type, length, and percentage of the system contribution is shown in Table 2 and Chart 2.

Table 2. Quantity of Distribution Main by Material Type

Material Type	Quantity [miles]	System Contribution [%]
Asbestos Cement (AC)	323.2	52
Ductile Iron (DI)	148.7	24
Polyvinyl Chloride (PVC)	88.1	14
Mortar Lined Steel (MLS)	49.0	8
Cast Iron (CI)	8.9	1
Unknown (UNK)	7.5	1
Outside Diameter Steel (ODS)	1.4	<1
Concrete Cylinder (CC)/Concrete (CONC)	0.4	<1
Total	**627**	**100**

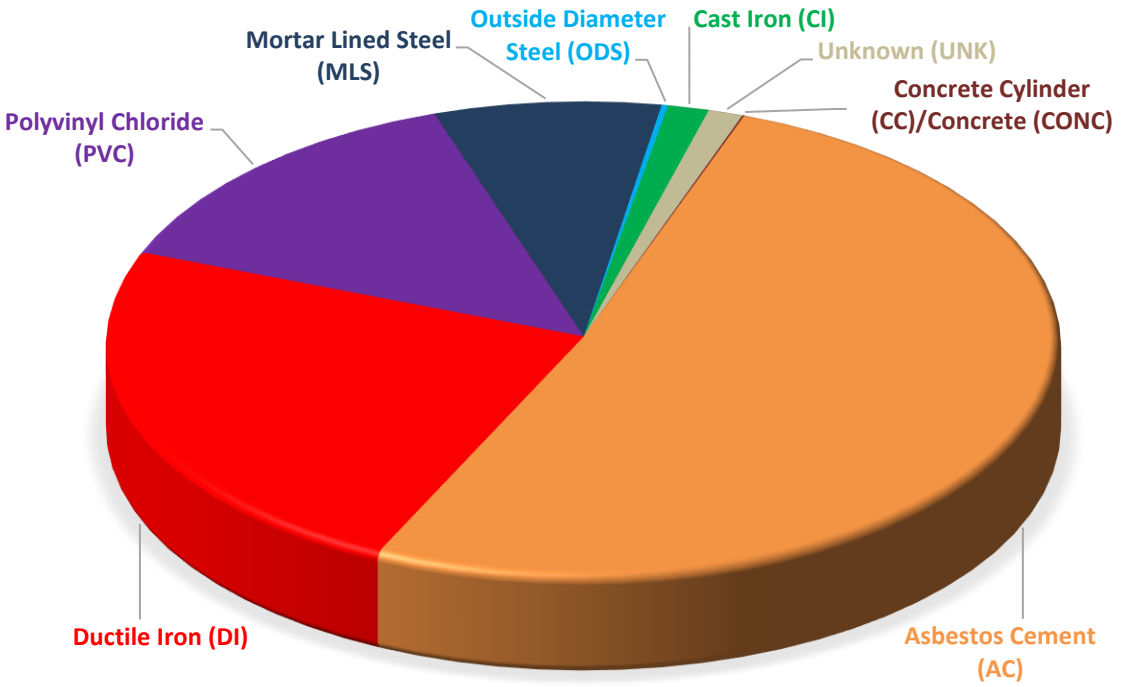
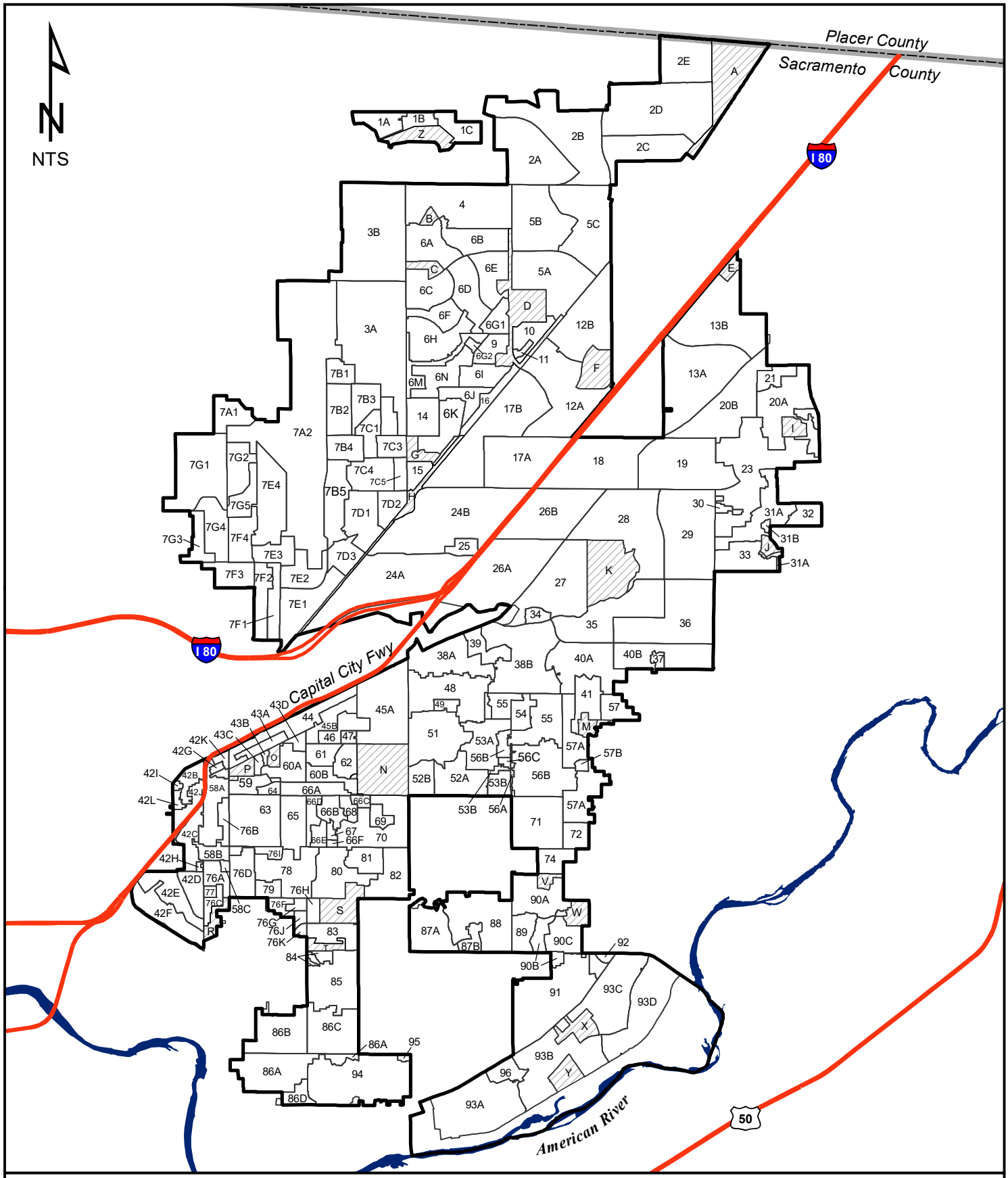


Chart 2. Quantity of Distribution Main by Material Type



Legend

- Distribution Main Areas
- Single Service Large Parcels

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August 2019

Figure 1

Distribution Main Areas

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Section 3

DISTRIBUTION MAIN REPLACEMENT STANDARDS

3.1 New Distribution Main Installation

For distribution main construction, SSWD's standard is DI pipe because of a projected useful life of "at least 105 years" (Ductile Iron Pipe Research Association, 2016). The useful life of other pipe material used in the distribution system can vary between 50 – 100 years.

Based on this information, to meet SSWD's plan to replace its distribution main system over 100-year intervals, approximately 6.3 miles of distribution main per year need to be replaced. Likewise, SSWD's Master Plan recommends a 10 to 20 year plan for distribution main replacement (about 140 miles of new mains in 20 years). The total unit cost for new distribution main in 2018 and 2019 is $1.9 to $2.0 million per mile. This cost includes, fees, environmental review, engineering services, materials, construction, construction management, inspection, and testing. This equates, dependent on total amount of distribution main replaced, to $280 million over the next twenty years with no allowance for cost escalation (i.e., present value).

As part of a distribution main replacement project, new wet barrel steamer-type fire hydrants replace existing dry barrel and wharf hydrants. Additional fire hydrants are installed to meet current SSWD spacing standards and by the local fire authority. Overall, this is expected to improve fire protection reliability and firefighting capability within SSWD. The projects also provide for the installation of new control valves and sampling stations in an effort to comply with Federal, State, and SSWD Standards. Additionally, new service installations off the new distribution main will install a water meter, endpoint, meter setter, utility box, and reconnect an in-tract service line to the customer's residence.

3.2 State Requirement for Meter Installation

State Law (AB 2572) requires "urban water supplier[s] … on or before January 1, 2025, to install water meters on all municipal and industrial water service connections that are located in its service area" (California Legislature, 2004). SSWD CIP budgeting has not permitted a pace of main replacement sufficient to achieve compliance by the Distribution Main Replacement Program alone. As a result, SSWD's Meter Retrofit Program (adopted by the Board in 2004) was implemented to ensure compliance. The Meter Retrofit Program installs approximately 1,200 meters each year on existing services located primarily in backyards.

3.3 Abandonment of Backyard Distribution Mains

After a distribution main is installed and the service line reconnected, the old backyard distribution mains are abandoned in place. Some locations will require the backyard main to remain in service after the new main is installed in the public right-of-way. This situation can occur at the boundary of current and future main replacement areas where only some of the backyard services would be connected to a new distribution main. The other fraction would be connected to a new distribution main in a future distribution main replacement project, thus requiring the existing backyard main to remain in service in the interim.

Section 4

CONDITION ASSESSMENT

A condition assessment is an important component of an asset management plan, which is essential to help prioritize the repair, rehabilitation, and replacement of the distribution mains. The condition assessment includes two major components, the Indirect and Direct Methods, which assess the condition of distribution mains in each main replacement area.

Analyzing collected data with certain industry standard tools has facilitated agencies to prioritize infrastructure replacement. SSWD utilized technical information through professional and industry entities, such as American Society of Civil Engineers (ASCE) and American Water Works Association (AWWA), which provided best practice assessment tools such as: the Risk Assessment evaluation and current state-of-the-art field investigation technologies. The ASCE Task Committee on Water Pipeline Condition Assessment elaborates on the condition assessment process:

> Current assessment tools…will rarely clearly define the remaining pipeline service life. Therefore, the managers of a condition assessment program should not be surprised if the results do not clearly define the exact condition of each asset but, instead, compare asset condition to other assets to gauge the level of deterioration and remaining life. (ASCE, 2017)

A risk assessment is conducted for each main replacement area to prioritize SSWD's future effort on pipeline infrastructure. As stated by the Water Research Foundation, "Utilities should evaluate each risk to an asset and prioritize projects to lessen that risk" (Water Research Foundation, 2016). The indirect method, i.e., data analysis, is used to conduct the risk assessment. SSWD's risk assessment is composed of the following categories:

- Likelihood of Failure (LOF);
- Consequence of Failure (COF);

- Risk of Failure (ROF); and
- Modifier (i.e., Fire Safety Factors, Economic Factors, and Regulatory Factors).

Following the indirect method analysis, the direct method is used to verify or adjust ranking prioritization.

The direct method, i.e., field investigations, are conducted in high risk areas to assess distribution main condition. This provides verification or adjustment to the indirect method's risk assessment prioritizations. The high risk areas will be analyzed using one or more of the following categories:

- Visual inspection;
- Laboratory strength testing;
- Material chemical testing;
- Wall thickness measurement; or
- Future technologies.

The combination of the indirect and direct methods provides the framework of the condition assessment.

4.1 Indirect Method

The indirect method is the data analysis portion of the risk assessment and is performed prior to the direct method. The data analysis is used to calculate the ROF for each main replacement area by using historical SSWD and industry data, correlating the results to "performance standards" (Slaven, 2017). Two industry standard categories for the risk calculation are LOF and COF. In addition, Fire Safety Factors (Modifier) are directly incorporated while Economic Factors are indirectly incorporated in the risk calculation; with a plan to incorporate Regulatory Factors in future condition assessments.

The categories/modifier capture specific objectives within their respective attributes. The process on how the Total Score is calculated for each main replacement area is shown in Chart 3 (Page 4-3). The Total Score for each main replacement area are compared relative to the others

rather than the maximum possible value. This ranking is used to prioritize SSWD's high risk main replacement areas. The Total Score calculation is shown in Equation 1 in Appendix M. A main replacement area which has a Total Score within the pre-determined high risk range could receive further examination as part of the direct method, described later in the Condition Assessment. The pre-determined Modified Risk of Failure Score Chart is shown in Chart 6. Modified Risk of Failure (ROF) (Page 4-33).

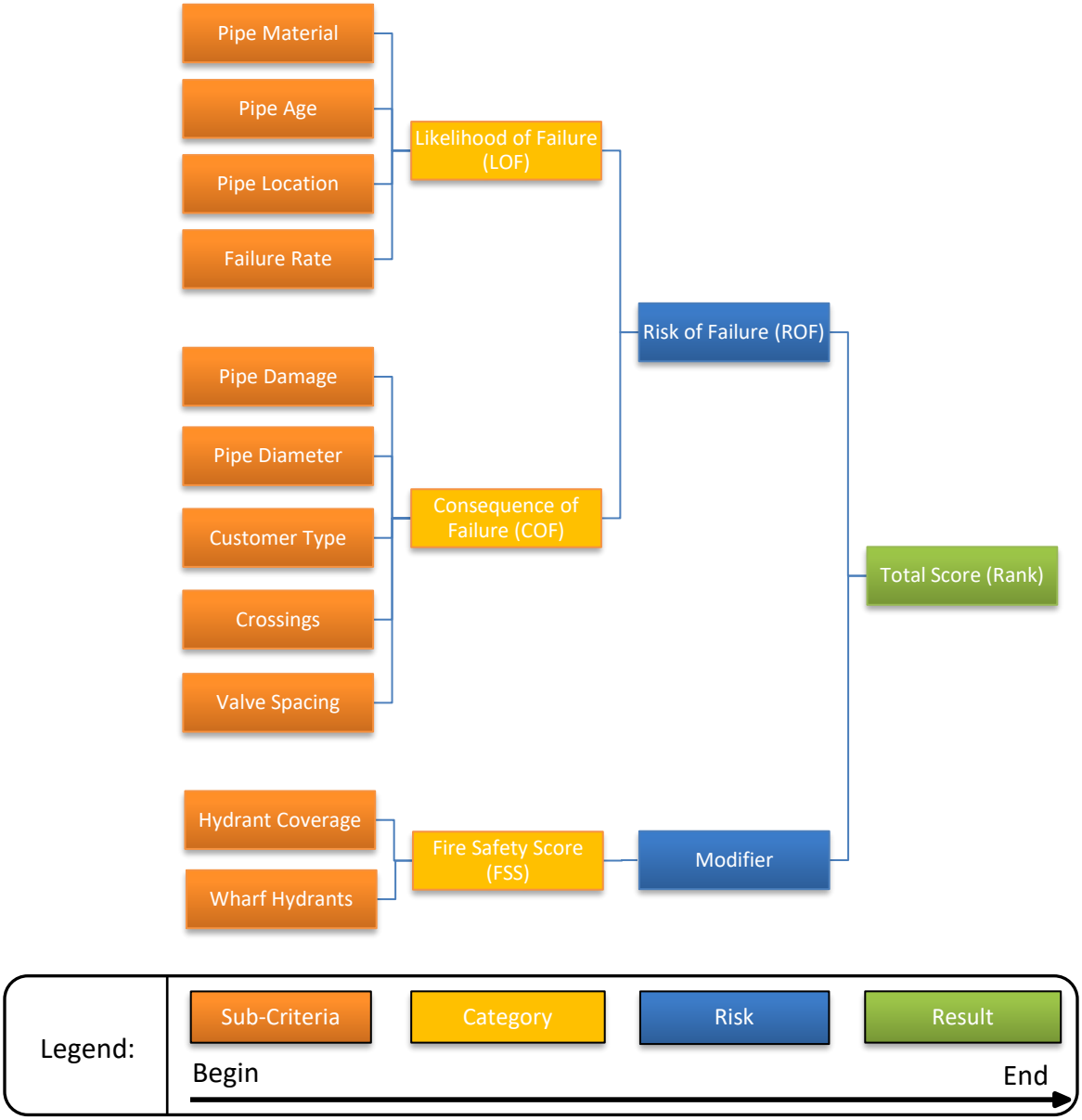


Chart 3. Ranking Flowchart

4.1.1 Likelihood of Failure (LOF)

The first category in the ROF analysis is LOF. LOF assesses and aggregates four (4) sub-criteria:

- Pipe Material;
- Pipe Age;
- Pipe Location; and
- Failure Rate.

These four sub-criteria have been demonstrated over many years to provide SSWD with the most accurate categorization of the quality of pipes in each main replacement area. The data is evaluated for each main replacement area as to how the sub-criteria contributes to the probability of a pipe failure.

Two sub-criteria (Pipe Material and Pipe Age) receive an effective score, which is calculated by taking the total percentage of each main material within a main replacement area and multiplying it by the respective scoring table. These formulas were derived from the *Statistical Engineering Division of the National Institute of Standards and Technology* (Rukhin, 2009) as weighted means statistics.

Once each sub-criteria has received a score, it is then normalized using Feature Scaling (Aksoy & Haralick, 2000). This mathematical technique sets the range maximum value to one (1), which corresponds to the worst rating in each category; and sets the range minimum value to zero (0), which corresponds to the best rating in each category. The LOF is calculated using Equation 2 in Appendix N.

The subsequent sections discuss the purpose, scoring criteria, and scoring calculation(s) for each of the four sub-criteria.

4.1.1.1 Pipe Material

Purpose

Pipe Material is one of the best indicators of distribution main reliability. Main replacement areas that have not been replaced in the Main Replacement Program consist of multiple Pipe Materials.

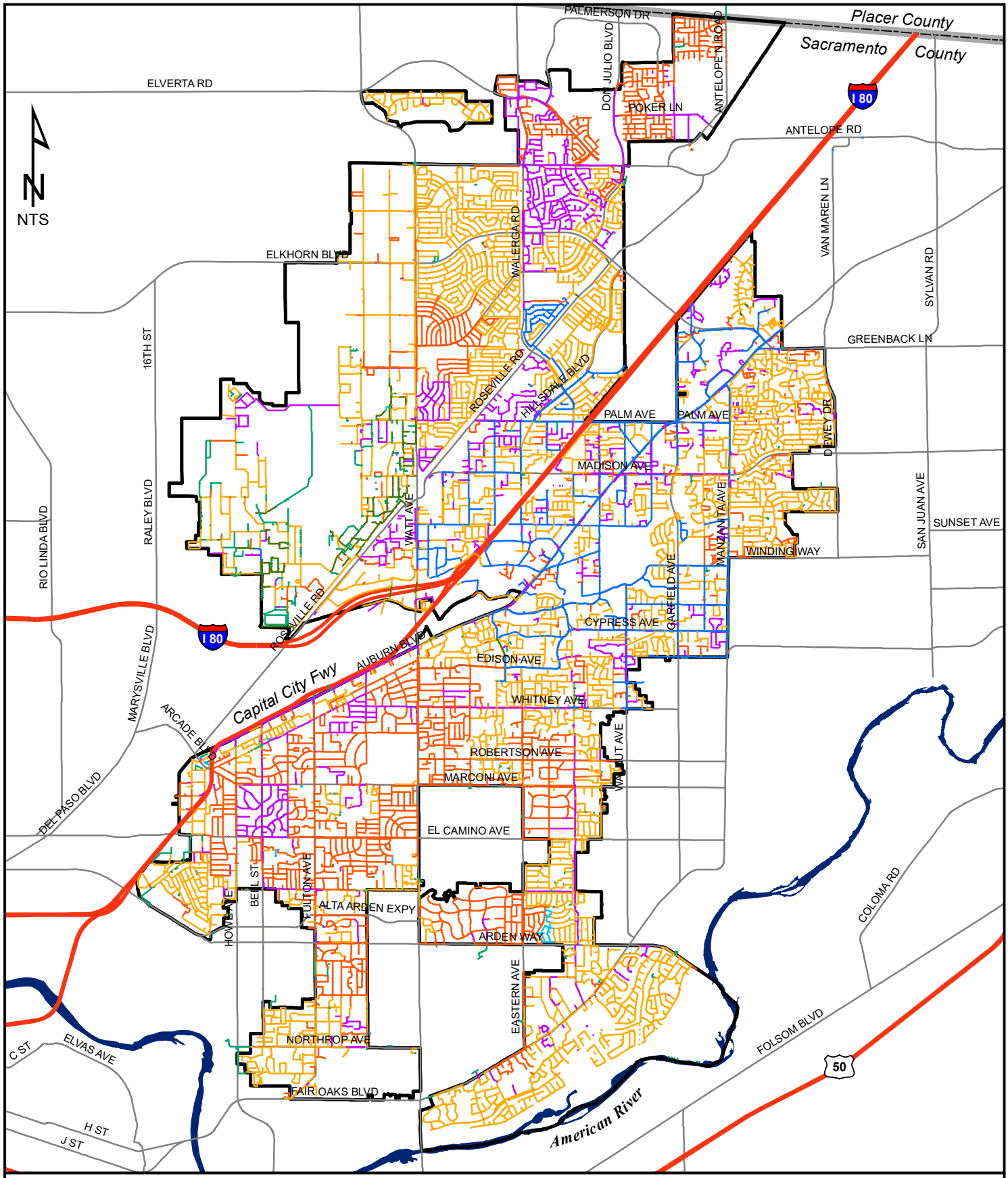
Scoring

Pipe Material scoring calculates an effective Pipe Material based on the percentage of each Pipe Material in a main replacement area. The effective Pipe Material is determined by taking the percentage of Pipe Material and multiplying it by the corresponding Pipe Material score (refer to Chart 5. Active Distribution Main Leak History – Leaks per Mile by Pipe Material and Size (Page 4-20) and Section 4.3 (Page 4-37) for scoring explanation).

The effective Pipe Material score results are shown in Appendix C. The criteria and equations are shown below in Table 3 and Equation 3 in Appendix N, respectively. Figure 2A (Page 4-6) shows the various Pipe Material used within SSWD, while Figures 2B – 2G isolate AC, CI, DI, MLS, ODS, and PVC pipe, respectively.

Table 3. Pipe Material Score

Pipe Material	Pipe Material Score
ODS, Other	5
AC, UNK	4
CI, MLS	3
PVC	2
DI	1



Legend

- AC
- DI
- PVC
- MLS
- ODS
- CI

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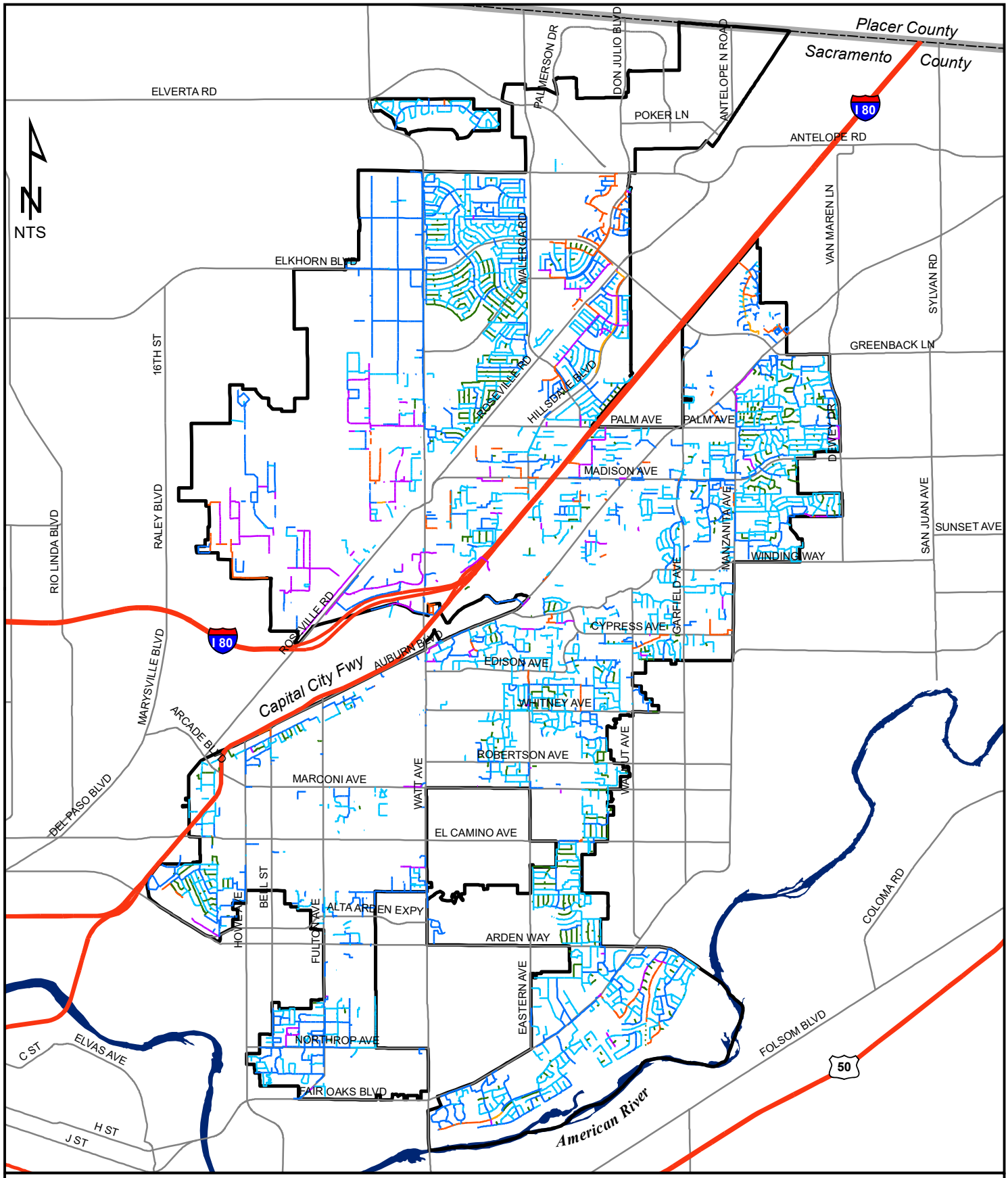
August 2019

Figure 2A

Distribution Main by Material - All



Legend

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"

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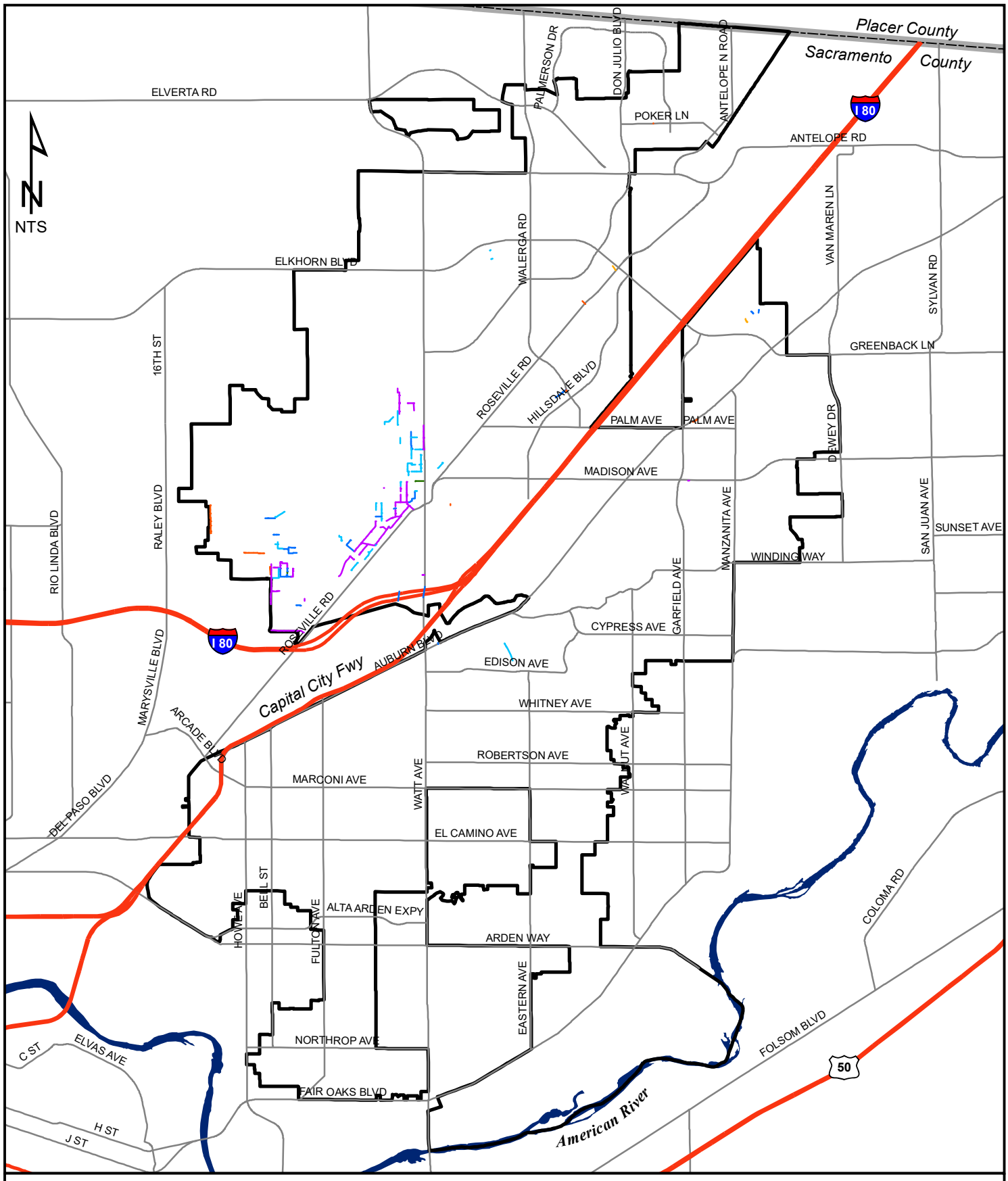
Distribution Main Asset Management Plan
August 2019

Figure 2B

Distribution Main by Material - AC



Legend

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"

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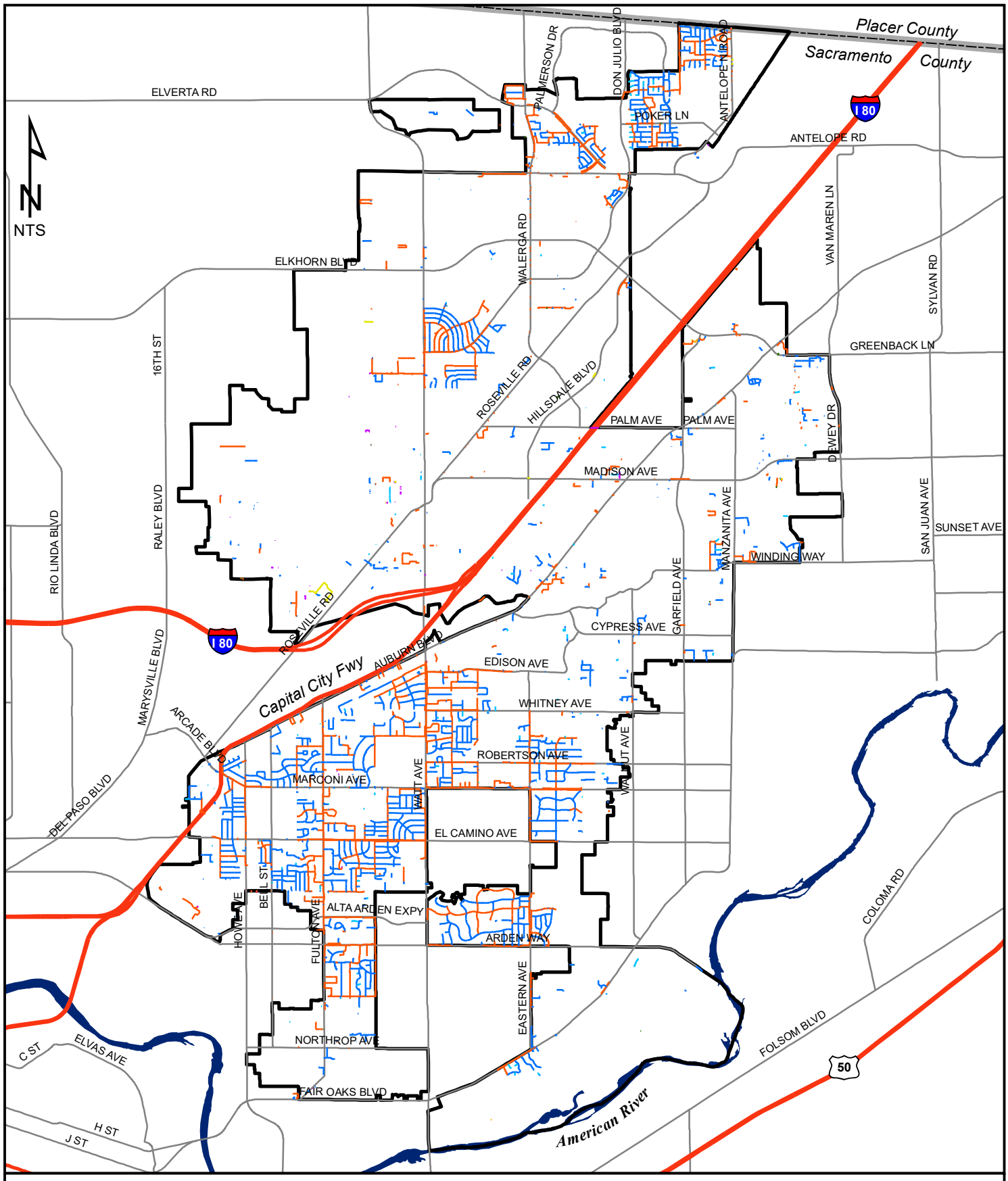
Distribution Main Asset Management Plan
August 2019

Figure 2C

Distribution Main by Material - CI



Legend

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"

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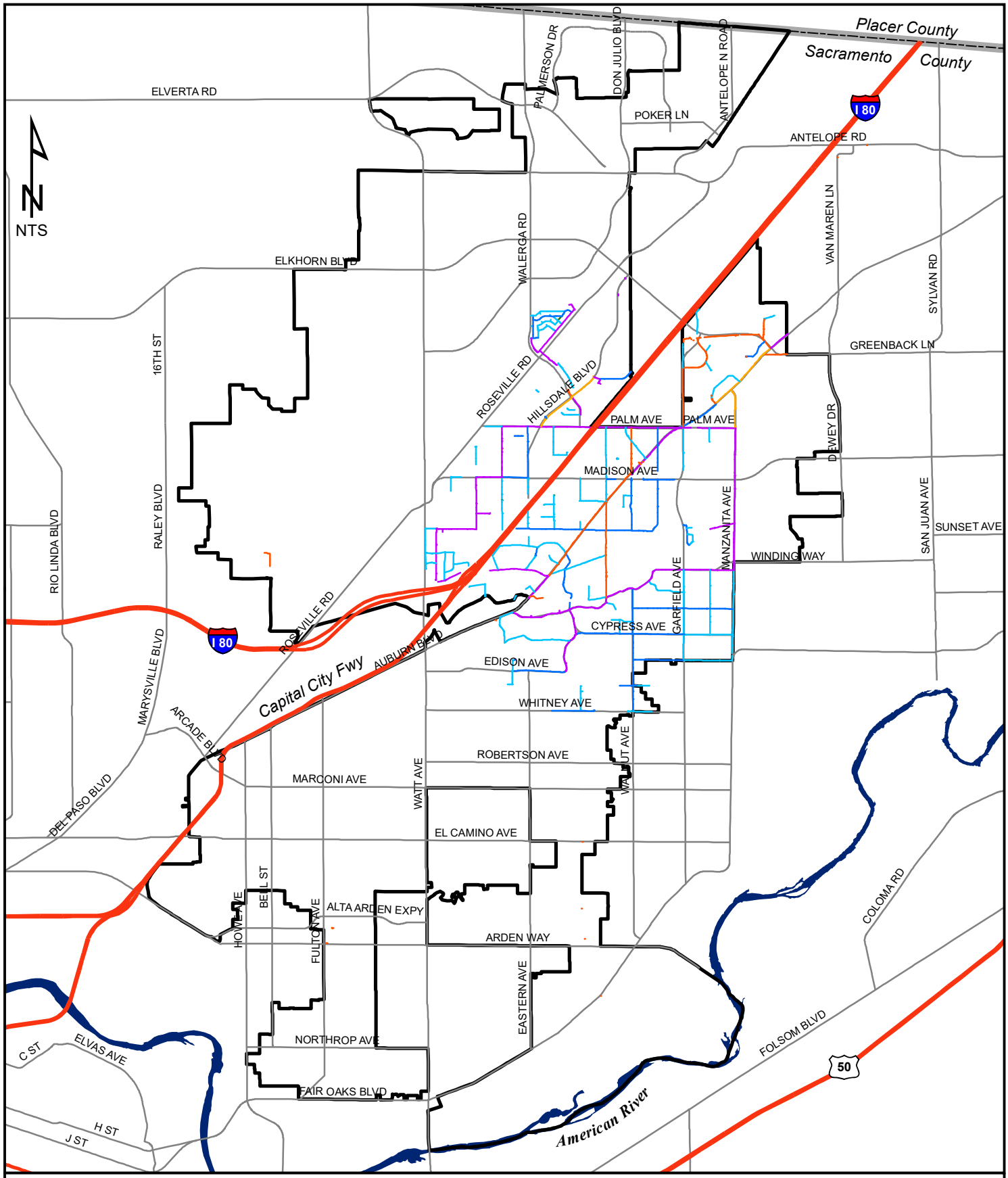
Distribution Main Asset Management Plan
August 2019

Figure 2D

Distribution Main by Material - DI



Legend

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"

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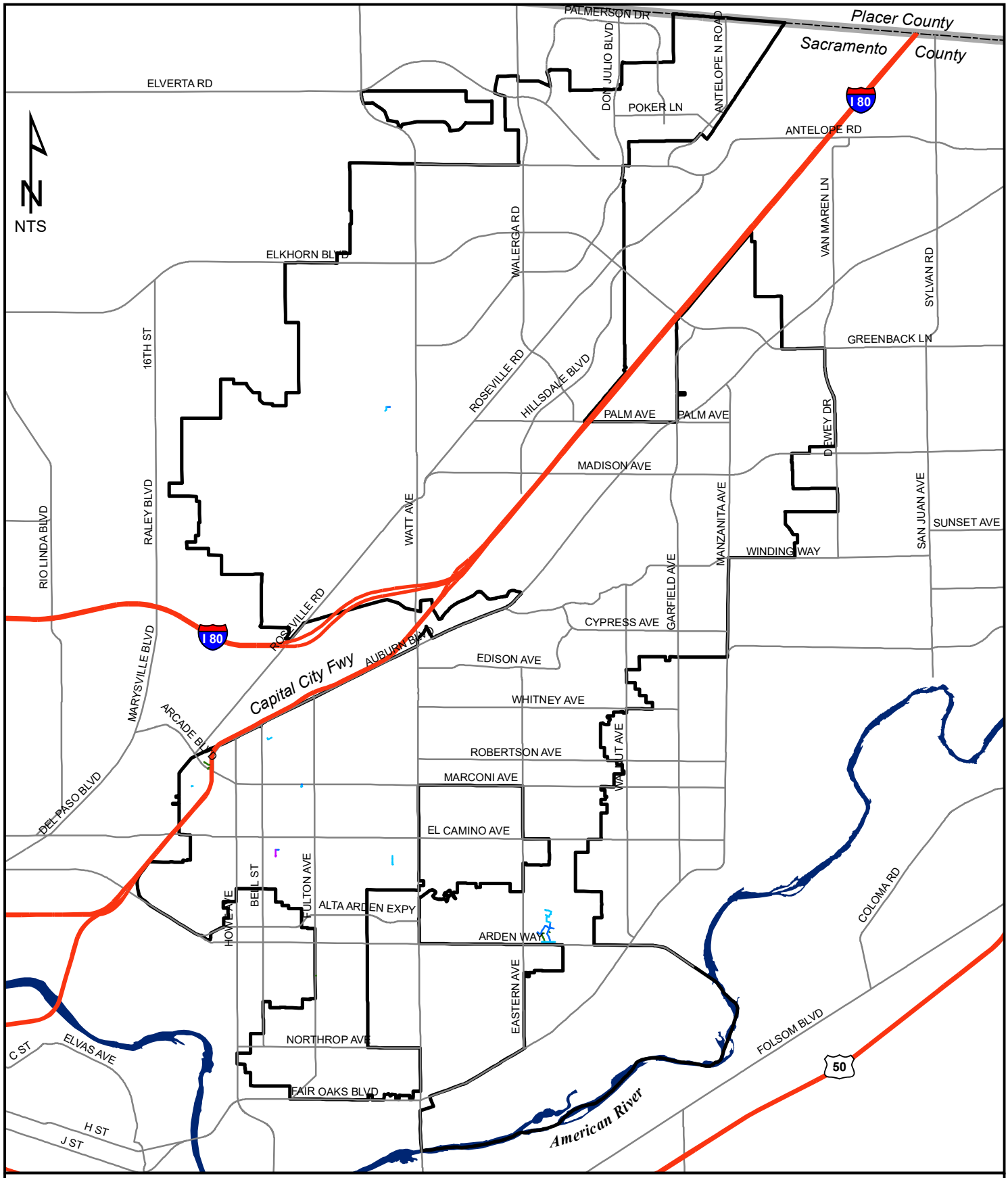
Distribution Main Asset Management Plan
August 2019

Figure 2E

Distribution Main by Material - MLS



Legend

- 4"
- 6"
- 8"
- 10"

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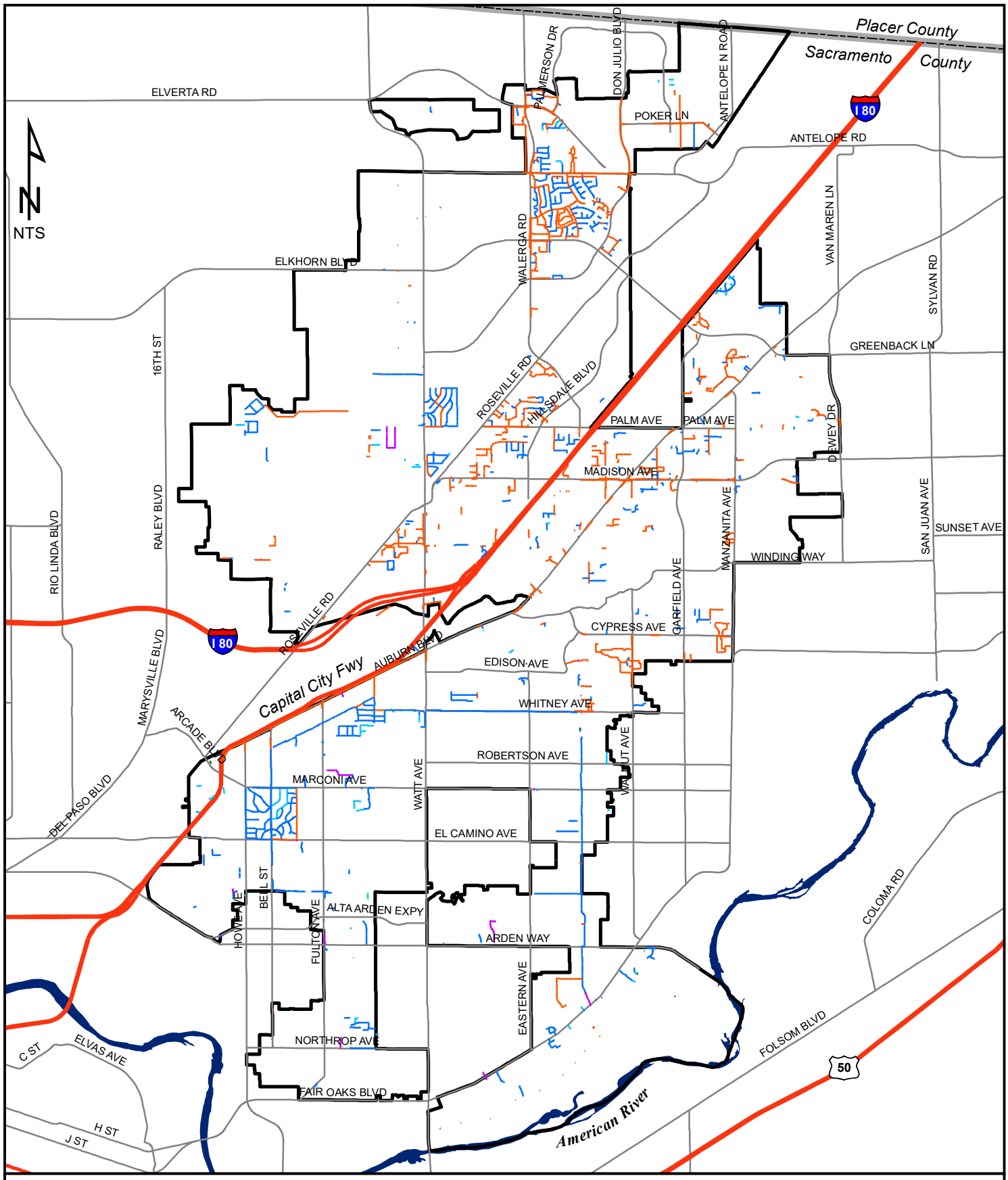
August 2019

Figure 2F

Distribution Main by Material - ODS



Legend

- 4"
- 6"
- 8"
- 10"
- 12"
- 16"

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Distribution Main Asset Management Plan
August 2019

Figure 2G

Distribution Main by Material - PVC

4.1.1.2 Pipe Age

Purpose

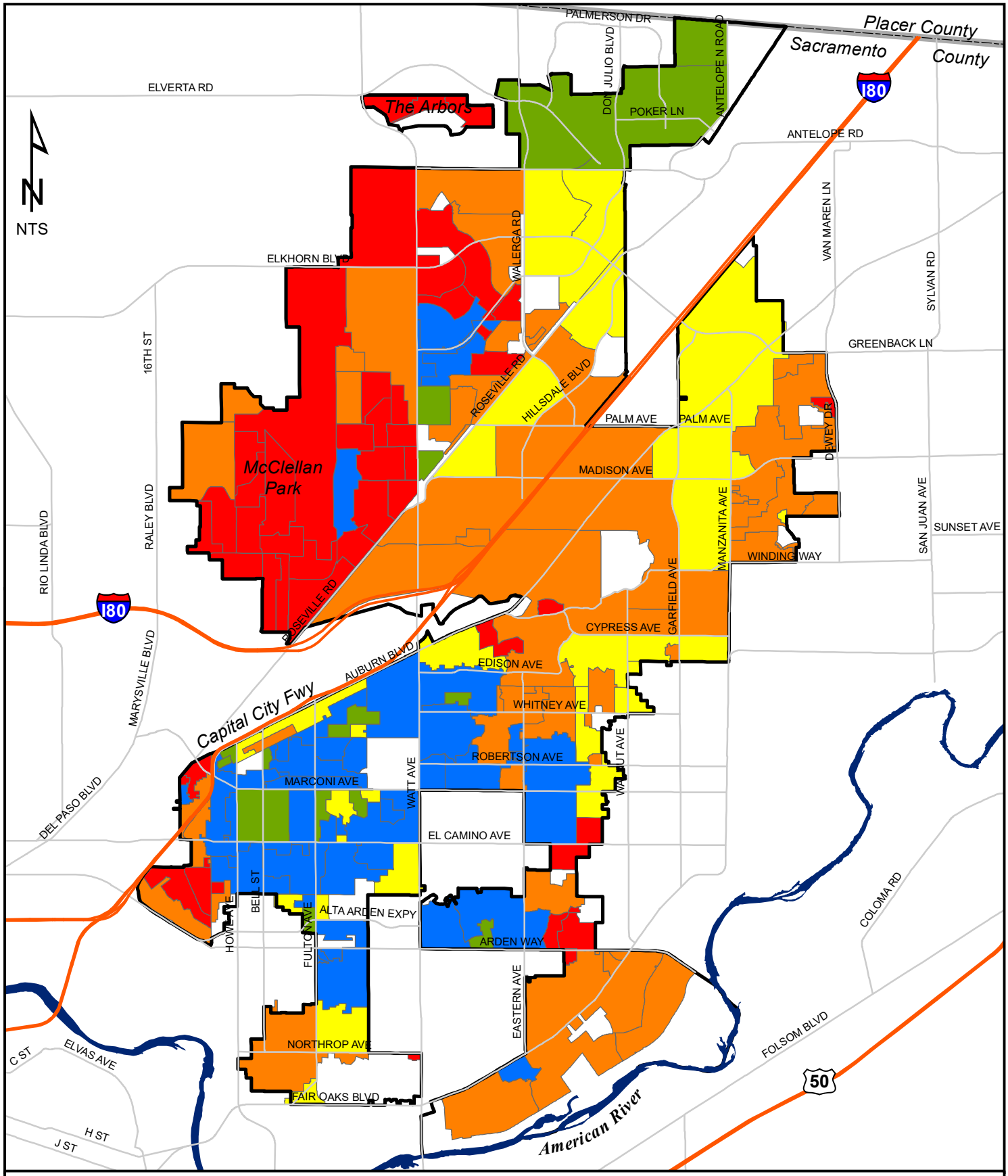
The Pipe Age is indicative of potential failure since older pipe is generally more likely to experience an age-related failure from general deterioration of the pipe material. As a pipe ages, coatings or protective materials degrade, causing the pipe to be more vulnerable to environmental factors; and in the case of AC, the chemical composition of the pipe material degrades and weakens.

Scoring

Pipe Age scoring uses average age for each pipe material and pipe diameter per main replacement area. Average age is multiplied by the Pipe Material percentage within the main replacement area (Equation 4 in Appendix N), which calculate the weighted age by material for each area. The summation of the weighted age by material calculates an effective Pipe Age for the main replacement area, which was then scored using Table 4 below. The Pipe Age increment scale was developed based on all pipe material types' assumed useful life, as shown in Table 8-1 (Distribution Mains Rehabilitation and Replacement Assumptions) of SSWD's Water System Master Plan (April 2017). Scoring detials are shown in Table 4, the effective age by distribution main area are shown in Figure 3 (Page 4-14), and the detailed analysis can be seen in Appendix D.

Table 4. Pipe Age Score

Pipe Age [years]	Pipe Age Score
> 60	5
> 45 ≤ 60	4
> 30 ≤ 45	3
> 15 ≤ 30	2
≤ 15	1



Legend

- > 60
- > 45 ≤ 60
- > 30 ≤ 45
- > 15 ≤ 30
- ≤ 15

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August 2019

Figure 3

Effective Age By Distribution Main Area

4.1.1.3 Pipe Location

Purpose

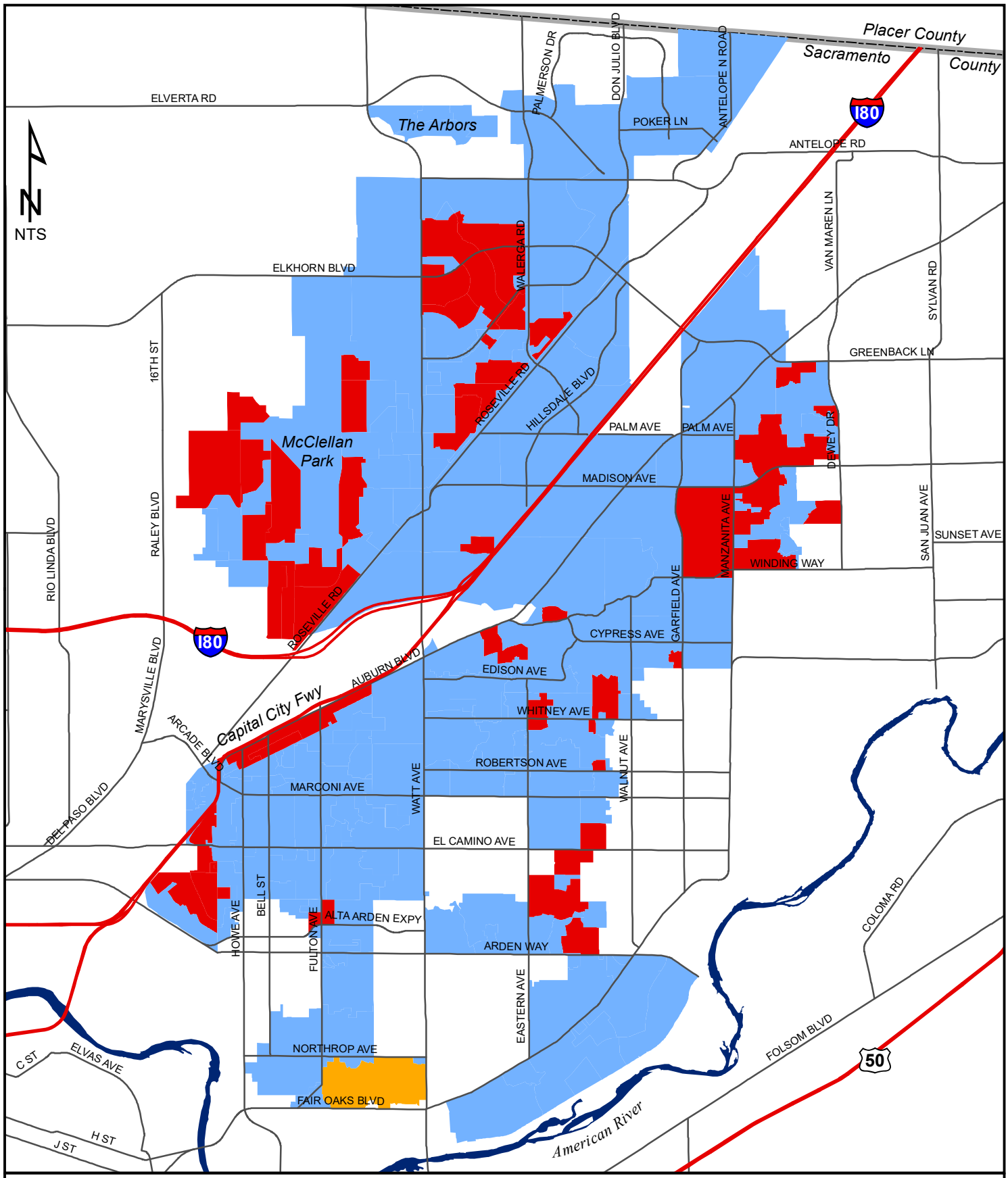
Pipe Location criterion was a critical factor in previous Distribution Main Asset Management Plans. Backyard mains are more prone to damage due to trees and various landscapes potentially growing directly on or around distribution mains. Backyard distribution mains also pose an access challenge for District personnel and an inconvenience to customers when maintenance and repairs are required.

Scoring

Pipe Location scoring examined all distribution main areas for location: front yard vs. backyard. If distribution mains are located in backyards it received a score of two (2). If distribution mains are located in the front yards it received a score of one (1). Scoring details are shown in Table 5. Distribution main locations are shown in Figure 4 (Page 4-16).

Table 5. Pipe Location Score

Pipe Location	Pipe Location Score
Backyard	2
Front Yard	1



Legend

- Backyard
- Front Yard
- No Service

SACRAMENTO SUBURBAN WATER DISTRICT

Distribution Main Asset Management Plan
August 2019

Figure 4

Front Yard and Backyard Distribution Main Area

4.1.1.4 Failure Rate

Purpose

All leaks on active distribution mains within SSWD are shown in Figure 5 (Page 4-18). The leaks are categorized by pipe size and material type in Chart 4. Active Distribution Main Leak History Totals by Pipe Material and Size and have been separated to account only for failures of the main not breaks caused by external forces. These numbers, however, do not account for the quantity of distribution mains within each main replacement area. To make the main replacement areas comparable, a normalized value of leaks per mile was used (Chart 5. Active Distribution Main Leak History – Leaks per Mile by Pipe Material and Size). Chart 5 provides a direct indicator of the distribution main condition (i.e. distribution mains with a higher number of leaks per mile have likely reached their useful life).

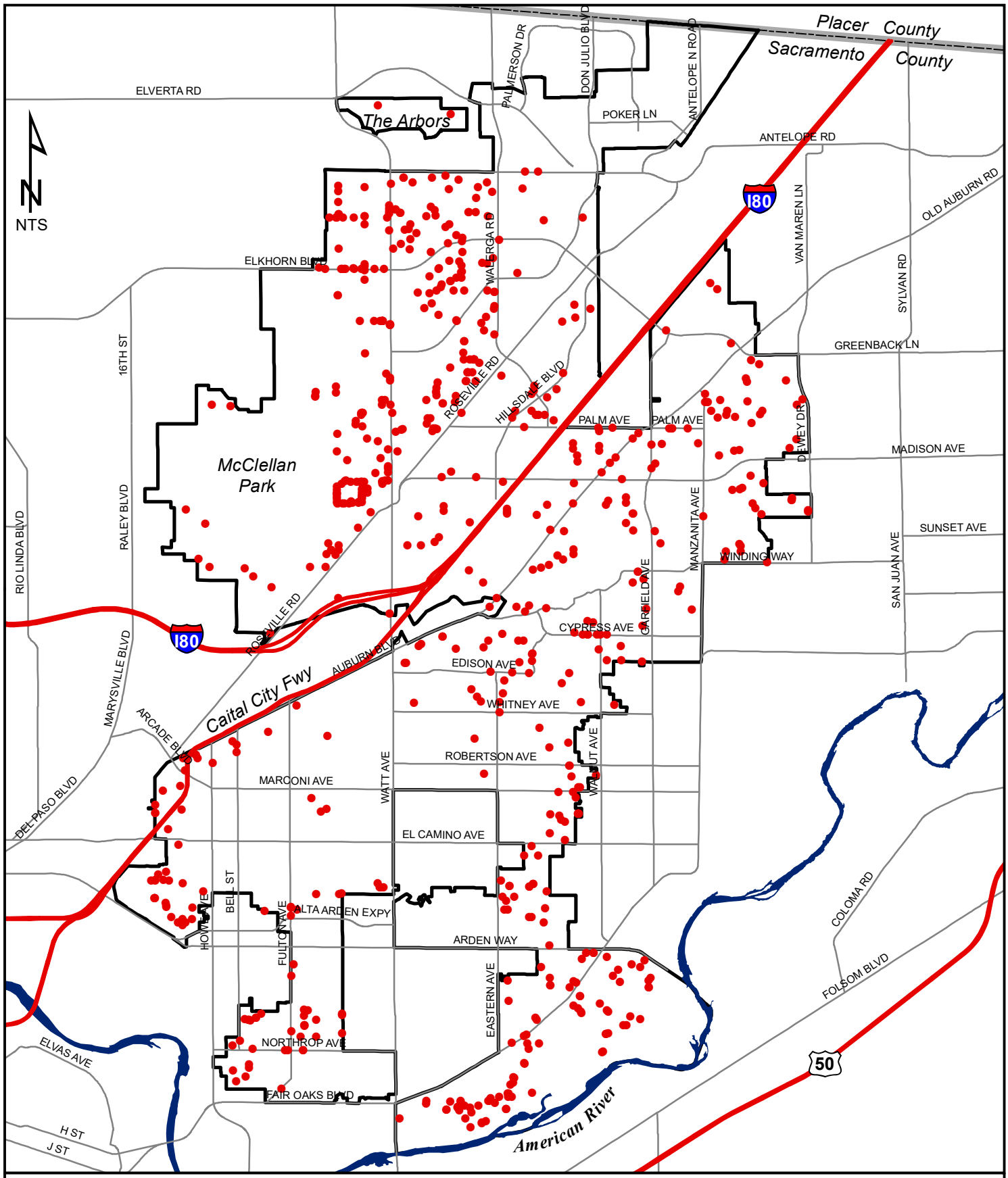
Scoring

Failure Rate scoring was calculated by taking total distribution main leaks in the main replacement area per total length of distribution main in the area (see Equation 5 in Appendix N), and scored using Table 6. Results are shown in Appendix F.

Table 6. Failure Rate Score

Failure Rate [leaks/mile]	Failure Rate Score
> 3	5
> 1 ≤ 3	3
≤ 1	1

As part of a yearly water conservation program, SSWD performs leak detection on approximately 10 percent of the total distribution main system. To utilize this program effectively, the Engineering and Water Conservation Departments collaborate to prioritize the location of the leak detection program; with anticipation that the leak detection program is near the Engineering Department's high-risk main replacement areas.



Legend

- Leaks

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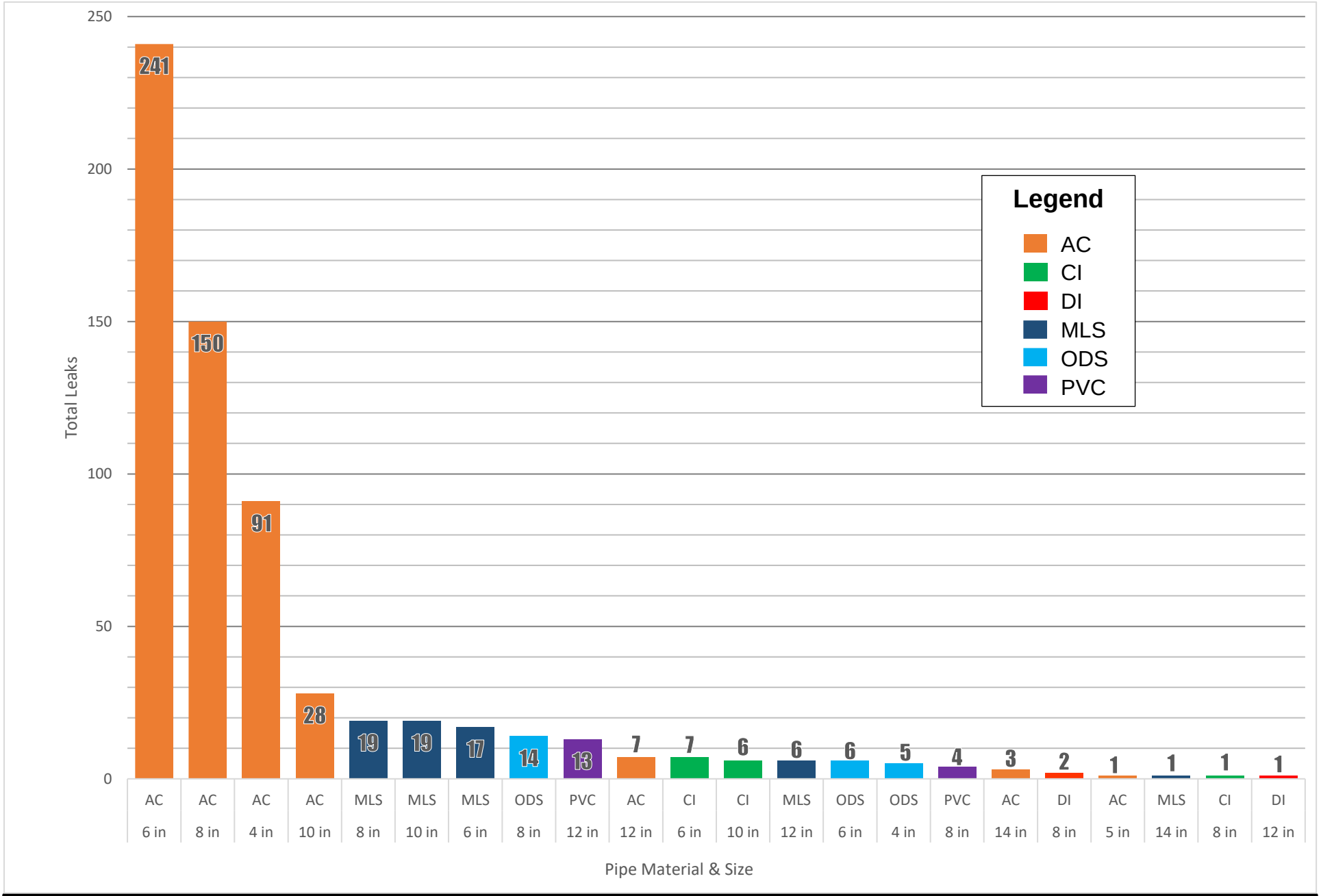
Distribution Main Asset Management Plan
August 2019

Figure 5

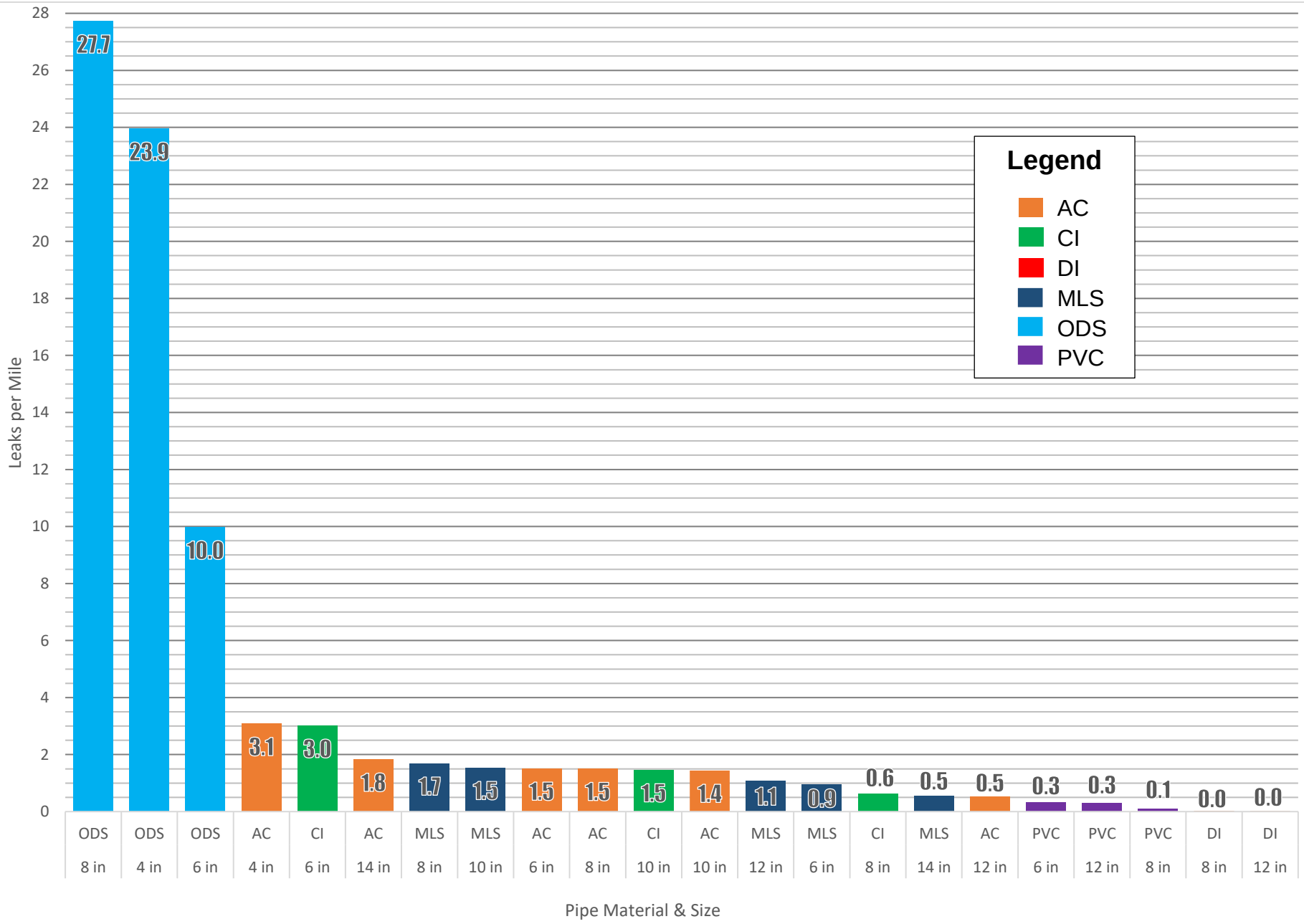
Active Distribution Main Leak History



Distribution Main Asset Management Plan
August 2019

SACRAMENTO SUBURBAN WATER DISTRICT

Chart 4.
Active Distribution Main
Leak History Totals by Pipe Material & Size



Distribution Main Asset Management Plan
August 2019

SACRAMENTO SUBURBAN WATER DISTRICT

Chart 5.
Active Distribution Main Leak History
Leaks per Mile by Pipe Material & Size

4.1.2 Consequence of Failure (COF)

The second category in the ROF analysis is COF. COF assesses and aggregates five (5) sub-criteria:

- Pipe Damage;
- Pipe Diameter;
- Customer Type;
- Crossings; and
- Valve Spacing.

These five (5) sub-criteria have been determined to pose a significant liability to SSWD. This liability, resulting from a pipe failure, is observed as the "Triple Bottom Line" (Slaven, 2017):

- Economic – capital and operating costs;
- Environmental – cost of environmental degradation or impacts; and
- Social – cost of community impacts.

The data is evaluated for each main replacement area on what will have the highest financial and physical impact from a distribution main failure.

Two (2) sub-criteria (Pipe Damage and Pipe Diameter) receive an effective score, which is calculated by taking the total percentage of each main material within a main replacement area and multiplying it by the respective scoring matrix. These formulas were derived from the *Statistical Engineering Division of the National Institute of Standards and Technology* (Rukhin, 2009) as weighted means statistics.

Once each sub-criteria has received a score, it is then normalized using Feature Scaling (Aksoy & Haralick, 2000). This mathematical technique sets the range maximum value to one (1), which corresponds to the worst rating in each category; and sets the range minimum value to zero (0),

which corresponds to the best rating in each category. The COF is calculated using Equation 6 in Appendix N.

The subsequent sections discuss the purpose, scoring criteria, and scoring calculation(s) for the five (5) sub-criteria.

4.1.2.1 Pipe Damage

Purpose

The Pipe Damage criterion intends to quantify the damage caused by a leak/blowout for the various Pipe Material Types. For example, a leak on AC pipe is typically small and concentrated, and causes generally low to moderate levels of damage. Conversely, a leak on a MLS, ODS, or PVC pipe is typically large and results in significant damage.

Scoring

The Pipe Damage scoring was established primarily from input from SSWD's Operations Department personnel. Based on their experience and knowledge, leaks on MLS, ODS, or PVC pipes cause significantly more damage than all other material types, and require immediate repair. All other material types have proven to typically produce a slow leak that does not require the same level of urgency; therefore, they were all given a lower score. The Pipe Material and corresponding Pipe Damage Score can be seen in Table 7 and is calculated using Equation 7 in Appendix N. Results are shown in Appendix G.

Table 7. Pipe Damage Score

Pipe Material	Pipe Damage Score
MLS, ODS, PVC	5
AC, CC, CI, CONC, DI, UNK	1

4.1.2.2 Pipe Diameter

Purpose

The Pipe Diameter criterion is used to classify main replacement areas containing larger diameter distribution mains. Larger diameter distribution mains have the ability to cause substantially greater damage by way of having the ability to flow more water.

Scoring

Pipe Diameter scoring calculates the effective Pipe Diameter based on the percentage of each Pipe Diameter in a main replacement area. The effective Pipe Diameter is determined by taking the percentage of Pipe Diameter and multiplying it by the corresponding Pipe Diameter Score (refer to Equation 8).

The Pipe Diameter scoring is established by assigning the 4-inch pipe size a score of one (1) and then adding one (1) point for every 2-inch increase in pipe diameter with the exception of 14-inch diameter which is given the same score as 12-inch, as shown in Table 8. Results are shown in Appendix H.

Table 8. Pipe Diameter Score

Pipe Diameter [in.]	Pipe Diameter Score
12, 14	5
10	4
8	3
6	2
4	1

4.1.2.3 Customer Type

Purpose

The Customer Type criterion is used to estimate the financial impact of a distribution main break in a majority commercialized area. Loss of water in a commercialized area can result in loss of business and/or product to a company, which creates greater liability for SSWD.

Scoring

The Customer Type scoring is established by taking the percentage of Commercial Accounts for each main replacement area, multiplying it by two (2), and adding a variable of one (1) (refer to Equation 9 in Appendix N). The resulting scores range from one (1) to three (3), as shown in Table 9. Results are shown in Appendix I.

Table 9. Customer Type Score

Commercial Density	Customer Type Score
High	3
Medium	2
Low	1

4.1.2.4 Crossings

Purpose

The Crossings criterion is used to estimate the consequence of a distribution main break at a crossing of a creek, freeway, or railroad. Such failures have potential to result in a higher liability and cost to repair for SSWD. A distribution main break that discharges water into a creek may result in environmental impacts and fines by regulatory agencies (e.g., Sacramento County Environmental Management, Division of Drinking Water, etc.), and a break under a freeway or railroad would cause major transportation issues in the respective areas, which creates greater risk for SSWD.

Scoring

The Crossings scoring was determined by taking the sum of Infrastructure Crossings from Equation 10 through Equation 16 in Appendix N. Staff estimated the cost of a distribution main break under a freeway to be five (5) times greater than a similar break crossing a creek. Staff estimated that the cost of a distribution main break under a railroad would be three (3) times greater than a similar break crossing a creek. Crossings Score is found in Table 10. Results are shown in Appendix J.

Note: A fixed value was added for each crossing type to aid in normalizing scores. The table below shows the ranges used for the Crossings Score, followed by the equations (Equation 10 through Equation 16 in Appendix N) used to obtain the Crossings Score.

Table 10. Crossings Score

Crossing Value	Crossings Score
> 10.4 ≤ 13.0	5
> 7.8 ≤ 10.4	4
> 5.2 ≤ 7.8	3
> 2.6 ≤ 5.2	2
≤ 2.6	1

4.1.2.5 Valve Spacing

Purpose

The Valve Spacing criterion is used to account for SSWD Improvement Standards Section D-5 (b) which requires a maximum valve spacing of 500 feet. A Main Replacement Area is considered desirable when a higher valve density is present allowing a distribution main break to be isolated more quickly and with fewer customers impacted by the break and repair work.

Scoring

The Valve Spacing score was calculated with the valve density by using Equation 17 in Appendix N. A valve density greater than or equal one (1) indicates the minimum density being met, while all areas less than one (1) received a score of two (2). Scoring for main replacement areas that did not meet the standard are shown in Table 11, results can be seen in Appendix K.

Table 11. Valve Spacing Score

Valves per 500-feet	Valve Spacing Score
<1	2
≥1	1

4.1.3 Risk of Failure (ROF)

The ROF equation (Equation 18 in Appendix N), calculates each main replacement area's risk by multiplying the LOF by the COF (Brown and Caldwell, 2017). The ROF is then modified with the Fire Safety Factors in the next section which produces the Modified Risk of Failure Score.

4.1.4 Fire Safety Factors

Fire protection is an essential function of SSWD's distribution main system, and cannot be accounted for solely using distribution main pipe diameter and material type. Some older areas within SSWD do not meet the current standards for hydrant type or spacing, which limits a main replacement area's fire suppression ability. Therefore, the Fire Safety Score acts as a modifier to the ROF. The Fire Safety Factors included as modifiers are Hydrant Coverage and Wharf Hydrants. Future condition assessments should include Flow Capability as a fire safety factor.

Fire Safety Score is calculated by Equation 19 in Appendix N. Once the Fire Safety Score is completed for each main replacement area, Equation 20 in Appendix N calculates the Modified ROF Score.

4.1.4.1 Hydrant Coverage

Purpose

The Hydrant Coverage criterion is used in reference to SSWD Improvement Standards Section D-5 (c), requiring a maximum hydrant spacing of 500 and 300 feet in residential and commercial areas, respectively.

Scoring

The Hydrant Coverage score is determined for each main replacement area by using the unprotected area divided by the total area of the main replacement area. Hydrant Coverage Deficiency, shown in Table 12, scores the main replacement areas based on their percentage of unprotected area. Next, a weighted rank was created using a multiplying factor of two (2) due to the importance placed on fire protection. Results can be seen in Appendix L.

Note: As a result of McClellan Park's prior purpose as an Air Force Base, there are large areas without hydrant coverage since there are large areas without conventional (e.g., residential, commercial) improvements, such as runways and air fields. For this reason, each of the main replacement areas in McClellan Park were analyzed manually in GIS to identify the level of hydrant coverage within the developed portions.

Table 12. Hydrant Coverage Score

Hydrant Coverage Deficiency [%]	Hydrant Coverage Score
> 20 ≤ 100	10
> 5 ≤ 20	6
≤ 5	2

4.1.4.2 Wharf Hydrants

Purpose

A wharf hydrant typically has a single or double 2.5-inch outlet and is typically connected by a direct tap into a small diameter distribution main. It was common for these types of hydrants to be used in the 1940's and 1950's in residential areas that were served by only 6-inch or smaller distribution mains.

Modern fire hydrants (steamer type) include safety features and increased flow capabilities not present on wharf hydrants. They are capable of higher flowrates due to the inclusion of multiple 2.5-inch outlets, a 4.5-inch outlet, and the connection to the main with a minimum 6-inch lateral. Additionally, in the event the hydrant has been damaged by a vehicle there is a break off check valve that will instantly close, allowing the flow capacity in the rest of the system to be unaffected. Therefore, wharf hydrants' ability to deliver flowrates are inferior to the modern type of fire hydrants used in today's standards.

Scoring

To evaluate this criterion, the total number of wharf hydrants in each main replacement area were counted and then divided by the total number of fire hydrants of all types in each main replacement area. The wharf hydrant percentage was then scored based on the criteria in Table 13. This criterion is not considered as important as hydrant coverage and flowrates capability since a wharf hydrant is still useful for fighting fires and is better than no hydrant at all (the latter is addressed by Hydrant Coverage). Results can be seen in Appendix M.

Table 13. Wharf Hydrant Score

Wharf Hydrant [%]	Wharf Hydrant Score
> 80 ≤ 100	5
> 60 ≤ 80	4
> 40 ≤ 60	3
> 20 ≤ 40	2
≤ 20	1

4.1.5 Economic Factors

In addition to the Indirect Method, SSWD's Engineering Department evaluates three (3) Economic Factors discretionarily as part of best engineering practices. Although these Economic Factors are utilized with discretion, they provide key information on an economic scale, as compared to a risk scale, when comparing the top ranked main replacement areas. These Economic Factors (e.g., Meter Retrofit Program Coordination, Economy of Scale, and the County or City Paving Schedules) do not directly influence the risk assessment's Modified Risk of Failure Score but provides an independent viewpoint examining future main replacement projects.

4.1.5.1 Meter Retrofit Program Coordination

In compliance with State Law (AB 2572) all water connections are required to be metered by January 1, 2025. SSWD's Meter Retrofit Program is installing meters in main replacement areas that have backyard mains, some of which are ranked in the top 20 of the Modified Risk of Failure calculations. Strategic planning of future main replacement projects can possibly eliminate high risk mains within planned Meter Retrofit Project areas. The ability to coordinate the main replacement and meter retrofit projects help reduce interruptions to SSWD customers.

4.1.5.2 Economy of Scale

The economy of scale evaluation could eliminate individual high risk pipe segments in main replacement areas. By replacing high risk segments, SSWD may defer the need for a main replacement project of an entire area, providing savings to SSWD ratepayer's. Currently, SSWD evaluates main replacement areas whose boundaries were created to retain and depict original subdivisions. The pipe installed in subdivisions were typically the same material and installed during the same time period. The method of using these original subdivisions as project areas has proven to be beneficial and fiscally responsible. Future small distribution main replacement projects should examine high risk areas and determine whether the replacement of certain pipe segments could appreciably reduce the risk of the entire area.

4.1.5.3 County and City Paving Schedules

Sacramento County (County) discourages utilities from cutting into recently paved roadways. As a result, the County imposes a substantial fee to the utility if new pavement is cut into within its first five (5) years. A paving schedule is provided to utilities in advance for planning purposes. An analyses is performed by SSWD using the paving schedule and Distribution Main Asset Management Plan. The analysis will determine whether a main replacement high-risk area or segment is within the paving schedule, and whether the main replacement schedule should be adjusted.

These three (3) Economic Factors do not influence the risk assessment's Modified Risk of Failure calculations but are analyzed independently to help prioritize main replacement projects. SSWD considers these economic factors as a significant aspect of being fiscally responsible when determining the timing of main replacement projects.

4.1.6 Regulatory Factors (Future)

Future regulations may affect this Distribution Main Asset Management Plan and any such changes will be evaluated and its results incorporated into future plans.

4.2 Direct Method

After the completion of the Indirect Method and all main replacement areas have received a Modified Risk of Failure Score, the highest ranking main replacement areas will be examined further with field investigations (i.e., Direct Method).

The Direct Method can verify or adjust the Indirect Method's prioritization of the main replacement areas, and will be contingent on assessment of anticipated cost and benefit. The Direct Method shall be utilized as recommended by the Engineering Manager and approved by the General Manager. The Modified Risk of Failure Score Scale, shown in Chart 6, will assist in determining which main replacement projects are classified as having a high modified risk of failure.

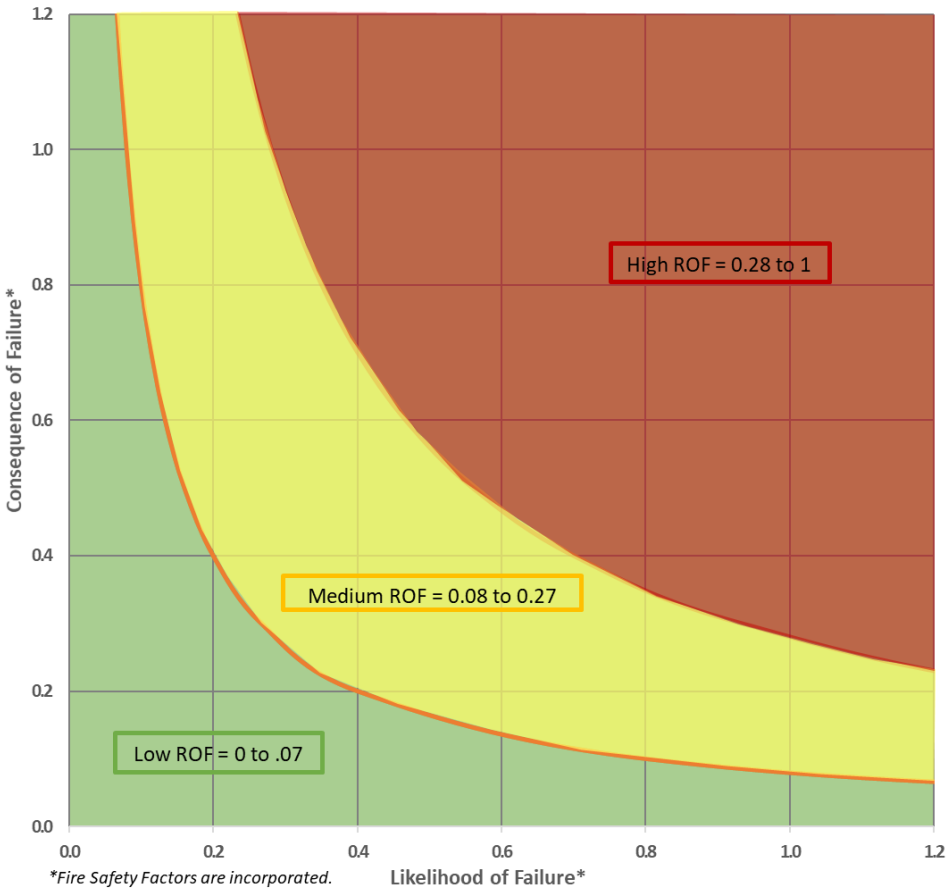


Chart 6. Modified Risk of Failure (ROF)

High Modified ROF areas will be evaluated using one or more of the following field investigation methods of the direct method:

- Visual inspection;
- Laboratory strength testing;
- Material chemical testing; or
- Wall thickness measurement.

4.2.1 Visual Inspection

The condition of pipelines may be analyzed through visual inspection by either internal video, or internal and external visual observation.

Traditional visual inspection technologies include a Closed Circuit Television (CCTV) survey that requires a complete shutdown to isolate a pipeline. This can cause issues due to customers and hydrants temporarily being taken out of service and is considered to be intrusive.

Another method of visual inspection that SSWD is currently performing is the removal of small sections of main, either at random locations or at recent leak locations, to verify the condition of the pipeline materials. This destructive method allows for verification of the deteriorated quality of older pipe material.

Potential non-destructive visual inspection technologies that could be utilized include the use of a swimming remotely operated vehicle with sensors and mini cameras. Vendors are beginning to offer the use of these technologies in new and innovative ways. SSWD will continue to research and try new technologies as they evolve. A brief description of some vendors utilizing these technologies in innovative ways are described below.

4.2.1.1 JD7 Investigator

This technology performs up to 1000 meter (3,280 feet) surveys at a time using a High Definition CCTV coupled with a hydrophone and high powered sonde for precise leakage and acoustic surveys. The combination of the CCTV and hydrophone allows up to double the distance surveyed a day compared to traditional leak detection methods.

4.2.1.2 SAHARA

This technology uses a method composed of a tethered system with acoustic leak detection and inline video. The monitoring tool is pulled by the flow of water and checks internal pipe wall conditions and pipeline features by sweeping across the pipe walls with the onboard sensors.

During current and past main replacement projects, visual inspection of the external pipe condition has been an essential component in verifying the degraded quality of the pipe material. SSWD plans to continue to incorporate this method of visual inspection within high risk main replacement areas, with plans to explore internal visual inspection technology when appropriate.

4.2.2 Laboratory Strength Testing and Material Chemical Testing

Laboratory strength testing can give an understanding on the relative strength of a pipe material. Compression and tensile testing can be used to estimate the remaining useful life of a pipe. Material chemical testing is an industry standard procedure when assessing the degradation of AC pipe. It has the ability to show the approximate calcium leached from the outer wall. Calcium leaching has proven to make AC pipe “water logged” causing it to become brittle. If the original design criterion is known, the remaining useful life of an AC pipe can be estimated based on the amount of calcium that has leached from the pipe walls.

4.2.3 Wall Thickness Measurement

Utilizing technology to calculate or measure wall thickness of an in service or removed section of pipe is another way to assess the remaining useful life of a pipeline.

4.2.3.1 Acoustic Monitoring (Echologics)

This technology is most effective on AC pipe and can provide an indication of average wall thickness between two transmitter locations. This method provides measurements which can detect widespread wall loss.

4.2.3.2 X-Ray (TEAM Industrial)

This method requires that a section of metallic pipe be removed for examination. This technology can provide a wall thickness profile of a metallic pipe section. Knowing the original thickness, one can estimate the remaining useful life of the pipe material based on the decay rate. Though an expensive method, the X-Ray testing method can provide reliable wall thickness data for metallic pipes.

SSWD has utilized wall thickness measurements to assess material condition and estimate the remaining useful life of MLS and AC pipes. Implementing destructive wall thickness testing methods can be expensive. However, the ability to calculate an estimate for pipeline decay may help determine the remaining useful life of those pipes.

4.2.3.3 Future Technologies

SSWD will continue to research and utilize appropriate technologies when opportunities arise.

4.3 Material Condition Evaluation

As verified in Section 4.1 and 4.2, the condition of the pipe material degrades with time from external factors (i.e. corrosion effects from water and/or soils). Newer pipe materials installed to modern standards are generally much less susceptible to corrosion. Pipe Materials such as ODS, AC, and MLS have proven to be the most problematic for SSWD. These materials have received additional field investigations by SSWD Staff and/or Consultants, which are discussed in more detail below.

As part of the indirect method, consultant reports were used along with internally developed failure data (Chart 5. Active Distribution Main Leak History – Leaks per Mile by Pipe Material and Size), to evaluate the condition of each Pipe Material. Failure Rate of each pipe material was calculated by using the total leaks divided by the miles of each Pipe Material and Diameter. The Failure Rate calculated in this Plan was confirmed with the combination of the indirect and direct methods, and consultants' data.

The field investigations and data analysis support the scores detailed for sub-criteria Pipe Material and Pipe Age. The scores are detailed in Table 3 (Page 4-5). Field investigations and data analysis support the rank for Pipe Material by critical age and type. As appropriate, future investigations and analysis's should be done to support the Failure Rate data gathered.

Outside Diameter Steel (ODS)

SSWD's 2014 Plan established a priority to replace all ODS pipe since it has been the least reliable material within SSWD. This priority was based on Failure Rate data collected for distribution mains. For this Plan update, no consultant Material Evaluation was performed on this material since scheduled Main Replacement Projects are scheduled to eliminate the vast majority of ODS by the end of 2020.

Asbestos Cement (AC)

AC was the next least reliable material based on Failure Rate and the consultants' evaluation estimating the remaining useful life. Consultant reports concluded that the smaller diameter AC

pipe is at higher risk of failure because of its lower flexural strength (JDH Corrosion Consultants, Inc., 2014). The report also concluded that all AC pipe examined is losing wall thickness from both interior and exterior wall surfaces due to major loss of calcium (JDH Corrosion Consultants, Inc., 2014). Another cause of failure of AC pipe is expansive soils, which can lead to swelling and shrinkage of the soil that generates bending stresses in pipes (East Bay Municipal Utility District, 2012). Expansive soils are present in SSWD but have a very irregular distribution (United States Department of Agriculture, 1993).

Useful life of AC pipe in the Western United States is considered to be 75 years (American Water Works Association, 2012). This correlates well with a useful life of 80 years in SSWD's *Water System Master Plan* (Brown and Caldwell, 2017). SSWD's Failure Rate data (Chart 5. Active Distribution Main Leak History – Leaks per Mile by Pipe Material and Size) confirms that SSWD's smallest AC pipes (4- and 6-inch diameter) have the highest Failure Rate (leaks/mile) – ignoring the 14-inch AC pipe since there is less than 2 miles in the distribution system.

Mortar Lined Steel (MLS)

MLS pipe followed AC pipe in priority, based on Failure Rate and a pipe evaluation done by a consultant. MLS pipe ranks high on the Consequence of Failure's category "Pipe Damage" but not as high on the "Pipe Material" category. The Failure Rate of this material ranks fourth highest among SSWD's Pipe Material. A condition assessment of MLS pipe samples showed that MLS Pipe's welds, mortar, and service points were in good condition at Main Replacement Area 10 (TEAM Industrial Services, 2018), correlating well with the Failure Rate data. The report submitted by TEAM Industrial Services detailed an absence of weld defects at the service saddle attachment point.

From the article *Buried No Longer: Confronting America's Water Infrastructure Challenge* (American Water Works Association, 2012), it is estimated that MLS pipe has a service life between 75 and 100 years.

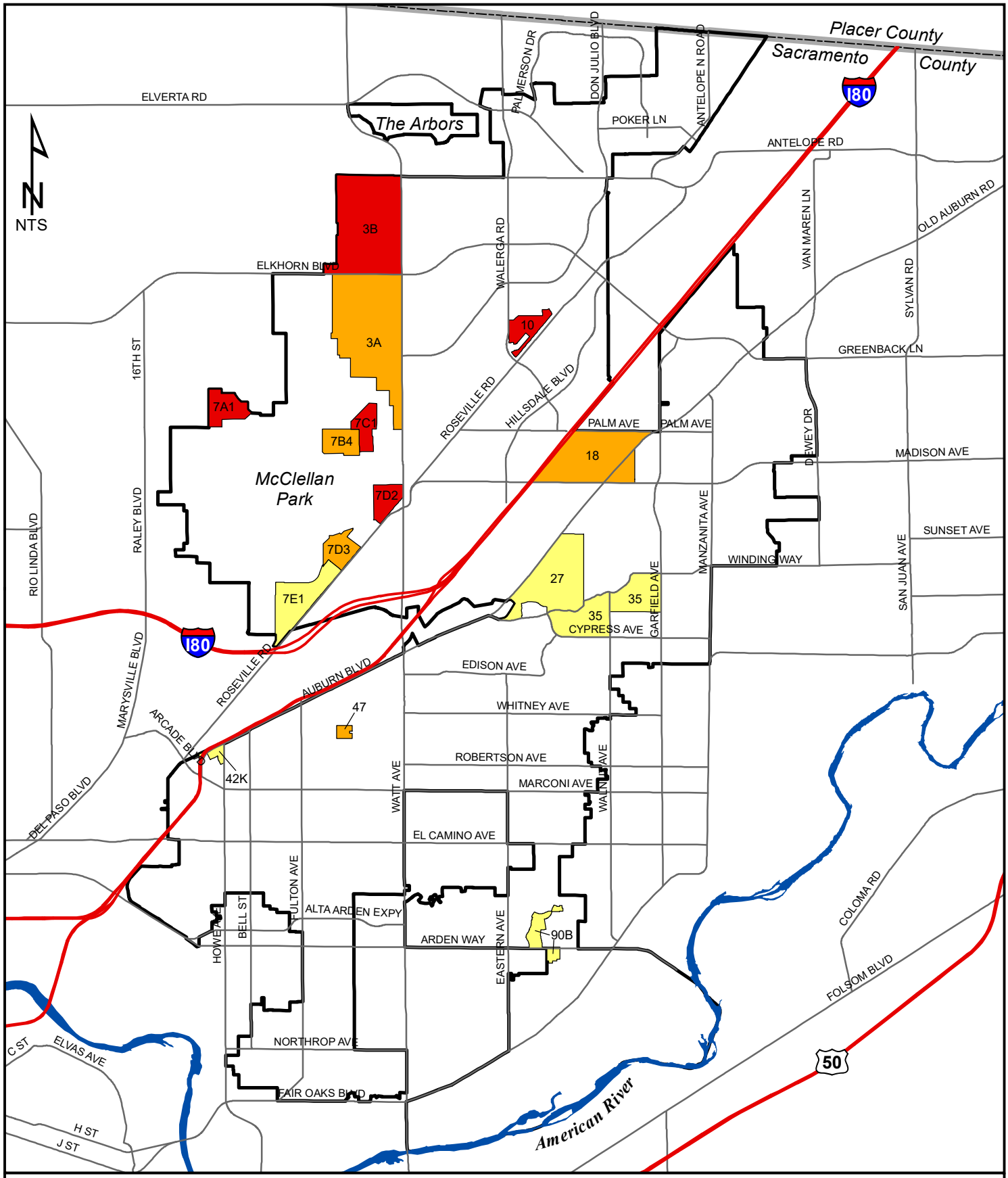
Test data developed from the MLS pipe condition assessment indicate that the MLS pipe in Area 10 is in good condition without indication of early failure. This is consistent with visual observation by District staff.

The MLS pipe in Area 10 was installed 59 years ago. Given the American Water Works Association's estimated service life, the estimated remaining service life of Area 10 MLS pipe is between 15 and 40 years (McCarthy, 2018).

4.4 Distribution Main Areas Priority

As a result of the analysis, the identified distribution main replacement areas are ranked in terms of priority for distribution main replacement. The ranking table (Appendix A) shows the priority for distribution main replacement projects per main replacement area. Information was also solicited from SSWD's Operations managers and staff regarding their experience in the maintenance of SSWD's distribution main system. In general, their experience supported the rankings shown. Additional information may become available in the future, that may necessitate revisions in the priority assignments.

Figure 6 represents the Top 15 ROF results that were produced from the analysis on each Main Replacement Area.



Legend

- ROF Rank 1-5
- ROF Rank 6-10
- ROF Rank 11-15

SACRAMENTO SUBURBAN WATER DISTRICT

Distribution Main Asset Management Plan
August 2019

Figure 6

Risk of Failure
Top 15 Distribution Main Areas

4.5 Projected Timing and Cost of Distribution Main Replacement Plan

In 2006, SSWD executed a contract with The Reed Group, Inc. to prepare a "*Multi-Year Financial Plan, Water Rates, and Facilities Development Update Charge Study*." Their plan reflected five-year operating and capital program budgets from CY2007 through CY2011. As a result of this study and report, the Board adopted a series of three annual rate increases of 13% per year beginning in January 2007. Ten percent (10%) of the 13% rate increases was allocated for SSWD's Capital Improvement Program (CIP) and was intended to fund a "pay-as-you-go" method of financing ongoing capital projects. These rate increases were expected to result in a CIP budget of approximately $19 million per year.

However, raw material costs are unpredictable in the long-term and only moderately predictable in the short-term. They are reflective of world markets and will therefore continue to have an impact on distribution main replacement costs. For reference, from 2010 to 2011, pipe material costs increased by approximately 35%. Additional rate increases or use of reserve funds may be needed to keep up with construction inflation to maintain a similar level of spending on a pay-as-you-go basis. Recently, labor rates and material costs have increased sharply due to factors such as economic, construction activity, and State prevailing wage updates.

Projects will be completed as funding is approved by the Board. No funding mechanism has been proposed or is in place beyond the pay-as-you-go level of financing currently generated through SSWD's rates.

4.6 Contracting and Construction Methods

Prior to 2006, SSWD utilized a traditional design-bid-build project delivery method consisting of design (either by a consultant or in-house), bidding to a pre-qualified select group of general contractors, and finally construction. In 2007, District staff recommended a "Master Service Contract" approach. The idea behind this alternative is to contract one or more contractors by giving them enough work for 3 - 5 years in exchange for a more competitive price to perform the work. Additional savings have been achieved through direct purchase of the majority of the materials, thereby avoiding contractor mark-ups.

In 2006, following Board approval, SSWD negotiated service contracts with both Ahlstrom Construction and GM Construction for the entire year. These contracts were eventually extended into early 2007 at negotiated 2006 prices. Using this approach, Ahlstrom Construction constructed the distribution mains in the street with saddles for the customers' new service lines; GM Construction then installed the customer service lines with meter boxes, meter setters, and meters.

In early 2007, in recognizing the Board's desire for competitive bidding, staff solicited price proposals from contractors for continuing the service contract approach. "Requests for Price Proposals" (RFPP) were issued to qualified contractors for both the main installation component and the service line component. SSWD received proposals from several contractors for both Requests. SSWD again selected Ahlstrom Construction and GM Construction to continue the service contract approach for the remainder of 2007 and beyond. The service contracts awarded were for a 5-year period consisting of annual contract renewals.

The current master service contract with Doug Veerkamp General Engineering (Veerkamp) and Flowline Contractors, Inc. (Flowline) has proven to be a cost effective tool for the main replacement program. The existing service contract for Veerkamp expires at the end of 2021 with SSWD's option to extend to 2023; and Flowline's contract expires in 2020, with SSWD's

option to extend to 2022. District staff has recommended to continue using this approach at least for large distribution main replacement projects.

The advantages to using the service contract approach for this type of construction are as follows:

- Cost savings of 10 to 20% have been realized using the service contract approach in combination with SSWD directly purchasing project materials.
- Using the service contract approach saves SSWD costs associated with bidding and awarding contracts verses traditional design-bid-build approach.
- The quality of work is high because the contractors that SSWD negotiates with have considerable experience and are very familiar with SSWD's Standards and Specifications.
- The contractors make a considerable commitment to SSWD by committing resources (labor and equipment) towards SSWD's projects.
- Because of the high quality of work, the County inspection costs are significantly less than traditional bid projects. In fact, SSWD's main replacement projects have become model projects for the County and other utility districts.
- Customer satisfaction is very high, and the few complaints received are addressed immediately.
- There have been very few, if any, warranty items on projects constructed by the Master Service Contract using the service contract approach.
- Service contracts promote better communications with SSWD, County, Contractor, and Customers.
- Significant savings have been achieved with the direct purchase of large quantities of pipe and materials.

Staff continues to investigate alternatives for cost effective management of the design and construction of distribution main replacement projects.

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Section 5

PUBLIC OUTREACH

Public outreach, as noted in SSWD's Mission Statement and Values, is what staff strives to achieve with every project. Having a transparent governance with the customers is important to all staff during these projects. For example, a significant amount of customer contact and outreach occurs during the design and construction phases of SSWD's distribution main replacement projects. In the past few years, the level of public outreach between SSWD and our customers has increased considerably on these projects. The steps outlined below follows the process currently used.

- During the final design phase, a letter is sent to each customer's property with an active water service within the project area explaining the need for the project and the proposed construction timeframe. This letter acts as a notice to the customer, providing a SSWD employee contact for any concerns, and how SSWD will need the customer's assistance during the project.

- Before design is completed, a SSWD representative meets in person with the customer to discuss the project. SSWD's representative will discuss and determine with the customer the best location for the new water meter. The planned construction period is also discussed.

- The contractor also sends a letter introducing themselves and provides their Project Manager's and/or Project Foreman's contact information.

- Prior to any work being started on a customer's property, a door hanger is placed 24 to 48 hours before commencing work at the residence. The flyer describes the work to be completed and the expected impact to water service.

- From the period of the first letter being sent to the end of the project, phone calls received by the project manager are responded to in less than 24 hours and, if necessary, a face-to-face meeting is arranged with the customer.
- Provide monthly updates to SSWD's website with project phases.
- Conduct three (3) open houses (prior, during, and after construction) for project area customers for SSWD to relay information and receive feedback regarding the project.
- Prior to the customer being converted from flat rate to metered rate, SSWD's Customer Service Department mails a final letter to each customer, which details the account changes starting the following month.

SSWD has received numerous positive comments from customers regarding customer outreach efforts. Nevertheless, staff continues to explore ways to improve both customer outreach and service.

Section 6

ADAPTIVE AND PERPETUAL PLAN

The Plan will require periodic updates as new information and assessment methodologies are developed. Future information that could influence the ranking of main replacement areas in the Plan include but are not limited to: improved recordkeeping systems, a better understating of pipe material's useful life, identification of new evaluation criteria, acquisition of new service areas, a change in land use, updated model features, infrastructure failures, catastrophic events, and changes in SSWD policies. Additionally, it is anticipated that projects may need to be constructed outside of the ranking order due to unforeseen circumstances, safety concerns, or to achieve greater cost efficiencies.

It is intended that this will be a perpetual Plan in that areas where the distribution mains have been recently replaced will continue to be evaluated and their rank (priority) adjusted accordingly. Obviously, those areas with newer distribution mains would rank lower on the priority list for replacement; and, over time, those areas will rise on the ranking list.

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Section 7

CONCLUSIONS AND RECOMMENDATIONS

Replacing aging distribution mains allows SSWD to provide decades of reliable and cost effective service for our customers. Staff's recommendation is to replace distribution main based on the rankings provided by the condition assessment of this Plan – with new Ductile Iron pipe in the public rights-of-way.

- This Plan provides a reasonable plan and strategy for replacing SSWD's distribution mains and coordination with the *Meter Retrofit Plan* and the *Water Transmission Main Asset Management Plan*.

- The *Distribution Main Asset Management Plan* provides a tool for communication between the Board and staff to identify areas of highest need for distribution main replacement.

- The Plan identifies probable costs associated with distribution main replacement; it does not prescribe funding mechanisms.

- There are approximately 126 miles of distribution main located in back and side yards. Of these, approximately 1.4 miles are ODS pipe which has the highest failure rate and is a top priority to replace.

- Based on the cost of the distribution main replacement projects in 2018 and 2019, the estimated cost to replace one (1) mile of distribution main is in the range of $1.9 to 2.0 million depending on the complexity of the project. This cost includes engineering, permitting, inspection, public relations, purchasing materials and all associated construction including the installation of the distribution main, water services and water meters, fire hydrants, valves, and reconnecting customer in-tract service lines to the new main.

- Due to the length of time to replace the backyard distribution mains, water meters are being installed on backyard water services as part of the Meter Retrofit Program.

- The condition assessment is a tool which creates a ranking list (Appendix A). It has been established to identify the priority areas in need of distribution main replacement that is objective, impartial, and defensible to our customers. However, this list can change due to unforeseen circumstances.

- The Plan is perpetual and will be reviewed and revised periodically as additional field and other information becomes available.

- The Plan can be used to coordinate with other Agencies.

Review and reassessment of the Plan is recommended in 4 to 6 year intervals.

REFERENCES

Aksoy, S., & Haralick, R. M. (2000, October 5). *Feature Normalization and Likelihood-based Similarity Measures for Image Retrieval.* Retrieved from Bilkent University Department of Computer Engineering.

American Society of Civil Engineers. (2017). *2017 Infrastructure Report Card.* American Society of Civil Engineers.

American Water Works Association. (2012). *Buried No Longer: Confronting America's Water Infrastructure Challenge.* AWWA.

ASCE. (2017). *Water Pipeline Condition Assessment.* Reston: American Society of Civil Engineers.

Brown and Caldwell. (2017). *Water System Master Plan.* Rancho Cordova.

California Legislature. (2004, September 29). AB - 2572 Water Meters. Sacramento.

Ductile Iron Pipe Research Association. (2016, February 2). *DIPRA Facts & Figures.* Retrieved August 9, 2018

East Bay Municipal Utility District. (2012). *Phase 1 Asbestos Cement Pipe Corrosion Study.* Oakland.

JDH Corrosion Consultants, Inc. (2014). *Asbestos - Cement Pipe Intergrity Evaluation Report.* Concord.

McCarthy, M. (2018). *Condition Assessment Technical Memorandum for Distribution Main Replacement Area 10.* Sacramento Suburban Water District.

Rukhin, A. L. (2009). *Weighted means statistics in interlaboratory studies.* Gaithersburg: National Institute of Standards and Technology.

Sacramento Suburban Water District. (2019, June). Mission Statement. Sacramento, California.

Slaven, K. (2017, November). Incorporating Predictive Maintenance Data with Asset Mangement Data for Risk Based Planning. Houston: Arcadis.

TEAM Industrial Services. (2018). *MLS Pipe Sampling.* Benicia.

United States Department of Agriculture. (1993). Soil Survey of Sacrament County, California. Washington, DC.

Water Research Foundation. (2016). *Asset Management - Risk Management.* Water Research Foundation.

Appendix A – Ranks (Priority)

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Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
03B	2.0	3.2	1.8	5	1	1	5	7.3	10	0.368	0.821	0.302	6	1	0.333	0.403	1
7C1	5.0	3.0	1.4	2	1	1	5	6.4	10	0.339	0.781	0.265	6	1	0.333	0.353	2
7D2	2.0	3.4	2.8	3	1	1	5	6.5	10	0.325	0.787	0.256	6	1	0.333	0.341	3
7A1	5.5	2.9	2.8	4	2	2	4	6.2	2	0.592	0.392	0.232	6	1	0.333	0.310	4
10	9.6	2.9	1.0	3	2	2	4	5.9	2	0.655	0.376	0.246	2	4	0.250	0.308	5
03A	2.5	3.3	1.8	3	1	1	4	6.7	10	0.293	0.747	0.219	6	1	0.333	0.292	6
47	9.9	2.1	1.0	1	1	1	3	4.0	10	0.472	0.570	0.269	2	1	0.000	0.269	7
18	6.3	3.6	1.4	3	1	1	4	6.1	6	0.491	0.529	0.260	2	1	0.000	0.260	8
7B4	3.7	3.2	2.8	3	1	1	5	6.9	6	0.406	0.614	0.249	2	1	0.000	0.249	9
7D3	2.0	3.0	2.4	3	1	1	5	6.9	10	0.287	0.804	0.231	2	1	0.000	0.231	10
90B	5.1	2.0	1.0	1	1	2	4	7.9	10	0.215	0.854	0.184	2	4	0.250	0.230	11
42K	5.3	3.9	1.4	1	1	2	3	4.7	10	0.351	0.651	0.229	2	1	0.000	0.229	12
27	6.7	3.4	1.3	2	1	1	4	5.7	6	0.440	0.509	0.224	2	1	0.000	0.224	13
7E1	2.0	3.6	2.3	2	1	2	5	6.4	6	0.260	0.640	0.166	6	1	0.333	0.222	14
35	5.9	2.4	1.0	2	1	1	4	6.9	6	0.332	0.568	0.189	2	3	0.167	0.220	15
7F3	3.8	4.0	3.0	1	1	1	5	6.9	6	0.356	0.615	0.219	2	1	0.000	0.219	16
7B2	2.2	3.5	2.6	2	2	2	4	7.9	6	0.332	0.660	0.219	2	1	0.000	0.219	17
13A	8.4	4.1	1.4	3	1	1	3	5.4	2	0.625	0.259	0.162	6	1	0.333	0.216	18
7D1	2.0	3.3	2.9	2	1	1	5	6.6	10	0.271	0.793	0.215	2	1	0.000	0.215	19
26A	6.9	3.0	1.2	3	1	1	4	5.5	2	0.486	0.309	0.150	6	2	0.417	0.213	20
7C3	3.3	3.2	1.9	3	1	1	5	6.7	6	0.335	0.604	0.202	2	1	0.000	0.202	21
7E4	2.0	2.6	2.8	3	1	2	5	8.0	2	0.280	0.522	0.146	6	1	0.333	0.195	22
7E2	2.0	3.9	3.0	2	2	2	5	8.0	2	0.361	0.524	0.189	2	1	0.000	0.189	23
06I	2.1	1.9	1.0	2	2	2	5	7.9	10	0.157	0.900	0.141	2	5	0.333	0.188	24
76H	3.4	2.9	2.5	1	1	2	3	6.1	10	0.253	0.717	0.181	2	1	0.000	0.181	25
7A2	5.9	3.2	1.0	3	2	1	5	6.0	2	0.475	0.381	0.181	2	1	0.000	0.181	26
19	5.8	3.2	1.2	2	1	1	3	6.2	6	0.373	0.484	0.181	2	1	0.000	0.181	27
24B	5.6	3.3	1.2	2	1	1	4	6.6	2	0.371	0.362	0.134	6	1	0.333	0.179	28
06D	2.0	1.8	1.0	2	2	2	5	7.9	10	0.147	0.901	0.132	2	5	0.333	0.176	29
7F2	2.0	3.4	2.5	1	1	2	5	6.4	6	0.206	0.637	0.132	6	1	0.333	0.175	30
17B	7.5	4.1	1.3	2	1	1	3	5.2	2	0.523	0.247	0.129	6	1	0.333	0.172	31
42F	2.2	3.9	2.4	1	1	1	4	6.5	6	0.236	0.547	0.129	6	1	0.333	0.172	32
13B	4.8	3.5	1.1	3	1	1	3	6.6	2	0.390	0.315	0.123	6	1	0.333	0.164	33
76C	4.1	3.0	1.2	1	1	1	4	6.3	10	0.225	0.729	0.164	2	1	0.000	0.164	34
28	5.7	3.0	1.1	3	1	1	4	6.7	2	0.407	0.367	0.149	2	2	0.083	0.162	35
7B3	3.4	3.1	2.7	1	1	1	5	6.3	6	0.273	0.585	0.160	2	1	0.000	0.160	36

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
26B	6.0	2.9	1.2	1	1	1	4	6.4	2	0.327	0.352	0.115	6	1	0.333	0.154	37
34	3.7	2.4	1.0	1	1	2	5	7.6	6	0.165	0.694	0.114	2	5	0.333	0.152	38
7F4	2.2	3.3	2.4	2	2	2	5	7.1	2	0.311	0.481	0.150	2	1	0.000	0.150	39
7G3	2.0	4.1	3.0	2	1	1	5	7.6	2	0.321	0.458	0.147	2	1	0.000	0.147	40
24A	5.1	3.4	1.6	1	1	1	4	6.2	2	0.321	0.343	0.110	6	1	0.333	0.147	41
66B	3.8	2.3	1.7	2	1	1	4	7.1	6	0.251	0.575	0.144	2	1	0.000	0.144	42
7G4	2.0	3.8	3.0	2	1	1	5	7.7	2	0.303	0.463	0.141	2	1	0.000	0.141	43
7C4	2.2	3.3	2.7	1	1	1	5	7.3	6	0.221	0.632	0.140	2	1	0.000	0.140	44
90A	3.1	2.1	1.0	2	1	2	4	7.3	6	0.165	0.633	0.105	2	5	0.333	0.140	45
7G2	2.7	3.0	1.7	3	2	2	4	6.7	2	0.334	0.414	0.138	2	1	0.000	0.138	46
7G5	2.6	3.0	3.0	2	1	1	5	7.7	2	0.296	0.461	0.137	2	1	0.000	0.137	47
38B	4.5	2.6	1.0	1	1	1	4	7.0	6	0.217	0.572	0.124	2	2	0.083	0.135	48
29	4.1	3.1	1.1	3	1	2	4	6.5	2	0.332	0.405	0.134	2	1	0.000	0.134	49
82	2.0	3.4	1.8	3	1	1	3	6.3	6	0.270	0.488	0.132	2	1	0.000	0.132	50
7G1	2.6	2.6	2.0	3	2	2	4	6.5	2	0.325	0.404	0.131	2	1	0.000	0.131	51
7C5	2.9	2.0	2.4	1	1	1	5	6.2	10	0.170	0.773	0.131	2	1	0.000	0.131	52
74	3.0	1.9	1.1	2	1	2	5	7.5	6	0.160	0.689	0.110	2	3	0.167	0.129	53
17A	6.2	3.1	1.0	2	1	1	4	6.0	2	0.388	0.332	0.129	2	1	0.000	0.129	54
76I	4.9	3.6	2.5	2	1	1	4	5.4	2	0.414	0.306	0.127	2	1	0.000	0.127	55
44	5.3	4.0	2.0	2	1	2	3	4.9	2	0.436	0.282	0.123	2	1	0.000	0.123	56
05A	3.4	3.4	1.0	4	1	1	3	7.2	2	0.358	0.343	0.123	2	1	0.000	0.123	57
86D	2.4	3.0	2.8	1	1	1	3	6.5	6	0.224	0.501	0.112	2	2	0.083	0.122	58
7C2	2.0	3.3	2.6	1	1	1	5	7.3	2	0.202	0.443	0.090	6	1	0.333	0.119	59
06K	2.9	2.0	1.0	1	1	2	5	7.5	10	0.098	0.883	0.086	2	5	0.333	0.115	60
37	5.0	2.1	1.0	1	1	2	4	6.9	2	0.212	0.424	0.090	2	4	0.250	0.112	61
42E	2.0	1.9	1.0	1	2	2	5	7.9	6	0.100	0.708	0.071	6	4	0.583	0.112	62
86C	3.5	2.6	1.1	2	1	1	3	6.6	6	0.221	0.502	0.111	2	1	0.000	0.111	63
05B	9.7	4.1	1.0	1	1	1	3	4.0	2	0.575	0.192	0.111	2	1	0.000	0.111	64
43A	3.5	2.3	1.0	1	1	2	4	7.3	6	0.147	0.635	0.093	2	3	0.167	0.109	65
36	6.1	2.7	1.0	1	1	1	4	6.3	2	0.309	0.348	0.108	2	1	0.000	0.108	66
55	3.3	2.5	1.0	3	1	1	4	7.1	2	0.253	0.388	0.098	2	2	0.083	0.107	67
06A	2.0	2.2	1.0	1	2	2	5	7.9	6	0.119	0.711	0.085	2	4	0.250	0.106	68
06B	2.0	2.3	1.0	1	2	2	4	8.0	6	0.119	0.667	0.079	2	5	0.333	0.106	69
20A	2.2	2.2	1.1	4	1	1	4	7.5	2	0.234	0.407	0.095	2	2	0.083	0.103	70
06E	2.0	2.2	1.0	1	2	2	4	8.0	6	0.116	0.665	0.077	2	5	0.333	0.103	71
68	9.9	3.0	1.4	1	1	1	3	4.0	2	0.541	0.189	0.102	2	1	0.000	0.102	72

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
42J	3.0	2.6	1.0	1	1	1	4	6.2	10	0.139	0.725	0.101	2	1	0.000	0.101	73
57	5.2	2.8	1.1	3	1	1	3	5.7	2	0.371	0.270	0.100	2	1	0.000	0.100	74
11	3.3	2.3	1.0	1	2	1	4	7.7	2	0.190	0.413	0.079	2	4	0.250	0.098	75
91	3.4	2.8	1.0	1	1	1	4	6.4	6	0.166	0.545	0.090	2	2	0.083	0.098	76
40B	5.2	2.9	1.2	1	1	1	4	6.3	2	0.282	0.347	0.098	2	1	0.000	0.098	77
7F1	2.7	3.8	2.3	1	1	2	4	5.9	2	0.255	0.378	0.096	2	1	0.000	0.096	78
32	1.9	2.2	1.0	1	2	2	4	7.7	6	0.110	0.653	0.072	2	5	0.333	0.096	79
40A	5.7	3.5	1.0	1	1	1	3	5.6	2	0.328	0.267	0.087	2	2	0.083	0.095	80
86B	2.0	2.8	1.1	2	1	1	4	7.8	6	0.154	0.609	0.094	2	1	0.000	0.094	81
90C	3.0	2.0	1.0	1	2	2	4	7.4	2	0.157	0.448	0.070	2	5	0.333	0.094	82
53A	2.6	2.1	1.0	3	1	1	4	7.6	2	0.195	0.409	0.080	2	3	0.167	0.093	83
93A	2.3	2.7	1.0	1	1	1	4	7.7	10	0.107	0.795	0.085	2	2	0.083	0.092	84
57B	4.2	1.3	1.0	1	2	2	4	6.9	2	0.184	0.424	0.078	2	3	0.167	0.091	85
46	9.9	3.1	1.0	3	1	1	2	4.0	2	0.633	0.142	0.090	2	1	0.000	0.090	86
12A	4.0	2.8	1.1	1	1	1	4	7.5	2	0.204	0.402	0.082	2	2	0.083	0.089	87
57A	3.5	2.4	1.1	1	1	1	3	6.8	6	0.157	0.515	0.081	2	2	0.083	0.088	88
05C	4.9	4.0	1.0	1	1	1	3	5.8	2	0.307	0.278	0.085	2	1	0.000	0.085	89
20B	3.2	2.7	1.2	3	1	1	3	6.6	2	0.268	0.315	0.084	2	1	0.000	0.084	90
95	2.0	3.0	1.0	1	1	1	5	8.0	2	0.106	0.476	0.051	10	1	0.667	0.084	91
25	3.5	2.4	1.0	1	1	2	4	7.3	2	0.152	0.442	0.067	2	4	0.250	0.084	92
42C	3.0	2.3	1.3	1	1	2	4	6.4	6	0.141	0.592	0.083	2	1	0.000	0.083	93
14	8.5	3.3	1.1	1	1	1	2	4.7	2	0.469	0.177	0.083	2	1	0.000	0.083	94
7E3	2.7	3.4	1.5	1	1	1	5	7.2	2	0.189	0.437	0.083	2	1	0.000	0.083	95
63	9.7	3.2	1.1	2	1	1	2	4.0	2	0.578	0.143	0.083	2	1	0.000	0.083	96
06F	2.0	1.7	1.0	2	1	2	5	7.8	6	0.088	0.706	0.062	2	5	0.333	0.082	97
93C	2.7	2.9	1.0	1	1	1	4	7.6	6	0.135	0.598	0.081	2	1	0.000	0.081	98
6G1	2.0	1.6	1.0	1	2	2	5	8.0	6	0.083	0.714	0.059	2	5	0.333	0.079	99
1C	2.0	2.3	1.2	2	1	1	5	7.7	2	0.127	0.464	0.059	2	5	0.333	0.078	100
15	9.4	3.3	1.0	1	1	1	2	4.1	2	0.513	0.150	0.077	2	1	0.000	0.077	101
92	2.0	2.0	1.0	1	1	2	4	8.0	10	0.054	0.857	0.046	10	1	0.667	0.077	102
09	2.0	2.3	1.0	2	1	1	4	7.9	6	0.120	0.616	0.074	2	1	0.000	0.074	103
49	9.7	3.2	1.0	1	1	1	2	3.9	2	0.524	0.140	0.073	2	1	0.000	0.073	104
06C	2.0	2.0	1.1	1	2	2	5	8.0	2	0.111	0.524	0.058	2	4	0.250	0.072	105
38A	2.5	2.8	1.2	1	1	1	3	7.5	6	0.130	0.547	0.071	2	1	0.000	0.071	106
54	2.7	2.0	1.0	1	1	2	4	7.0	6	0.089	0.621	0.055	2	4	0.250	0.069	107
77	2.0	1.8	1.0	1	2	2	5	8.0	2	0.095	0.524	0.050	2	5	0.333	0.066	108

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
1B	2.4	2.6	1.3	1	1	1	5	7.2	2	0.121	0.437	0.053	2	4	0.250	0.066	109
23	2.1	2.1	1.0	2	1	2	4	7.6	2	0.113	0.458	0.052	2	4	0.250	0.064	110
6G2	2.0	1.7	1.0	1	2	2	5	7.9	2	0.092	0.520	0.048	2	4	0.250	0.060	111
02B	5.1	4.5	1.3	2	1	1	2	2.8	2	0.412	0.084	0.035	10	1	0.667	0.058	112
76J	2.0	4.1	3.0	1	1	2	2	4.4	2	0.270	0.209	0.056	2	1	0.000	0.056	113
31A	2.4	2.3	1.0	2	1	1	4	7.2	2	0.143	0.392	0.056	2	1	0.000	0.056	114
12B	2.0	3.1	1.0	1	1	1	3	7.7	2	0.113	0.368	0.041	6	1	0.333	0.055	115
86A	2.0	2.5	1.1	2	1	1	4	7.5	2	0.135	0.406	0.055	2	1	0.000	0.055	116
93B	2.4	2.3	1.0	1	1	1	4	7.7	6	0.090	0.603	0.054	2	1	0.000	0.054	117
76K	2.3	4.0	3.0	1	1	1	3	4.0	2	0.278	0.192	0.054	2	1	0.000	0.054	118
42D	2.0	2.1	1.0	1	1	2	5	7.9	6	0.056	0.711	0.040	2	5	0.333	0.053	119
04	2.0	2.7	1.0	1	1	1	4	7.6	6	0.088	0.601	0.053	2	1	0.000	0.053	120
02A	6.2	4.2	1.1	3	1	1	2	3.1	2	0.498	0.102	0.051	2	1	0.000	0.051	121
72	2.1	1.8	1.1	1	1	2	5	7.9	6	0.057	0.712	0.040	2	4	0.250	0.050	122
93D	2.0	2.4	1.1	1	1	1	4	7.9	6	0.075	0.614	0.046	2	2	0.083	0.050	123
22	2.0	2.1	1.0	1	1	2	5	7.8	6	0.059	0.704	0.042	2	3	0.167	0.049	124
7B1	2.0	2.3	1.2	1	1	2	4	7.8	2	0.078	0.467	0.036	6	1	0.333	0.048	125
66C	3.3	2.4	1.2	1	1	1	3	6.3	2	0.153	0.302	0.046	2	1	0.000	0.046	126
1A	2.0	2.2	1.1	1	1	1	5	8.0	2	0.069	0.476	0.033	2	5	0.333	0.044	127
39	2.2	2.1	1.0	1	1	2	5	7.4	2	0.066	0.496	0.033	2	5	0.333	0.044	128
76F	2.0	2.7	1.0	1	1	1	3	6.3	6	0.089	0.490	0.044	2	1	0.000	0.044	129
43D	6.7	2.7	1.4	2	1	1	1	4.2	2	0.407	0.103	0.042	2	1	0.000	0.042	130
33	2.0	2.6	1.1	1	1	2	4	6.9	2	0.090	0.425	0.038	2	2	0.083	0.042	131
45B	3.5	2.9	1.0	2	1	1	2	4.6	2	0.231	0.174	0.040	2	1	0.000	0.040	132
30	2.7	2.1	1.0	1	1	1	4	7.7	2	0.094	0.413	0.039	2	1	0.000	0.039	133
87B	5.8	4.0	1.0	2	1	1	2	3.0	2	0.413	0.093	0.038	2	1	0.000	0.038	134
31B	2.0	2.5	1.0	1	1	1	4	6.6	2	0.078	0.361	0.028	2	5	0.333	0.037	135
53B	2.0	2.7	1.2	1	1	1	4	6.4	2	0.097	0.355	0.034	2	2	0.083	0.037	136
41	2.1	2.1	1.0	1	1	2	4	7.8	2	0.062	0.467	0.029	2	4	0.250	0.036	137
42B	2.5	1.6	1.3	1	1	2	3	5.4	6	0.073	0.494	0.036	2	1	0.000	0.036	138
06J	2.1	1.7	1.0	1	1	2	4	7.2	6	0.043	0.627	0.027	2	4	0.250	0.034	139
43C	2.0	2.7	1.0	1	2	1	3	4.6	2	0.141	0.219	0.031	2	1	0.000	0.031	140
52A	2.0	3.7	1.1	2	1	1	2	4.3	2	0.199	0.155	0.031	2	1	0.000	0.031	141
87A	2.0	3.6	1.1	3	1	1	2	3.5	2	0.249	0.118	0.029	2	1	0.000	0.029	142
83	2.9	3.6	1.2	2	1	1	2	3.4	2	0.248	0.114	0.028	2	1	0.000	0.028	143
7B5	2.0	2.0	1.0	1	1	2	5	8.0	2	0.053	0.524	0.028	2	1	0.000	0.028	144

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
66D	2.0	4.4	3.0	1	1	1	2	3.0	2	0.284	0.095	0.027	2	1	0.000	0.027	145
16	2.1	2.0	1.0	1	1	1	4	6.8	2	0.056	0.372	0.021	2	3	0.167	0.024	146
67	1.9	3.2	1.0	2	1	1	2	4.1	2	0.162	0.148	0.024	2	1	0.000	0.024	147
21	2.0	2.3	1.1	1	1	2	3	5.8	2	0.067	0.321	0.021	2	2	0.083	0.023	148
02C	4.6	4.0	1.0	1	1	1	2	2.6	2	0.292	0.078	0.023	2	1	0.000	0.023	149
66E	2.0	3.7	1.6	1	1	1	2	3.7	2	0.176	0.129	0.023	2	1	0.000	0.023	150
56C	0.0	0.0	1.0	1	1	1	0	0.0	2	-0.158	-0.143	0.023	2	1	0.000	0.023	151
06M	2.0	3.9	1.1	2	1	1	2	3.2	2	0.210	0.105	0.022	2	1	0.000	0.022	152
89	3.1	3.5	1.0	1	1	1	2	3.4	2	0.192	0.112	0.022	2	1	0.000	0.022	153
66F	2.0	5.0	1.0	1	1	1	3	2.0	2	0.211	0.095	0.020	2	1	0.000	0.020	154
76A	2.5	3.4	1.0	1	1	1	2	3.7	2	0.151	0.128	0.019	2	1	0.000	0.019	155
84	2.0	4.4	1.9	1	1	1	2	2.5	2	0.229	0.073	0.017	2	1	0.000	0.017	156
02D	2.7	3.6	1.0	1	1	1	2	2.2	2	0.170	0.056	0.009	10	1	0.667	0.016	157
71	3.1	3.6	1.1	1	1	1	2	2.6	2	0.200	0.077	0.015	2	1	0.000	0.015	158
66A	4.9	3.4	2.0	1	1	1	1	2.9	2	0.331	0.042	0.014	2	1	0.000	0.014	159
42H	2.0	1.4	1.0	1	1	2	5	7.8	2	0.020	0.513	0.010	2	5	0.333	0.014	160
42G	2.0	2.7	1.0	1	1	1	2	3.9	2	0.088	0.139	0.012	2	1	0.000	0.012	161
58B	2.0	3.5	1.2	1	1	1	2	2.6	2	0.142	0.077	0.011	2	1	0.000	0.011	162
02E	2.0	4.0	1.0	2	1	1	2	2.0	2	0.209	0.048	0.010	2	1	0.000	0.010	163
76G	2.0	4.6	3.0	1	1	1	1	2.6	2	0.297	0.028	0.008	2	1	0.000	0.008	164
45A	3.8	4.0	1.2	1	1	1	1	2.6	2	0.262	0.027	0.007	2	1	0.000	0.007	165
65	2.1	3.7	1.4	3	1	1	1	2.5	2	0.274	0.025	0.007	2	1	0.000	0.007	166
78	3.1	3.8	1.2	2	1	1	1	2.5	2	0.269	0.025	0.007	2	1	0.000	0.007	167
60B	3.9	3.9	1.2	1	1	1	1	2.5	2	0.266	0.024	0.006	2	1	0.000	0.006	168
79	4.2	3.0	1.0	1	1	1	1	2.6	2	0.219	0.029	0.006	2	1	0.000	0.006	169
06N	2.0	3.5	1.0	2	1	1	1	2.5	2	0.183	0.023	0.004	2	1	0.000	0.004	170
48	2.6	4.2	1.0	1	1	1	1	2.4	2	0.201	0.020	0.004	2	1	0.000	0.004	171
56A	2.0	4.7	1.0	2	1	1	1	2.3	2	0.249	0.016	0.004	2	1	0.000	0.004	172
51	2.6	3.7	1.0	2	1	1	1	2.3	2	0.228	0.015	0.004	2	1	0.000	0.004	173
56B	2.4	3.5	1.0	1	1	1	1	2.5	2	0.155	0.022	0.003	2	1	0.000	0.003	174
85	2.1	3.8	1.2	1	1	1	1	2.4	2	0.161	0.021	0.003	2	1	0.000	0.003	175
59	3.1	3.5	1.0	1	1	1	1	2.4	2	0.190	0.017	0.003	2	1	0.000	0.003	176
42L	2.0	2.9	1.0	1	1	1	1	2.5	2	0.103	0.022	0.002	2	1	0.000	0.002	177
70	2.0	3.7	1.2	1	1	1	1	2.3	2	0.152	0.014	0.002	2	1	0.000	0.002	178
81	2.3	3.5	1.0	1	1	1	1	2.3	2	0.144	0.013	0.002	2	1	0.000	0.002	179
58C	2.0	4.9	1.0	1	1	1	1	2.1	2	0.207	0.007	0.001	2	1	0.000	0.001	180

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
06H	2.0	3.8	1.0	2	1	1	1	2.1	2	0.201	0.005	0.001	2	1	0.000	0.001	181
58A	2.5	3.5	1.1	1	1	1	1	2.1	2	0.162	0.006	0.001	2	1	0.000	0.001	182
96	2.0	3.3	1.0	1	1	1	1	2.1	2	0.123	0.007	0.001	2	1	0.000	0.001	183
76D	2.0	3.8	1.0	2	1	1	1	2.0	2	0.199	0.002	0.000	10	1	0.667	0.001	184
61	2.2	4.0	1.2	1	1	1	1	2.1	2	0.178	0.003	0.001	2	1	0.000	0.001	185
60A	2.0	3.3	1.1	1	1	1	1	2.1	2	0.130	0.004	0.000	2	1	0.000	0.000	186
80	2.1	3.7	1.0	1	1	1	1	2.0	2	0.147	0.001	0.000	2	1	0.000	0.000	187
69	2.0	3.3	1.0	1	1	1	1	2.0	2	0.123	0.001	0.000	2	1	0.000	0.000	188
76B	2.0	4.0	1.1	1	1	1	1	2.0	2	0.161	0.000	0.000	2	1	0.000	0.000	189
88	2.0	4.0	1.1	5	1	1	1	2.0	2	0.371	0.000	0.000	2	1	0.000	0.000	190
42I	2.0	1.0	1.0	1	1	1	5	8.0	2	0.000	0.476	0.000	2	1	0.000	0.000	191
52B	2.0	4.1	1.2	2	1	1	1	2.0	2	0.228	0.000	0.000	2	1	0.000	0.000	192
64	2.0	3.4	1.0	1	1	1	1	2.0	2	0.125	0.000	0.000	2	1	0.000	0.000	193
42A	2.0	3.2	1.0	1	1	1	1	2.0	2	0.117	0.000	0.000	2	1	0.000	0.000	194
60	2.0	3.9	1.0	1	1	1	1	2.0	2	0.154	0.000	0.000	2	1	0.000	0.000	195
43B	2.0	3.0	1.0	1	1	1	1	2.0	2	0.105	0.000	0.000	2	1	0.000	0.000	196
62	2.0	3.1	1.0	1	1	1	1	2.0	2	0.110	0.000	0.000	2	1	0.000	0.000	197

Appendix B – Ranks (Areas)

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Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
02A	6.2	4.2	1.1	3	1	1	2	3.1	2	0.498	0.102	0.051	2	1	0.000	0.051	121
02B	5.1	4.5	1.3	2	1	1	2	2.8	2	0.412	0.084	0.035	10	1	0.667	0.058	112
02C	4.6	4.0	1.0	1	1	1	2	2.6	2	0.292	0.078	0.023	2	1	0.000	0.023	149
02D	2.7	3.6	1.0	1	1	1	2	2.2	2	0.170	0.056	0.009	10	1	0.667	0.016	157
02E	2.0	4.0	1.0	2	1	1	2	2.0	2	0.209	0.048	0.010	2	1	0.000	0.010	163
03A	2.5	3.3	1.8	3	1	1	4	6.7	10	0.293	0.747	0.219	6	1	0.333	0.292	6
03B	2.0	3.2	1.8	5	1	1	5	7.3	10	0.368	0.821	0.302	6	1	0.333	0.403	1
04	2.0	2.7	1.0	1	1	1	4	7.6	6	0.088	0.601	0.053	2	1	0.000	0.053	120
05A	3.4	3.4	1.0	4	1	1	3	7.2	2	0.358	0.343	0.123	2	1	0.000	0.123	57
05B	9.7	4.1	1.0	1	1	1	3	4.0	2	0.575	0.192	0.111	2	1	0.000	0.111	64
05C	4.9	4.0	1.0	1	1	1	3	5.8	2	0.307	0.278	0.085	2	1	0.000	0.085	89
06A	2.0	2.2	1.0	1	2	2	5	7.9	6	0.119	0.711	0.085	2	4	0.250	0.106	68
06B	2.0	2.3	1.0	1	2	2	4	8.0	6	0.119	0.667	0.079	2	5	0.333	0.106	69
06C	2.0	2.0	1.1	1	2	2	5	8.0	2	0.111	0.524	0.058	2	4	0.250	0.072	105
06D	2.0	1.8	1.0	2	2	2	5	7.9	10	0.147	0.901	0.132	2	5	0.333	0.176	29
06E	2.0	2.2	1.0	1	2	2	4	8.0	6	0.116	0.665	0.077	2	5	0.333	0.103	71
06F	2.0	1.7	1.0	2	1	2	5	7.8	6	0.088	0.706	0.062	2	5	0.333	0.082	97
06H	2.0	3.8	1.0	2	1	1	1	2.1	2	0.201	0.005	0.001	2	1	0.000	0.001	181
06I	2.1	1.9	1.0	2	2	2	5	7.9	10	0.157	0.900	0.141	2	5	0.333	0.188	24
06J	2.1	1.7	1.0	1	1	2	4	7.2	6	0.043	0.627	0.027	2	4	0.250	0.034	139
06K	2.9	2.0	1.0	1	1	2	5	7.5	10	0.098	0.883	0.086	2	5	0.333	0.115	60
06M	2.0	3.9	1.1	2	1	1	2	3.2	2	0.210	0.105	0.022	2	1	0.000	0.022	152
06N	2.0	3.5	1.0	2	1	1	1	2.5	2	0.183	0.023	0.004	2	1	0.000	0.004	170
09	2.0	2.3	1.0	2	1	1	4	7.9	6	0.120	0.616	0.074	2	1	0.000	0.074	103
10	9.6	2.9	1.0	3	2	2	4	5.9	2	0.655	0.376	0.246	2	4	0.250	0.308	5
11	3.3	2.3	1.0	1	2	1	4	7.7	2	0.190	0.413	0.079	2	4	0.250	0.098	75
12A	4.0	2.8	1.1	1	1	1	4	7.5	2	0.204	0.402	0.082	2	2	0.083	0.089	87
12B	2.0	3.1	1.0	1	1	1	3	7.7	2	0.113	0.368	0.041	6	1	0.333	0.055	115
13A	8.4	4.1	1.4	3	1	1	3	5.4	2	0.625	0.259	0.162	6	1	0.333	0.216	18
13B	4.8	3.5	1.1	3	1	1	3	6.6	2	0.390	0.315	0.123	6	1	0.333	0.164	33
14	8.5	3.3	1.1	1	1	1	2	4.7	2	0.469	0.177	0.083	2	1	0.000	0.083	94
15	9.4	3.3	1.0	1	1	1	2	4.1	2	0.513	0.150	0.077	2	1	0.000	0.077	101
16	2.1	2.0	1.0	1	1	1	4	6.8	2	0.056	0.372	0.021	2	3	0.167	0.024	146
17A	6.2	3.1	1.0	2	1	1	4	6.0	2	0.388	0.332	0.129	2	1	0.000	0.129	54
17B	7.5	4.1	1.3	2	1	1	3	5.2	2	0.523	0.247	0.129	6	1	0.333	0.172	31
18	6.3	3.6	1.4	3	1	1	4	6.1	6	0.491	0.529	0.260	2	1	0.000	0.260	8

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
19	5.8	3.2	1.2	2	1	1	3	6.2	6	0.373	0.484	0.181	2	1	0.000	0.181	27
1A	2.0	2.2	1.1	1	1	1	5	8.0	2	0.069	0.476	0.033	2	5	0.333	0.044	127
1B	2.4	2.6	1.3	1	1	1	5	7.2	2	0.121	0.437	0.053	2	4	0.250	0.066	109
1C	2.0	2.3	1.2	2	1	1	5	7.7	2	0.127	0.464	0.059	2	5	0.333	0.078	100
20A	2.2	2.2	1.1	4	1	1	4	7.5	2	0.234	0.407	0.095	2	2	0.083	0.103	70
20B	3.2	2.7	1.2	3	1	1	3	6.6	2	0.268	0.315	0.084	2	1	0.000	0.084	90
21	2.0	2.3	1.1	1	1	2	3	5.8	2	0.067	0.321	0.021	2	2	0.083	0.023	148
22	2.0	2.1	1.0	1	1	2	5	7.8	6	0.059	0.704	0.042	2	3	0.167	0.049	124
23	2.1	2.1	1.0	2	1	2	4	7.6	2	0.113	0.458	0.052	2	4	0.250	0.064	110
24A	5.1	3.4	1.6	1	1	1	4	6.2	2	0.321	0.343	0.110	6	1	0.333	0.147	41
24B	5.6	3.3	1.2	2	1	1	4	6.6	2	0.371	0.362	0.134	6	1	0.333	0.179	28
25	3.5	2.4	1.0	1	1	2	4	7.3	2	0.152	0.442	0.067	2	4	0.250	0.084	92
26A	6.9	3.0	1.2	3	1	1	4	5.5	2	0.486	0.309	0.150	6	2	0.417	0.213	20
26B	6.0	2.9	1.2	1	1	1	4	6.4	2	0.327	0.352	0.115	6	1	0.333	0.154	37
27	6.7	3.4	1.3	2	1	1	4	5.7	6	0.440	0.509	0.224	2	1	0.000	0.224	13
28	5.7	3.0	1.1	3	1	1	4	6.7	2	0.407	0.367	0.149	2	2	0.083	0.162	35
29	4.1	3.1	1.1	3	1	2	4	6.5	2	0.332	0.405	0.134	2	1	0.000	0.134	49
30	2.7	2.1	1.0	1	1	1	4	7.7	2	0.094	0.413	0.039	2	1	0.000	0.039	133
31A	2.4	2.3	1.0	2	1	1	4	7.2	2	0.143	0.392	0.056	2	1	0.000	0.056	114
31B	2.0	2.5	1.0	1	1	1	4	6.6	2	0.078	0.361	0.028	2	5	0.333	0.037	135
32	1.9	2.2	1.0	1	2	2	4	7.7	6	0.110	0.653	0.072	2	5	0.333	0.096	79
33	2.0	2.6	1.1	1	1	2	4	6.9	2	0.090	0.425	0.038	2	2	0.083	0.042	131
34	3.7	2.4	1.0	1	1	2	5	7.6	6	0.165	0.694	0.114	2	5	0.333	0.152	38
35	5.9	2.4	1.0	2	1	1	4	6.9	6	0.332	0.568	0.189	2	3	0.167	0.220	15
36	6.1	2.7	1.0	1	1	1	4	6.3	2	0.309	0.348	0.108	2	1	0.000	0.108	66
37	5.0	2.1	1.0	1	1	2	4	6.9	2	0.212	0.424	0.090	2	4	0.250	0.112	61
38A	2.5	2.8	1.2	1	1	1	3	7.5	6	0.130	0.547	0.071	2	1	0.000	0.071	106
38B	4.5	2.6	1.0	1	1	1	4	7.0	6	0.217	0.572	0.124	2	2	0.083	0.135	48
39	2.2	2.1	1.0	1	1	2	5	7.4	2	0.066	0.496	0.033	2	5	0.333	0.044	128
40A	5.7	3.5	1.0	1	1	1	3	5.6	2	0.328	0.267	0.087	2	2	0.083	0.095	80
40B	5.2	2.9	1.2	1	1	1	4	6.3	2	0.282	0.347	0.098	2	1	0.000	0.098	77
41	2.1	2.1	1.0	1	1	2	4	7.8	2	0.062	0.467	0.029	2	4	0.250	0.036	137
42A	2.0	3.2	1.0	1	1	1	1	2.0	2	0.117	0.000	0.000	2	1	0.000	0.000	194
42B	2.5	1.6	1.3	1	1	2	3	5.4	6	0.073	0.494	0.036	2	1	0.000	0.036	138
42C	3.0	2.3	1.3	1	1	2	4	6.4	6	0.141	0.592	0.083	2	1	0.000	0.083	93
42D	2.0	2.1	1.0	1	1	2	5	7.9	6	0.056	0.711	0.040	2	5	0.333	0.053	119

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
42E	2.0	1.9	1.0	1	2	2	5	7.9	6	0.100	0.708	0.071	6	4	0.583	0.112	62
42F	2.2	3.9	2.4	1	1	1	4	6.5	6	0.236	0.547	0.129	6	1	0.333	0.172	32
42G	2.0	2.7	1.0	1	1	1	2	3.9	2	0.088	0.139	0.012	2	1	0.000	0.012	161
42H	2.0	1.4	1.0	1	1	2	5	7.8	2	0.020	0.513	0.010	2	5	0.333	0.014	160
42I	2.0	1.0	1.0	1	1	1	5	8.0	2	0.000	0.476	0.000	2	1	0.000	0.000	191
42J	3.0	2.6	1.0	1	1	1	4	6.2	10	0.139	0.725	0.101	2	1	0.000	0.101	73
42K	5.3	3.9	1.4	1	1	2	3	4.7	10	0.351	0.651	0.229	2	1	0.000	0.229	12
42L	2.0	2.9	1.0	1	1	1	1	2.5	2	0.103	0.022	0.002	2	1	0.000	0.002	177
43A	3.5	2.3	1.0	1	1	2	4	7.3	6	0.147	0.635	0.093	2	3	0.167	0.109	65
43B	2.0	3.0	1.0	1	1	1	1	2.0	2	0.105	0.000	0.000	2	1	0.000	0.000	196
43C	2.0	2.7	1.0	1	2	1	3	4.6	2	0.141	0.219	0.031	2	1	0.000	0.031	140
43D	6.7	2.7	1.4	2	1	1	1	4.2	2	0.407	0.103	0.042	2	1	0.000	0.042	130
44	5.3	4.0	2.0	2	1	2	3	4.9	2	0.436	0.282	0.123	2	1	0.000	0.123	56
45A	3.8	4.0	1.2	1	1	1	1	2.6	2	0.262	0.027	0.007	2	1	0.000	0.007	165
45B	3.5	2.9	1.0	2	1	1	2	4.6	2	0.231	0.174	0.040	2	1	0.000	0.040	132
46	9.9	3.1	1.0	3	1	1	2	4.0	2	0.633	0.142	0.090	2	1	0.000	0.090	86
47	9.9	2.1	1.0	1	1	1	3	4.0	10	0.472	0.570	0.269	2	1	0.000	0.269	7
48	2.6	4.2	1.0	1	1	1	1	2.4	2	0.201	0.020	0.004	2	1	0.000	0.004	171
49	9.7	3.2	1.0	1	1	1	2	3.9	2	0.524	0.140	0.073	2	1	0.000	0.073	104
51	2.6	3.7	1.0	2	1	1	1	2.3	2	0.228	0.015	0.004	2	1	0.000	0.004	173
52A	2.0	3.7	1.1	2	1	1	2	4.3	2	0.199	0.155	0.031	2	1	0.000	0.031	141
52B	2.0	4.1	1.2	2	1	1	1	2.0	2	0.228	0.000	0.000	2	1	0.000	0.000	192
53A	2.6	2.1	1.0	3	1	1	4	7.6	2	0.195	0.409	0.080	2	3	0.167	0.093	83
53B	2.0	2.7	1.2	1	1	1	4	6.4	2	0.097	0.355	0.034	2	2	0.083	0.037	136
54	2.7	2.0	1.0	1	1	2	4	7.0	6	0.089	0.621	0.055	2	4	0.250	0.069	107
55	3.3	2.5	1.0	3	1	1	4	7.1	2	0.253	0.388	0.098	2	2	0.083	0.107	67
56A	2.0	4.7	1.0	2	1	1	1	2.3	2	0.249	0.016	0.004	2	1	0.000	0.004	172
56B	2.4	3.5	1.0	1	1	1	1	2.5	2	0.155	0.022	0.003	2	1	0.000	0.003	174
56C	0.0	0.0	1.0	1	1	1	0	0.0	2	-0.158	-0.143	0.023	2	1	0.000	0.023	151
57	5.2	2.8	1.1	3	1	1	3	5.7	2	0.371	0.270	0.100	2	1	0.000	0.100	74
57A	3.5	2.4	1.1	1	1	1	3	6.8	6	0.157	0.515	0.081	2	2	0.083	0.088	88
57B	4.2	1.3	1.0	1	2	2	4	6.9	2	0.184	0.424	0.078	2	3	0.167	0.091	85
58A	2.5	3.5	1.1	1	1	1	1	2.1	2	0.162	0.006	0.001	2	1	0.000	0.001	182
58B	2.0	3.5	1.2	1	1	1	2	2.6	2	0.142	0.077	0.011	2	1	0.000	0.011	162
58C	2.0	4.9	1.0	1	1	1	1	2.1	2	0.207	0.007	0.001	2	1	0.000	0.001	180
59	3.1	3.5	1.0	1	1	1	1	2.4	2	0.190	0.017	0.003	2	1	0.000	0.003	176

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
60	2.0	3.9	1.0	1	1	1	1	2.0	2	0.154	0.000	0.000	2	1	0.000	0.000	195
60A	2.0	3.3	1.1	1	1	1	1	2.1	2	0.130	0.004	0.000	2	1	0.000	0.000	186
60B	3.9	3.9	1.2	1	1	1	1	2.5	2	0.266	0.024	0.006	2	1	0.000	0.006	168
61	2.2	4.0	1.2	1	1	1	1	2.1	2	0.178	0.003	0.001	2	1	0.000	0.001	185
62	2.0	3.1	1.0	1	1	1	1	2.0	2	0.110	0.000	0.000	2	1	0.000	0.000	197
63	9.7	3.2	1.1	2	1	1	2	4.0	2	0.578	0.143	0.083	2	1	0.000	0.083	96
64	2.0	3.4	1.0	1	1	1	1	2.0	2	0.125	0.000	0.000	2	1	0.000	0.000	193
65	2.1	3.7	1.4	3	1	1	1	2.5	2	0.274	0.025	0.007	2	1	0.000	0.007	166
66A	4.9	3.4	2.0	1	1	1	1	2.9	2	0.331	0.042	0.014	2	1	0.000	0.014	159
66B	3.8	2.3	1.7	2	1	1	4	7.1	6	0.251	0.575	0.144	2	1	0.000	0.144	42
66C	3.3	2.4	1.2	1	1	1	3	6.3	2	0.153	0.302	0.046	2	1	0.000	0.046	126
66D	2.0	4.4	3.0	1	1	1	2	3.0	2	0.284	0.095	0.027	2	1	0.000	0.027	145
66E	2.0	3.7	1.6	1	1	1	2	3.7	2	0.176	0.129	0.023	2	1	0.000	0.023	150
66F	2.0	5.0	1.0	1	1	1	3	2.0	2	0.211	0.095	0.020	2	1	0.000	0.020	154
67	1.9	3.2	1.0	2	1	1	2	4.1	2	0.162	0.148	0.024	2	1	0.000	0.024	147
68	9.9	3.0	1.4	1	1	1	3	4.0	2	0.541	0.189	0.102	2	1	0.000	0.102	72
69	2.0	3.3	1.0	1	1	1	1	2.0	2	0.123	0.001	0.000	2	1	0.000	0.000	188
6G1	2.0	1.6	1.0	1	2	2	5	8.0	6	0.083	0.714	0.059	2	5	0.333	0.079	99
6G2	2.0	1.7	1.0	1	2	2	5	7.9	2	0.092	0.520	0.048	2	4	0.250	0.060	111
70	2.0	3.7	1.2	1	1	1	1	2.3	2	0.152	0.014	0.002	2	1	0.000	0.002	178
71	3.1	3.6	1.1	1	1	1	2	2.6	2	0.200	0.077	0.015	2	1	0.000	0.015	158
72	2.1	1.8	1.1	1	1	2	5	7.9	6	0.057	0.712	0.040	2	4	0.250	0.050	122
74	3.0	1.9	1.1	2	1	2	5	7.5	6	0.160	0.689	0.110	2	3	0.167	0.129	53
76A	2.5	3.4	1.0	1	1	1	2	3.7	2	0.151	0.128	0.019	2	1	0.000	0.019	155
76B	2.0	4.0	1.1	1	1	1	1	2.0	2	0.161	0.000	0.000	2	1	0.000	0.000	189
76C	4.1	3.0	1.2	1	1	1	4	6.3	10	0.225	0.729	0.164	2	1	0.000	0.164	34
76D	2.0	3.8	1.0	2	1	1	1	2.0	2	0.199	0.002	0.000	10	1	0.667	0.001	184
76F	2.0	2.7	1.0	1	1	1	3	6.3	6	0.089	0.490	0.044	2	1	0.000	0.044	129
76G	2.0	4.6	3.0	1	1	1	1	2.6	2	0.297	0.028	0.008	2	1	0.000	0.008	164
76H	3.4	2.9	2.5	1	1	2	3	6.1	10	0.253	0.717	0.181	2	1	0.000	0.181	25
76I	4.9	3.6	2.5	2	1	1	4	5.4	2	0.414	0.306	0.127	2	1	0.000	0.127	55
76J	2.0	4.1	3.0	1	1	2	2	4.4	2	0.270	0.209	0.056	2	1	0.000	0.056	113
76K	2.3	4.0	3.0	1	1	1	3	4.0	2	0.278	0.192	0.054	2	1	0.000	0.054	118
77	2.0	1.8	1.0	1	2	2	5	8.0	2	0.095	0.524	0.050	2	5	0.333	0.066	108
78	3.1	3.8	1.2	2	1	1	1	2.5	2	0.269	0.025	0.007	2	1	0.000	0.007	167
79	4.2	3.0	1.0	1	1	1	1	2.6	2	0.219	0.029	0.006	2	1	0.000	0.006	169

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
7A1	5.5	2.9	2.8	4	2	2	4	6.2	2	0.592	0.392	0.232	6	1	0.333	0.310	4
7A2	5.9	3.2	1.0	3	2	1	5	6.0	2	0.475	0.381	0.181	2	1	0.000	0.181	26
7B1	2.0	2.3	1.2	1	1	2	4	7.8	2	0.078	0.467	0.036	6	1	0.333	0.048	125
7B2	2.2	3.5	2.6	2	2	2	4	7.9	6	0.332	0.660	0.219	2	1	0.000	0.219	17
7B3	3.4	3.1	2.7	1	1	1	5	6.3	6	0.273	0.585	0.160	2	1	0.000	0.160	36
7B4	3.7	3.2	2.8	3	1	1	5	6.9	6	0.406	0.614	0.249	2	1	0.000	0.249	9
7B5	2.0	2.0	1.0	1	1	2	5	8.0	2	0.053	0.524	0.028	2	1	0.000	0.028	144
7C1	5.0	3.0	1.4	2	1	1	5	6.4	10	0.339	0.781	0.265	6	1	0.333	0.353	2
7C2	2.0	3.3	2.6	1	1	1	5	7.3	2	0.202	0.443	0.090	6	1	0.333	0.119	59
7C3	3.3	3.2	1.9	3	1	1	5	6.7	6	0.335	0.604	0.202	2	1	0.000	0.202	21
7C4	2.2	3.3	2.7	1	1	1	5	7.3	6	0.221	0.632	0.140	2	1	0.000	0.140	44
7C5	2.9	2.0	2.4	1	1	1	5	6.2	10	0.170	0.773	0.131	2	1	0.000	0.131	52
7D1	2.0	3.3	2.9	2	1	1	5	6.6	10	0.271	0.793	0.215	2	1	0.000	0.215	19
7D2	2.0	3.4	2.8	3	1	1	5	6.5	10	0.325	0.787	0.256	6	1	0.333	0.341	3
7D3	2.0	3.0	2.4	3	1	1	5	6.9	10	0.287	0.804	0.231	2	1	0.000	0.231	10
7E1	2.0	3.6	2.3	2	1	2	5	6.4	6	0.260	0.640	0.166	6	1	0.333	0.222	14
7E2	2.0	3.9	3.0	2	2	2	5	8.0	2	0.361	0.524	0.189	2	1	0.000	0.189	23
7E3	2.7	3.4	1.5	1	1	1	5	7.2	2	0.189	0.437	0.083	2	1	0.000	0.083	95
7E4	2.0	2.6	2.8	3	1	2	5	8.0	2	0.280	0.522	0.146	6	1	0.333	0.195	22
7F1	2.7	3.8	2.3	1	1	2	4	5.9	2	0.255	0.378	0.096	2	1	0.000	0.096	78
7F2	2.0	3.4	2.5	1	1	2	5	6.4	6	0.206	0.637	0.132	6	1	0.333	0.175	30
7F3	3.8	4.0	3.0	1	1	1	5	6.9	6	0.356	0.615	0.219	2	1	0.000	0.219	16
7F4	2.2	3.3	2.4	2	2	2	5	7.1	2	0.311	0.481	0.150	2	1	0.000	0.150	39
7G1	2.6	2.6	2.0	3	2	2	4	6.5	2	0.325	0.404	0.131	2	1	0.000	0.131	51
7G2	2.7	3.0	1.7	3	2	2	4	6.7	2	0.334	0.414	0.138	2	1	0.000	0.138	46
7G3	2.0	4.1	3.0	2	1	1	5	7.6	2	0.321	0.458	0.147	2	1	0.000	0.147	40
7G4	2.0	3.8	3.0	2	1	1	5	7.7	2	0.303	0.463	0.141	2	1	0.000	0.141	43
7G5	2.6	3.0	3.0	2	1	1	5	7.7	2	0.296	0.461	0.137	2	1	0.000	0.137	47
80	2.1	3.7	1.0	1	1	1	1	2.0	2	0.147	0.001	0.000	2	1	0.000	0.000	187
81	2.3	3.5	1.0	1	1	1	1	2.3	2	0.144	0.013	0.002	2	1	0.000	0.002	179
82	2.0	3.4	1.8	3	1	1	3	6.3	6	0.270	0.488	0.132	2	1	0.000	0.132	50
83	2.9	3.6	1.2	2	1	1	2	3.4	2	0.248	0.114	0.028	2	1	0.000	0.028	143
84	2.0	4.4	1.9	1	1	1	2	2.5	2	0.229	0.073	0.017	2	1	0.000	0.017	156
85	2.1	3.8	1.2	1	1	1	1	2.4	2	0.161	0.021	0.003	2	1	0.000	0.003	175
86A	2.0	2.5	1.1	2	1	1	4	7.5	2	0.135	0.406	0.055	2	1	0.000	0.055	116
86B	2.0	2.8	1.1	2	1	1	4	7.8	6	0.154	0.609	0.094	2	1	0.000	0.094	81

Distribution Main
Risk of Failure Ranking

Area	Consequence of Failure (COF)					Likelihood of Failure (LOF)				Risk of Failure (ROF) (0-1)			Safety Factors			Total Score	Overall Rank
	Doubly Weighted	*Normally Weighted*				*Normally Weighted*		*Doubly Weighted*		(COF x LOF)			*Doubly Weighted*	*Normally Weighted*	*Sum 15*		
	Pipe Damage (2-10)	Pipe Diameter (1-5)	Customer Type (1-3)	Crossings (1-5)	Valve Spacing (1-2)	Main Location (1-2)	Pipe Age (1-5)	Pipe Material (2-10)	Failure Rate (2-10)	COF Score	LOF Score	ROF Score	Hydrant Coverage (2-10)	Wharf Hydrants (1-5)	Safety Score		
86C	3.5	2.6	1.1	2	1	1	3	6.6	6	0.221	0.502	0.111	2	1	0.000	0.111	63
86D	2.4	3.0	2.8	1	1	1	3	6.5	6	0.224	0.501	0.112	2	2	0.083	0.122	58
87A	2.0	3.6	1.1	3	1	1	2	3.5	2	0.249	0.118	0.029	2	1	0.000	0.029	142
87B	5.8	4.0	1.0	2	1	1	2	3.0	2	0.413	0.093	0.038	2	1	0.000	0.038	134
88	2.0	4.0	1.1	5	1	1	1	2.0	2	0.371	0.000	0.000	2	1	0.000	0.000	190
89	3.1	3.5	1.0	1	1	1	2	3.4	2	0.192	0.112	0.022	2	1	0.000	0.022	153
90A	3.1	2.1	1.0	2	1	2	4	7.3	6	0.165	0.633	0.105	2	5	0.333	0.140	45
90B	5.1	2.0	1.0	1	1	2	4	7.9	10	0.215	0.854	0.184	2	4	0.250	0.230	11
90C	3.0	2.0	1.0	1	2	2	4	7.4	2	0.157	0.448	0.070	2	5	0.333	0.094	82
91	3.4	2.8	1.0	1	1	1	4	6.4	6	0.166	0.545	0.090	2	2	0.083	0.098	76
92	2.0	2.0	1.0	1	1	2	4	8.0	10	0.054	0.857	0.046	10	1	0.667	0.077	102
93A	2.3	2.7	1.0	1	1	1	4	7.7	10	0.107	0.795	0.085	2	2	0.083	0.092	84
93B	2.4	2.3	1.0	1	1	1	4	7.7	6	0.090	0.603	0.054	2	1	0.000	0.054	117
93C	2.7	2.9	1.0	1	1	1	4	7.6	6	0.135	0.598	0.081	2	1	0.000	0.081	98
93D	2.0	2.4	1.1	1	1	1	4	7.9	6	0.075	0.614	0.046	2	2	0.083	0.050	123
95	2.0	3.0	1.0	1	1	1	5	8.0	2	0.106	0.476	0.051	10	1	0.667	0.084	91
96	2.0	3.3	1.0	1	1	1	1	2.1	2	0.123	0.007	0.001	2	1	0.000	0.001	183

Appendix C – Pipe Material

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Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
02A	48,505	ACP	699	1.4	4	0.1	1.6
		DIP	22,265	45.9	1	0.5	
		PVC	25,541	52.5	2	1.0	
02B	26,917	DIP	16,499	61.3	1	0.6	1.4
		PVC	10,418	38.7	2	0.8	
02C	24,972	CIP	13	0.1	3	0.0	1.3
		DIP	16,921	67.8	1	0.7	
		PVC	8,038	32.2	2	0.6	
02D	31,006	CIP	17	0.1	3	0.0	1.1
		DIP	28,416	91.6	1	0.9	
		PVC	2,573	8.3	2	0.2	
02E	27,198	DIP	27,198	100.0	1	1.0	1.0
03A	33,039	ACP	25,026	75.7	4	3.0	3.3
		CIP	34	0.1	3	0.0	
		DIP	5,844	17.7	1	0.2	
		PVC	2,135	6.5	2	0.1	
03B	28,104	ACP	24,530	87.3	4	3.5	3.6
		DIP	3,458	12.3	1	0.1	
		PVC	75	0.3	2	0.0	
		UNK	41	0.1	4	0.0	
04	49,199	ACP	46,021	93.5	4	3.7	3.8
		DIP	3,115	6.3	1	0.1	
		PVC	28	0.1	2	0.0	
		UNK	35	0.1	4	0.0	
05A	43,409	ACP	34,763	80.1	4	3.2	3.6
		CIP	286	0.7	3	0.0	
		DIP	503	1.2	1	0.0	
		PVC	7,857	18.1	2	0.4	
05B	41,075	ACP	720	1.8	4	0.1	2.0
		DIP	570	1.4	1	0.0	
		PVC	39,785	96.8	2	1.9	
05C	45,153	ACP	23,274	51.5	4	2.1	2.9
		DIP	5,573	12.3	1	0.1	
		PVC	16,129	35.7	2	0.7	
		UNK	177	0.4	4	0.0	
06A	25,683	ACP	25,381	98.8	4	4.0	4.0
		DIP	277	1.1	1	0.0	
		PVC	26	0.1	2	0.0	
06B	19,778	ACP	19,778	100.0	4	4.0	4.0
06C	19,701	ACP	19,394	98.4	4	3.9	4.0
		DIP	0	0.0	1	0.0	
		UNK	307	1.6	4	0.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
06D	24,661	ACP	24,307	98.6	4	3.9	4.0
		CIP	25	0.1	3	0.0	
		DIP	329	1.3	1	0.0	
06E	21,175	ACP	21,003	99.2	4	4.0	4.0
		CIP	30	0.1	3	0.0	
		DIP	142	0.7	1	0.0	
06F	13,979	ACP	13,569	97.1	4	3.9	3.9
		DIP	410	2.9	1	0.0	
06H	24,480	ACP	457	1.9	4	0.1	1.1
		DIP	24,022	98.1	1	1.0	
06I	15,236	ACP	14,920	97.9	4	3.9	3.9
		DIP	192	1.3	1	0.0	
		PVC	125	0.8	2	0.0	
06J	12,678	ACP	10,884	85.8	4	3.4	3.6
		DIP	1,664	13.1	1	0.1	
		PVC	130	1.0	2	0.0	
06K	19,823	ACP	17,581	88.7	4	3.5	3.8
		PVC	2,242	11.3	2	0.2	
06M	13,909	ACP	2,774	19.9	4	0.8	1.6
		DIP	11,135	80.1	1	0.8	
06N	13,412	ACP	1,091	8.1	4	0.3	1.2
		DIP	12,321	91.9	1	0.9	
09	11,913	ACP	11,775	98.8	4	4.0	4.0
		DIP	138	1.2	1	0.0	
10	14,323	ACP	258	1.8	4	0.1	2.9
		DIP	503	3.5	1	0.0	
		MLS	13,561	94.7	3	2.8	
11	3,124	ACP	2,620	83.8	4	3.4	3.8
		MLS	505	16.2	3	0.5	
12A	48,674	ACP	36,330	74.6	4	3.0	3.7
		DIP	220	0.5	1	0.0	
		MLS	11,536	23.7	3	0.7	
		PVC	588	1.2	2	0.0	
12B	40,026	ACP	37,942	94.8	4	3.8	3.9
		CIP	203	0.5	3	0.0	
		DIP	1,730	4.3	1	0.0	
		MLS	152	0.4	3	0.0	
13A	38,145	ACP	5,185	13.6	4	0.5	2.7
		DIP	2,547	6.7	1	0.1	
		MLS	19,561	51.3	3	1.5	
		PVC	10,853	28.5	2	0.6	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
13B	35,161	ACP	21,208	60.3	4	2.4	3.3
		CIP	517	1.5	3	0.0	
		DIP	1,270	3.6	1	0.0	
		MLS	4,437	12.6	3	0.4	
		PVC	7,730	22.0	2	0.4	
14	14,712	ACP	2,639	17.9	4	0.7	2.4
		DIP	56	0.4	1	0.0	
		PVC	12,017	81.7	2	1.6	
15	5,792	CIP	410	7.1	3	0.2	2.1
		PVC	5,382	92.9	2	1.9	
16	6,825	ACP	5,460	80.0	4	3.2	3.4
		DIP	1,317	19.3	1	0.2	
		PVC	48	0.7	2	0.0	
17A	41,281	ACP	16,320	39.5	4	1.6	3.0
		DIP	3,110	7.5	1	0.1	
		MLS	11,110	26.9	3	0.8	
		PVC	10,723	26.0	2	0.5	
		UNK	18	0.0	4	0.0	
17B	45,467	ACP	11,131	24.5	4	1.0	2.6
		CIP	722	1.6	3	0.0	
		DIP	1,779	3.9	1	0.0	
		MLS	6,585	14.5	3	0.4	
		PVC	24,931	54.8	2	1.1	
		UNK	3	0.0	4	0.0	
18	53,758	ACP	22,321	41.5	4	1.7	3.0
		DIP	2,588	4.8	1	0.0	
		MLS	14,380	26.7	3	0.8	
		PVC	14,470	26.9	2	0.5	
19	47,512	ACP	21,735	45.7	4	1.8	3.1
		DIP	3,251	6.8	1	0.1	
		MLS	11,138	23.4	3	0.7	
		PVC	11,386	24.0	2	0.5	
		UNK	2	0.0	4	0.0	
1A	9,772	ACP	9,647	98.7	4	3.9	4.0
		UNK	125	1.3	4	0.1	
1B	6,385	ACP	5,394	84.5	4	3.4	3.6
		DIP	618	9.7	1	0.1	
		PVC	359	5.6	2	0.1	
1C	10,473	ACP	10,001	95.5	4	3.8	3.9
		DIP	463	4.4	1	0.0	
		UNK	8	0.1	4	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
20A	34,434	ACP	31,605	91.8	4	3.7	3.8
		DIP	2,037	5.9	1	0.1	
		PVC	737	2.1	2	0.0	
20B	48,476	ACP	33,670	69.5	4	2.8	3.3
		CIP	264	0.5	3	0.0	
		DIP	4,404	9.1	1	0.1	
		MLS	4,942	10.2	3	0.3	
		PVC	2,914	6.0	2	0.1	
21	7,384	ACP	4,675	63.3	4	2.5	2.9
		DIP	2,530	34.3	1	0.3	
22	3,619	ACP	3,500	96.7	4	3.9	3.9
		PVC	38	1.1	2	0.0	
23	67,439	ACP	63,200	93.7	4	3.7	3.8
		DIP	2,651	3.9	1	0.0	
		PVC	733	1.1	2	0.0	
		UNK	26	0.0	4	0.0	
24A	49,259	ACP	24,356	49.4	4	2.0	3.1
		CIP	602	1.2	3	0.0	
		DIP	5,042	10.2	1	0.1	
		MLS	9,954	20.2	3	0.6	
		PVC	9,264	18.8	2	0.4	
		UNK	41	0.1	4	0.0	
24B	52,564	ACP	28,237	53.7	4	2.1	3.3
		CIP	60	0.1	3	0.0	
		DIP	353	0.7	1	0.0	
		MLS	11,726	22.3	3	0.7	
		PVC	11,967	22.8	2	0.5	
		UNK	220	0.4	4	0.0	
25	7,248	ACP	5,862	80.9	4	3.2	3.6
		MLS	203	2.8	3	0.1	
		PVC	1,184	16.3	2	0.3	
26A	29,619	ACP	6,352	21.4	4	0.9	2.7
		DIP	4,947	16.7	1	0.2	
		MLS	14,317	48.3	3	1.5	
		PVC	4,003	13.5	2	0.3	
26B	41,271	ACP	18,261	44.2	4	1.8	3.2
		DIP	2,052	5.0	1	0.0	
		MLS	15,036	36.4	3	1.1	
		PVC	5,821	14.1	2	0.3	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
27	31,842	ACP	8,386	26.3	4	1.1	2.8
		DIP	4,841	15.2	1	0.2	
		MLS	14,902	46.8	3	1.4	
		PVC	3,612	11.3	2	0.2	
		UNK	102	0.3	4	0.0	
28	52,221	ACP	28,010	53.6	4	2.1	3.3
		DIP	254	0.5	1	0.0	
		MLS	14,665	28.1	3	0.8	
		PVC	9,292	17.8	2	0.4	
29	51,228	ACP	30,373	59.3	4	2.4	3.3
		CIP	74	0.1	3	0.0	
		DIP	7,366	14.4	1	0.1	
		MLS	10,853	21.2	3	0.6	
		PVC	2,492	4.9	2	0.1	
30	3,313	ACP	3,039	91.7	4	3.7	3.8
		PVC	274	8.3	2	0.2	
31A	26,653	ACP	22,801	85.5	4	3.4	3.6
		DIP	2,250	8.4	1	0.1	
		PVC	1,443	5.4	2	0.1	
31B	1,036	ACP	790	76.3	4	3.1	3.3
		DIP	246	23.7	1	0.2	
32	10,572	ACP	10,188	96.4	4	3.9	3.9
		PVC	7	0.1	2	0.0	
33	18,435	ACP	15,178	82.3	4	3.3	3.5
		DIP	3,028	16.4	1	0.2	
34	5,806	ACP	4,545	78.3	4	3.1	3.8
		MLS	1,260	21.7	3	0.7	
35	32,441	ACP	16,244	50.1	4	2.0	3.5
		DIP	422	1.3	1	0.0	
		MLS	15,500	47.8	3	1.4	
		PVC	276	0.9	2	0.0	
36	45,772	ACP	19,396	42.4	4	1.7	3.2
		DIP	2,830	6.2	1	0.1	
		MLS	16,898	36.9	3	1.1	
		PVC	6,601	14.4	2	0.3	
37	3,471	ACP	1,999	57.6	4	2.3	3.5
		DIP	15	0.4	1	0.0	
		MLS	1,321	38.1	3	1.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
38A	25,036	ACP	21,837	87.2	4	3.5	3.7
		CIP	388	1.5	3	0.0	
		DIP	1,057	4.2	1	0.0	
		MLS	597	2.4	3	0.1	
		PVC	1,047	4.2	2	0.1	
		UNK	48	0.2	4	0.0	
38B	46,403	ACP	29,899	64.4	4	2.6	3.5
		CIP	4	0.0	3	0.0	
		DIP	1,618	3.5	1	0.0	
		MLS	12,148	26.2	3	0.8	
		PVC	2,561	5.5	2	0.1	
		UNK	33	0.1	4	0.0	
39	11,720	ACP	10,105	86.2	4	3.4	3.7
		CIP	679	5.8	3	0.2	
		DIP	125	1.1	1	0.0	
		MLS	31	0.3	3	0.0	
		PVC	351	3.0	2	0.1	
		UNK	30	0.3	4	0.0	
40A	30,817	ACP	12,872	41.8	4	1.7	2.8
		DIP	3,763	12.2	1	0.1	
		MLS	2,694	8.7	3	0.3	
		PVC	11,489	37.3	2	0.7	
40B	31,294	ACP	15,726	50.3	4	2.0	3.1
		DIP	2,855	9.1	1	0.1	
		MLS	7,738	24.1	3	0.7	
		PVC	4,975	15.9	2	0.3	
41	17,423	ACP	16,807	96.5	4	3.9	3.9
		DIP	38	0.2	1	0.0	
		MLS	198	1.1	3	0.0	
		PVC	46	0.3	2	0.0	
42A	1,304	DIP	1,304	100.0	1	1.0	1.0
42B	7,586	ACP	4,072	53.7	4	2.1	2.7
		DIP	1,105	14.6	1	0.1	
		ODS	445	5.9	5	0.3	
		PVC	400	5.3	2	0.1	
42C	9,393	ACP	6,599	70.2	4	2.8	3.2
		DIP	1,272	13.5	1	0.1	
		PVC	1,269	13.5	2	0.3	
		UNK	3	0.0	4	0.0	
42D	11,540	ACP	11,436	99.1	4	4.0	4.0
		DIP	8	0.1	1	0.0	
		PVC	14	0.1	2	0.0	
		UNK	8	0.1	4	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
42E	20,652	ACP	20,287	98.2	4	3.9	3.9
42F	9,775	ACP	7,162	73.3	4	2.9	3.2
		DIP	2,327	23.8	1	0.2	
		PVC	217	2.2	2	0.0	
		UNK	68	0.7	4	0.0	
42G	1,836	ACP	588	32.0	4	1.3	2.0
		DIP	1,249	68.0	1	0.7	
42H	1,000	ACP	963	96.2	4	3.8	3.9
		DIP	38	3.8	1	0.0	
42I	295	ACP	295	100.0	4	4.0	4.0
42J	4,767	ACP	3,157	66.2	4	2.6	3.1
		DIP	1,018	21.4	1	0.2	
		ODS	1	0.0	5	0.0	
		PVC	591	12.4	2	0.2	
42K	3,459	ACP	1,044	30.2	4	1.2	2.3
		DIP	955	27.6	1	0.3	
		PVC	1,437	41.6	2	0.8	
		UNK	22	0.6	4	0.0	
42L	2,042	ACP	155	7.6	4	0.3	1.2
		DIP	1,887	92.4	1	0.9	
43A	11,715	ACP	9,397	80.2	4	3.2	3.7
		DIP	59	0.5	1	0.0	
		ODS	284	2.4	5	0.1	
		PVC	1,945	16.6	2	0.3	
		UNK	12	0.1	4	0.0	
43B	105	DIP	105	100.0	1	1.0	1.0
43C	1,508	ACP	653	43.3	4	1.7	2.3
		DIP	853	56.5	1	0.6	
		PVC	3	0.2	2	0.0	
43D	1,440	ACP	238	16.5	4	0.7	2.1
		DIP	363	25.2	1	0.3	
		PVC	839	58.3	2	1.2	
44	19,372	ACP	6,807	35.1	4	1.4	2.5
		DIP	4,685	24.2	1	0.2	
		PVC	7,880	40.7	2	0.8	
45A	41,312	ACP	801	1.9	4	0.1	1.3
		DIP	31,251	75.6	1	0.8	
		PVC	9,237	22.4	2	0.4	
		UNK	23	0.1	4	0.0	
45B	12,609	ACP	4,800	38.1	4	1.5	2.3
		DIP	5,524	43.8	1	0.4	
		PVC	2,286	18.1	2	0.4	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
46	9,942	DIP	106	1.1	1	0.0	2.0
		PVC	9,836	98.9	2	2.0	
47	1,636	DIP	25	1.5	1	0.0	2.0
		PVC	1,612	98.5	2	2.0	
48	25,708	ACP	1,154	4.5	4	0.2	1.2
		DIP	22,572	87.8	1	0.9	
		PVC	1,962	7.6	2	0.2	
		UNK	19	0.1	4	0.0	
49	2,779	DIP	97	3.5	1	0.0	2.0
		PVC	2,682	96.5	2	1.9	
51	33,029	ACP	915	2.8	4	0.1	1.2
		DIP	29,523	89.4	1	0.9	
		PVC	2,590	7.8	2	0.2	
52A	16,973	ACP	6,400	37.7	4	1.5	2.1
		DIP	10,572	62.3	1	0.6	
52B	10,972	DIP	10,972	100.0	1	1.0	1.0
53A	17,785	ACP	16,092	90.5	4	3.6	3.8
		DIP	345	1.9	1	0.0	
		PVC	1,349	7.6	2	0.2	
53B	7,819	ACP	5,856	74.9	4	3.0	3.2
		DIP	1,775	22.7	1	0.2	
54	10,382	ACP	8,491	81.8	4	3.3	3.5
		DIP	568	5.5	1	0.1	
		PVC	992	9.6	2	0.2	
55	33,056	ACP	25,594	77.4	4	3.1	3.6
		DIP	2,168	6.6	1	0.1	
		MLS	2,992	9.1	3	0.3	
		PVC	2,200	6.7	2	0.1	
		UNK	53	0.2	4	0.0	
56A	3,131	ACP	173	5.5	4	0.2	1.2
		DIP	2,958	94.5	1	0.9	
56B	31,955	ACP	1,966	6.2	4	0.2	1.2
		DIP	28,468	89.1	1	0.9	
		PVC	1,521	4.8	2	0.1	
57	8,270	ACP	3,110	37.6	4	1.5	2.8
		DIP	1,892	22.9	1	0.2	
		MLS	2,546	30.8	3	0.9	
		PVC	723	8.7	2	0.2	
57A	33,693	ACP	24,770	73.5	4	2.9	3.4
		DIP	2,230	6.6	1	0.1	
		MLS	709	2.1	3	0.1	
		PVC	5,650	16.8	2	0.3	
		UNK	26	0.1	4	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
57B	2,130	ACP	1,547	72.6	4	2.9	3.5
		PVC	583	27.4	2	0.5	
58A	13,346	ACP	3	0.0	4	0.0	1.1
		DIP	12,500	93.7	1	0.9	
		PVC	843	6.3	2	0.1	
58B	3,999	ACP	416	10.4	4	0.4	1.3
		DIP	3,583	89.6	1	0.9	
58C	923	ACP	21	2.3	4	0.1	1.1
		DIP	901	97.7	1	1.0	
59	7,337	ACP	98	1.3	4	0.1	1.2
		DIP	6,247	85.1	1	0.9	
		PVC	991	13.5	2	0.3	
60	424	DIP	424	100.0	1	1.0	1.0
60A	11,021	ACP	139	1.3	4	0.1	1.0
		DIP	10,882	98.7	1	1.0	
60B	6,128	DIP	4,643	75.8	1	0.8	1.2
		PVC	1,468	24.0	2	0.5	
		UNK	17	0.3	4	0.0	
61	5,680	ACP	20	0.4	4	0.0	1.0
		DIP	5,529	97.3	1	1.0	
		PVC	131	2.3	2	0.0	
62	5,117	DIP	5,117	100.0	1	1.0	1.0
63	32,834	ACP	353	1.1	4	0.0	2.0
		DIP	611	1.9	1	0.0	
		PVC	31,837	96.7	2	1.9	
		UNK	33	0.1	4	0.0	
64	3,351	DIP	3,351	100.0	1	1.0	1.0
65	12,960	ACP	973	7.5	4	0.3	1.3
		DIP	11,831	91.3	1	0.9	
		ODS	122	0.9	5	0.0	
		PVC	34	0.3	2	0.0	
66A	6,575	ACP	62	0.9	4	0.0	1.4
		DIP	4,058	61.7	1	0.6	
		ODS	51	0.8	5	0.0	
		PVC	2,346	35.7	2	0.7	
		UNK	58	0.9	4	0.0	
66B	5,238	ACP	3,910	74.7	4	3.0	3.5
		DIP	30	0.6	1	0.0	
		PVC	1,160	22.2	2	0.4	
		UNK	137	2.6	4	0.1	
66C	2,792	ACP	1,870	67.0	4	2.7	3.2
		DIP	462	16.6	1	0.2	
		PVC	460	16.5	2	0.3	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
66D	5,793	ACP	946	16.3	4	0.7	1.5
		DIP	4,823	83.3	1	0.8	
		PVC	24	0.4	2	0.0	
66E	3,279	ACP	932	28.4	4	1.1	1.9
		DIP	2,347	71.6	1	0.7	
66F	605	DIP	605	100.0	1	1.0	1.0
67	2,101	ACP	744	35.4	4	1.4	2.1
		DIP	1,229	58.5	1	0.6	
		UNK	28	1.3	4	0.1	
68	899	DIP	10	1.1	1	0.0	2.0
		PVC	889	98.9	2	2.0	
69	4,959	ACP	12	0.2	4	0.0	1.0
		DIP	4,947	99.8	1	1.0	
6G1	8,922	ACP	8,922	100.0	4	4.0	4.0
6G2	2,310	ACP	2,278	98.6	4	3.9	4.0
		DIP	31	1.4	1	0.0	
70	30,740	ACP	1,559	5.1	4	0.2	1.2
		DIP	29,181	94.9	1	0.9	
71	25,716	ACP	1,462	5.7	4	0.2	1.3
		DIP	20,824	81.0	1	0.8	
		PVC	3,430	13.3	2	0.3	
72	9,398	ACP	9,266	98.6	4	3.9	4.0
		DIP	3	0.0	1	0.0	
		PVC	123	1.3	2	0.0	
		UNK	7	0.1	4	0.0	
74	11,137	ACP	9,678	86.9	4	3.5	3.7
		MLS	5	0.0	3	0.0	
		PVC	1,451	13.0	2	0.3	
		UNK	3	0.0	4	0.0	
76A	9,389	ACP	2,479	26.4	4	1.1	1.8
		DIP	6,377	67.9	1	0.7	
		PVC	534	5.7	2	0.1	
76B	5,406	ACP	5	0.1	4	0.0	1.0
		DIP	5,400	99.9	1	1.0	
76C	3,060	ACP	1,932	63.1	4	2.5	3.2
		DIP	332	10.8	1	0.1	
		PVC	796	26.0	2	0.5	
76D	6,184	ACP	41	0.7	4	0.0	1.0
		DIP	6,132	99.2	1	1.0	
		PVC	12	0.2	2	0.0	
76F	3,786	ACP	2,704	71.4	4	2.9	3.1
		DIP	1,081	28.6	1	0.3	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
76G	2,121	ACP	211	9.9	4	0.4	1.3
		DIP	1,910	90.1	1	0.9	
76H	4,594	ACP	2,812	61.2	4	2.4	3.0
		DIP	934	20.3	1	0.2	
		PVC	832	18.1	2	0.4	
		UNK	16	0.4	4	0.0	
76I	1,797	ACP	658	36.6	4	1.5	2.7
		DIP	489	27.2	1	0.3	
		ODS	146	8.1	5	0.4	
		PVC	495	27.6	2	0.6	
		UNK	9	0.5	4	0.0	
76J	1,137	ACP	453	39.9	4	1.6	2.2
		DIP	682	60.0	1	0.6	
		UNK	1	0.1	4	0.0	
76K	1,232	ACP	402	32.6	4	1.3	2.0
		DIP	780	63.3	1	0.6	
		PVC	50	4.1	2	0.1	
		UNK	1	0.1	4	0.0	
77	2,061	ACP	2,058	99.9	4	4.0	4.0
		PVC	3	0.1	2	0.0	
78	22,595	ACP	565	2.5	4	0.1	1.3
		DIP	18,884	83.6	1	0.8	
		ODS	345	1.5	5	0.1	
		PVC	2,741	12.1	2	0.2	
		UNK	61	0.3	4	0.0	
79	6,998	ACP	28	0.4	4	0.0	1.3
		DIP	5,040	72.0	1	0.7	
		PVC	1,888	27.0	2	0.5	
		UNK	42	0.6	4	0.0	
7A1	8,068	ACP	3,688	45.7	4	1.8	3.1
		PVC	3,563	44.2	2	0.9	
		UNK	817	10.1	4	0.4	
7A2	13,504	ACP	868	6.4	4	0.3	3.0
		CIP	384	2.8	3	0.1	
		PVC	6,526	48.3	2	1.0	
		UNK	5,726	42.4	4	1.7	
7B1	5,110	ACP	4,309	84.3	4	3.4	3.9
		DIP	163	3.2	1	0.0	
		UNK	638	12.5	4	0.5	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7B2	7,029	ACP	6,728	95.7	4	3.8	3.9
		DIP	12	0.2	1	0.0	
		PVC	210	3.0	2	0.1	
		UNK	80	1.1	4	0.0	
7B3	7,775	ACP	4,747	61.0	4	2.4	3.1
		CIP	240	3.1	3	0.1	
		DIP	1,257	16.2	1	0.2	
		PVC	1,325	17.0	2	0.3	
		UNK	207	2.7	4	0.1	
7B4	8,086	ACP	4,537	56.1	4	2.2	3.4
		DIP	361	4.5	1	0.0	
		PVC	1,693	20.9	2	0.4	
		UNK	1,495	18.5	4	0.7	
7B5	408	UNK	408	100.0	4	4.0	4.0
7C1	5,062	ACP	1,410	27.9	4	1.1	3.2
		CIP	1,405	27.8	3	0.8	
		ODS	395	7.8	5	0.4	
		PVC	1,510	29.8	2	0.6	
		UNK	342	6.7	4	0.3	
7C2	5,448	ACP	3,334	61.2	4	2.4	3.7
		CIP	1,878	34.5	3	1.0	
		UNK	236	4.3	4	0.2	
7C3	6,938	ACP	1,699	24.5	4	1.0	3.3
		CCP	230	3.3	5	0.2	
		CIP	2,565	37.0	3	1.1	
		DIP	6	0.1	1	0.0	
		PVC	1,099	15.8	2	0.3	
		UNK	1,338	19.3	4	0.8	
7C4	12,313	ACP	7,519	61.0	4	2.4	3.6
		CCP	20	0.2	5	0.0	
		CIP	1,102	8.9	3	0.3	
		DIP	923	7.5	1	0.1	
		PVC	310	2.5	2	0.1	
		UNK	2,439	19.8	4	0.8	
7C5	6,165	ACP	1,917	31.1	4	1.2	3.1
		CIP	2,986	48.4	3	1.5	
		DIP	363	5.9	1	0.1	
		PVC	669	10.9	2	0.2	
		UNK	229	3.7	4	0.1	
7D1	15,346	ACP	7,419	48.3	4	1.9	3.3
		CIP	5,050	32.9	3	1.0	
		DIP	1,787	11.6	1	0.1	
		UNK	1,089	7.1	4	0.3	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7D2	8,759	ACP	2,503	28.6	4	1.1	3.3
		CIP	5,576	63.4	3	1.9	
		DIP	274	3.1	1	0.0	
		UNK	406	4.6	4	0.2	
7D3	10,941	ACP	2,645	23.8	4	1.0	3.4
		CIP	5,134	46.9	3	1.4	
		DIP	280	2.6	1	0.0	
		UNK	2,882	26.3	4	1.1	
7E1	14,671	ACP	7,423	50.6	4	2.0	3.2
		CIP	1,974	13.5	3	0.4	
		DIP	3,166	21.5	1	0.2	
		UNK	2,108	14.4	4	0.6	
7E2	4,246	ACP	3,997	94.1	4	3.8	4.0
		UNK	249	5.9	4	0.2	
7E3	9,281	ACP	5,629	60.7	4	2.4	3.6
		CIP	2,049	22.1	3	0.7	
		DIP	21	0.2	1	0.0	
		PVC	855	9.2	2	0.2	
		UNK	726	7.8	4	0.3	
7E4	9,049	ACP	4,041	44.7	4	1.8	4.0
		CIP	949	10.5	3	0.3	
		CONC	792	8.8	5	0.4	
		PVC	5	0.1	2	0.0	
		UNK	3,262	36.0	4	1.4	
7F1	7,279	ACP	2,815	38.7	4	1.5	3.0
		CIP	1,231	16.9	3	0.5	
		DIP	1,638	22.5	1	0.2	
		PVC	681	9.4	2	0.2	
		UNK	914	12.6	4	0.5	
7F2	8,807	ACP	1,408	16.0	4	0.6	3.2
		CIP	6,620	75.2	3	2.3	
		DIP	176	2.0	1	0.0	
		UNK	602	6.8	4	0.3	
7F3	9,910	ACP	4,813	48.6	4	1.9	3.5
		CIP	386	3.9	3	0.1	
		DIP	425	4.3	1	0.0	
		MLS	791	8.0	3	0.2	
		PVC	1,453	14.7	2	0.3	
		UNK	2,042	20.6	4	0.8	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7F4	7,013	ACP	3,032	43.2	4	1.7	3.5
		CIP	1,448	20.6	3	0.6	
		DIP	519	7.4	1	0.1	
		MLS	171	2.4	3	0.1	
		UNK	1,844	26.3	4	1.1	
7G1	5,763	DIP	1,191	20.7	1	0.2	3.2
		PVC	398	6.9	2	0.1	
		UNK	4,173	72.4	4	2.9	
7G2	4,520	ACP	3,020	66.8	4	2.7	3.3
		DIP	706	15.6	1	0.2	
		PVC	413	9.1	2	0.2	
		UNK	381	8.4	4	0.3	
7G3	8,809	ACP	6,518	74.0	4	3.0	3.8
		CIP	1,445	16.4	3	0.5	
		DIP	85	1.0	1	0.0	
		UNK	761	8.6	4	0.3	
7G4	8,847	ACP	5,780	65.3	4	2.6	3.9
		CCP	806	9.1	5	0.5	
		CIP	54	0.6	3	0.0	
		DIP	655	7.4	1	0.1	
		UNK	1,551	17.5	4	0.7	
7G5	5,784	ACP	5,228	90.4	4	3.6	3.8
		DIP	11	0.2	1	0.0	
		PVC	439	7.6	2	0.2	
		UNK	106	1.8	4	0.1	
80	23,397	DIP	23,124	98.8	1	1.0	1.0
		PVC	230	1.0	2	0.0	
		UNK	43	0.2	4	0.0	
81	11,949	ACP	3	0.0	4	0.0	1.1
		DIP	11,503	95.0	1	0.9	
		ODS	443	3.7	5	0.2	
82	14,962	ACP	10,602	70.8	4	2.8	3.1
		DIP	4,314	28.8	1	0.3	
		UNK	18	0.1	4	0.0	
83	12,612	ACP	2,376	18.8	4	0.8	1.7
		DIP	8,735	69.3	1	0.7	
		MLS	144	1.1	3	0.0	
		PVC	1,352	10.7	2	0.2	
		UNK	6	0.0	4	0.0	
84	3,862	ACP	343	8.9	4	0.4	1.3
		DIP	3,519	91.1	1	0.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
85	29,021	ACP	2,172	7.5	4	0.3	1.2
		DIP	26,281	90.6	1	0.9	
		PVC	173	0.6	2	0.0	
86A	23,907	ACP	22,130	92.6	4	3.7	3.8
		DIP	1,406	5.9	1	0.1	
		PVC	58	0.2	2	0.0	
		UNK	1	0.0	4	0.0	
86B	26,720	ACP	25,787	96.5	4	3.9	3.9
		DIP	856	3.2	1	0.0	
		PVC	77	0.3	2	0.0	
86C	27,043	ACP	18,838	69.7	4	2.8	3.3
		DIP	2,877	10.6	1	0.1	
		PVC	5,165	19.1	2	0.4	
		UNK	7	0.0	4	0.0	
86D	5,011	ACP	3,682	73.5	4	2.9	3.3
		DIP	1,052	21.0	1	0.2	
		PVC	277	5.5	2	0.1	
87A	15,840	ACP	3,878	24.5	4	1.0	1.7
		DIP	11,913	75.2	1	0.8	
		PVC	50	0.3	2	0.0	
87B	4,012	DIP	2,103	52.4	1	0.5	1.5
		PVC	1,909	47.6	2	1.0	
88	27,686	DIP	27,681	100.0	1	1.0	1.0
		PVC	5	0.0	2	0.0	
89	12,946	ACP	537	4.1	4	0.2	1.7
		DIP	10,614	82.0	1	0.8	
		ODS	1,796	13.9	5	0.7	
90A	30,255	ACP	25,243	83.4	4	3.3	3.6
		DIP	389	1.3	1	0.0	
		PVC	4,180	13.8	2	0.3	
		UNK	152	0.5	4	0.0	
90B	10,063	ACP	5,642	56.1	4	2.2	4.0
		MLS	5	0.0	3	0.0	
		ODS	3,107	30.9	5	1.5	
		PVC	906	9.0	2	0.2	
90C	16,214	ACP	13,949	86.0	4	3.4	3.7
		MLS	14	0.1	3	0.0	
		PVC	2,091	12.9	2	0.3	
91	44,476	ACP	30,428	68.4	4	2.7	3.2
		DIP	6,363	14.3	1	0.1	
		PVC	7,550	17.0	2	0.3	
92	512	ACP	512	100.0	4	4.0	4.0

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
93A	37,963	ACP	35,440	93.4	4	3.7	3.8
		DIP	944	2.5	1	0.0	
		PVC	1,577	4.2	2	0.1	
		UNK	2	0.0	4	0.0	
93B	34,838	ACP	32,293	92.7	4	3.7	3.8
		DIP	839	2.4	1	0.0	
		PVC	1,706	4.9	2	0.1	
93C	36,427	ACP	32,731	89.9	4	3.6	3.8
		DIP	498	1.4	1	0.0	
		MLS	4	0.0	3	0.0	
		PVC	3,137	8.6	2	0.2	
		UNK	19	0.1	4	0.0	
93D	34,079	ACP	33,487	98.3	4	3.9	3.9
		DIP	270	0.8	1	0.0	
		PVC	45	0.1	2	0.0	
		UNK	14	0.0	4	0.0	
95	663	ACP	648	97.8	4	3.9	4.0
		PVC	0	0.0	2	0.0	
		UNK	14	2.2	4	0.1	
96	6,245	ACP	149	2.4	4	0.1	1.1
		DIP	6,096	97.6	1	1.0	

**Corresponding score in Appendix A is doubly weighted*

Appendix D – Pipe Age

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Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
02A	48,505	ACP	34	699	1.4	0.5	22.3	2
		DIP	19	22,265	45.9	8.8		
		PVC	24	25,541	52.5	13.0		
02B	26,917	DIP	17	16,499	61.3	10.1	19.5	2
		PVC	23	10,418	38.7	9.4		
02C	24,972	CIP	21	13	0.1	0.0	21.4	2
		DIP	18	16,921	67.8	11.8		
		PVC	30	8,038	32.2	9.6		
02D	31,006	CIP	21	17	0.1	0.0	23.2	2
		DIP	22	28,416	91.6	20.5		
		PVC	31	2,573	8.3	2.7		
02E	27,198	DIP	18	27,198	100.0	18.0	18.0	2
03A	33,039	ACP	73	25,026	75.7	55.3	59.2	4
		CIP	79	34	0.1	0.1		
		DIP	12	5,844	17.7	1.9		
		PVC	23	2,135	6.5	1.8		
03B	28,104	ACP	73	24,530	87.3	63.7	67.6	5
		DIP	31	3,458	12.3	3.7		
		PVC	17	75	0.3	0.0		
		UNK	73	41	0.1	0.1		
04	49,199	ACP	51	46,021	93.5	47.3	48.2	4
		DIP	14	3,115	6.3	0.8		
		PVC	17	28	0.1	0.0		
		UNK	17	35	0.1	0.0		
05A	43,409	ACP	42	34,763	80.1	33.5	39.8	3
		CIP	41	286	0.7	0.3		
		DIP	20	503	1.2	0.4		
		PVC	32	7,857	18.1	5.7		
05B	41,075	ACP	39	720	1.8	0.7	34.6	3
		DIP	23	570	1.4	0.4		
		PVC	35	39,785	96.8	33.5		
05C	45,153	ACP	39	23,274	51.5	20.0	35.0	3
		DIP	21	5,573	12.3	2.5		
		PVC	34	16,129	35.7	12.4		
		UNK	33	177	0.4	0.1		
06A	25,683	ACP	61	25,381	98.8	60.4	61.1	5
		DIP	63	277	1.1	0.7		
		PVC	17	26	0.1	0.0		
06B	19,778	ACP	57	19,778	100.0	57.3	57.3	4
06C	19,701	ACP	64	19,394	98.4	62.7	63.7	5
		DIP	63	0	0.0	0.0		
		UNK	63	307	1.6	1.0		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
06D	24,661	ACP	64	24,307	98.6	62.6	62.9	5
		CIP	36	25	0.1	0.0		
		DIP	26	329	1.3	0.2		
06E	21,175	ACP	60	21,003	99.2	59.5	59.6	4
		CIP	10	30	0.1	0.0		
		DIP	10	142	0.7	0.1		
06F	13,979	ACP	65	13,569	97.1	63.1	63.3	5
		DIP	6	410	2.9	0.2		
06H	24,480	ACP	65	457	1.9	1.2	7.7	1
		DIP	7	24,022	98.1	6.5		
06I	15,236	ACP	65	14,920	97.9	63.5	64.1	5
		DIP	18	192	1.3	0.5		
		PVC	14	125	0.8	0.1		
06J	12,678	ACP	65	10,884	85.8	55.3	56.3	4
		DIP	6	1,664	13.1	0.8		
		PVC	21	130	1.0	0.2		
06K	19,823	ACP	65	17,581	88.7	57.8	60.1	5
		PVC	21	2,242	11.3	2.4		
06M	13,909	ACP	64	2,774	19.9	13.0	19.3	2
		DIP	8	11,135	80.1	6.3		
06N	13,412	ACP	66	1,091	8.1	5.4	10.9	1
		DIP	6	12,321	91.9	5.5		
09	11,913	ACP	48	11,775	98.8	47.7	47.8	4
		DIP	6	138	1.2	0.1		
10	14,323	ACP	57	258	1.8	1.1	57.8	4
		DIP	3	503	3.5	0.1		
		MLS	60	13,561	94.7	56.7		
11	3,124	ACP	59	2,620	83.8	49.5	59.0	4
		MLS	60	505	16.2	9.6		
12A	48,674	ACP	51	36,330	74.6	37.8	49.6	4
		DIP	5	220	0.5	0.0		
		MLS	46	11,536	23.7	11.4		
		PVC	39	588	1.2	0.4		
12B	40,026	ACP	45	37,942	94.8	42.7	44.8	3
		CIP	41	203	0.5	0.2		
		DIP	39	1,730	4.3	1.7		
		MLS	43	152	0.4	0.2		
13A	38,145	ACP	50	5,185	13.6	6.5	44.4	3
		DIP	26	2,547	6.7	1.7		
		MLS	49	19,561	51.3	25.7		
		PVC	37	10,853	28.5	10.4		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
13B	35,161	ACP	40	21,208	60.3	24.2	39.1	3
		CIP	40	517	1.5	0.6		
		DIP	18	1,270	3.6	0.5		
		MLS	50	4,437	12.6	6.1		
		PVC	33	7,730	22.0	7.7		
14	14,712	ACP	70	2,639	17.9	12.5	29.7	2
		DIP	6	56	0.4	0.0		
		PVC	21	12,017	81.7	17.2		
15	5,792	CIP	21	410	7.1	1.5	21.0	2
		PVC	21	5,382	92.9	19.5		
16	6,825	ACP	64	5,460	80.0	51.3	56.4	4
		DIP	19	1,317	19.3	4.9		
		PVC	14	48	0.7	0.1		
17A	41,281	ACP	50	16,320	39.5	21.0	46.9	4
		DIP	27	3,110	7.5	2.1		
		MLS	56	11,110	26.9	14.7		
		PVC	36	10,723	26.0	9.2		
		UNK	40	18	0.0	0.0		
17B	45,467	ACP	42	11,131	24.5	10.1	39.6	3
		CIP	40	722	1.6	0.6		
		DIP	28	1,779	3.9	1.0		
		MLS	54	6,585	14.5	8.1		
		PVC	36	24,931	54.8	19.8		
		UNK	34	3	0.0	0.0		
18	53,758	ACP	47	22,321	41.5	19.5	46.8	4
		DIP	33	2,588	4.8	1.7		
		MLS	59	14,380	26.7	15.3		
		PVC	38	14,470	26.9	10.3		
19	47,512	ACP	49	21,735	45.7	22.7	44.7	3
		DIP	17	3,251	6.8	1.1		
		MLS	57	11,138	23.4	13.6		
		PVC	28	11,386	24.0	7.3		
		UNK	61	2	0.0	0.0		
1A	9,772	ACP	79	9,647	98.7	78.0	78.8	5
		UNK	61	125	1.3	0.8		
1B	6,385	ACP	79	5,394	84.5	66.7	67.8	5
		DIP	7	618	9.7	0.7		
		PVC	7	359	5.6	0.4		
1C	10,473	ACP	79	10,001	95.5	75.4	75.8	5
		DIP	6	463	4.4	0.3		
		UNK	79	8	0.1	0.1		
20A	34,434	ACP	56	31,605	91.8	51.8	54.0	4
		DIP	25	2,037	5.9	1.4		
		PVC	32	737	2.1	0.8		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
20B	48,476	ACP	48	33,670	69.5	33.2	43.2	3
		CIP	61	264	0.5	0.3		
		DIP	24	4,404	9.1	2.0		
		MLS	56	4,942	10.2	5.4		
		PVC	34	2,914	6.0	2.2		
21	7,384	ACP	60	4,675	63.3	38.5	42.3	3
		DIP	14	2,530	34.3	3.8		
22	3,619	ACP	62	3,500	96.7	60.0	60.6	5
		PVC	61	38	1.1	0.6		
23	67,439	ACP	59	63,200	93.7	55.0	56.4	4
		DIP	21	2,651	3.9	0.8		
		PVC	48	733	1.1	0.6		
		UNK	62	26	0.0	0.0		
24A	49,259	ACP	54	24,356	49.4	26.9	48.7	4
		CIP	48	602	1.2	0.6		
		DIP	15	5,042	10.2	1.3		
		MLS	69	9,954	20.2	13.9		
		PVC	33	9,264	18.8	6.0		
		UNK	39	41	0.1	0.0		
24B	52,564	ACP	47	28,237	53.7	25.0	46.2	4
		CIP	35	60	0.1	0.0		
		DIP	13	353	0.7	0.1		
		MLS	60	11,726	22.3	13.4		
		PVC	33	11,967	22.8	7.5		
		UNK	48	220	0.4	0.2		
25	7,248	ACP	62	5,862	80.9	50.2	53.1	4
		MLS	64	203	2.8	1.8		
		PVC	10	1,184	16.3	1.1		
26A	29,619	ACP	57	6,352	21.4	12.6	49.2	4
		DIP	21	4,947	16.7	3.2		
		MLS	59	14,317	48.3	28.8		
		PVC	33	4,003	13.5	4.5		
26B	41,271	ACP	49	18,261	44.2	22.4	51.0	4
		DIP	29	2,052	5.0	1.5		
		MLS	59	15,036	36.4	21.9		
		PVC	37	5,821	14.1	5.2		
27	31,842	ACP	50	8,386	26.3	12.9	46.4	4
		DIP	22	4,841	15.2	3.3		
		MLS	57	14,902	46.8	26.6		
		PVC	31	3,612	11.3	3.5		
		UNK	5	102	0.3	0.0		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
28	52,221	ACP	52	28,010	53.6	29.7	51.9	4
		DIP	37	254	0.5	0.2		
		MLS	56	14,665	28.1	15.4		
		PVC	37	9,292	17.8	6.6		
29	51,228	ACP	47	30,373	59.3	28.3	45.2	4
		CIP	45	74	0.1	0.1		
		DIP	14	7,366	14.4	2.1		
		MLS	61	10,853	21.2	12.9		
		PVC	33	2,492	4.9	1.7		
30	3,313	ACP	48	3,039	91.7	40.8	46.0	4
		PVC	62	274	8.3	5.1		
31A	26,653	ACP	54	22,801	85.5	45.3	48.6	4
		DIP	25	2,250	8.4	3.0		
		PVC	16	1,443	5.4	0.4		
31B	1,036	ACP	58	790	76.3	44.2	45.2	4
		DIP	4	246	23.7	0.9		
32	10,572	ACP	59	10,188	96.4	57.5	57.6	4
		PVC	59	7	0.1	0.0		
33	18,435	ACP	61	15,178	82.3	50.5	56.7	4
		DIP	45	3,028	16.4	6.2		
34	5,806	ACP	61	4,545	78.3	48.5	61.9	5
		MLS	62	1,260	21.7	13.5		
35	32,441	ACP	55	16,244	50.1	27.5	56.8	4
		DIP	15	422	1.3	0.3		
		MLS	60	15,500	47.8	28.8		
		PVC	32	276	0.9	0.3		
36	45,772	ACP	45	19,396	42.4	19.4	46.9	4
		DIP	19	2,830	6.2	1.1		
		MLS	57	16,898	36.9	21.3		
		PVC	35	6,601	14.4	5.1		
37	3,471	ACP	57	1,999	57.6	33.9	56.6	4
		DIP	59	15	0.4	0.3		
		MLS	59	1,321	38.1	22.5		
38A	25,036	ACP	44	21,837	87.2	38.0	41.4	3
		CIP	56	388	1.5	0.9		
		DIP	8	1,057	4.2	0.3		
		MLS	36	597	2.4	1.1		
		PVC	27	1,047	4.2	1.1		
		UNK	37	48	0.2	0.1		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
38B	46,403	ACP	54	29,899	64.4	35.0	53.1	4
		CIP	63	4	0.0	0.0		
		DIP	22	1,618	3.5	0.9		
		MLS	58	12,148	26.2	15.5		
		PVC	30	2,561	5.5	1.8		
		UNK	17	33	0.1	0.0		
39	11,720	ACP	63	10,105	86.2	54.8	60.3	5
		CIP	63	679	5.8	3.6		
		DIP	7	125	1.1	0.1		
		MLS	17	31	0.3	0.0		
		PVC	47	351	3.0	1.8		
		UNK	17	30	0.3	0.0		
40A	30,817	ACP	54	12,872	41.8	22.5	40.9	3
		DIP	17	3,763	12.2	1.8		
		MLS	59	2,694	8.7	5.2		
		PVC	30	11,489	37.3	11.4		
40B	31,294	ACP	48	15,726	50.3	24.7	46.7	4
		DIP	32	2,855	9.1	3.3		
		MLS	57	7,738	24.1	13.7		
		PVC	34	4,975	15.9	4.9		
41	17,423	ACP	60	16,807	96.5	57.9	58.6	4
		DIP	20	38	0.2	0.0		
		MLS	47	198	1.1	0.6		
		PVC	34	46	0.3	0.1		
42A	1,304	DIP	4	1,304	100.0	2.7	2.7	1
42B	7,586	ACP	72	4,072	53.7	38.3	44.9	3
		DIP	10	1,105	14.6	1.6		
		ODS	72	445	5.9	4.2		
		PVC	15	400	5.3	0.8		
42C	9,393	ACP	64	6,599	70.2	44.7	54.3	4
		DIP	15	1,272	13.5	1.8		
		PVC	58	1,269	13.5	7.8		
		UNK	58	3	0.0	0.0		
42D	11,540	ACP	65	11,436	99.1	64.4	64.5	5
		DIP	12	8	0.1	0.0		
		PVC	58	14	0.1	0.1		
		UNK	65	8	0.1	0.0		
42E	20,652	ACP	64	20,287	98.2	62.9	62.9	5
42F	9,775	ACP	57	7,162	73.3	41.3	48.5	4
		DIP	24	2,327	23.8	6.1		
		PVC	31	217	2.2	0.7		
		UNK	56	68	0.7	0.4		
42G	1,836	ACP	65	588	32.0	20.8	25.6	2
		DIP	7	1,249	68.0	4.8		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
42H	1,000	ACP	65	963	96.2	62.6	63.0	5
		DIP	13	38	3.8	0.5		
42I	295	ACP	70	295	100.0	71.9	71.9	5
42J	4,767	ACP	72	3,157	66.2	47.7	51.4	4
		DIP	9	1,018	21.4	2.0		
		ODS	93	1	0.0	0.0		
		PVC	20	591	12.4	1.7		
42K	3,459	ACP	65	1,044	30.2	19.6	30.4	3
		DIP	10	955	27.6	2.7		
		PVC	18	1,437	41.6	8.0		
		UNK	20	22	0.6	0.1		
42L	2,042	ACP	72	155	7.6	5.5	6.7	1
		DIP	5	1,887	92.4	1.3		
43A	11,715	ACP	66	9,397	80.2	52.9	56.8	4
		DIP	20	59	0.5	0.1		
		ODS	65	284	2.4	1.6		
		PVC	18	1,945	16.6	2.2		
		UNK	65	12	0.1	0.1		
43B	105	DIP	10	105	100.0	10.0	10.0	1
43C	1,508	ACP	73	653	43.3	31.6	37.3	3
		DIP	10	853	56.5	5.7		
		PVC	10	3	0.2	0.0		
43D	1,440	ACP	39	238	16.5	5.9	13.5	1
		DIP	10	363	25.2	2.5		
		PVC	9	839	58.3	5.1		
44	19,372	ACP	64	6,807	35.1	22.7	39.7	3
		DIP	13	4,685	24.2	3.5		
		PVC	30	7,880	40.7	13.5		
45A	41,312	ACP	65	801	1.9	1.2	10.8	1
		DIP	7	31,251	75.6	4.7		
		PVC	21	9,237	22.4	4.9		
		UNK	12	23	0.1	0.0		
45B	12,609	ACP	55	4,800	38.1	20.2	25.5	2
		DIP	7	5,524	43.8	3.2		
		PVC	10	2,286	18.1	2.1		
46	9,942	DIP	11	106	1.1	0.1	19.8	2
		PVC	19	9,836	98.9	19.7		
47	1,636	DIP	13	25	1.5	0.2	34.7	3
		PVC	35	1,612	98.5	34.5		
48	25,708	ACP	56	1,154	4.5	2.3	5.4	1
		DIP	2	22,572	87.8	1.1		
		PVC	20	1,962	7.6	2.0		
		UNK	17	19	0.1	0.0		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
49	2,779	DIP	2	97	3.5	0.1	20.5	2
		PVC	24	2,682	96.5	20.4		
51	33,029	ACP	67	915	2.8	1.7	8.7	1
		DIP	7	29,523	89.4	6.4		
		PVC	8	2,590	7.8	0.6		
52A	16,973	ACP	58	6,400	37.7	21.6	26.8	2
		DIP	9	10,572	62.3	5.3		
52B	10,972	DIP	7	10,972	100.0	7.4	7.4	1
53A	17,785	ACP	58	16,092	90.5	52.9	57.8	4
		DIP	6	345	1.9	0.1		
		PVC	61	1,349	7.6	4.8		
53B	7,819	ACP	58	5,856	74.9	44.5	46.1	4
		DIP	8	1,775	22.7	1.7		
54	10,382	ACP	61	8,491	81.8	49.6	55.4	4
		DIP	3	568	5.5	0.2		
		PVC	54	992	9.6	5.7		
55	33,056	ACP	54	25,594	77.4	42.2	48.9	4
		DIP	21	2,168	6.6	1.6		
		MLS	45	2,992	9.1	3.4		
		PVC	29	2,200	6.7	1.5		
		UNK	59	53	0.2	0.1		
56A	3,131	ACP	51	173	5.5	3.1	5.9	1
		DIP	3	2,958	94.5	2.8		
56B	31,955	ACP	53	1,966	6.2	3.3	6.2	1
		DIP	2	28,468	89.1	1.8		
		PVC	22	1,521	4.8	1.1		
57	8,270	ACP	45	3,110	37.6	16.5	41.2	3
		DIP	18	1,892	22.9	4.5		
		MLS	55	2,546	30.8	17.3		
		PVC	33	723	8.7	2.9		
57A	33,693	ACP	50	24,770	73.5	37.4	43.9	3
		DIP	9	2,230	6.6	0.5		
		MLS	49	709	2.1	0.9		
		PVC	32	5,650	16.8	5.0		
		UNK	27	26	0.1	0.0		
57B	2,130	ACP	59	1,547	72.6	45.6	56.5	4
		PVC	40	583	27.4	10.9		
58A	13,346	ACP	65	3	0.0	0.0	10.2	1
		DIP	11	12,500	93.7	9.6		
		PVC	10	843	6.3	0.7		
58B	3,999	ACP	70	416	10.4	6.6	15.6	2
		DIP	10	3,583	89.6	9.0		
58C	923	ACP	73	21	2.3	1.7	14.4	1
		DIP	13	901	97.7	12.7		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
59	7,337	ACP	73	98	1.3	1.0	13.9	1
		DIP	13	6,247	85.1	11.1		
		PVC	14	991	13.5	1.9		
60	424	DIP	12	424	100.0	11.6	11.6	1
60A	11,021	ACP	74	139	1.3	0.9	10.9	1
		DIP	10	10,882	98.7	10.0		
60B	6,128	DIP	10	4,643	75.8	7.8	10.3	1
		PVC	10	1,468	24.0	2.5		
		UNK	10	17	0.3	0.0		
61	5,680	ACP	74	20	0.4	0.3	12.7	1
		DIP	12	5,529	97.3	12.1		
		PVC	11	131	2.3	0.3		
62	5,117	DIP	12	5,117	100.0	13.0	13.0	1
63	32,834	ACP	81	353	1.1	0.9	22.1	2
		DIP	13	611	1.9	0.2		
		PVC	22	31,837	96.7	20.9		
		UNK	26	33	0.1	0.0		
64	3,351	DIP	13	3,351	100.0	13.0	13.0	1
65	12,960	ACP	54	973	7.5	3.8	14.5	1
		DIP	12	11,831	91.3	10.1		
		ODS	70	122	0.9	0.7		
		PVC	4	34	0.3	0.0		
66A	6,575	ACP	68	62	0.9	0.6	11.4	1
		DIP	10	4,058	61.7	6.5		
		ODS	70	51	0.8	0.5		
		PVC	10	2,346	35.7	3.6		
		UNK	10	58	0.9	0.1		
66B	5,238	ACP	55	3,910	74.7	42.9	46.4	4
		DIP	12	30	0.6	0.1		
		PVC	9	1,160	22.2	2.0		
		UNK	57	137	2.6	1.5		
66C	2,792	ACP	41	1,870	67.0	27.3	38.5	3
		DIP	14	462	16.6	5.8		
		PVC	18	460	16.5	5.3		
66D	5,793	ACP	68	946	16.3	10.7	16.7	2
		DIP	8	4,823	83.3	5.9		
		PVC	9	24	0.4	0.0		
66E	3,279	ACP	71	932	28.4	20.2	22.4	2
		DIP	4	2,347	71.6	2.2		
66F	605	DIP	18	605	100.0	31.1	31.1	3
67	2,101	ACP	62	744	35.4	21.8	27.8	2
		DIP	9	1,229	58.5	5.3		
		UNK	55	28	1.3	0.7		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
68	899	DIP	9	10	1.1	0.1	30.2	3
		PVC	19	889	98.9	30.1		
69	4,959	ACP	78	12	0.2	0.2	11.8	1
		DIP	13	4,947	99.8	11.6		
6G1	8,922	ACP	63	8,922	100.0	62.6	62.6	5
6G2	2,310	ACP	64	2,278	98.6	63.1	63.2	5
		DIP	8	31	1.4	0.1		
70	30,740	ACP	72	1,559	5.1	3.9	12.5	1
		DIP	9	29,181	94.9	8.6		
71	25,716	ACP	75	1,462	5.7	4.2	15.0	2
		DIP	12	20,824	81.0	9.2		
		PVC	15	3,430	13.3	1.7		
72	9,398	ACP	65	9,266	98.6	64.0	64.6	5
		DIP	38	3	0.0	0.0		
		PVC	21	123	1.3	0.5		
		UNK	65	7	0.1	0.0		
74	11,137	ACP	64	9,678	86.9	55.6	62.5	5
		MLS	64	5	0.0	0.0		
		PVC	31	1,451	13.0	6.8		
		UNK	64	3	0.0	0.0		
76A	9,389	ACP	70	2,479	26.4	18.3	27.4	2
		DIP	12	6,377	67.9	8.4		
		PVC	24	534	5.7	0.8		
76B	5,406	ACP	72	5	0.1	0.1	9.8	1
		DIP	10	5,400	99.9	9.7		
76C	3,060	ACP	66	1,932	63.1	41.4	51.5	4
		DIP	12	332	10.8	1.3		
		PVC	32	796	26.0	8.8		
76D	6,184	ACP	73	41	0.7	0.5	4.7	1
		DIP	5	6,132	99.2	4.2		
		PVC	21	12	0.2	0.1		
76F	3,786	ACP	46	2,704	71.4	33.9	35.5	3
		DIP	8	1,081	28.6	1.6		
76G	2,121	ACP	51	211	9.9	5.2	12.4	1
		DIP	7	1,910	90.1	7.1		
76H	4,594	ACP	57	2,812	61.2	35.4	42.2	3
		DIP	6	934	20.3	1.3		
		PVC	31	832	18.1	5.3		
		UNK	24	16	0.4	0.1		
76I	1,797	ACP	99	658	36.6	38.9	55.2	4
		DIP	10	489	27.2	2.0		
		ODS	66	146	8.1	5.3		
		PVC	42	495	27.6	8.7		
		UNK	69	9	0.5	0.4		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
76J	1,137	ACP	56	453	39.9	22.3	27.9	2
		DIP	9	682	60.0	5.6		
		UNK	12	1	0.1	0.0		
76K	1,232	ACP	73	402	32.6	23.8	30.6	3
		DIP	11	780	63.3	6.3		
		PVC	12	50	4.1	0.5		
		UNK	12	1	0.1	0.0		
77	2,061	ACP	70	2,058	99.9	69.9	69.9	5
		PVC	12	3	0.1	0.0		
78	22,595	ACP	36	565	2.5	0.6	8.1	1
		DIP	6	18,884	83.6	4.5		
		ODS	69	345	1.5	1.1		
		PVC	17	2,741	12.1	1.8		
		UNK	50	61	0.3	0.1		
79	6,998	ACP	58	28	0.4	0.2	12.9	1
		DIP	11	5,040	72.0	8.5		
		PVC	13	1,888	27.0	3.8		
		UNK	69	42	0.6	0.4		
7A1	8,068	ACP	69	3,688	45.7	31.5	59.0	4
		PVC	43	3,563	44.2	20.5		
		UNK	69	817	10.1	7.0		
7A2	13,504	ACP	71	868	6.4	4.5	69.0	5
		CIP	77	384	2.8	2.0		
		PVC	69	6,526	48.3	33.2		
		UNK	70	5,726	42.4	29.3		
7B1	5,110	ACP	53	4,309	84.3	47.2	54.2	4
		DIP	1	163	3.2	0.0		
		UNK	56	638	12.5	7.0		
7B2	7,029	ACP	57	6,728	95.7	53.9	56.2	4
		DIP	11	12	0.2	0.0		
		PVC	56	210	3.0	1.7		
		UNK	56	80	1.1	0.6		
7B3	7,775	ACP	78	4,747	61.0	48.1	60.4	5
		CIP	79	240	3.1	2.4		
		DIP	14	1,257	16.2	2.0		
		PVC	34	1,325	17.0	5.8		
		UNK	79	207	2.7	2.1		
7B4	8,086	ACP	79	4,537	56.1	44.3	73.0	5
		DIP	10	361	4.5	0.4		
		PVC	74	1,693	20.9	13.8		
		UNK	76	1,495	18.5	14.4		
7B5	408	UNK	79	408	100.0	79.0	79.0	5

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
7C1	5,062	ACP	79	1,410	27.9	22.0	61.7	5
		CIP	79	1,405	27.8	21.9		
		ODS	79	395	7.8	6.2		
		PVC	21	1,510	29.8	6.3		
		UNK	79	342	6.7	5.3		
7C2	5,448	ACP	79	3,334	61.2	48.3	79.0	5
		CIP	79	1,878	34.5	27.2		
		UNK	79	236	4.3	3.4		
7C3	6,938	ACP	79	1,699	24.5	19.3	71.4	5
		CCP	79	230	3.3	2.6		
		CIP	79	2,565	37.0	29.2		
		DIP	12	6	0.1	0.0		
		PVC	31	1,099	15.8	5.0		
		UNK	79	1,338	19.3	15.2		
7C4	12,313	ACP	79	7,519	61.0	48.2	73.1	5
		CCP	79	20	0.2	0.1		
		CIP	79	1,102	8.9	7.1		
		DIP	13	923	7.5	1.0		
		PVC	32	310	2.5	1.0		
		UNK	79	2,439	19.8	15.6		
7C5	6,165	ACP	79	1,917	31.1	24.6	75.0	5
		CIP	78	2,986	48.4	38.2		
		DIP	14	363	5.9	0.7		
		PVC	79	669	10.9	8.6		
		UNK	79	229	3.7	2.9		
7D1	15,346	ACP	79	7,419	48.3	38.2	71.8	5
		CIP	79	5,050	32.9	26.0		
		DIP	16	1,787	11.6	2.0		
		UNK	79	1,089	7.1	5.6		
7D2	8,759	ACP	79	2,503	28.6	22.6	76.3	5
		CIP	78	5,576	63.4	49.9		
		DIP	12	274	3.1	0.2		
		UNK	79	406	4.6	3.7		
7D3	10,941	ACP	79	2,645	23.8	18.8	77.1	5
		CIP	79	5,134	46.9	37.1		
		DIP	13	280	2.6	0.4		
		UNK	79	2,882	26.3	20.8		
7E1	14,671	ACP	79	7,423	50.6	40.0	62.8	5
		CIP	79	1,974	13.5	10.6		
		DIP	4	3,166	21.5	0.8		
		UNK	79	2,108	14.4	11.4		
7E2	4,246	ACP	79	3,997	94.1	74.4	79.0	5
		UNK	79	249	5.9	4.6		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
7E3	9,281	ACP	79	5,629	60.7	47.4	75.9	5
		CIP	79	2,049	22.1	17.4		
		DIP	3	21	0.2	0.0		
		PVC	59	855	9.2	4.9		
		UNK	79	726	7.8	6.2		
7E4	9,049	ACP	70	4,041	44.7	30.8	69.2	5
		CIP	69	949	10.5	7.2		
		CONC	69	792	8.8	6.0		
		PVC	79	5	0.1	0.0		
		UNK	70	3,262	36.0	25.1		
7F1	7,279	ACP	79	2,815	38.7	30.5	59.7	4
		CIP	75	1,231	16.9	13.2		
		DIP	7	1,638	22.5	1.7		
		PVC	43	681	9.4	4.3		
		UNK	79	914	12.6	9.9		
7F2	8,807	ACP	78	1,408	16.0	12.2	69.8	5
		CIP	70	6,620	75.2	52.7		
		DIP	6	176	2.0	0.1		
		UNK	70	602	6.8	4.8		
7F3	9,910	ACP	79	4,813	48.6	38.4	75.7	5
		CIP	79	386	3.9	3.1		
		DIP	8	425	4.3	0.3		
		MLS	79	791	8.0	6.3		
		PVC	79	1,453	14.7	11.6		
		UNK	78	2,042	20.6	16.0		
7F4	7,013	ACP	70	3,032	43.2	30.2	66.8	5
		CIP	76	1,448	20.6	15.7		
		DIP	10	519	7.4	0.9		
		MLS	79	171	2.4	1.9		
		UNK	69	1,844	26.3	18.1		
7G1	5,763	DIP	5	1,191	20.7	1.0	55.8	4
		PVC	69	398	6.9	4.8		
		UNK	69	4,173	72.4	50.0		
7G2	4,520	ACP	69	3,020	66.8	46.1	56.8	4
		DIP	5	706	15.6	0.8		
		PVC	46	413	9.1	4.1		
		UNK	69	381	8.4	5.8		
7G3	8,809	ACP	69	6,518	74.0	51.1	68.5	5
		CIP	69	1,445	16.4	11.3		
		DIP	10	85	1.0	0.1		
		UNK	69	761	8.6	6.0		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
7G4	8,847	ACP	69	5,780	65.3	45.1	64.8	5
		CCP	72	806	9.1	6.3		
		CIP	79	54	0.6	0.5		
		DIP	10	655	7.4	0.8		
		UNK	69	1,551	17.5	12.1		
7G5	5,784	ACP	69	5,228	90.4	62.4	66.2	5
		DIP	3	11	0.2	0.0		
		PVC	34	439	7.6	2.6		
		UNK	69	106	1.8	1.3		
80	23,397	DIP	4	23,124	98.8	3.5	4.2	1
		PVC	49	230	1.0	0.6		
		UNK	36	43	0.2	0.1		
81	11,949	ACP	69	3	0.0	0.0	14.6	1
		DIP	12	11,503	95.0	12.0		
		ODS	69	443	3.7	2.6		
82	14,962	ACP	48	10,602	70.8	34.9	37.8	3
		DIP	11	4,314	28.8	2.9		
		UNK	34	18	0.1	0.0		
83	12,612	ACP	58	2,376	18.8	10.1	19.9	2
		DIP	12	8,735	69.3	8.4		
		MLS	12	144	1.1	0.1		
		PVC	12	1,352	10.7	1.3		
		UNK	12	6	0.0	0.0		
84	3,862	ACP	67	343	8.9	6.0	16.9	2
		DIP	12	3,519	91.1	10.9		
85	29,021	ACP	53	2,172	7.5	3.7	5.0	1
		DIP	6	26,281	90.6	1.2		
		PVC	20	173	0.6	0.1		
86A	23,907	ACP	50	22,130	92.6	46.5	47.5	4
		DIP	15	1,406	5.9	0.9		
		PVC	27	58	0.2	0.1		
		UNK	43	1	0.0	0.0		
86B	26,720	ACP	49	25,787	96.5	47.0	47.6	4
		DIP	19	856	3.2	0.5		
		PVC	25	77	0.3	0.1		
86C	27,043	ACP	48	18,838	69.7	33.5	39.0	3
		DIP	12	2,877	10.6	1.2		
		PVC	23	5,165	19.1	4.3		
		UNK	46	7	0.0	0.0		
86D	5,011	ACP	41	3,682	73.5	29.5	34.1	3
		DIP	13	1,052	21.0	2.8		
		PVC	32	277	5.5	1.8		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
87A	15,840	ACP	71	3,878	24.5	17.6	22.0	2
		DIP	6	11,913	75.2	4.3		
		PVC	20	50	0.3	0.1		
87B	4,012	DIP	5	2,103	52.4	2.6	16.4	2
		PVC	29	1,909	47.6	13.8		
88	27,686	DIP	5	27,681	100.0	5.1	5.1	1
		PVC	29	5	0.0	0.0		
89	12,946	ACP	66	537	4.1	2.7	21.2	2
		DIP	11	10,614	82.0	9.1		
		ODS	68	1,796	13.9	9.4		
90A	30,255	ACP	64	25,243	83.4	53.5	56.2	4
		DIP	8	389	1.3	0.1		
		PVC	17	4,180	13.8	2.4		
		UNK	44	152	0.5	0.2		
90B	10,063	ACP	63	5,642	56.1	35.6	58.4	4
		MLS	65	5	0.0	0.0		
		ODS	68	3,107	30.9	20.9		
		PVC	20	906	9.0	1.8		
90C	16,214	ACP	66	13,949	86.0	56.2	58.9	4
		MLS	17	14	0.1	0.0		
		PVC	25	2,091	12.9	2.6		
91	44,476	ACP	62	30,428	68.4	43.6	49.3	4
		DIP	12	6,363	14.3	1.6		
		PVC	26	7,550	17.0	4.1		
92	512	ACP	60	512	100.0	60.0	60.0	4
93A	37,963	ACP	53	35,440	93.4	49.9	51.2	4
		DIP	11	944	2.5	0.1		
		PVC	34	1,577	4.2	1.2		
		UNK	53	2	0.0	0.0		
93B	34,838	ACP	53	32,293	92.7	49.3	50.8	4
		DIP	6	839	2.4	0.1		
		PVC	24	1,706	4.9	1.3		
93C	36,427	ACP	54	32,731	89.9	47.9	50.6	4
		DIP	8	498	1.4	0.1		
		MLS	17	4	0.0	0.0		
		PVC	31	3,137	8.6	2.6		
		UNK	53	19	0.1	0.0		
93D	34,079	ACP	54	33,487	98.3	53.3	53.5	4
		DIP	16	270	0.8	0.1		
		PVC	59	45	0.1	0.1		
		UNK	40	14	0.0	0.0		
95	663	ACP	73	648	97.8	71.4	71.8	5
		PVC	17	0	0.0	0.0		
		UNK	17	14	2.2	0.4		

Area	Total Length Within Area [feet]	Material	Average Age [years]	Length of Material [feet]	Material Within Area [%]	Weighted Age [years]	Total Weighted Age	Total Weighted Score
96	6,245	ACP	57	149	2.4	1.4	5.3	1
		DIP	4	6,096	97.6	3.9		

Appendix E – Pipe Location

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Sacramento Suburban Water District
Pipe Material Score

Area	Main Location	Score
02A	Frontyard	1
02B	Frontyard	1
02C	Frontyard	1
02D	Frontyard	1
02E	Frontyard	1
03A	Frontyard	1
03B	Frontyard	1
04	Frontyard	1
05A	Frontyard	1
05B	Frontyard	1
05C	Frontyard	1
06A	Backyard	2
06B	Backyard	2
06C	Backyard	2
06D	Backyard	2
06E	Backyard	2
06F	Backyard	2
06H	Frontyard	1
06I	Backyard	2
06J	Backyard	2
06K	Backyard	2
06M	Frontyard	1
06N	Frontyard	1
09	Frontyard	1
10	Backyard	2
11	Frontyard	1
12A	Frontyard	1
12B	Frontyard	1
13A	Frontyard	1
13B	Frontyard	1
14	Frontyard	1
15	Frontyard	1
16	Frontyard	1
17A	Frontyard	1
17B	Frontyard	1
18	Frontyard	1
19	Frontyard	1
1A	Frontyard	1
1B	Frontyard	1
1C	Frontyard	1
20A	Frontyard	1
20B	Frontyard	1
21	Backyard	2
22	Backyard	2
23	Backyard	2
24A	Frontyard	1

Sacramento Suburban Water District
Pipe Material Score

Area	Main Location	Score
24B	Frontyard	1
25	Backyard	2
26A	Frontyard	1
26B	Frontyard	1
27	Frontyard	1
28	Frontyard	1
29	Backyard	2
30	Frontyard	1
31A	Frontyard	1
31B	Frontyard	1
32	Backyard	2
33	Backyard	2
34	Backyard	2
35	Frontyard	1
36	Frontyard	1
37	Backyard	2
38A	Frontyard	1
38B	Frontyard	1
39	Backyard	2
40A	Frontyard	1
40B	Frontyard	1
41	Backyard	2
42A	Frontyard	1
42B	Backyard	2
42C	Backyard	2
42D	Backyard	2
42E	Backyard	2
42F	Frontyard	1
42G	Frontyard	1
42H	Backyard	2
42I	Frontyard	1
42J	Frontyard	1
42K	Backyard	2
42L	Frontyard	1
43A	Backyard	2
43B	Frontyard	1
43C	Frontyard	1
43D	Frontyard	1
44	Backyard	2
45A	Frontyard	1
45B	Frontyard	1
46	Frontyard	1
47	Frontyard	1
48	Frontyard	1
49	Frontyard	1
51	Frontyard	1

Sacramento Suburban Water District
Pipe Material Score

Area	Main Location	Score
52A	Frontyard	1
52B	Frontyard	1
53A	Frontyard	1
53B	Frontyard	1
54	Backyard	2
55	Frontyard	1
56A	Frontyard	1
56B	Frontyard	1
56C	Frontyard	1
57	Frontyard	1
57A	Frontyard	1
57B	Backyard	2
58A	Frontyard	1
58B	Frontyard	1
58C	Frontyard	1
59	Frontyard	1
60	Frontyard	1
60A	Frontyard	1
60B	Frontyard	1
61	Frontyard	1
62	Frontyard	1
63	Frontyard	1
64	Frontyard	1
65	Frontyard	1
66A	Frontyard	1
66B	Frontyard	1
66C	Frontyard	1
66D	Frontyard	1
66E	Frontyard	1
66F	Frontyard	1
67	Frontyard	1
68	Frontyard	1
69	Frontyard	1
6G1	Backyard	2
6G2	Backyard	2
70	Frontyard	1
71	Frontyard	1
72	Backyard	2
74	Backyard	2
76A	Frontyard	1
76B	Frontyard	1
76C	Frontyard	1
76D	Frontyard	1
76F	Frontyard	1
76G	Frontyard	1
76H	Backyard	2

Sacramento Suburban Water District
Pipe Material Score

Area	Main Location	Score
76I	Frontyard	1
76J	Backyard	2
76K	Frontyard	1
77	Backyard	2
78	Frontyard	1
79	Frontyard	1
7A1	Backyard	2
7A2	Frontyard	1
7B1	Backyard	2
7B2	Backyard	2
7B3	Frontyard	1
7B4	Frontyard	1
7B5	Backyard	2
7C1	Frontyard	1
7C2	Frontyard	1
7C3	Frontyard	1
7C4	Frontyard	1
7C5	Frontyard	1
7D1	Frontyard	1
7D2	Frontyard	1
7D3	Frontyard	1
7E1	Backyard	2
7E2	Backyard	2
7E3	Frontyard	1
7E4	Backyard	2
7F1	Backyard	2
7F2	Backyard	2
7F3	Frontyard	1
7F4	Backyard	2
7G1	Backyard	2
7G2	Backyard	2
7G3	Frontyard	1
7G4	Frontyard	1
7G5	Frontyard	1
80	Frontyard	1
81	Frontyard	1
82	Frontyard	1
83	Frontyard	1
84	Frontyard	1
85	Frontyard	1
86A	Frontyard	1
86B	Frontyard	1
86C	Frontyard	1
86D	Frontyard	1
87A	Frontyard	1
87B	Frontyard	1

Sacramento Suburban Water District
Pipe Material Score

Area	Main Location	Score
88	Frontyard	1
89	Frontyard	1
90A	Backyard	2
90B	Backyard	2
90C	Backyard	2
91	Frontyard	1
92	Backyard	2
93A	Frontyard	1
93B	Frontyard	1
93C	Frontyard	1
93D	Frontyard	1
95	Frontyard	1
96	Frontyard	1

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Appendix F – Failure Rate

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Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
103	02A	2	48,505	0.22	1
109	02B	0	26,917	0.00	1
110	02C	0	24,972	0.00	1
111	02D	0	31,006	0.00	1
112	02E	0	27,198	0.00	1
12	03A	25	33,039	4.00	5
5	03B	33	28,104	6.20	5
33	04	20	49,199	2.15	3
102	05A	2	43,409	0.24	1
101	05B	2	41,075	0.26	1
108	05C	1	45,153	0.12	1
23	06A	13	25,683	2.67	3
61	06B	4	19,778	1.07	3
72	06C	3	19,701	0.80	1
15	06D	16	24,661	3.43	5
57	06E	5	21,175	1.25	3
38	06F	5	13,979	1.89	3
113	06H	0	24,480	0.00	1
10	06I	13	15,236	4.50	5
25	06J	6	12,678	2.50	3
18	06K	12	19,823	3.20	5
114	06M	0	13,909	0.00	1
115	06N	0	13,412	0.00	1
24	09	6	11,913	2.66	3
116	10	0	14,323	0.00	1
117	11	0	3,124	0.00	1
66	12A	9	48,674	0.98	1
90	12B	4	40,026	0.53	1
106	13A	1	38,145	0.14	1
98	13B	2	35,161	0.30	1
95	14	1	14,712	0.36	1
118	15	0	5,792	0.00	1
119	16	0	6,825	0.00	1
107	17A	1	41,281	0.13	1
88	17B	5	45,467	0.58	1
56	18	13	53,758	1.28	3
53	19	12	47,512	1.33	3
89	1A	1	9,772	0.54	1
120	1B	0	6,385	0.00	1
91	1C	1	10,473	0.50	1
67	20A	6	34,434	0.92	1
75	20B	7	48,476	0.76	1
77	21	1	7,384	0.72	1
20	22	2	3,619	2.92	3
74	23	10	67,439	0.78	1

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
96	24A	3	49,259	0.32	1
85	24B	6	52,564	0.60	1
76	25	1	7,248	0.73	1
105	26A	1	29,619	0.18	1
68	26B	7	41,271	0.90	1
59	27	7	31,842	1.16	3
71	28	8	52,221	0.81	1
97	29	3	51,228	0.31	1
121	30	0	3,313	0.00	1
73	31A	4	26,653	0.79	1
122	31B	0	1,036	0.00	1
26	32	5	10,572	2.50	3
70	33	3	18,435	0.86	1
22	34	3	5,806	2.73	3
34	35	13	32,441	2.12	3
78	36	6	45,772	0.69	1
123	37	0	3,471	0.00	1
45	38A	7	25,036	1.48	3
64	38B	9	46,403	1.02	3
93	39	1	11,720	0.45	1
79	40A	4	30,817	0.69	1
81	40B	4	31,294	0.67	1
84	41	2	17,423	0.61	1
124	42A	0	1,304	0.00	1
49	42B	2	7,586	1.39	3
41	42C	3	9,393	1.69	3
50	42D	3	11,540	1.37	3
21	42E	11	20,652	2.81	3
42	42F	3	9,775	1.62	3
125	42G	0	1,836	0.00	1
126	42H	0	1,000	0.00	1
127	42I	0	295	0.00	1
11	42J	4	4,767	4.43	5
9	42K	3	3,459	4.58	5
128	42L	0	2,042	0.00	1
52	43A	3	11,715	1.35	3
129	43B	0	105	0.00	1
130	43C	0	1,508	0.00	1
131	43D	0	1,440	0.00	1
100	44	1	19,372	0.27	1
132	45A	0	41,312	0.00	1
133	45B	0	12,609	0.00	1
134	46	0	9,942	0.00	1
17	47	1	1,636	3.23	5
104	48	1	25,708	0.21	1

Saacramento Suburban Water District
Failure Rate Score

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
135	49	0	2,779	0.00	1
136	51	0	33,029	0.00	1
137	52A	0	16,973	0.00	1
138	52B	0	10,972	0.00	1
99	53A	1	17,785	0.30	1
80	53B	1	7,819	0.68	1
44	54	3	10,382	1.53	3
92	55	3	33,056	0.48	1
139	56A	0	3,131	0.00	1
140	56B	0	31,955	0.00	1
197	56C	0	0	0.00	1
83	57	1	8,270	0.64	1
35	57A	13	33,693	2.04	3
141	57B	0	2,130	0.00	1
142	58A	0	13,346	0.00	1
143	58B	0	3,999	0.00	1
144	58C	0	923	0.00	1
145	59	0	7,337	0.00	1
146	60	0	424	0.00	1
147	60A	0	11,021	0.00	1
148	60B	0	6,128	0.00	1
149	61	0	5,680	0.00	1
150	62	0	5,117	0.00	1
151	63	0	32,834	0.00	1
152	64	0	3,351	0.00	1
153	65	0	12,960	0.00	1
154	66A	0	6,575	0.00	1
36	66B	2	5,238	2.02	3
155	66C	0	2,792	0.00	1
156	66D	0	5,793	0.00	1
157	66E	0	3,279	0.00	1
158	66F	0	605	0.00	1
159	67	0	2,101	0.00	1
160	68	0	899	0.00	1
161	69	0	4,959	0.00	1
19	6G1	5	8,922	2.96	3
162	6G2	0	2,310	0.00	1
163	70	0	30,740	0.00	1
164	71	0	25,716	0.00	1
31	72	4	9,398	2.25	3
46	74	3	11,137	1.42	3
165	76A	0	9,389	0.00	1
166	76B	0	5,406	0.00	1
14	76C	2	3,060	3.45	5
167	76D	0	6,184	0.00	1

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
48	76F	1	3,786	1.39	3
168	76G	0	2,121	0.00	1
8	76H	4	4,594	4.60	5
169	76I	0	1,797	0.00	1
170	76J	0	1,137	0.00	1
171	76K	0	1,232	0.00	1
172	77	0	2,061	0.00	1
173	78	0	22,595	0.00	1
174	79	0	6,998	0.00	1
82	7A1	1	8,068	0.65	1
175	7A2	0	13,504	0.00	1
176	7B1	0	5,110	0.00	1
30	7B2	3	7,029	2.25	3
51	7B3	2	7,775	1.36	3
54	7B4	2	8,086	1.31	3
177	7B5	0	408	0.00	1
4	7C1	7	5,062	7.30	5
178	7C2	0	5,448	0.00	1
29	7C3	3	6,938	2.28	3
40	7C4	4	12,313	1.72	3
6	7C5	7	6,165	5.99	5
3	7D1	29	15,346	9.98	5
7	7D2	8	8,759	4.82	5
16	7D3	7	10,941	3.38	5
60	7E1	3	14,671	1.08	3
179	7E2	0	4,246	0.00	1
180	7E3	0	9,281	0.00	1
181	7E4	0	9,049	0.00	1
182	7F1	0	7,279	0.00	1
58	7F2	2	8,807	1.20	3
62	7F3	2	9,910	1.07	3
183	7F4	0	7,013	0.00	1
184	7G1	0	5,763	0.00	1
185	7G2	0	4,520	0.00	1
86	7G3	1	8,809	0.60	1
87	7G4	1	8,847	0.60	1
186	7G5	0	5,784	0.00	1
187	80	0	23,397	0.00	1
188	81	0	11,949	0.00	1
47	82	4	14,962	1.41	3
189	83	0	12,612	0.00	1
190	84	0	3,862	0.00	1
94	85	2	29,021	0.36	1
69	86A	4	23,907	0.88	1
32	86B	11	26,720	2.17	3

Saacramento Suburban Water District
Failure Rate Score

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
28	86C	12	27,043	2.34	3
63	86D	1	5,011	1.05	3
191	87A	0	15,840	0.00	1
192	87B	0	4,012	0.00	1
193	88	0	27,686	0.00	1
194	89	0	12,946	0.00	1
43	90A	9	30,255	1.57	3
2	90B	21	10,063	11.02	5
65	90C	3	16,214	0.98	1
55	91	11	44,476	1.31	3
1	92	3	512	30.94	5
13	93A	26	37,963	3.62	5
37	93B	13	34,838	1.97	3
39	93C	12	36,427	1.74	3
27	93D	16	34,079	2.48	3
195	95	0	663	0.00	1
196	96	0	6,245	0.00	1

**Corresponding score in Appendix A is doubly weighted*

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Appendix G – Pipe Damage

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Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
02A	48,505	ACP	699	1	1	0.0	3.1
		DIP	22,265	46	1	0.5	
		PVC	25,541	52	5	2.6	
02B	26,917	DIP	16,499	61	1	0.6	2.5
		PVC	10,418	39	5	1.9	
02C	24,972	CIP	13	0	1	0.0	2.3
		DIP	16,921	68	1	0.7	
		PVC	8,038	32	5	1.6	
02D	31,006	CIP	17	0	1	0.0	1.3
		DIP	28,416	92	1	0.9	
		PVC	2,573	8	5	0.4	
02E	27,198	DIP	27,198	100	1	1.0	1.0
03A	33,039	ACP	25,026	76	1	0.8	1.3
		CIP	34	0	1	0.0	
		DIP	5,844	18	1	0.2	
		PVC	2,135	6	5	0.3	
03B	28,104	ACP	24,530	87	1	0.9	1.0
		DIP	3,458	12	1	0.1	
		PVC	75	0	5	0.0	
		UNK	41	0	1	0.0	
04	49,199	ACP	46,021	94	1	0.9	1.0
		DIP	3,115	6	1	0.1	
		PVC	28	0	5	0.0	
		UNK	35	0	1	0.0	
05A	43,409	ACP	34,763	80	1	0.8	1.7
		CIP	286	1	1	0.0	
		DIP	503	1	1	0.0	
		PVC	7,857	18	5	0.9	
05B	41,075	ACP	720	2	1	0.0	4.9
		DIP	570	1	1	0.0	
		PVC	39,785	97	5	4.8	
05C	45,153	ACP	23,274	52	1	0.5	2.4
		DIP	5,573	12	1	0.1	
		PVC	16,129	36	5	1.8	
		UNK	177	0	1	0.0	
06A	25,683	ACP	25,381	99	1	1.0	1.0
		DIP	277	1	1	0.0	
		PVC	26	0	5	0.0	
06B	19,778	ACP	19,778	100	1	1.0	1.0
06C	19,701	ACP	19,394	98	1	1.0	1.0
		DIP	0	0	1	0.0	
		UNK	307	2	1	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
06D	24,661	ACP	24,307	99	1	1.0	1.0
		CIP	25	0	1	0.0	
		DIP	329	1	1	0.0	
06E	21,175	ACP	21,003	99	1	1.0	1.0
		CIP	30	0	1	0.0	
		DIP	142	1	1	0.0	
06F	13,979	ACP	13,569	97	1	1.0	1.0
		DIP	410	3	1	0.0	
06H	24,480	ACP	457	2	1	0.0	1.0
		DIP	24,022	98	1	1.0	
06I	15,236	ACP	14,920	98	1	1.0	1.0
		DIP	192	1	1	0.0	
		PVC	125	1	5	0.0	
06J	12,678	ACP	10,884	86	1	0.9	1.0
		DIP	1,664	13	1	0.1	
		PVC	130	1	5	0.1	
06K	19,823	ACP	17,581	89	1	0.9	1.5
		PVC	2,242	11	5	0.6	
06M	13,909	ACP	2,774	20	1	0.2	1.0
		DIP	11,135	80	1	0.8	
06N	13,412	ACP	1,091	8	1	0.1	1.0
		DIP	12,321	92	1	0.9	
09	11,913	ACP	11,775	99	1	1.0	1.0
		DIP	138	1	1	0.0	
10	14,323	ACP	258	2	1	0.0	4.8
		DIP	503	4	1	0.0	
		MLS	13,561	95	5	4.7	
11	3,124	ACP	2,620	84	1	0.8	1.6
		MLS	505	16	5	0.8	
12A	48,674	ACP	36,330	75	1	0.7	2.0
		DIP	220	0	1	0.0	
		MLS	11,536	24	5	1.2	
		PVC	588	1	5	0.1	
12B	40,026	ACP	37,942	95	1	0.9	1.0
		CIP	203	1	1	0.0	
		DIP	1,730	4	1	0.0	
		MLS	152	0	5	0.0	
13A	38,145	ACP	5,185	14	1	0.1	4.2
		DIP	2,547	7	1	0.1	
		MLS	19,561	51	5	2.6	
		PVC	10,853	28	5	1.4	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
13B	35,161	ACP	21,208	60	1	0.6	2.4
		CIP	517	1	1	0.0	
		DIP	1,270	4	1	0.0	
		MLS	4,437	13	5	0.6	
		PVC	7,730	22	5	1.1	
14	14,712	ACP	2,639	18	1	0.2	4.3
		DIP	56	0	1	0.0	
		PVC	12,017	82	5	4.1	
15	5,792	CIP	410	7	1	0.1	4.7
		PVC	5,382	93	5	4.6	
16	6,825	ACP	5,460	80	1	0.8	1.0
		DIP	1,317	19	1	0.2	
		PVC	48	1	5	0.0	
17A	41,281	ACP	16,320	40	1	0.4	3.1
		DIP	3,110	8	1	0.1	
		MLS	11,110	27	5	1.3	
		PVC	10,723	26	5	1.3	
		UNK	18	0	1	0.0	
17B	45,467	ACP	11,131	24	1	0.2	3.8
		CIP	722	2	1	0.0	
		DIP	1,779	4	1	0.0	
		MLS	6,585	14	5	0.7	
		PVC	24,931	55	5	2.7	
		UNK	3	0	1	0.0	
18	53,758	ACP	22,321	42	1	0.4	3.1
		DIP	2,588	5	1	0.0	
		MLS	14,380	27	5	1.3	
		PVC	14,470	27	5	1.3	
19	47,512	ACP	21,735	46	1	0.5	2.9
		DIP	3,251	7	1	0.1	
		MLS	11,138	23	5	1.2	
		PVC	11,386	24	5	1.2	
		UNK	2	0	1	0.0	
1A	9,772	ACP	9,647	99	1	1.0	1.0
		UNK	125	1	1	0.0	
1B	6,385	ACP	5,394	84	1	0.8	1.2
		DIP	618	10	1	0.1	
		PVC	359	6	5	0.3	
1C	10,473	ACP	10,001	95	1	1.0	1.0
		DIP	463	4	1	0.0	
		UNK	8	0	1	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
20A	34,434	ACP	31,605	92	1	0.9	1.1
		DIP	2,037	6	1	0.1	
		PVC	737	2	5	0.1	
20B	48,476	ACP	33,670	69	1	0.7	1.6
		CIP	264	1	1	0.0	
		DIP	4,404	9	1	0.1	
		MLS	4,942	10	5	0.5	
		PVC	2,914	6	5	0.3	
21	7,384	ACP	4,675	63	1	0.6	1.0
		DIP	2,530	34	1	0.3	
22	3,619	ACP	3,500	97	1	1.0	1.0
		PVC	38	1	5	0.1	
23	67,439	ACP	63,200	94	1	0.9	1.0
		DIP	2,651	4	1	0.0	
		PVC	733	1	5	0.1	
		UNK	26	0	1	0.0	
24A	49,259	ACP	24,356	49	1	0.5	2.6
		CIP	602	1	1	0.0	
		DIP	5,042	10	1	0.1	
		MLS	9,954	20	5	1.0	
		PVC	9,264	19	5	0.9	
		UNK	41	0	1	0.0	
24B	52,564	ACP	28,237	54	1	0.5	2.8
		CIP	60	0	1	0.0	
		DIP	353	1	1	0.0	
		MLS	11,726	22	5	1.1	
		PVC	11,967	23	5	1.1	
		UNK	220	0	1	0.0	
25	7,248	ACP	5,862	81	1	0.8	1.8
		MLS	203	3	5	0.1	
		PVC	1,184	16	5	0.8	
26A	29,619	ACP	6,352	21	1	0.2	3.5
		DIP	4,947	17	1	0.2	
		MLS	14,317	48	5	2.4	
		PVC	4,003	13	5	0.7	
26B	41,271	ACP	18,261	44	1	0.4	3.0
		DIP	2,052	5	1	0.0	
		MLS	15,036	36	5	1.8	
		PVC	5,821	14	5	0.7	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
27	31,842	ACP	8,386	26	1	0.3	3.3
		DIP	4,841	15	1	0.2	
		MLS	14,902	47	5	2.3	
		PVC	3,612	11	5	0.6	
		UNK	102	0	1	0.0	
28	52,221	ACP	28,010	54	1	0.5	2.8
		DIP	254	0	1	0.0	
		MLS	14,665	28	5	1.4	
		PVC	9,292	18	5	0.9	
29	51,228	ACP	30,373	59	1	0.6	2.0
		CIP	74	0	1	0.0	
		DIP	7,366	14	1	0.1	
		MLS	10,853	21	5	1.1	
		PVC	2,492	5	5	0.2	
30	3,313	ACP	3,039	92	1	0.9	1.3
		PVC	274	8	5	0.4	
31A	26,653	ACP	22,801	86	1	0.9	1.2
		DIP	2,250	8	1	0.1	
		PVC	1,443	5	5	0.3	
31B	1,036	ACP	790	76	1	0.8	1.0
		DIP	246	24	1	0.2	
32	10,572	ACP	10,188	96	1	1.0	1.0
		PVC	7	0	5	0.0	
33	18,435	ACP	15,178	82	1	0.8	1.0
		DIP	3,028	16	1	0.2	
34	5,806	ACP	4,545	78	1	0.8	1.9
		MLS	1,260	22	5	1.1	
35	32,441	ACP	16,244	50	1	0.5	2.9
		DIP	422	1	1	0.0	
		MLS	15,500	48	5	2.4	
		PVC	276	1	5	0.0	
36	45,772	ACP	19,396	42	1	0.4	3.0
		DIP	2,830	6	1	0.1	
		MLS	16,898	37	5	1.8	
		PVC	6,601	14	5	0.7	
37	3,471	ACP	1,999	58	1	0.6	2.5
		DIP	15	0	1	0.0	
		MLS	1,321	38	5	1.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
38A	25,036	ACP	21,837	87	1	0.9	1.3
		CIP	388	2	1	0.0	
		DIP	1,057	4	1	0.0	
		MLS	597	2	5	0.1	
		PVC	1,047	4	5	0.2	
		UNK	48	0	1	0.0	
38B	46,403	ACP	29,899	64	1	0.6	2.3
		CIP	4	0	1	0.0	
		DIP	1,618	3	1	0.0	
		MLS	12,148	26	5	1.3	
		PVC	2,561	6	5	0.3	
		UNK	33	0	1	0.0	
39	11,720	ACP	10,105	86	1	0.9	1.1
		CIP	679	6	1	0.1	
		DIP	125	1	1	0.0	
		MLS	31	0	5	0.0	
		PVC	351	3	5	0.1	
		UNK	30	0	1	0.0	
40A	30,817	ACP	12,872	42	1	0.4	2.8
		DIP	3,763	12	1	0.1	
		MLS	2,694	9	5	0.4	
		PVC	11,489	37	5	1.9	
40B	31,294	ACP	15,726	50	1	0.5	2.6
		DIP	2,855	9	1	0.1	
		MLS	7,738	24	5	1.2	
		PVC	4,975	16	5	0.8	
41	17,423	ACP	16,807	96	1	1.0	1.0
		DIP	38	0	1	0.0	
		MLS	198	1	5	0.1	
		PVC	46	0	5	0.0	
42A	1,304	DIP	1,304	100	1	1.0	1.0
42B	7,586	ACP	4,072	54	1	0.5	1.2
		DIP	1,105	15	1	0.1	
		ODS	445	6	5	0.3	
		PVC	400	5	5	0.3	
42C	9,393	ACP	6,599	70	1	0.7	1.5
		DIP	1,272	14	1	0.1	
		PVC	1,269	14	5	0.7	
		UNK	3	0	1	0.0	
42D	11,540	ACP	11,436	99	1	1.0	1.0
		DIP	8	0	1	0.0	
		PVC	14	0	5	0.0	
		UNK	8	0	1	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
42E	20,652	ACP	20,287	98	1	1.0	1.0
42F	9,775	ACP	7,162	73	1	0.7	1.1
		DIP	2,327	24	1	0.2	
		PVC	217	2	5	0.1	
		UNK	68	1	1	0.0	
42G	1,836	ACP	588	32	1	0.3	1.0
		DIP	1,249	68	1	0.7	
42H	1,000	ACP	963	96	1	1.0	1.0
		DIP	38	4	1	0.0	
42I	295	ACP	295	100	1	1.0	1.0
42J	4,767	ACP	3,157	66	1	0.7	1.5
		DIP	1,018	21	1	0.2	
		ODS	1	0	5	0.0	
		PVC	591	12	5	0.6	
42K	3,459	ACP	1,044	30	1	0.3	2.7
		DIP	955	28	1	0.3	
		PVC	1,437	42	5	2.1	
		UNK	22	1	1	0.0	
42L	2,042	ACP	155	8	1	0.1	1.0
		DIP	1,887	92	1	0.9	
43A	11,715	ACP	9,397	80	1	0.8	1.8
		DIP	59	1	1	0.0	
		ODS	284	2	5	0.1	
		PVC	1,945	17	5	0.8	
		UNK	12	0	1	0.0	
43B	105	DIP	105	100	1	1.0	1.0
43C	1,508	ACP	653	43	1	0.4	1.0
		DIP	853	57	1	0.6	
		PVC	3	0	5	0.0	
43D	1,440	ACP	238	17	1	0.2	3.3
		DIP	363	25	1	0.3	
		PVC	839	58	5	2.9	
44	19,372	ACP	6,807	35	1	0.4	2.6
		DIP	4,685	24	1	0.2	
		PVC	7,880	41	5	2.0	
45A	41,312	ACP	801	2	1	0.0	1.9
		DIP	31,251	76	1	0.8	
		PVC	9,237	22	5	1.1	
		UNK	23	0	1	0.0	
45B	12,609	ACP	4,800	38	1	0.4	1.7
		DIP	5,524	44	1	0.4	
		PVC	2,286	18	5	0.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
46	9,942	DIP	106	1	1	0.0	5.0
		PVC	9,836	99	5	4.9	
47	1,636	DIP	25	2	1	0.0	4.9
		PVC	1,612	98	5	4.9	
48	25,708	ACP	1,154	4	1	0.0	1.3
		DIP	22,572	88	1	0.9	
		PVC	1,962	8	5	0.4	
		UNK	19	0	1	0.0	
49	2,779	DIP	97	3	1	0.0	4.9
		PVC	2,682	97	5	4.8	
51	33,029	ACP	915	3	1	0.0	1.3
		DIP	29,523	89	1	0.9	
		PVC	2,590	8	5	0.4	
52A	16,973	ACP	6,400	38	1	0.4	1.0
		DIP	10,572	62	1	0.6	
52B	10,972	DIP	10,972	100	1	1.0	1.0
53A	17,785	ACP	16,092	90	1	0.9	1.3
		DIP	345	2	1	0.0	
		PVC	1,349	8	5	0.4	
53B	7,819	ACP	5,856	75	1	0.7	1.0
		DIP	1,775	23	1	0.2	
54	10,382	ACP	8,491	82	1	0.8	1.4
		DIP	568	5	1	0.1	
		PVC	992	10	5	0.5	
55	33,056	ACP	25,594	77	1	0.8	1.6
		DIP	2,168	7	1	0.1	
		MLS	2,992	9	5	0.5	
		PVC	2,200	7	5	0.3	
		UNK	53	0	1	0.0	
56A	3,131	ACP	173	6	1	0.1	1.0
		DIP	2,958	94	1	0.9	
56B	31,955	ACP	1,966	6	1	0.1	1.2
		DIP	28,468	89	1	0.9	
		PVC	1,521	5	5	0.2	
57	8,270	ACP	3,110	38	1	0.4	2.6
		DIP	1,892	23	1	0.2	
		MLS	2,546	31	5	1.5	
		PVC	723	9	5	0.4	
57A	33,693	ACP	24,770	74	1	0.7	1.7
		DIP	2,230	7	1	0.1	
		MLS	709	2	5	0.1	
		PVC	5,650	17	5	0.8	
		UNK	26	0	1	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
57B	2,130	ACP	1,547	73	1	0.7	2.1
		PVC	583	27	5	1.4	
58A	13,346	ACP	3	0	1	0.0	1.3
		DIP	12,500	94	1	0.9	
		PVC	843	6	5	0.3	
58B	3,999	ACP	416	10	1	0.1	1.0
		DIP	3,583	90	1	0.9	
58C	923	ACP	21	2	1	0.0	1.0
		DIP	901	98	1	1.0	
59	7,337	ACP	98	1	1	0.0	1.5
		DIP	6,247	85	1	0.9	
		PVC	991	14	5	0.7	
60	424	DIP	424	100	1	1.0	1.0
60A	11,021	ACP	139	1	1	0.0	1.0
		DIP	10,882	99	1	1.0	
60B	6,128	DIP	4,643	76	1	0.8	2.0
		PVC	1,468	24	5	1.2	
		UNK	17	0	1	0.0	
61	5,680	ACP	20	0	1	0.0	1.1
		DIP	5,529	97	1	1.0	
		PVC	131	2	5	0.1	
62	5,117	DIP	5,117	100	1	1.0	1.0
63	32,834	ACP	353	1	1	0.0	4.9
		DIP	611	2	1	0.0	
		PVC	31,837	97	5	4.8	
		UNK	33	0	1	0.0	
64	3,351	DIP	3,351	100	1	1.0	1.0
65	12,960	ACP	973	8	1	0.1	1.0
		DIP	11,831	91	1	0.9	
		ODS	122	1	5	0.0	
		PVC	34	0	5	0.0	
66A	6,575	ACP	62	1	1	0.0	2.5
		DIP	4,058	62	1	0.6	
		ODS	51	1	5	0.0	
		PVC	2,346	36	5	1.8	
		UNK	58	1	1	0.0	
66B	5,238	ACP	3,910	75	1	0.7	1.9
		DIP	30	1	1	0.0	
		PVC	1,160	22	5	1.1	
		UNK	137	3	1	0.0	
66C	2,792	ACP	1,870	67	1	0.7	1.7
		DIP	462	17	1	0.2	
		PVC	460	16	5	0.8	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
66D	5,793	ACP	946	16	1	0.2	1.0
		DIP	4,823	83	1	0.8	
		PVC	24	0	5	0.0	
66E	3,279	ACP	932	28	1	0.3	1.0
		DIP	2,347	72	1	0.7	
66F	605	DIP	605	100	1	1.0	1.0
67	2,101	ACP	744	35	1	0.4	1.0
		DIP	1,229	58	1	0.6	
		UNK	28	1	1	0.0	
68	899	DIP	10	1	1	0.0	5.0
		PVC	889	99	5	4.9	
69	4,959	ACP	12	0	1	0.0	1.0
		DIP	4,947	100	1	1.0	
6G1	8,922	ACP	8,922	100	1	1.0	1.0
6G2	2,310	ACP	2,278	99	1	1.0	1.0
		DIP	31	1	1	0.0	
70	30,740	ACP	1,559	5	1	0.1	1.0
		DIP	29,181	95	1	0.9	
71	25,716	ACP	1,462	6	1	0.1	1.5
		DIP	20,824	81	1	0.8	
		PVC	3,430	13	5	0.7	
72	9,398	ACP	9,266	99	1	1.0	1.1
		DIP	3	0	1	0.0	
		PVC	123	1	5	0.1	
		UNK	7	0	1	0.0	
74	11,137	ACP	9,678	87	1	0.9	1.5
		MLS	5	0	5	0.0	
		PVC	1,451	13	5	0.7	
		UNK	3	0	1	0.0	
76A	9,389	ACP	2,479	26	1	0.3	1.2
		DIP	6,377	68	1	0.7	
		PVC	534	6	5	0.3	
76B	5,406	ACP	5	0	1	0.0	1.0
		DIP	5,400	100	1	1.0	
76C	3,060	ACP	1,932	63	1	0.6	2.0
		DIP	332	11	1	0.1	
		PVC	796	26	5	1.3	
76D	6,184	ACP	41	1	1	0.0	1.0
		DIP	6,132	99	1	1.0	
		PVC	12	0	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
76F	3,786	ACP	2,704	71	1	0.7	1.0
		DIP	1,081	29	1	0.3	
76G	2,121	ACP	211	10	1	0.1	1.0
		DIP	1,910	90	1	0.9	
76H	4,594	ACP	2,812	61	1	0.6	1.7
		DIP	934	20	1	0.2	
		PVC	832	18	5	0.9	
		UNK	16	0	1	0.0	
76I	1,797	ACP	658	37	1	0.4	2.4
		DIP	489	27	1	0.3	
		ODS	146	8	5	0.4	
		PVC	495	28	5	1.4	
		UNK	9	1	1	0.0	
76J	1,137	ACP	453	40	1	0.4	1.0
		DIP	682	60	1	0.6	
		UNK	1	0	1	0.0	
76K	1,232	ACP	402	33	1	0.3	1.2
		DIP	780	63	1	0.6	
		PVC	50	4	5	0.2	
		UNK	1	0	1	0.0	
77	2,061	ACP	2,058	100	1	1.0	1.0
		PVC	3	0	5	0.0	
78	22,595	ACP	565	2	1	0.0	1.5
		DIP	18,884	84	1	0.8	
		ODS	345	2	5	0.1	
		PVC	2,741	12	5	0.6	
		UNK	61	0	1	0.0	
79	6,998	ACP	28	0	1	0.0	2.1
		DIP	5,040	72	1	0.7	
		PVC	1,888	27	5	1.3	
		UNK	42	1	1	0.0	
7A1	8,068	ACP	3,688	46	1	0.5	2.8
		PVC	3,563	44	5	2.2	
		UNK	817	10	1	0.1	
7A2	13,504	ACP	868	6	1	0.1	2.9
		CIP	384	3	1	0.0	
		PVC	6,526	48	5	2.4	
		UNK	5,726	42	1	0.4	
7B1	5,110	ACP	4,309	84	1	0.8	1.0
		DIP	163	3	1	0.0	
		UNK	638	12	1	0.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7B2	7,029	ACP	6,728	96	1	1.0	1.1
		DIP	12	0	1	0.0	
		PVC	210	3	5	0.1	
		UNK	80	1	1	0.0	
7B3	7,775	ACP	4,747	61	1	0.6	1.7
		CIP	240	3	1	0.0	
		DIP	1,257	16	1	0.2	
		PVC	1,325	17	5	0.9	
		UNK	207	3	1	0.0	
7B4	8,086	ACP	4,537	56	1	0.6	1.8
		DIP	361	4	1	0.0	
		PVC	1,693	21	5	1.0	
		UNK	1,495	18	1	0.2	
7B5	408	UNK	408	100	1	1.0	1.0
7C1	5,062	ACP	1,410	28	1	0.3	2.5
		CIP	1,405	28	1	0.3	
		ODS	395	8	5	0.4	
		PVC	1,510	30	5	1.5	
		UNK	342	7	1	0.1	
7C2	5,448	ACP	3,334	61	1	0.6	1.0
		CIP	1,878	34	1	0.3	
		UNK	236	4	1	0.0	
7C3	6,938	ACP	1,699	24	1	0.2	1.6
		CCP	230	3	1	0.0	
		CIP	2,565	37	1	0.4	
		DIP	6	0	1	0.0	
		PVC	1,099	16	5	0.8	
		UNK	1,338	19	1	0.2	
7C4	12,313	ACP	7,519	61	1	0.6	1.1
		CCP	20	0	1	0.0	
		CIP	1,102	9	1	0.1	
		DIP	923	7	1	0.1	
		PVC	310	3	5	0.1	
		UNK	2,439	20	1	0.2	
7C5	6,165	ACP	1,917	31	1	0.3	1.4
		CIP	2,986	48	1	0.5	
		DIP	363	6	1	0.1	
		PVC	669	11	5	0.5	
		UNK	229	4	1	0.0	
7D1	15,346	ACP	7,419	48	1	0.5	1.0
		CIP	5,050	33	1	0.3	
		DIP	1,787	12	1	0.1	
		UNK	1,089	7	1	0.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7D2	8,759	ACP	2,503	29	1	0.3	1.0
		CIP	5,576	63	1	0.6	
		DIP	274	3	1	0.0	
		UNK	406	5	1	0.0	
7D3	10,941	ACP	2,645	24	1	0.2	1.0
		CIP	5,134	47	1	0.5	
		DIP	280	3	1	0.0	
		UNK	2,882	26	1	0.3	
7E1	14,671	ACP	7,423	51	1	0.5	1.0
		CIP	1,974	13	1	0.1	
		DIP	3,166	21	1	0.2	
		UNK	2,108	14	1	0.1	
7E2	4,246	ACP	3,997	94	1	0.9	1.0
		UNK	249	6	1	0.1	
7E3	9,281	ACP	5,629	61	1	0.6	1.4
		CIP	2,049	22	1	0.2	
		DIP	21	0	1	0.0	
		PVC	855	9	5	0.5	
		UNK	726	8	1	0.1	
7E4	9,049	ACP	4,041	45	1	0.4	1.0
		CIP	949	10	1	0.1	
		CONC	792	9	1	0.1	
		PVC	5	0	5	0.0	
		UNK	3,262	36	1	0.4	
7F1	7,279	ACP	2,815	39	1	0.4	1.4
		CIP	1,231	17	1	0.2	
		DIP	1,638	22	1	0.2	
		PVC	681	9	5	0.5	
		UNK	914	13	1	0.1	
7F2	8,807	ACP	1,408	16	1	0.2	1.0
		CIP	6,620	75	1	0.8	
		DIP	176	2	1	0.0	
		UNK	602	7	1	0.1	
7F3	9,910	ACP	4,813	49	1	0.5	1.9
		CIP	386	4	1	0.0	
		DIP	425	4	1	0.0	
		MLS	791	8	5	0.4	
		PVC	1,453	15	5	0.7	
		UNK	2,042	21	1	0.2	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7F4	7,013	ACP	3,032	43	1	0.4	1.1
		CIP	1,448	21	1	0.2	
		DIP	519	7	1	0.1	
		MLS	171	2	5	0.1	
		UNK	1,844	26	1	0.3	
7G1	5,763	DIP	1,191	21	1	0.2	1.3
		PVC	398	7	5	0.3	
		UNK	4,173	72	1	0.7	
7G2	4,520	ACP	3,020	67	1	0.7	1.4
		DIP	706	16	1	0.2	
		PVC	413	9	5	0.5	
		UNK	381	8	1	0.1	
7G3	8,809	ACP	6,518	74	1	0.7	1.0
		CIP	1,445	16	1	0.2	
		DIP	85	1	1	0.0	
		UNK	761	9	1	0.1	
7G4	8,847	ACP	5,780	65	1	0.7	1.0
		CCP	806	9	1	0.1	
		CIP	54	1	1	0.0	
		DIP	655	7	1	0.1	
		UNK	1,551	18	1	0.2	
7G5	5,784	ACP	5,228	90	1	0.9	1.3
		DIP	11	0	1	0.0	
		PVC	439	8	5	0.4	
		UNK	106	2	1	0.0	
80	23,397	DIP	23,124	99	1	1.0	1.0
		PVC	230	1	5	0.0	
		UNK	43	0	1	0.0	
81	11,949	ACP	3	0	1	0.0	1.1
		DIP	11,503	95	1	0.9	
		ODS	443	4	5	0.2	
82	14,962	ACP	10,602	71	1	0.7	1.0
		DIP	4,314	29	1	0.3	
		UNK	18	0	1	0.0	
83	12,612	ACP	2,376	19	1	0.2	1.5
		DIP	8,735	69	1	0.7	
		MLS	144	1	5	0.1	
		PVC	1,352	11	5	0.5	
		UNK	6	0	1	0.0	
84	3,862	ACP	343	9	1	0.1	1.0
		DIP	3,519	91	1	0.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
85	29,021	ACP	2,172	7	1	0.1	1.0
		DIP	26,281	91	1	0.9	
		PVC	173	1	5	0.0	
86A	23,907	ACP	22,130	93	1	0.9	1.0
		DIP	1,406	6	1	0.1	
		PVC	58	0	5	0.0	
		UNK	1	0	1	0.0	
86B	26,720	ACP	25,787	97	1	1.0	1.0
		DIP	856	3	1	0.0	
		PVC	77	0	5	0.0	
86C	27,043	ACP	18,838	70	1	0.7	1.8
		DIP	2,877	11	1	0.1	
		PVC	5,165	19	5	1.0	
		UNK	7	0	1	0.0	
86D	5,011	ACP	3,682	73	1	0.7	1.2
		DIP	1,052	21	1	0.2	
		PVC	277	6	5	0.3	
87A	15,840	ACP	3,878	24	1	0.2	1.0
		DIP	11,913	75	1	0.8	
		PVC	50	0	5	0.0	
87B	4,012	DIP	2,103	52	1	0.5	2.9
		PVC	1,909	48	5	2.4	
88	27,686	DIP	27,681	100	1	1.0	1.0
		PVC	5	0	5	0.0	
89	12,946	ACP	537	4	1	0.0	1.6
		DIP	10,614	82	1	0.8	
		ODS	1,796	14	5	0.7	
90A	30,255	ACP	25,243	83	1	0.8	1.5
		DIP	389	1	1	0.0	
		PVC	4,180	14	5	0.7	
		UNK	152	1	1	0.0	
90B	10,063	ACP	5,642	56	1	0.6	2.6
		MLS	5	0	5	0.0	
		ODS	3,107	31	5	1.5	
		PVC	906	9	5	0.5	
90C	16,214	ACP	13,949	86	1	0.9	1.5
		MLS	14	0	5	0.0	
		PVC	2,091	13	5	0.6	
91	44,476	ACP	30,428	68	1	0.7	1.7
		DIP	6,363	14	1	0.1	
		PVC	7,550	17	5	0.8	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
92	512	ACP	512	100	1	1.0	1.0
93A	37,963	ACP	35,440	93	1	0.9	1.2
		DIP	944	2	1	0.0	
		PVC	1,577	4	5	0.2	
		UNK	2	0	1	0.0	
93B	34,838	ACP	32,293	93	1	0.9	1.2
		DIP	839	2	1	0.0	
		PVC	1,706	5	5	0.2	
93C	36,427	ACP	32,731	90	1	0.9	1.3
		DIP	498	1	1	0.0	
		MLS	4	0	5	0.0	
		PVC	3,137	9	5	0.4	
		UNK	19	0	1	0.0	
93D	34,079	ACP	33,487	98	1	1.0	1.0
		DIP	270	1	1	0.0	
		PVC	45	0	5	0.0	
		UNK	14	0	1	0.0	
95	663	ACP	648	98	1	1.0	1.0
		PVC	0	0	5	0.0	
		UNK	14	2	1	0.0	
96	6,245	ACP	149	2	1	0.0	1.0
		DIP	6,096	98	1	1.0	

**Corresponding score in Appendix A is doubly weighted*

Appendix H – Pipe Diameter

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Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
02A	48,505	4	59	0.1	1	0.0	4.2
		6	1,965	4.1	2	0.1	
		8	17,426	35.9	3	1.1	
		12	29,030	59.8	5	3.0	
		16	26	0.1	5	0.0	
02B	26,917	6	216	0.8	2	0.0	4.5
		8	6,808	25.3	3	0.8	
		10	4	0.0	4	0.0	
		12	19,859	73.8	5	3.7	
		16	30	0.1	5	0.0	
02C	24,972	4	12	0.0	1	0.0	4.0
		6	767	3.1	2	0.1	
		8	11,792	47.2	3	1.4	
		12	12,400	49.7	5	2.5	
02D	31,006	4	71	0.2	1	0.0	3.6
		6	3,299	10.6	2	0.2	
		8	17,347	55.9	3	1.7	
		12	10,289	33.2	5	1.7	
02E	27,198	8	13,980	51.4	3	1.5	4.0
		12	13,194	48.5	5	2.4	
		16	24	0.1	5	0.0	
03A	33,039	4	181	0.5	1	0.0	3.3
		6	1,692	5.1	2	0.1	
		8	25,312	76.6	3	2.3	
		10	34	0.1	4	0.0	
		12	5,451	16.5	5	0.8	
		16	368	1.1	5	0.1	
03B	28,104	6	1,117	4.0	2	0.1	3.2
		8	24,205	86.1	3	2.6	
		12	2,782	9.9	5	0.5	
04	49,199	4	531	1.1	1	0.0	2.7
		6	21,513	43.7	2	0.9	
		8	24,023	48.8	3	1.5	
		10	71	0.1	4	0.0	
		12	3,062	6.2	5	0.3	
05A	43,409	4	2,129	4.9	1	0.0	3.4
		6	10,730	24.7	2	0.5	
		8	12,800	29.5	3	0.9	
		10	4,818	11.1	4	0.4	
		12	12,779	29.4	5	1.5	
		14	152	0.3	5	0.0	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
05B	41,075	8	17,528	42.7	3	1.3	4.1
		12	23,547	57.3	5	2.9	
05C	45,153	5	177	0.4	2	0.0	4.0
		6	764	1.7	2	0.0	
		8	21,985	48.7	3	1.5	
		10	187	0.4	4	0.0	
		12	22,040	48.8	5	2.4	
06A	25,683	4	2,276	8.9	1	0.1	2.2
		6	15,263	59.4	2	1.2	
		8	7,964	31.0	3	0.9	
		12	180	0.7	5	0.0	
06B	19,778	6	14,759	74.6	2	1.5	2.3
		8	4,886	24.7	3	0.7	
		10	133	0.7	4	0.0	
06C	19,701	4	5,349	27.2	1	0.3	2.0
		5	307	1.6	2	0.0	
		6	9,460	48.0	2	1.0	
		8	4,584	23.3	3	0.7	
		12	0	0.0	5	0.0	
06D	24,661	4	9,426	38.2	1	0.4	1.8
		6	11,124	45.1	2	0.9	
		8	4,107	16.7	3	0.5	
		12	3	0.0	5	0.0	
06E	21,175	4	215	1.0	1	0.0	2.2
		6	16,627	78.5	2	1.6	
		8	4,333	20.5	3	0.6	
06F	13,979	4	6,074	43.4	1	0.4	1.7
		6	6,906	49.4	2	1.0	
		8	861	6.2	3	0.2	
		12	138	1.0	5	0.0	
06H	24,480	4	168	0.7	1	0.0	3.8
		6	177	0.7	2	0.0	
		8	14,118	57.7	3	1.7	
		12	10,016	40.9	5	2.0	
06I	15,236	4	4,731	31.1	1	0.3	1.9
		6	7,078	46.5	2	0.9	
		8	3,406	22.4	3	0.7	
		12	22	0.1	5	0.0	
06J	12,678	4	5,308	41.9	1	0.4	1.7
		6	5,571	43.9	2	0.9	
		8	1,671	13.2	3	0.4	
		12	127	1.0	5	0.1	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
06K	19,823	4	6,771	34.2	1	0.3	2.0
		6	7,736	39.0	2	0.8	
		8	5,042	25.4	3	0.8	
		12	274	1.4	5	0.1	
06M	13,909	4	3	0.0	1	0.0	3.9
		6	2,784	20.0	2	0.4	
		8	3,239	23.3	3	0.7	
		12	7,883	56.7	5	2.8	
06N	13,412	4	316	2.4	1	0.0	3.5
		6	731	5.4	2	0.1	
		8	8,460	63.1	3	1.9	
		12	3,905	29.1	5	1.5	
09	11,913	4	263	2.2	1	0.0	2.3
		6	8,113	68.1	2	1.4	
		8	3,537	29.7	3	0.9	
10	14,323	4	276	1.9	1	0.0	2.9
		6	6,100	42.6	2	0.9	
		8	3,769	26.3	3	0.8	
		10	3,663	25.6	4	1.0	
		12	515	3.6	5	0.2	
11	3,124	6	2,620	83.8	2	1.7	2.3
		10	505	16.2	4	0.6	
12A	48,674	4	1,734	3.6	1	0.0	2.8
		6	25,574	52.5	2	1.1	
		8	10,016	20.6	3	0.6	
		10	5,126	10.5	4	0.4	
		12	1,048	2.2	5	0.1	
		14	4,973	10.2	5	0.5	
		16	203	0.4	5	0.0	
12B	40,026	4	135	0.3	1	0.0	3.1
		6	16,695	41.7	2	0.8	
		8	9,177	22.9	3	0.7	
		10	6,818	17.0	4	0.7	
		12	3,215	8.0	5	0.4	
		14	3,987	10.0	5	0.5	
13A	38,145	6	6,878	18.0	2	0.4	4.1
		8	6,720	17.6	3	0.5	
		10	37	0.1	4	0.0	
		12	20,201	53.0	5	2.6	
		14	4,309	11.3	5	0.6	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
13B	35,161	6	5,486	15.6	2	0.3	3.5
		8	16,880	48.0	3	1.4	
		10	1,014	2.9	4	0.1	
		12	9,095	25.9	5	1.3	
		14	2,686	7.6	5	0.4	
14	14,712	4	67	0.5	1	0.0	3.3
		6	18	0.1	2	0.0	
		8	12,340	83.9	3	2.5	
		12	2,287	15.5	5	0.8	
15	5,792	6	534	9.2	2	0.2	3.3
		8	4,099	70.8	3	2.1	
		12	1,160	20.0	5	1.0	
16	6,825	4	1,540	22.6	1	0.2	2.0
		6	3,838	56.2	2	1.1	
		8	1,428	20.9	3	0.6	
		12	19	0.3	5	0.0	
17A	41,281	4	280	0.7	1	0.0	3.1
		6	10,568	25.6	2	0.5	
		8	20,128	48.8	3	1.5	
		10	4,804	11.6	4	0.5	
		12	5,441	13.2	5	0.7	
		14	15	0.0	5	0.0	
		16	45	0.1	5	0.0	
17B	45,467	4	617	1.4	1	0.0	4.1
		6	3,236	7.1	2	0.1	
		8	11,079	24.4	3	0.7	
		10	4,477	9.8	4	0.4	
		12	25,742	56.6	5	2.8	
18	53,758	4	328	0.6	1	0.0	3.6
		6	13,871	25.8	2	0.5	
		8	10,173	18.9	3	0.6	
		10	10,578	19.7	4	0.8	
		12	18,808	35.0	5	1.7	
19	47,512	4	921	1.9	1	0.0	3.2
		5	2	0.0	2	0.0	
		6	15,609	32.9	2	0.7	
		8	14,806	31.2	3	0.9	
		10	7,641	16.1	4	0.6	
		12	8,460	17.8	5	0.9	
		14	21	0.0	5	0.0	
		24	52	0.1	5	0.0	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
1A	9,772	4	218	2.2	1	0.0	2.2
		6	7,572	77.5	2	1.5	
		8	1,982	20.3	3	0.6	
1B	6,385	4	162	2.5	1	0.0	2.6
		6	2,907	45.5	2	0.9	
		8	2,990	46.8	3	1.4	
		12	312	4.9	5	0.2	
1C	10,473	4	65	0.6	1	0.0	2.3
		5	8	0.1	2	0.0	
		6	7,644	73.0	2	1.5	
		8	2,755	26.3	3	0.8	
20A	34,434	4	7,286	21.2	1	0.2	2.2
		6	16,505	47.9	2	1.0	
		8	8,129	23.6	3	0.7	
		10	1,310	3.8	4	0.2	
		12	1,151	3.3	5	0.2	
20B	48,476	4	5,453	11.2	1	0.1	2.7
		6	14,856	30.6	2	0.6	
		8	15,786	32.6	3	1.0	
		10	2,686	5.5	4	0.2	
		12	5,467	11.3	5	0.6	
		14	1,945	4.0	5	0.2	
21	7,384	4	1,349	18.3	1	0.2	2.3
		6	2,362	32.0	2	0.6	
		8	3,431	46.5	3	1.4	
		12	62	0.8	5	0.0	
22	3,619	4	577	15.9	1	0.2	2.1
		6	1,995	55.1	2	1.1	
		8	928	25.6	3	0.8	
		12	38	1.1	5	0.1	
23	67,439	4	9,899	14.7	1	0.1	2.1
		6	42,749	63.4	2	1.3	
		8	13,087	19.4	3	0.6	
		10	2	0.0	4	0.0	
		12	867	1.3	5	0.1	
		16	6	0.0	5	0.0	
24A	49,259	5	41	0.1	2	0.0	3.4
		6	10,671	21.7	2	0.4	
		8	16,001	32.5	3	1.0	
		10	14,157	28.7	4	1.1	
		12	8,390	17.0	5	0.9	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
24B	52,564	4	1,267	2.4	1	0.0	3.3
		6	20,910	39.8	2	0.8	
		8	7,574	14.4	3	0.4	
		10	8,216	15.6	4	0.6	
		12	14,592	27.8	5	1.4	
		16	4	0.0	5	0.0	
25	7,248	4	1,449	20.0	1	0.2	2.4
		6	4,261	58.8	2	1.2	
		8	178	2.5	3	0.1	
		10	203	2.8	4	0.1	
		12	1,157	16.0	5	0.8	
26A	29,619	4	788	2.7	1	0.0	3.0
		6	13,132	44.3	2	0.9	
		8	5,829	19.7	3	0.6	
		10	3,798	12.8	4	0.5	
		12	6,071	20.5	5	1.0	
26B	41,271	4	1,542	3.7	1	0.0	2.9
		6	19,471	47.2	2	0.9	
		8	9,722	23.6	3	0.7	
		10	393	1.0	4	0.0	
		12	10,043	24.3	5	1.2	
27	31,842	4	11	0.0	1	0.0	3.4
		6	9,913	31.1	2	0.6	
		8	8,343	26.2	3	0.8	
		10	3,056	9.6	4	0.4	
		12	10,519	33.0	5	1.7	
28	52,221	4	167	0.3	1	0.0	3.0
		6	20,068	38.4	2	0.8	
		8	21,362	40.9	3	1.2	
		10	2,482	4.8	4	0.2	
		12	8,141	15.6	5	0.8	
29	51,228	4	1,117	2.2	1	0.0	3.1
		6	13,109	25.6	2	0.5	
		8	21,828	42.6	3	1.3	
		10	8,493	16.6	4	0.7	
		12	6,610	12.9	5	0.6	
30	3,313	6	3,039	91.7	2	1.8	2.1
		8	274	8.3	3	0.2	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
31A	26,653	4	2,440	9.2	1	0.1	2.3
		6	16,232	60.9	2	1.2	
		8	6,623	24.8	3	0.7	
		10	114	0.4	4	0.0	
		12	1,021	3.8	5	0.2	
		16	64	0.2	5	0.0	
31B	1,036	6	542	52.4	2	1.0	2.5
		8	493	47.6	3	1.4	
32	10,572	4	1,242	11.7	1	0.1	2.2
		6	6,693	63.3	2	1.3	
		8	1,052	9.9	3	0.3	
		10	1,038	9.8	4	0.4	
		12	170	1.6	5	0.1	
33	18,435	4	815	4.4	1	0.0	2.6
		6	9,575	51.9	2	1.0	
		8	5,236	28.4	3	0.9	
		12	2,580	14.0	5	0.7	
34	5,806	4	1,145	19.7	1	0.2	2.4
		6	2,558	44.1	2	0.9	
		8	811	14.0	3	0.4	
		10	1,260	21.7	4	0.9	
		12	31	0.5	5	0.0	
35	32,441	4	211	0.6	1	0.0	2.4
		6	21,569	66.5	2	1.3	
		8	7,781	24.0	3	0.7	
		10	2,864	8.8	4	0.4	
		12	17	0.1	5	0.0	
36	45,772	4	294	0.6	1	0.0	2.7
		6	23,679	51.7	2	1.0	
		8	15,211	33.2	3	1.0	
		10	699	1.5	4	0.1	
		12	5,843	12.8	5	0.6	
37	3,471	4	28	0.8	1	0.0	2.1
		6	2,838	81.8	2	1.6	
		8	455	13.1	3	0.4	
		12	15	0.4	5	0.0	
38A	25,036	4	107	0.4	1	0.0	2.8
		6	12,864	51.4	2	1.0	
		8	7,394	29.5	3	0.9	
		10	2,141	8.6	4	0.3	
		12	2,468	9.9	5	0.5	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
38B	46,403	4	720	1.6	1	0.0	2.6
		6	27,325	58.9	2	1.2	
		8	10,831	23.3	3	0.7	
		10	4,892	10.5	4	0.4	
		12	2,495	5.4	5	0.3	
39	11,720	4	1,460	12.5	1	0.1	2.1
		6	6,894	58.8	2	1.2	
		8	2,901	24.8	3	0.7	
		10	30	0.3	4	0.0	
		12	36	0.3	5	0.0	
40A	30,817	4	600	1.9	1	0.0	3.5
		6	5,590	18.1	2	0.4	
		8	12,355	40.1	3	1.2	
		10	1,231	4.0	4	0.2	
		12	11,041	35.8	5	1.8	
40B	31,294	4	2,305	7.4	1	0.1	2.9
		6	13,166	42.1	2	0.8	
		8	7,873	25.2	3	0.8	
		10	568	1.8	4	0.1	
		12	7,330	23.4	5	1.2	
		18	51	0.2	5	0.0	
41	17,423	4	1,454	8.3	1	0.1	2.1
		6	11,878	68.2	2	1.4	
		8	3,716	21.3	3	0.6	
		12	40	0.2	5	0.0	
42A	1,304	6	69	5.3	2	0.1	3.2
		8	1,054	80.8	3	2.4	
		12	181	13.9	5	0.7	
42B	7,586	4	1,525	20.1	1	0.2	1.6
		6	3,382	44.6	2	0.9	
		8	718	9.5	3	0.3	
		12	397	5.2	5	0.3	
42C	9,393	4	665	7.1	1	0.1	2.3
		5	3	0.0	2	0.0	
		6	4,199	44.7	2	0.9	
		8	4,218	44.9	3	1.3	
		12	57	0.6	5	0.0	
42D	11,540	4	2,436	21.1	1	0.2	2.1
		6	5,588	48.4	2	1.0	
		8	3,441	29.8	3	0.9	
42E	20,652	4	6,182	29.9	1	0.3	1.9
		6	8,814	42.7	2	0.9	
		8	5,292	25.6	3	0.8	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
42F	9,775	4	7	0.1	1	0.0	3.9
		5	39	0.4	2	0.0	
		6	182	1.9	2	0.0	
		8	4,096	41.9	3	1.3	
		10	1,753	17.9	4	0.7	
		12	3,698	37.8	5	1.9	
42G	1,836	4	3	0.2	1	0.0	2.7
		6	585	31.8	2	0.6	
		8	1,249	68.0	3	2.0	
42H	1,000	4	633	63.3	1	0.6	1.4
		6	352	35.2	2	0.7	
		8	15	1.5	3	0.0	
42I	295	4	295	100.0	1	1.0	1.0
42J	4,767	4	1	0.0	1	0.0	2.6
		6	3,688	77.4	2	1.5	
		8	153	3.2	3	0.1	
		12	925	19.4	5	1.0	
42K	3,459	4	600	17.3	1	0.2	3.9
		6	444	12.8	2	0.3	
		8	28	0.8	3	0.0	
		10	22	0.6	4	0.0	
		12	2,365	68.4	5	3.4	
42L	2,042	6	210	10.3	2	0.2	2.9
		8	1,779	87.1	3	2.6	
		12	52	2.6	5	0.1	
43A	11,715	4	2,505	21.4	1	0.2	2.3
		6	4,542	38.8	2	0.8	
		8	4,090	34.9	3	1.0	
		10	15	0.1	4	0.0	
		12	546	4.7	5	0.2	
43B	105	8	105	100.0	3	3.0	3.0
43C	1,508	6	505	33.5	2	0.7	2.7
		8	1,001	66.4	3	2.0	
		12	3	0.2	5	0.0	
43D	1,440	4	238	16.5	1	0.2	2.7
		8	1,187	82.4	3	2.5	
		12	15	1.1	5	0.1	
44	19,372	4	13	0.1	1	0.0	4.0
		6	1,709	8.8	2	0.2	
		8	6,626	34.2	3	1.0	
		10	578	3.0	4	0.1	
		12	10,446	53.9	5	2.7	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
45A	41,312	6	795	1.9	2	0.0	4.0
		8	18,834	45.6	3	1.4	
		12	21,682	52.5	5	2.6	
45B	12,609	4	396	3.1	1	0.0	2.9
		6	1,975	15.7	2	0.3	
		8	9,516	75.5	3	2.3	
		12	722	5.7	5	0.3	
46	9,942	8	9,411	94.7	3	2.8	3.1
		12	531	5.3	5	0.3	
47	1,636	6	1,488	91.0	2	1.8	2.1
		8	148	9.0	3	0.3	
48	25,708	6	1,374	5.3	2	0.1	4.2
		8	8,585	33.4	3	1.0	
		10	19	0.1	4	0.0	
		12	15,729	61.2	5	3.1	
49	2,779	8	2,450	88.2	3	2.6	3.2
		12	328	11.8	5	0.6	
51	33,029	6	1,534	4.6	2	0.1	3.7
		8	19,601	59.3	3	1.8	
		12	11,893	36.0	5	1.8	
52A	16,973	4	573	3.4	1	0.0	3.7
		6	2,609	15.4	2	0.3	
		8	5,990	35.3	3	1.1	
		10	147	0.9	4	0.0	
		12	7,653	45.1	5	2.3	
52B	10,972	6	207	1.9	2	0.0	4.1
		8	4,378	39.9	3	1.2	
		12	6,388	58.2	5	2.9	
53A	17,785	4	1,499	8.4	1	0.1	2.1
		6	13,630	76.6	2	1.5	
		8	2,324	13.1	3	0.4	
		12	332	1.9	5	0.1	
53B	7,819	4	569	7.3	1	0.1	2.7
		6	4,095	52.4	2	1.0	
		8	1,407	18.0	3	0.5	
		12	1,559	19.9	5	1.0	
54	10,382	4	2,232	21.5	1	0.2	2.0
		6	6,101	58.8	2	1.2	
		8	1,151	11.1	3	0.3	
		12	568	5.5	5	0.3	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
55	33,056	4	1,433	4.3	1	0.0	2.5
		6	20,085	60.8	2	1.2	
		8	7,842	23.7	3	0.7	
		10	167	0.5	4	0.0	
		12	3,479	10.5	5	0.5	
56A	3,131	6	75	2.4	2	0.0	4.7
		8	286	9.1	3	0.3	
		10	52	1.7	4	0.1	
		12	2,718	86.8	5	4.3	
56B	31,955	4	208	0.7	1	0.0	3.5
		6	1,577	4.9	2	0.1	
		8	20,497	64.1	3	1.9	
		10	45	0.1	4	0.0	
		12	9,628	30.1	5	1.5	
57	8,270	4	291	3.5	1	0.0	2.8
		6	1,955	23.6	2	0.5	
		8	5,495	66.4	3	2.0	
		12	529	6.4	5	0.3	
57A	33,693	4	3,076	9.1	1	0.1	2.4
		6	18,228	54.1	2	1.1	
		8	8,924	26.5	3	0.8	
		10	21	0.1	4	0.0	
		12	3,137	9.3	5	0.5	
57B	2,130	4	1,492	70.1	1	0.7	1.3
		6	638	29.9	2	0.6	
58A	13,346	4	3	0.0	1	0.0	3.5
		6	328	2.5	2	0.0	
		8	9,672	72.5	3	2.2	
		12	3,343	25.0	5	1.3	
58B	3,999	4	151	3.8	1	0.0	3.5
		6	146	3.7	2	0.1	
		8	2,487	62.2	3	1.9	
		12	1,215	30.4	5	1.5	
58C	923	6	21	2.3	2	0.0	4.9
		12	901	97.7	5	4.9	
59	7,337	8	5,426	74.0	3	2.2	3.5
		12	1,911	26.0	5	1.3	
60	424	8	228	53.8	3	1.6	3.9
		12	196	46.2	5	2.3	
60A	11,021	8	9,138	82.9	3	2.5	3.3
		12	1,883	17.1	5	0.9	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
60B	6,128	8	2,511	41.0	3	1.2	3.9
		10	1,513	24.7	4	1.0	
		12	2,104	34.3	5	1.7	
61	5,680	4	2	0.0	1	0.0	4.0
		6	10	0.2	2	0.0	
		8	2,955	52.0	3	1.6	
		12	2,713	47.8	5	2.4	
62	5,117	8	4,890	95.6	3	2.9	3.1
		12	227	4.4	5	0.2	
63	32,834	5	7	0.0	2	0.0	3.2
		6	3,356	10.2	2	0.2	
		8	25,241	76.9	3	2.3	
		10	51	0.2	4	0.0	
		12	4,180	12.7	5	0.6	
64	3,351	8	2,710	80.9	3	2.4	3.4
		12	641	19.1	5	1.0	
65	12,960	6	278	2.1	2	0.0	3.7
		8	8,017	61.9	3	1.9	
		12	4,666	36.0	5	1.8	
66A	6,575	6	191	2.9	2	0.1	3.4
		8	4,876	74.2	3	2.2	
		10	115	1.8	4	0.1	
		12	1,393	21.2	5	1.1	
66B	5,238	4	188	3.6	1	0.0	2.3
		5	85	1.6	2	0.0	
		6	3,074	58.7	2	1.2	
		8	1,890	36.1	3	1.1	
66C	2,792	6	1,993	71.4	2	1.4	2.4
		8	587	21.0	3	0.6	
		12	213	7.6	5	0.4	
66D	5,793	6	256	4.4	2	0.1	4.4
		8	1,434	24.8	3	0.7	
		10	24	0.4	4	0.0	
		12	4,079	70.4	5	3.5	
66E	3,279	6	936	28.5	2	0.6	3.7
		8	650	19.8	3	0.6	
		12	1,693	51.6	5	2.6	
66F	605	12	605	100.0	5	5.0	5.0
67	2,101	4	28	1.3	1	0.0	3.2
		6	300	14.3	2	0.3	
		8	1,172	55.8	3	1.7	
		12	501	23.8	5	1.2	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
68	899	6	10	1.1	2	0.0	3.0
		8	889	98.9	3	3.0	
69	4,959	6	12	0.2	2	0.0	3.3
		8	4,126	83.2	3	2.5	
		12	821	16.6	5	0.8	
6G1	8,922	4	3,740	41.9	1	0.4	1.6
		6	5,182	58.1	2	1.2	
6G2	2,310	4	613	26.5	1	0.3	1.7
		6	1,665	72.1	2	1.4	
		8	31	1.4	3	0.0	
70	30,740	6	1,415	4.6	2	0.1	3.7
		8	17,922	58.3	3	1.7	
		12	11,404	37.1	5	1.9	
71	25,716	6	83	0.3	2	0.0	3.6
		8	17,683	68.8	3	2.1	
		10	238	0.9	4	0.0	
		12	7,711	30.0	5	1.5	
72	9,398	4	3,514	37.4	1	0.4	1.8
		6	3,902	41.5	2	0.8	
		8	1,967	20.9	3	0.6	
		10	7	0.1	4	0.0	
		12	9	0.1	5	0.0	
74	11,137	4	3,367	30.2	1	0.3	1.9
		6	5,776	51.9	2	1.0	
		8	1,850	16.6	3	0.5	
		12	144	1.3	5	0.1	
76A	9,389	4	8	0.1	1	0.0	3.4
		6	520	5.5	2	0.1	
		8	6,612	70.4	3	2.1	
		12	2,249	24.0	5	1.2	
76B	5,406	6	5	0.1	2	0.0	4.0
		8	2,811	52.0	3	1.6	
		12	2,590	47.9	5	2.4	
76C	3,060	6	278	9.1	2	0.2	3.0
		8	2,435	79.6	3	2.4	
		10	347	11.3	4	0.5	
76D	6,184	6	221	3.6	2	0.1	3.8
		8	3,463	56.0	3	1.7	
		10	12	0.2	4	0.0	
		12	2,489	40.2	5	2.0	
76F	3,786	6	1,885	49.8	2	1.0	2.7
		8	1,546	40.8	3	1.2	
		12	355	9.4	5	0.5	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
76G	2,121	6	241	11.4	2	0.2	4.6
		8	11	0.5	3	0.0	
		12	1,869	88.1	5	4.4	
76H	4,594	6	2,310	50.3	2	1.0	2.9
		8	1,406	30.6	3	0.9	
		12	879	19.1	5	1.0	
76I	1,797	6	22	1.2	2	0.0	3.6
		8	1,223	68.1	3	2.0	
		10	78	4.4	4	0.2	
		12	473	26.3	5	1.3	
76J	1,137	6	1	0.1	2	0.0	4.1
		8	496	43.7	3	1.3	
		12	640	56.3	5	2.8	
76K	1,232	4	14	1.1	1	0.0	4.0
		6	349	28.3	2	0.6	
		8	90	7.3	3	0.2	
		12	780	63.3	5	3.2	
77	2,061	4	933	45.3	1	0.5	1.8
		6	633	30.7	2	0.6	
		8	492	23.9	3	0.7	
		10	3	0.1	4	0.0	
78	22,595	6	685	3.0	2	0.1	3.8
		8	12,684	56.1	3	1.7	
		10	396	1.8	4	0.1	
		12	8,831	39.1	5	2.0	
79	6,998	6	79	1.1	2	0.0	3.0
		8	6,872	98.2	3	2.9	
		10	47	0.7	4	0.0	
7A1	8,068	5	810	10.0	2	0.2	2.9
		6	743	9.2	2	0.2	
		8	5,978	74.1	3	2.2	
		12	538	6.7	5	0.3	
7A2	13,504	5	5,205	38.5	2	0.8	3.2
		6	602	4.5	2	0.1	
		8	3,765	27.9	3	0.8	
		12	3,932	29.1	5	1.5	
7B1	5,110	5	638	12.5	2	0.2	2.3
		6	3,814	74.6	2	1.5	
		10	569	11.1	4	0.4	
		12	89	1.7	5	0.1	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
7B2	7,029	5	80	1.1	2	0.0	3.5
		6	813	11.6	2	0.2	
		8	2,039	29.0	3	0.9	
		10	3,888	55.3	4	2.2	
		12	210	3.0	5	0.1	
7B3	7,775	5	207	2.7	2	0.1	3.1
		6	2,001	25.7	2	0.5	
		8	2,497	32.1	3	1.0	
		10	2,985	38.4	4	1.5	
		12	84	1.1	5	0.1	
7B4	8,086	5	1,405	17.4	2	0.3	3.2
		6	1,533	19.0	2	0.4	
		8	2,031	25.1	3	0.8	
		10	1,679	20.8	4	0.8	
		12	1,438	17.8	5	0.9	
7B5	408	5	408	100.0	2	2.0	2.0
7C1	5,062	5	342	6.7	2	0.1	3.0
		6	1,650	32.6	2	0.7	
		8	899	17.8	3	0.5	
		10	2,171	42.9	4	1.7	
7C2	5,448	4	390	7.2	1	0.1	3.3
		5	236	4.3	2	0.1	
		6	1,137	20.9	2	0.4	
		10	3,685	67.6	4	2.7	
7C3	6,938	4	20	0.3	1	0.0	3.2
		5	1,338	19.3	2	0.4	
		6	925	13.3	2	0.3	
		8	837	12.1	3	0.4	
		10	3,818	55.0	4	2.2	
7C4	12,313	5	2,255	18.3	2	0.4	3.3
		6	3,811	31.0	2	0.6	
		8	180	1.5	3	0.0	
		10	1,900	15.4	4	0.6	
		12	4,166	33.8	5	1.7	
7C5	6,165	4	427	6.9	1	0.1	2.0
		5	112	1.8	2	0.0	
		6	5,299	85.9	2	1.7	
		8	211	3.4	3	0.1	
		10	116	1.9	4	0.1	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
7D1	15,346	5	1,031	6.7	2	0.1	3.3
		6	4,186	27.3	2	0.5	
		8	1,934	12.6	3	0.4	
		10	6,773	44.1	4	1.8	
		12	967	6.3	5	0.3	
		14	444	2.9	5	0.1	
		16	11	0.1	5	0.0	
7D2	8,759	4	34	0.4	1	0.0	3.4
		5	406	4.6	2	0.1	
		6	1,777	20.3	2	0.4	
		8	878	10.0	3	0.3	
		10	5,665	64.7	4	2.6	
7D3	10,941	5	1,700	15.5	2	0.3	3.0
		6	3,082	28.2	2	0.6	
		8	1,042	9.5	3	0.3	
		10	5,117	46.8	4	1.9	
7E1	14,671	5	2,108	14.4	2	0.3	3.6
		6	1,125	7.7	2	0.2	
		8	1,633	11.1	3	0.3	
		10	7,516	51.2	4	2.0	
		16	2,289	15.6	5	0.8	
7E2	4,246	5	249	5.9	2	0.1	3.9
		6	57	1.3	2	0.0	
		10	3,940	92.8	4	3.7	
7E3	9,281	5	726	7.8	2	0.2	3.4
		6	1,584	17.1	2	0.3	
		8	2,177	23.5	3	0.7	
		10	3,938	42.4	4	1.7	
		12	855	9.2	5	0.5	
7E4	9,049	5	3,262	36.0	2	0.7	2.6
		6	1,593	17.6	2	0.4	
		8	3,360	37.1	3	1.1	
		10	830	9.2	4	0.4	
		12	5	0.1	5	0.0	
7F1	7,279	5	577	7.9	2	0.2	3.8
		8	1,927	26.5	3	0.8	
		10	3,198	43.9	4	1.8	
		12	1,576	21.7	5	1.1	
7F2	8,807	4	77	0.9	1	0.0	3.4
		5	602	6.8	2	0.1	
		6	868	9.9	2	0.2	
		8	2,248	25.5	3	0.8	
		10	5,012	56.9	4	2.3	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
7F3	9,910	4	51	0.5	1	0.0	4.0
		5	2,042	20.6	2	0.4	
		8	1,993	20.1	3	0.6	
		10	23	0.2	4	0.0	
		12	5,802	58.5	5	2.9	
7F4	7,013	5	1,437	20.5	2	0.4	3.3
		6	652	9.3	2	0.2	
		8	2,050	29.2	3	0.9	
		10	1,445	20.6	4	0.8	
		12	1,429	20.4	5	1.0	
7G1	5,763	5	4,173	72.4	2	1.4	2.6
		6	398	6.9	2	0.1	
		12	1,191	20.7	5	1.0	
7G2	4,520	6	381	8.4	2	0.2	3.0
		8	4,053	89.7	3	2.7	
		12	85	1.9	5	0.1	
7G3	8,809	5	761	8.6	2	0.2	4.1
		6	6	0.1	2	0.0	
		8	1,704	19.3	3	0.6	
		10	2,175	24.7	4	1.0	
		12	4,163	47.3	5	2.4	
7G4	8,847	5	1,551	17.5	2	0.4	3.8
		8	441	5.0	3	0.1	
		10	5,384	60.9	4	2.4	
		12	1,471	16.6	5	0.8	
7G5	5,784	5	106	1.8	2	0.0	3.0
		6	297	5.1	2	0.1	
		8	4,850	83.8	3	2.5	
		10	531	9.2	4	0.4	
80	23,397	6	276	1.2	2	0.0	3.7
		8	15,192	64.9	3	1.9	
		10	109	0.5	4	0.0	
		12	7,819	33.4	5	1.7	
81	11,949	6	443	3.7	2	0.1	3.5
		8	8,557	71.6	3	2.1	
		10	3	0.0	4	0.0	
		12	2,946	24.7	5	1.2	
82	14,962	4	74	0.5	1	0.0	3.4
		6	2,369	15.8	2	0.3	
		8	7,888	52.7	3	1.6	
		10	1,310	8.8	4	0.4	
		12	3,293	22.0	5	1.1	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
83	12,612	6	2,331	18.5	2	0.4	3.6
		8	5,576	44.2	3	1.3	
		12	4,705	37.3	5	1.9	
84	3,862	8	1,092	28.3	3	0.8	4.4
		12	2,771	71.7	5	3.6	
85	29,021	4	14	0.0	1	0.0	3.8
		6	1,077	3.7	2	0.1	
		8	14,260	49.1	3	1.5	
		12	13,275	45.7	5	2.3	
86A	23,907	6	10,829	45.3	2	0.9	2.5
		8	12,706	53.1	3	1.6	
		12	61	0.3	5	0.0	
86B	26,720	4	202	0.8	1	0.0	2.8
		6	8,414	31.5	2	0.6	
		8	14,877	55.7	3	1.7	
		10	2,368	8.9	4	0.4	
		12	859	3.2	5	0.2	
86C	27,043	4	459	1.7	1	0.0	2.6
		6	11,281	41.7	2	0.8	
		8	14,116	52.2	3	1.6	
		10	655	2.4	4	0.1	
		12	376	1.4	5	0.1	
86D	5,011	4	10	0.2	1	0.0	3.0
		6	1,546	30.8	2	0.6	
		8	2,519	50.3	3	1.5	
		10	362	7.2	4	0.3	
		12	574	11.5	5	0.6	
87A	15,840	8	11,419	72.1	3	2.2	3.6
		10	50	0.3	4	0.0	
		12	4,372	27.6	5	1.4	
87B	4,012	8	1,196	29.8	3	0.9	4.0
		10	1,458	36.3	4	1.5	
		12	1,358	33.8	5	1.7	
88	27,686	8	14,152	51.1	3	1.5	4.0
		12	13,534	48.9	5	2.4	
89	12,946	4	474	3.7	1	0.0	3.5
		6	1,280	9.9	2	0.2	
		8	6,758	52.2	3	1.6	
		12	4,434	34.3	5	1.7	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
90A	30,255	4	6,539	21.6	1	0.2	2.1
		6	15,412	50.9	2	1.0	
		8	7,580	25.1	3	0.8	
		10	39	0.1	4	0.0	
		12	394	1.3	5	0.1	
90B	10,063	4	2,155	21.4	1	0.2	2.0
		6	4,888	48.6	2	1.0	
		8	2,577	25.6	3	0.8	
		12	40	0.4	5	0.0	
90C	16,214	4	3,877	23.9	1	0.2	2.0
		6	8,922	55.0	2	1.1	
		8	3,064	18.9	3	0.6	
		12	192	1.2	5	0.1	
91	44,476	4	1,876	4.2	1	0.0	2.8
		6	17,676	39.7	2	0.8	
		8	17,687	39.8	3	1.2	
		10	1,166	2.6	4	0.1	
		12	5,935	13.3	5	0.7	
92	512	6	512	100.0	2	2.0	2.0
93A	37,963	4	2,995	7.9	1	0.1	2.7
		6	12,483	32.9	2	0.7	
		8	18,583	49.0	3	1.5	
		10	470	1.2	4	0.0	
		12	2,661	7.0	5	0.4	
		14	770	2.0	5	0.1	
93B	34,838	4	1,772	5.1	1	0.1	2.3
		6	23,156	66.5	2	1.3	
		8	8,609	24.7	3	0.7	
		10	870	2.5	4	0.1	
		12	432	1.2	5	0.1	
93C	36,427	4	1,856	5.1	1	0.1	2.9
		6	14,441	39.6	2	0.8	
		8	12,554	34.5	3	1.0	
		10	1,895	5.2	4	0.2	
		12	5,643	15.5	5	0.8	
93D	34,079	4	2,002	5.9	1	0.1	2.4
		6	20,173	59.2	2	1.2	
		8	10,019	29.4	3	0.9	
		10	234	0.7	4	0.0	
		12	1,388	4.1	5	0.2	
95	663	8	648	97.8	3	2.9	3.0
		10	14	2.2	4	0.1	
		12	0	0.0	5	0.0	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
96	6,245	6	1,045	16.7	2	0.3	3.3
		8	3,648	58.4	3	1.8	
		12	1,552	24.9	5	1.2	

**Corresponding score in Appendix A is doubly weighted*

Appendix I – Customer Type

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Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
83	02A	35	601	636	5.5	94.5	100	1.1
54	02B	24	165	189	12.7	87.3	100	1.3
134	02C	1	404	405	0.2	99.8	100	1.0
133	02D	2	590	592	0.3	99.7	100	1.0
140	02E	0	628	628	0.0	100.0	100	1.0
36	03A	77	124	201	38.3	61.7	100	1.8
34	03B	81	118	199	40.7	59.3	100	1.8
130	04	4	1006	1,010	0.4	99.6	100	1.0
139	05A	1	839	840	0.1	99.9	100	1.0
111	05B	10	648	658	1.5	98.5	100	1.0
120	05C	10	1088	1,098	0.9	99.1	100	1.0
125	06A	3	467	470	0.6	99.4	100	1.0
141	06B	0	415	415	0.0	100.0	100	1.0
77	06C	28	370	398	7.0	93.0	100	1.1
138	06D	1	438	439	0.2	99.8	100	1.0
135	06E	1	410	411	0.2	99.8	100	1.0
131	06F	1	255	256	0.4	99.6	100	1.0
119	06H	5	534	539	0.9	99.1	100	1.0
142	06I	0	337	337	0.0	100.0	100	1.0
143	06J	0	252	252	0.0	100.0	100	1.0
144	06K	0	463	463	0.0	100.0	100	1.0
101	06M	4	127	131	3.1	96.9	100	1.1
145	06N	0	311	311	0.0	100.0	100	1.0
146	09	0	218	218	0.0	100.0	100	1.0
147	10	0	240	240	0.0	100.0	100	1.0
148	11	0	42	42	0.0	100.0	100	1.0
81	12A	82	1291	1,373	6.0	94.0	100	1.1
136	12B	2	842	844	0.2	99.8	100	1.0
46	13A	62	251	313	19.8	80.2	100	1.4
85	13B	32	563	595	5.4	94.6	100	1.1
98	14	10	284	294	3.4	96.6	100	1.1
149	15	0	83	83	0.0	100.0	100	1.0
117	16	1	96	97	1.0	99.0	100	1.0
112	17A	10	676	686	1.5	98.5	100	1.0
50	17B	58	347	405	14.3	85.7	100	1.3
43	18	82	315	397	20.7	79.3	100	1.4
73	19	50	613	663	7.5	92.5	100	1.2
79	1A	14	194	208	6.7	93.3	100	1.1
53	1B	14	93	107	13.1	86.9	100	1.3
74	1C	21	259	280	7.5	92.5	100	1.2
93	20A	23	508	531	4.3	95.7	100	1.1
65	20B	128	1158	1,286	10.0	90.0	100	1.2
103	21	4	140	144	2.8	97.2	100	1.1

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
150	22	0	48	48	0.0	100.0	100	1.0
124	23	9	1170	1,179	0.8	99.2	100	1.0
40	24A	76	192	268	28.4	71.6	100	1.6
69	24B	59	605	664	8.9	91.1	100	1.2
151	25	0	93	93	0.0	100.0	100	1.0
58	26A	38	279	317	12.0	88.0	100	1.2
57	26B	64	469	533	12.0	88.0	100	1.2
51	27	53	337	390	13.6	86.4	100	1.3
88	28	37	681	718	5.2	94.8	100	1.1
86	29	53	944	997	5.3	94.7	100	1.1
110	30	1	52	53	1.9	98.1	100	1.0
123	31A	3	386	389	0.8	99.2	100	1.0
152	31B	0	18	18	0.0	100.0	100	1.0
153	32	0	167	167	0.0	100.0	100	1.0
87	33	12	215	227	5.3	94.7	100	1.1
154	34	0	64	64	0.0	100.0	100	1.0
137	35	1	421	422	0.2	99.8	100	1.0
109	36	11	571	582	1.9	98.1	100	1.0
155	37	0	35	35	0.0	100.0	100	1.0
63	38A	34	305	339	10.0	90.0	100	1.2
132	38B	3	778	781	0.4	99.6	100	1.0
156	39	0	149	149	0.0	100.0	100	1.0
127	40A	2	345	347	0.6	99.4	100	1.0
59	40B	66	493	559	11.8	88.2	100	1.2
129	41	1	250	251	0.4	99.6	100	1.0
157	42A	0	36	36	0.0	100.0	100	1.0
52	42B	13	83	96	13.5	86.5	100	1.3
49	42C	19	107	126	15.1	84.9	100	1.3
158	42D	0	235	235	0.0	100.0	100	1.0
126	42E	2	316	318	0.6	99.4	100	1.0
25	42F	16	7	23	69.6	30.4	100	2.4
159	42G	0	36	36	0.0	100.0	100	1.0
160	42H	0	18	18	0.0	100.0	100	1.0
161	42I	0	0	0	0.0	0.0	0	1.0
107	42J	2	94	96	2.1	97.9	100	1.0
42	42K	2	7	9	22.2	77.8	100	1.4
162	42L	0	32	32	0.0	100.0	100	1.0
163	43A	0	138	138	0.0	100.0	100	1.0
164	43B	0	11	11	0.0	100.0	100	1.0
165	43C	0	11	11	0.0	100.0	100	1.0
47	43D	4	17	21	19.0	81.0	100	1.4
29	44	43	42	85	50.6	49.4	100	2.0
72	45A	39	471	510	7.6	92.4	100	1.2

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
106	45B	5	219	224	2.2	97.8	100	1.0
166	46	0	203	203	0.0	100.0	100	1.0
167	47	0	51	51	0.0	100.0	100	1.0
108	48	7	352	359	1.9	98.1	100	1.0
168	49	0	70	70	0.0	100.0	100	1.0
115	51	7	557	564	1.2	98.8	100	1.0
94	52A	8	184	192	4.2	95.8	100	1.1
67	52B	15	143	158	9.5	90.5	100	1.2
169	53A	0	230	230	0.0	100.0	100	1.0
60	53B	9	69	78	11.5	88.5	100	1.2
170	54	0	126	126	0.0	100.0	100	1.0
105	55	10	428	438	2.3	97.7	100	1.0
171	56A	0	7	7	0.0	100.0	100	1.0
113	56B	8	588	596	1.3	98.7	100	1.0
172	56C	0	6	6	0.0	100.0	100	1.0
97	57	4	111	115	3.5	96.5	100	1.1
102	57A	10	338	348	2.9	97.1	100	1.1
173	57B	0	27	27	0.0	100.0	100	1.0
89	58A	14	261	275	5.1	94.9	100	1.1
62	58B	10	88	98	10.2	89.8	100	1.2
174	58C	0	22	22	0.0	100.0	100	1.0
122	59	1	114	115	0.9	99.1	100	1.0
175	60	0	6	6	0.0	100.0	100	1.0
78	60A	15	206	221	6.8	93.2	100	1.1
61	60B	8	68	76	10.5	89.5	100	1.2
56	61	11	80	91	12.1	87.9	100	1.2
176	62	0	73	73	0.0	100.0	100	1.0
91	63	21	426	447	4.7	95.3	100	1.1
177	64	0	50	50	0.0	100.0	100	1.0
44	65	34	134	168	20.2	79.8	100	1.4
31	66A	22	24	46	47.8	52.2	100	2.0
37	66B	19	38	57	33.3	66.7	100	1.7
75	66C	3	37	40	7.5	92.5	100	1.2
1	66D	22	0	22	100.0	0.0	100	3.0
39	66E	10	24	34	29.4	70.6	100	1.6
178	66F	0	3	3	0.0	100.0	100	1.0
179	67	0	31	31	0.0	100.0	100	1.0
48	68	3	13	16	18.8	81.3	100	1.4
180	69	0	73	73	0.0	100.0	100	1.0
181	6G1	0	198	198	0.0	100.0	100	1.0
182	6G2	0	45	45	0.0	100.0	100	1.0
68	70	39	387	426	9.2	90.8	100	1.2
82	71	17	271	288	5.9	94.1	100	1.1

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
80	72	9	126	135	6.7	93.3	100	1.1
90	74	6	120	126	4.8	95.2	100	1.1
183	76A	0	145	145	0.0	100.0	100	1.0
84	76B	6	105	111	5.4	94.6	100	1.1
70	76C	4	43	47	8.5	91.5	100	1.2
184	76D	0	106	106	0.0	100.0	100	1.0
185	76F	0	53	53	0.0	100.0	100	1.0
2	76G	31	0	31	100.0	0.0	100	3.0
21	76H	14	5	19	73.7	26.3	100	2.5
22	76I	8	3	11	72.7	27.3	100	2.5
3	76J	3	0	3	100.0	0.0	100	3.0
4	76K	14	0	14	100.0	0.0	100	3.0
186	77	0	50	50	0.0	100.0	100	1.0
55	78	52	367	419	12.4	87.6	100	1.2
187	79	0	133	133	0.0	100.0	100	1.0
14	7A1	8	1	9	88.9	11.1	100	2.8
188	7A2	0	3	3	0.0	100.0	100	1.0
64	7B1	1	9	10	10.0	90.0	100	1.2
18	7B2	15	4	19	78.9	21.1	100	2.6
16	7B3	23	4	27	85.2	14.8	100	2.7
11	7B4	11	1	12	91.7	8.3	100	2.8
189	7B5	0	0	0	0.0	0.0	0	1.0
45	7C1	3	12	15	20.0	80.0	100	1.4
19	7C2	14	4	18	77.8	22.2	100	2.6
33	7C3	11	14	25	44.0	56.0	100	1.9
17	7C4	34	7	41	82.9	17.1	100	2.7
26	7C5	25	12	37	67.6	32.4	100	2.4
10	7D1	55	4	59	93.2	6.8	100	2.9
13	7D2	34	4	38	89.5	10.5	100	2.8
23	7D3	10	4	14	71.4	28.6	100	2.4
27	7E1	8	4	12	66.7	33.3	100	2.3
5	7E2	2	0	2	100.0	0.0	100	3.0
41	7E3	3	9	12	25.0	75.0	100	1.5
15	7E4	7	1	8	87.5	12.5	100	2.8
28	7F1	13	7	20	65.0	35.0	100	2.3
20	7F2	10	3	13	76.9	23.1	100	2.5
6	7F3	11	0	11	100.0	0.0	100	3.0
24	7F4	7	3	10	70.0	30.0	100	2.4
30	7G1	1	1	2	50.0	50.0	100	2.0
38	7G2	3	6	9	33.3	66.7	100	1.7
7	7G3	11	0	11	100.0	0.0	100	3.0
8	7G4	21	0	21	100.0	0.0	100	3.0
9	7G5	17	0	17	100.0	0.0	100	3.0

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
104	80	10	403	413	2.4	97.6	100	1.0
128	81	1	204	205	0.5	99.5	100	1.0
35	82	30	47	77	39.0	61.0	100	1.8
66	83	16	145	161	9.9	90.1	100	1.2
32	84	16	19	35	45.7	54.3	100	1.9
71	85	34	393	427	8.0	92.0	100	1.2
100	86A	9	272	281	3.2	96.8	100	1.1
95	86B	13	307	320	4.1	95.9	100	1.1
92	86C	14	291	305	4.6	95.4	100	1.1
12	86D	33	3	36	91.7	8.3	100	2.8
76	87A	10	125	135	7.4	92.6	100	1.1
190	87B	0	32	32	0.0	100.0	100	1.0
96	88	10	244	254	3.9	96.1	100	1.1
116	89	2	186	188	1.1	98.9	100	1.0
191	90A	0	450	450	0.0	100.0	100	1.0
192	90B	0	180	180	0.0	100.0	100	1.0
193	90C	0	242	242	0.0	100.0	100	1.0
118	91	4	422	426	0.9	99.1	100	1.0
194	92	0	9	9	0.0	100.0	100	1.0
114	93A	6	447	453	1.3	98.7	100	1.0
121	93B	5	563	568	0.9	99.1	100	1.0
99	93C	15	442	457	3.3	96.7	100	1.1
195	93D	0	597	597	0.0	100.0	100	1.0
196	95	0	6	6	0.0	100.0	100	1.0
197	96	0	84	84	0.0	100.0	100	1.0

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Appendix J – Crossings

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Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
18	02A	4	0	0	7	1	1	9	3
37	02B	2	0	0	5	1	1	7	2
78	02C	0	0	0	3	1	1	5	1
79	02D	0	0	0	3	1	1	5	1
38	02E	2	0	0	5	1	1	7	2
6	03A	6	0	0	9	1	1	11	3
1	03B	9	0	0	12	1	1	14	5
80	04	0	0	0	3	1	1	5	1
3	05A	0	0	2	3	1	9	13	4
81	05B	0	0	0	3	1	1	5	1
82	05C	0	0	0	3	1	1	5	1
83	06A	0	0	0	3	1	1	5	1
84	06B	0	0	0	3	1	1	5	1
85	06C	0	0	0	3	1	1	5	1
39	06D	2	0	0	5	1	1	7	2
86	06E	0	0	0	3	1	1	5	1
58	06F	1	0	0	4	1	1	6	2
40	06H	2	0	0	5	1	1	7	2
59	06I	1	0	0	4	1	1	6	2
87	06J	0	0	0	3	1	1	5	1
88	06K	0	0	0	3	1	1	5	1
60	06M	1	0	0	4	1	1	6	2
41	06N	2	0	0	5	1	1	7	2
31	09	3	0	0	6	1	1	8	2
19	10	0	0	1	3	1	5	9	3
89	11	0	0	0	3	1	1	5	1
90	12A	0	0	0	3	1	1	5	1
91	12B	0	0	0	3	1	1	5	1
10	13A	5	0	0	8	1	1	10	3
7	13B	6	0	0	9	1	1	11	3
92	14	0	0	0	3	1	1	5	1
93	15	0	0	0	3	1	1	5	1
94	16	0	0	0	3	1	1	5	1
61	17A	1	0	0	4	1	1	6	2
42	17B	2	0	0	5	1	1	7	2
11	18	0	1	0	3	6	1	10	3
62	19	1	0	0	4	1	1	6	2
95	1A	0	0	0	3	1	1	5	1
96	1B	0	0	0	3	1	1	5	1
43	1C	2	0	0	5	1	1	7	2
5	20A	7	0	0	10	1	1	12	4
20	20B	4	0	0	7	1	1	9	3
97	21	0	0	0	3	1	1	5	1
98	22	0	0	0	3	1	1	5	1
44	23	2	0	0	5	1	1	7	2

Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
99	24A	0	0	0	3	1	1	5	1
45	24B	2	0	0	5	1	1	7	2
100	25	0	0	0	3	1	1	5	1
8	26A	1	1	0	4	6	1	11	3
101	26B	0	0	0	3	1	1	5	1
46	27	2	0	0	5	1	1	7	2
9	28	6	0	0	9	1	1	11	3
21	29	4	0	0	7	1	1	9	3
102	30	0	0	0	3	1	1	5	1
32	31A	3	0	0	6	1	1	8	2
103	31B	0	0	0	3	1	1	5	1
104	32	0	0	0	3	1	1	5	1
105	33	0	0	0	3	1	1	5	1
106	34	0	0	0	3	1	1	5	1
47	35	2	0	0	5	1	1	7	2
107	36	0	0	0	3	1	1	5	1
108	37	0	0	0	3	1	1	5	1
109	38A	0	0	0	3	1	1	5	1
110	38B	0	0	0	3	1	1	5	1
111	39	0	0	0	3	1	1	5	1
112	40A	0	0	0	3	1	1	5	1
113	40B	0	0	0	3	1	1	5	1
114	41	0	0	0	3	1	1	5	1
115	42A	0	0	0	3	1	1	5	1
116	42B	0	0	0	3	1	1	5	1
117	42C	0	0	0	3	1	1	5	1
118	42D	0	0	0	3	1	1	5	1
119	42E	0	0	0	3	1	1	5	1
120	42F	0	0	0	3	1	1	5	1
121	42G	0	0	0	3	1	1	5	1
122	42H	0	0	0	3	1	1	5	1
123	42I	0	0	0	3	1	1	5	1
124	42J	0	0	0	3	1	1	5	1
125	42K	0	0	0	3	1	1	5	1
126	42L	0	0	0	3	1	1	5	1
127	43A	0	0	0	3	1	1	5	1
128	43B	0	0	0	3	1	1	5	1
129	43C	0	0	0	3	1	1	5	1
63	43D	1	0	0	4	1	1	6	2
64	44	1	0	0	4	1	1	6	2
130	45A	0	0	0	3	1	1	5	1
65	45B	1	0	0	4	1	1	6	2
12	46	5	0	0	8	1	1	10	3
131	47	0	0	0	3	1	1	5	1
132	48	0	0	0	3	1	1	5	1

Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
133	49	0	0	0	3	1	1	5	1
48	51	2	0	0	5	1	1	7	2
33	52A	3	0	0	6	1	1	8	2
66	52B	1	0	0	4	1	1	6	2
13	53A	5	0	0	8	1	1	10	3
134	53B	0	0	0	3	1	1	5	1
135	54	0	0	0	3	1	1	5	1
22	55	4	0	0	7	1	1	9	3
67	56A	1	0	0	4	1	1	6	2
136	56B	0	0	0	3	1	1	5	1
137	56C	0	0	0	3	1	1	5	1
23	57	4	0	0	7	1	1	9	3
138	57A	0	0	0	3	1	1	5	1
139	57B	0	0	0	3	1	1	5	1
140	58A	0	0	0	3	1	1	5	1
141	58B	0	0	0	3	1	1	5	1
142	58C	0	0	0	3	1	1	5	1
143	59	0	0	0	3	1	1	5	1
144	60	0	0	0	3	1	1	5	1
145	60A	0	0	0	3	1	1	5	1
146	60B	0	0	0	3	1	1	5	1
147	61	0	0	0	3	1	1	5	1
148	62	0	0	0	3	1	1	5	1
68	63	1	0	0	4	1	1	6	2
149	64	0	0	0	3	1	1	5	1
14	65	5	0	0	8	1	1	10	3
150	66A	0	0	0	3	1	1	5	1
69	66B	1	0	0	4	1	1	6	2
151	66C	0	0	0	3	1	1	5	1
152	66D	0	0	0	3	1	1	5	1
153	66E	0	0	0	3	1	1	5	1
154	66F	0	0	0	3	1	1	5	1
70	67	1	0	0	4	1	1	6	2
155	68	0	0	0	3	1	1	5	1
156	69	0	0	0	3	1	1	5	1
157	6G1	0	0	0	3	1	1	5	1
158	6G2	0	0	0	3	1	1	5	1
159	70	0	0	0	3	1	1	5	1
160	71	0	0	0	3	1	1	5	1
161	72	0	0	0	3	1	1	5	1
49	74	2	0	0	5	1	1	7	2
162	76A	0	0	0	3	1	1	5	1
163	76B	0	0	0	3	1	1	5	1
164	76C	0	0	0	3	1	1	5	1
71	76D	1	0	0	4	1	1	6	2

Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
165	76F	0	0	0	3	1	1	5	1
166	76G	0	0	0	3	1	1	5	1
167	76H	0	0	0	3	1	1	5	1
34	76I	3	0	0	6	1	1	8	2
168	76J	0	0	0	3	1	1	5	1
169	76K	0	0	0	3	1	1	5	1
170	77	0	0	0	3	1	1	5	1
50	78	2	0	0	5	1	1	7	2
171	79	0	0	0	3	1	1	5	1
4	7A1	8	0	0	11	1	1	13	4
24	7A2	4	0	0	7	1	1	9	3
172	7B1	0	0	0	3	1	1	5	1
51	7B2	2	0	0	5	1	1	7	2
173	7B3	0	0	0	3	1	1	5	1
25	7B4	4	0	0	7	1	1	9	3
174	7B5	0	0	0	3	1	1	5	1
72	7C1	1	0	0	4	1	1	6	2
175	7C2	0	0	0	3	1	1	5	1
26	7C3	4	0	0	7	1	1	9	3
176	7C4	0	0	0	3	1	1	5	1
177	7C5	0	0	0	3	1	1	5	1
35	7D1	3	0	0	6	1	1	8	2
15	7D2	1	0	1	4	1	5	10	3
16	7D3	1	0	1	4	1	5	10	3
52	7E1	2	0	0	5	1	1	7	2
53	7E2	2	0	0	5	1	1	7	2
178	7E3	0	0	0	3	1	1	5	1
27	7E4	4	0	0	7	1	1	9	3
179	7F1	0	0	0	3	1	1	5	1
180	7F2	0	0	0	3	1	1	5	1
181	7F3	0	0	0	3	1	1	5	1
73	7F4	1	0	0	4	1	1	6	2
28	7G1	4	0	0	7	1	1	9	3
17	7G2	5	0	0	8	1	1	10	3
36	7G3	3	0	0	6	1	1	8	2
54	7G4	2	0	0	5	1	1	7	2
74	7G5	1	0	0	4	1	1	6	2
182	80	0	0	0	3	1	1	5	1
183	81	0	0	0	3	1	1	5	1
29	82	4	0	0	7	1	1	9	3
55	83	2	0	0	5	1	1	7	2
184	84	0	0	0	3	1	1	5	1
185	85	0	0	0	3	1	1	5	1
75	86A	1	0	0	4	1	1	6	2
56	86B	2	0	0	5	1	1	7	2

Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
57	86C	2	0	0	5	1	1	7	2
186	86D	0	0	0	3	1	1	5	1
30	87A	4	0	0	7	1	1	9	3
76	87B	1	0	0	4	1	1	6	2
2	88	9	0	0	12	1	1	14	5
187	89	0	0	0	3	1	1	5	1
77	90A	1	0	0	4	1	1	6	2
188	90B	0	0	0	3	1	1	5	1
189	90C	0	0	0	3	1	1	5	1
190	91	0	0	0	3	1	1	5	1
191	92	0	0	0	3	1	1	5	1
192	93A	0	0	0	3	1	1	5	1
193	93B	0	0	0	3	1	1	5	1
194	93C	0	0	0	3	1	1	5	1
195	93D	0	0	0	3	1	1	5	1
196	95	0	0	0	3	1	1	5	1
197	96	0	0	0	3	1	1	5	1

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Appendix K – Valve Spacing

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Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
148	02A	193	48,505	2.0	1
162	02B	113	26,917	2.1	1
135	02C	96	24,972	1.9	1
156	02D	127	31,006	2.0	1
134	02E	104	27,198	1.9	1
172	03A	146	33,039	2.2	1
52	03B	70	28,104	1.2	1
96	04	161	49,199	1.6	1
116	05A	151	43,409	1.7	1
119	05B	145	41,075	1.8	1
143	05C	178	45,153	2.0	1
22	06A	45	25,683	0.9	2
15	06B	32	19,778	0.8	2
10	06C	27	19,701	0.7	2
25	06D	47	24,661	1.0	2
24	06E	39	21,175	0.9	2
33	06F	29	13,979	1.0	1
101	06H	81	24,480	1.7	1
16	06I	25	15,236	0.8	2
49	06J	31	12,678	1.2	1
32	06K	41	19,823	1.0	1
174	06M	63	13,909	2.3	1
128	06N	49	13,412	1.8	1
87	09	37	11,913	1.6	1
11	10	20	14,323	0.7	2
27	11	6	3,124	1.0	2
67	12A	135	48,674	1.4	1
76	12B	117	40,026	1.5	1
83	13A	117	38,145	1.5	1
152	13B	141	35,161	2.0	1
179	14	68	14,712	2.3	1
147	15	23	5,792	2.0	1
41	16	16	6,825	1.2	1
79	17A	123	41,281	1.5	1
168	17B	197	45,467	2.2	1
103	18	179	53,758	1.7	1
100	19	157	47,512	1.7	1
36	1A	21	9,772	1.1	1
165	1B	27	6,385	2.1	1
92	1C	33	10,473	1.6	1
160	20A	143	34,434	2.1	1
138	20B	188	48,476	1.9	1
131	21	28	7,384	1.9	1
51	22	9	3,619	1.2	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
45	23	162	67,439	1.2	1
43	24A	117	49,259	1.2	1
129	24B	193	52,564	1.8	1
64	25	20	7,248	1.4	1
40	26A	68	29,619	1.1	1
137	26B	160	41,271	1.9	1
78	27	94	31,842	1.5	1
80	28	156	52,221	1.5	1
95	29	167	51,228	1.6	1
46	30	8	3,313	1.2	1
82	31A	81	26,653	1.5	1
73	31B	3	1,036	1.4	1
13	32	17	10,572	0.8	2
53	33	46	18,435	1.2	1
37	34	13	5,806	1.1	1
35	35	69	32,441	1.1	1
75	36	133	45,772	1.5	1
72	37	10	3,471	1.4	1
124	38A	90	25,036	1.8	1
54	38B	116	46,403	1.2	1
56	39	30	11,720	1.3	1
91	40A	97	30,817	1.6	1
89	40B	98	31,294	1.6	1
31	41	36	17,423	1.0	1
84	42A	4	1,304	1.5	1
178	42B	35	7,586	2.3	1
154	42C	38	9,393	2.0	1
34	42D	24	11,540	1.0	1
18	42E	35	20,652	0.8	2
106	42F	33	9,775	1.7	1
132	42G	7	1,836	1.9	1
81	42H	3	1,000	1.5	1
1	42I	0	295	0.0	1
150	42J	19	4,767	2.0	1
113	42K	12	3,459	1.7	1
77	42L	6	2,042	1.5	1
110	43A	40	11,715	1.7	1
194	43B	1	105	4.7	1
9	43C	2	1,508	0.7	2
114	43D	5	1,440	1.7	1
181	44	90	19,372	2.3	1
146	45A	164	41,312	2.0	1
163	45B	53	12,609	2.1	1
158	46	41	9,942	2.1	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
167	47	7	1,636	2.1	1
170	48	112	25,708	2.2	1
71	49	8	2,779	1.4	1
133	51	126	33,029	1.9	1
115	52A	59	16,973	1.7	1
105	52B	37	10,972	1.7	1
61	53A	48	17,785	1.3	1
30	53B	16	7,819	1.0	1
60	54	28	10,382	1.3	1
123	55	117	33,056	1.8	1
196	56A	38	3,131	6.1	1
153	56B	129	31,955	2.0	1
197	56C	0	0.00	0.0	1
157	57	34	8,270	2.1	1
136	57A	130	33,693	1.9	1
5	57B	2	2,130	0.5	2
161	58A	56	13,346	2.1	1
193	58B	32	3,999	4.0	1
169	58C	4	923	2.2	1
164	59	31	7,337	2.1	1
2	60	0	424	0.0	1
140	60A	43	11,021	2.0	1
171	60B	27	6,128	2.2	1
176	61	26	5,680	2.3	1
55	62	13	5,117	1.3	1
180	63	152	32,834	2.3	1
139	64	13	3,351	1.9	1
107	65	44	12,960	1.7	1
192	66A	48	6,575	3.7	1
127	66B	19	5,238	1.8	1
142	66C	11	2,792	2.0	1
65	66D	16	5,793	1.4	1
48	66E	8	3,279	1.2	1
190	66F	4	605	3.3	1
183	67	10	2,101	2.4	1
186	68	5	899	2.8	1
173	69	22	4,959	2.2	1
17	6G1	15	8,922	0.8	2
21	6G2	4	2,310	0.9	2
97	70	101	30,740	1.6	1
121	71	91	25,716	1.8	1
50	72	23	9,398	1.2	1
47	74	27	11,137	1.2	1
177	76A	43	9,389	2.3	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
155	76B	22	5,406	2.0	1
175	76C	14	3,060	2.3	1
185	76D	32	6,184	2.6	1
144	76F	15	3,786	2.0	1
99	76G	7	2,121	1.7	1
189	76H	28	4,594	3.0	1
191	76I	12	1,797	3.3	1
118	76J	4	1,137	1.8	1
188	76K	7	1,232	2.8	1
6	77	2	2,061	0.5	2
130	78	83	22,595	1.8	1
187	79	39	6,998	2.8	1
14	7A1	13	8,068	0.8	2
7	7A2	16	13,504	0.6	2
88	7B1	16	5,110	1.6	1
19	7B2	12	7,029	0.9	2
125	7B3	28	7,775	1.8	1
85	7B4	25	8,086	1.5	1
3	7B5	0	408	0.0	1
93	7C1	16	5,062	1.6	1
29	7C2	11	5,448	1.0	1
102	7C3	23	6,938	1.7	1
69	7C4	35	12,313	1.4	1
108	7C5	21	6,165	1.7	1
141	7D1	60	15,346	2.0	1
122	7D2	31	8,759	1.8	1
59	7D3	29	10,941	1.3	1
38	7E1	33	14,671	1.1	1
12	7E2	6	4,246	0.7	2
39	7E3	21	9,281	1.1	1
66	7E4	25	9,049	1.4	1
149	7F1	29	7,279	2.0	1
68	7F2	25	8,807	1.4	1
28	7F3	20	9,910	1.0	1
20	7F4	12	7,013	0.9	2
8	7G1	7	5,763	0.6	2
23	7G2	8	4,520	0.9	2
44	7G3	21	8,809	1.2	1
62	7G4	24	8,847	1.4	1
58	7G5	15	5,784	1.3	1
112	80	81	23,397	1.7	1
182	81	56	11,949	2.3	1
159	82	62	14,962	2.1	1
145	83	50	12,612	2.0	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
126	84	14	3,862	1.8	1
109	85	99	29,021	1.7	1
90	86A	75	23,907	1.6	1
117	86B	94	26,720	1.8	1
98	86C	89	27,043	1.6	1
184	86D	24	5,011	2.4	1
120	87A	56	15,840	1.8	1
151	87B	16	4,012	2.0	1
104	88	93	27,686	1.7	1
166	89	55	12,946	2.1	1
42	90A	71	30,255	1.2	1
57	90B	26	10,063	1.3	1
26	90C	31	16,214	1.0	2
70	91	127	44,476	1.4	1
4	92	0	512	0.0	1
94	93A	120	37,963	1.6	1
111	93B	119	34,838	1.7	1
86	93C	113	36,427	1.6	1
74	93D	99	34,079	1.5	1
195	95	8	663	6.0	1
63	96	17	6,245	1.4	1

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Appendix L – Hydrant Coverage

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Sacramento Suburban Water District
Hydrant Coverage Score

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
50	02A	282,192	9,904,486	2.8	1
2	02B	4,373,063	13,219,750	33.1	5
44	02C	251,340	6,231,884	4.0	1
3	02D	4,723,218	14,884,159	31.7	5
88	02E	8,671	6,123,401	0.1	1
9	03A	3,896,259	19,627,742	19.9	3
10	03B	2,643,651	16,965,902	15.6	3
87	04	16,657	11,314,904	0.1	1
82	05A	38,137	9,425,374	0.4	1
96	05B	201	8,736,415	0.0	1
47	05C	341,366	10,179,369	3.4	1
107	06A	1	4,544,498	0.0	1
130	06B	0	4,067,509	0.0	1
157	06C	0	4,282,018	0.0	1
117	06D	1	4,518,114	0.0	1
187	06E	0	3,974,116	0.0	1
128	06F	0	2,423,214	0.0	1
114	06H	1	5,423,865	0.0	1
105	06I	1	2,599,318	0.0	1
159	06J	0	2,238,554	0.0	1
181	06K	0	3,567,541	0.0	1
53	06M	56,498	2,510,272	2.3	1
63	06N	54,578	3,901,457	1.4	1
170	09	0	2,000,190	0.0	1
194	10	0	2,280,522	0.0	1
183	11	0	373,485	0.0	1
52	12A	289,468	12,410,479	2.3	1
24	12B	482,320	9,233,779	5.2	3
14	13A	1,637,567	13,209,357	12.4	3
11	13B	1,761,364	12,285,976	14.3	3
143	14	0	3,263,553	0.0	1
160	15	0	1,344,337	0.0	1
106	16	1	2,185,279	0.0	1
48	17A	301,086	9,727,612	3.1	1
22	17B	765,060	13,923,023	5.5	3
51	18	330,249	11,601,805	2.8	1
65	19	151,667	11,406,735	1.3	1
59	1A	41,026	2,521,144	1.6	1
98	1B	13	1,436,542	0.0	1
83	1C	8,771	2,519,911	0.3	1
129	20A	0	7,959,281	0.0	1
84	20B	28,666	9,309,333	0.3	1
141	21	0	1,684,906	0.0	1
43	22	29,830	697,318	4.3	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
110	23	2	13,298,716	0.0	1
16	24A	1,860,016	16,069,173	11.6	3
20	24B	1,168,413	18,062,816	6.5	3
189	25	0	1,215,757	0.0	1
15	26A	1,684,025	13,616,330	12.4	3
23	26B	518,805	9,826,213	5.3	3
54	27	223,719	10,199,598	2.2	1
75	28	97,897	13,323,451	0.7	1
45	29	458,168	12,633,788	3.6	1
125	30	0	593,926	0.0	1
86	31A	9,063	5,704,373	0.2	1
151	31B	0	235,411	0.0	1
172	32	0	1,850,465	0.0	1
79	33	19,107	3,931,331	0.5	1
173	34	0	873,657	0.0	1
46	35	341,816	9,429,465	3.6	1
73	36	93,221	11,852,405	0.8	1
132	37	0	520,621	0.0	1
57	38A	116,778	6,228,747	1.9	1
99	38B	22	11,694,575	0.0	1
131	39	0	2,306,869	0.0	1
71	40A	64,909	7,389,401	0.9	1
152	40B	0	6,248,309	0.0	1
147	41	0	3,062,098	0.0	1
191	42A	0	318,382	0.0	1
74	42B	12,224	1,592,768	0.8	1
66	42C	30,146	2,548,438	1.2	1
167	42D	0	2,172,594	0.0	1
19	42E	257,543	3,782,105	6.8	3
21	42F	239,536	4,231,978	5.7	3
171	42G	0	276,544	0.0	1
100	42H	0	145,897	0.0	1
64	42I	2,874	207,766	1.4	1
91	42J	678	2,171,883	0.0	1
93	42K	236	790,396	0.0	1
127	42L	0	455,032	0.0	1
166	43A	0	1,280,331	0.0	1
165	43B	0	203,062	0.0	1
139	43C	0	419,336	0.0	1
108	43D	0	715,577	0.0	1
60	44	77,084	4,877,708	1.6	1
174	45A	0	9,497,494	0.0	1
179	45B	0	2,289,376	0.0	1
193	46	0	2,107,691	0.0	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
102	47	0	522,828	0.0	1
77	48	43,162	7,681,829	0.6	1
190	49	0	760,440	0.0	1
145	51	0	7,192,041	0.0	1
156	52A	0	4,625,889	0.0	1
163	52B	0	2,278,955	0.0	1
90	53A	2,027	4,470,207	0.0	1
158	53B	0	1,495,151	0.0	1
186	54	0	1,760,129	0.0	1
192	55	0	6,523,863	0.0	1
182	56A	0	267,217	0.0	1
80	56B	41,672	8,931,481	0.5	1
175	56C	0	284,774	0.0	1
161	57	0	1,995,814	0.0	1
137	57A	0	7,451,127	0.0	1
176	57B	0	376,099	0.0	1
162	58A	0	3,711,493	0.0	1
180	58B	0	1,315,219	0.0	1
169	58C	0	266,637	0.0	1
134	59	0	1,658,992	0.0	1
103	60	0	104,183	0.0	1
148	60A	0	2,855,683	0.0	1
153	60B	0	1,831,579	0.0	1
135	61	0	1,779,338	0.0	1
122	62	0	1,854,222	0.0	1
138	63	0	7,031,305	0.0	1
126	64	0	629,779	0.0	1
94	65	425	3,772,897	0.0	1
95	66A	94	2,408,039	0.0	1
120	66B	0	1,713,222	0.0	1
185	66C	0	566,612	0.0	1
104	66D	1	1,274,271	0.0	1
101	66E	1	987,608	0.0	1
196	66F	0	200,056	0.0	1
149	67	0	406,582	0.0	1
178	68	0	893,029	0.0	1
146	69	0	1,068,907	0.0	1
197	6G1	0	1,806,891	0.0	1
195	6G2	0	327,322	0.0	1
155	70	0	6,896,503	0.0	1
118	71	1	7,098,137	0.0	1
113	72	0	1,778,801	0.0	1
177	74	0	2,126,722	0.0	1
81	76A	7,390	1,659,422	0.4	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
123	76B	0	1,196,761	0.0	1
56	76C	19,414	1,006,931	1.9	1
5	76D	836,918	3,103,177	27.0	5
164	76F	0	1,100,184	0.0	1
115	76G	0	572,104	0.0	1
184	76H	0	852,515	0.0	1
154	76I	0	1,063,205	0.0	1
49	76J	14,969	494,160	3.0	1
85	76K	1,078	359,827	0.3	1
124	77	0	392,726	0.0	1
112	78	1	5,905,316	0.0	1
111	79	0	1,176,221	0.0	1
7	7A1	936,115	2,805,963	33.4	3
26	7A2	31,979,926	36,356,072	88.0	1
12	7B1	234,672	1,680,662	14.0	3
41	7B2	233,725	3,383,858	6.9	1
31	7B3	787,617	2,682,679	29.4	1
35	7B4	255,337	2,421,813	10.5	1
28	7B5	3,769,107	4,710,366	80.0	1
25	7C1	7,019	2,117,098	0.3	3
13	7C2	203,892	1,531,691	13.3	3
55	7C3	35,720	1,712,843	2.1	1
42	7C4	262,653	3,827,766	6.9	1
121	7C5	0	1,136,030	0.0	1
40	7D1	370,132	4,723,104	7.8	1
18	7D2	244,815	2,181,171	11.2	3
61	7D3	37,390	2,411,227	1.6	1
17	7E1	646,046	5,690,634	11.4	3
29	7E2	2,043,221	3,264,410	62.6	1
37	7E3	203,543	2,400,113	8.5	1
6	7E4	4,228,405	6,805,323	62.1	3
38	7F1	184,402	2,286,888	8.1	1
8	7F2	819,765	3,122,545	26.3	3
32	7F3	844,909	2,956,109	28.6	1
33	7F4	723,190	3,196,451	22.6	1
27	7G1	8,561,180	10,076,724	85.0	1
30	7G2	1,388,251	3,228,269	43.0	1
36	7G3	215,780	2,245,230	9.6	1
39	7G4	305,095	3,803,791	8.0	1
34	7G5	359,140	2,268,497	15.8	1
140	80	0	5,154,129	0.0	1
168	81	0	2,344,672	0.0	1
72	82	36,386	4,472,343	0.8	1
109	83	0	2,754,201	0.0	1

Sacramento Suburban Water District
Hydrant Coverage Score

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
188	84	0	661,877	0.0	1
97	85	97	7,193,294	0.0	1
76	86A	49,439	7,596,346	0.7	1
78	86B	31,471	6,207,330	0.5	1
68	86C	64,589	6,125,177	1.1	1
67	86D	17,249	1,463,136	1.2	1
70	87A	50,512	4,972,453	1.0	1
116	87B	0	1,263,488	0.0	1
62	88	121,698	8,399,058	1.4	1
136	89	0	2,227,192	0.0	1
133	90A	0	5,057,017	0.0	1
150	90B	0	1,996,490	0.0	1
119	90C	0	2,790,447	0.0	1
58	91	223,560	13,018,985	1.7	1
1	92	241,237	354,194	68.1	5
69	93A	114,824	10,957,414	1.0	1
92	93B	2,983	9,853,778	0.0	1
89	93C	5,300	8,518,565	0.1	1
144	93D	0	8,618,863	0.0	1
4	95	67,461	230,845	29.2	5
142	96	0	1,701,757	0.0	1

*Corresponding score in Appendix A is doubly weighted

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Appendix M – Wharf Hydrant

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Sacramento Suburban Water District
Wharf Hydrant Score

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
97	02A	107	1	108	0.9	1
91	02B	74	2	76	2.6	1
98	02C	45	0	45	0.0	1
99	02D	61	0	61	0.0	1
100	02E	49	0	49	0.0	1
101	03A	76	0	76	0.0	1
102	03B	81	0	81	0.0	1
103	04	82	0	82	0.0	1
94	05A	64	1	65	1.5	1
104	05B	74	0	74	0.0	1
105	05C	73	0	73	0.0	1
20	06A	8	25	33	75.8	4
7	06B	3	26	29	89.7	5
21	06C	8	25	33	75.8	4
17	06D	6	26	32	81.3	5
15	06E	5	23	28	82.1	5
9	06F	2	15	17	88.2	5
106	06H	49	0	49	0.0	1
1	06I	0	18	18	100.0	5
22	06J	4	12	16	75.0	4
18	06K	5	21	26	80.8	5
107	06M	23	0	23	0.0	1
89	06N	32	1	33	3.0	1
57	09	13	3	16	18.8	1
19	10	3	11	14	78.6	4
26	11	2	4	6	66.7	4
43	12A	42	22	64	34.4	2
80	12B	53	3	56	5.4	1
86	13A	74	3	77	3.9	1
108	13B	78	0	78	0.0	1
109	14	29	0	29	0.0	1
110	15	9	0	9	0.0	1
37	16	4	4	8	50.0	3
56	17A	55	13	68	19.1	1
93	17B	115	2	117	1.7	1
84	18	110	5	115	4.3	1
69	19	92	9	101	8.9	1
16	1A	4	18	22	81.8	5
31	1B	5	9	14	64.3	4
6	1C	2	23	25	92.0	5
47	20A	39	17	56	30.4	2
92	20B	78	2	80	2.5	1
49	21	7	3	10	30.0	2
38	22	1	1	2	50.0	3
33	23	30	49	79	62.0	4

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
64	24A	87	11	98	11.2	1
76	24B	119	8	127	6.3	1
27	25	3	6	9	66.7	4
55	26A	46	12	58	20.7	2
73	26B	74	6	80	7.5	1
79	27	63	4	67	6.0	1
50	28	76	29	105	27.6	2
68	29	94	10	104	9.6	1
111	30	5	0	5	0.0	1
70	31A	41	4	45	8.9	1
2	31B	0	1	1	100.0	5
11	32	2	10	12	83.3	5
51	33	19	7	26	26.9	2
12	34	1	5	6	83.3	5
35	35	22	28	50	56.0	3
67	36	74	8	82	9.8	1
28	37	1	2	3	66.7	4
77	38A	45	3	48	6.3	1
44	38B	45	23	68	33.8	2
3	39	0	10	10	100.0	5
54	40A	49	13	62	21.0	2
65	40B	51	6	57	10.5	1
30	41	7	13	20	65.0	4
112	42A	3	0	3	0.0	1
61	42B	7	1	8	12.5	1
66	42C	17	2	19	10.5	1
13	42D	3	15	18	83.3	5
25	42E	7	19	26	73.1	4
113	42F	39	0	39	0.0	1
114	42G	1	0	1	0.0	1
4	42H	0	1	1	100.0	5
115	42I	0	0	0	0.0	1
116	42J	10	0	10	0.0	1
60	42K	6	1	7	14.3	1
117	42L	4	0	4	0.0	1
36	43A	6	7	13	53.8	3
118	43B	2	0	2	0.0	1
119	43C	5	0	5	0.0	1
120	43D	10	0	10	0.0	1
121	44	73	0	73	0.0	1
122	45A	95	0	95	0.0	1
123	45B	23	0	23	0.0	1
124	46	13	0	13	0.0	1
125	47	6	0	6	0.0	1
96	48	78	1	79	1.3	1

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
126	49	3	0	3	0.0	1
95	51	65	1	66	1.5	1
75	52A	29	2	31	6.5	1
127	52B	21	0	21	0.0	1
34	53A	9	12	21	57.1	3
53	53B	14	4	18	22.2	2
23	54	3	9	12	75.0	4
48	55	30	13	43	30.2	2
128	56A	4	0	4	0.0	1
90	56B	70	2	72	2.8	1
129	56C	2	0	2	0.0	1
74	57	14	1	15	6.7	1
52	57A	49	15	64	23.4	2
39	57B	2	2	4	50.0	3
130	58A	38	0	38	0.0	1
131	58B	13	0	13	0.0	1
132	58C	1	0	1	0.0	1
133	59	9	0	9	0.0	1
134	60	0	0	0	0.0	1
135	60A	30	0	30	0.0	1
136	60B	14	0	14	0.0	1
137	61	12	0	12	0.0	1
138	62	7	0	7	0.0	1
85	63	44	2	46	4.3	1
139	64	5	0	5	0.0	1
140	65	42	0	42	0.0	1
141	66A	27	0	27	0.0	1
71	66B	12	1	13	7.7	1
142	66C	9	0	9	0.0	1
143	66D	20	0	20	0.0	1
144	66E	12	0	12	0.0	1
145	66F	1	0	1	0.0	1
146	67	2	0	2	0.0	1
59	68	5	1	6	16.7	1
147	69	8	0	8	0.0	1
8	6G1	1	8	9	88.9	5
29	6G2	1	2	3	66.7	4
148	70	70	0	70	0.0	1
149	71	50	0	50	0.0	1
32	72	4	7	11	63.6	4
40	74	11	8	19	42.1	3
62	76A	15	2	17	11.8	1
150	76B	12	0	12	0.0	1
151	76C	7	0	7	0.0	1
152	76D	17	0	17	0.0	1

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
153	76F	11	0	11	0.0	1
154	76G	8	0	8	0.0	1
155	76H	17	0	17	0.0	1
156	76I	9	0	9	0.0	1
157	76J	4	0	4	0.0	1
158	76K	4	0	4	0.0	1
5	77	0	2	2	100.0	5
159	78	68	0	68	0.0	1
160	79	14	0	14	0.0	1
161	7A1	12	0	12	0.0	1
162	7A2	20	0	20	0.0	1
163	7B1	12	0	12	0.0	1
164	7B2	19	0	19	0.0	1
165	7B3	16	0	16	0.0	1
81	7B4	18	1	19	5.3	1
166	7B5	2	0	2	0.0	1
167	7C1	15	0	15	0.0	1
168	7C2	12	0	12	0.0	1
169	7C3	16	0	16	0.0	1
170	7C4	36	0	36	0.0	1
171	7C5	14	0	14	0.0	1
172	7D1	33	0	33	0.0	1
173	7D2	17	0	17	0.0	1
174	7D3	24	0	24	0.0	1
175	7E1	37	0	37	0.0	1
176	7E2	6	0	6	0.0	1
88	7E3	28	1	29	3.4	1
177	7E4	14	0	14	0.0	1
178	7F1	21	0	21	0.0	1
179	7F2	18	0	18	0.0	1
180	7F3	15	0	15	0.0	1
78	7F4	15	1	16	6.3	1
181	7G1	5	0	5	0.0	1
182	7G2	8	0	8	0.0	1
183	7G3	25	0	25	0.0	1
184	7G4	28	0	28	0.0	1
185	7G5	13	0	13	0.0	1
186	80	50	0	50	0.0	1
187	81	23	0	23	0.0	1
188	82	43	0	43	0.0	1
189	83	26	0	26	0.0	1
190	84	9	0	9	0.0	1
191	85	99	0	99	0.0	1
82	86A	56	3	59	5.1	1
63	86B	62	8	70	11.4	1

Sacramento Suburban Water District
Wharf Hydrant Score

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
72	86C	49	4	53	7.5	1
42	86D	13	7	20	35.0	2
192	87A	32	0	32	0.0	1
193	87B	5	0	5	0.0	1
194	88	54	0	54	0.0	1
83	89	21	1	22	4.5	1
14	90A	7	35	42	83.3	5
24	90B	3	9	12	75.0	4
10	90C	4	22	26	84.6	5
45	91	43	20	63	31.7	2
195	92	0	0	0	0.0	1
46	93A	43	19	62	30.6	2
58	93B	49	10	59	16.9	1
87	93C	53	2	55	3.6	1
41	93D	42	23	65	35.4	2
196	95	2	0	2	0.0	1
197	96	14	0	14	0.0	1
198	96	14	0	24	0.0	1

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Appendix N – Equations

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Equation 1. Total Score by Main Replacement Area

$$Total\ Score = LOF \text{ x } COF \text{ x } (1 + FSS)$$

Equation 2. Likelihood of Failure (LOF) per Main Replacement Area

$$LOF_i = \frac{\sum LOF\ Criteria\ Score_i}{Max(\sum LOF\ Criteria\ Score)}$$

LOF_i = Likelihood of Failure for Main Replacement Area "i"
∑LOF Criteria Scorei = Sum of all the LOF Criteria Scores per Main Replacement Area "i"
Max(∑LOF Criteria Score) = Maximum LOF score possible

Equation 3. Effective Pipe Material Score by Main Replacement Area

$$\text{EPM} = \sum (\%_{ACP} \times Score_{\text{ACP}} + \%_{DI} \times Score_{DI} + \cdots + \%_x \times Score_x)$$

EPM = Effective Pipe Material
$\%_x$ = Percentage of pipe material "x" within Main Replacement Area "i"
Scorex = Corresponding Pipe Material Score (e.g. ACP = 4)

Equation 4. Effective Pipe Age by Main Replacement Area

$$EPA = \sum \begin{pmatrix} \%_{Age_{0-15}} \times Score_{0-15} + \%_{15.01-30} \times Score_{15.01-30} + \\ \ldots + \%_x \times Score_y \end{pmatrix}$$

EPA = Effective Pipe Age
$\%Age_x$ = Percentage of Pipe Age "x" within Main Replacement Area "i"
$Score_y$ = Corresponding Pipe Age Score (e.g. 60+ = 5

Equation 5. Leaks per Mile by Main Replacement Area

$$Leaks\ per\ Mile\ by\ Area = \frac{\sum Leaks_i}{\sum Miles_i}$$

$Leaks_i$ = Total Leaks within the replacement area
$Miles_i$ = Total length of Main within the replacement area in miles

Equation 6. Consequence of Failure (COF) per Main Replacement Area

$$COF_i = \frac{\sum COF\ Criteria\ Score_i}{Max(\sum COF\ Criteria\ Score)}$$

COF_i = Consequence of Failure for per Main Replacement Area "i"
$\sum COF\ Criteria\ Score_i$ = Sum of all the COF Criteria Scores per Main Replacement Area "i"
Max(∑COF Criteria Score) = Maximum COF score possible

Equation 7. Pipe Damage Score per Main Replacement Area

$$PDaS_i = \sum PDaS_{ix} \times {}^{l_{ix}}/_{L_i}$$

$PDaS_i$ = Pipe Damage Score per Main Replacement Area "i"
$PDaS_{ix}$ = Score of respective Pipe Damage "x" within Main Replacement Area "i"
l_{ix} = Length of respective material "x" within Main Replacement Area "i"
L_i = Total length of Main within Main Replacement Area "i"

Equation 8. Pipe Diameter Score per Main Replacement Area

$$PDiS_i = \sum PDiS_{ix} \times {}^{l_{ix}}/_{L_i}$$

$PDiS_i$ = Pipe Diameter Score per Main Replacement Area "i"
$PDiS_{ix}$ = Score of respective Pipe Diameter Score "x" within Main Replacement Area "i"
l_{ix} = Length of respective Pipe Diameter "x" within Main Replacement Area "i"
L_i = Total length of Main within Main Replacement Area "i"

Equation 9. Commercial Density per Main Replacement Area

$$CD_i = 1 + 2 \times \left(\frac{CA_i}{TA_i}\right)$$

CD_i = Commercial Density per Main Replacement Area "i"
CAi = Commercial Accounts per Main Replacement Area "i"
TA_i = Total Accounts per Main Replacement Area "i"

Equation 10. Creek Crossings Score by Main Replacement Area

$$CCS_i = 3 + CC_i$$

Equation 11. Freeway Crossings Score by Main Replacement Area

$$FWCS_i = 1 + FW_i \times 5$$

Equation 12. Railroad Crossings Score by Main Replacement Area

$$RRCS_i = 1 + RC_i \times 3$$

Equation 13. Sum of Crossings Score by Main Replacement Area

$$SC_i = CCS_i + FWCS_i + RRCS_i$$

Equation 14. Crossings Score Upper Limit

$$C_{UL} = Max(SC_i)$$

Equation 15. Crossings Score Range Interval

$$C_R = \frac{C_{UL}}{5}$$

Equation 16. Crossings Value by Main Replacement Area

$$CV_i = \frac{SC_i}{C_{UL}}$$

CCS_i = Creek Crossings Score by Main Replacement Area "i"
$FWCS_i$ = Freeway Crossings Score by Main Replacement Area "i"
$RRCS_i$ = Railroad Crossings Score by Main Replacement Area "i"
SC_i = Sum of Crossings by Main Replacement Area "i"
CV_i = Crossings Value by Main Replacement Area "i"

Equation 17. Valve Spacing by Main Replacement Area

$$V_{500'_i} = \frac{V_i}{L_i} \times 500'$$

$V_{500'_i}$ = Valve Spacing per Main Replacement Area "i"
V = Valves per Main Replacement Area "i"
L_i = Distribution Main Length per Main Replacement Area "i"

Equation 18. Risk of Failure Score by Main Replacement Area

$$ROF_i = COF_i \times LOF_i$$

ROF_i = Risk of Failure per Main Replacement Area "i"
COF_i = Consequence of Failure for per Main Replacement Area "i"
LOF_i = Likelihood of Failure for Main Replacement Area "i"

Equation 19. Fire Safety Score per Main Replacement Area

$$Fire\ Safety\ Score = \frac{[Hydrant\ Coverage\ Score]\ +\ [Wharf\ Hydrant\ Score]}{15}$$

Equation 20. Modified ROF Score

$$Modified\ ROF\ Score = ROF\ \times\ (1 + Fire\ Safety\ Score)$$