Agenda

Sacramento Suburban Water District

Facilities and Operations Committee

3701 Marconi Avenue, Suite 100
Sacramento, CA 95821

Thursday, September 13, 2018
2:00 p.m.

Public documents relating to any open session item listed on this agenda that are distributed to the Committee members less than 72 hours before the meeting are available for public inspection in the customer service area of the District's Administrative Office at the address listed above.

The public may address the Committee concerning any item of interest. Persons who wish to comment on either agenda or non-agenda items should fill out a Comment Card and give it to the General Manager. The Committee Chair will call for comments at the appropriate time. Comments will be subject to reasonable time limits (3 minutes).

In compliance with the Americans with Disabilities Act, if you have a disability, and you need a disability-related modification or accommodation to participate in this meeting, then please contact Sacramento Suburban Water District Human Resources at (916)679-3972. Requests must be made as early as possible and at least one-full business day before the start of the meeting.

Call to Order

Pledge of Allegiance

Roll Call

Announcements

Public Comment
This is an opportunity for the public to comment on non-agenda items within the subject matter jurisdiction of the Committee. Comments are limited to 3 minutes.

Consent Items
The Committee will be asked to approve all Consent Items at one time without discussion. Consent Items are expected to be routine and non-controversial. If any member of the Committee, staff or interested person requests that an item be removed from the Consent Items, it will be considered with the Items for Discussion and/or Action.

1. **Minutes of the August 1, 2018 Facilities and Operations Committee Meeting**
   Recommendation: Approve subject minutes.

Items for Discussion and/or Action

2. **Distribution Main Asset Management Plan Update**
   Recommendation: Receive staff report and direct staff as appropriate.

3. **Review Draft Language for 2018 Consumer Confidence Report**
   Recommendation: Receive staff report and direct staff as appropriate.

4. **McClellan Business Park Update**
   Recommendation: Receive staff presentation.

5. **Antelope Gardens**
   Recommendation: Receive staff report and direct staff as appropriate.

Adjournment

* *

Upcoming Meetings:

Monday, September 17, 2018 at 6:00 p.m., Regular Board Meeting
Wednesday, October 3, 2018 at 4:30 p.m., San Juan Water District/Sacramento Suburban Water District Water Management/Re-Organization Committee Meeting
Monday, October 15, 2018 at 6:00 p.m., Regular Board Meeting

* *

I certify that the foregoing agenda for the September 13, 2018 meeting of the Sacramento Suburban Water District Facilities and Operations Committee was posted by September 6, 2018 in a publicly-accessible location at the Sacramento Suburban Water District office, 3701 Marconi Avenue, Suite 100, Sacramento, California, and was made available to the public during normal business hours.

_____
Dan York
General Manager/Secretary
Sacramento Suburban Water District

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Agenda Item: 1

Minutes

Sacramento Suburban Water District
Facilities and Operations Committee
Wednesday, August 1, 2018

Call to Order
Chair Jones called the meeting to order at 11:00 a.m.

Pledge of Allegiance
Chair Jones led the Pledge of Allegiance.

Roll Call

Directors Present:	Dave Jones.
Directors Absent:	Robert Wichert (Arrived at 11:17 a.m.)
Staff Present:	General Manager Dan York, Assistant General Manager Mike Huot, Amy Bullock, Matt Underwood, David Morrow, Dana Dean, Mitchell McCarthy, Jim Arenz, David Espinoza and David Armand.
Public Present:	William Eubanks, Paul Selsky, Ken Loy, Ken Worster, Pete Delevalle, Jim Mulligan and Kelye McKinney.

Announcements
General Manager Dan York (GM York) announced that on August 2, 2018, at 6:00 p.m. to 7:30 p.m. the District will host a Public Outreach event on the main replacement program on Edison Meadows and Parkland Estates where Director McPherson and Director Thomas will attend to represent their division.

Public Comment
None.

Consent Items

1. **Minutes of the May 30, 2018 Facilities and Operations Committee Meeting**

   Chair Jones moved to approve Consent Item 1; The motion passed by unanimous vote.

AYES:	Jones.	ABSTAINED:	
NOES:		RECUSED:	
ABSENT:	Wichert.		

Items for Discussion and/or Action

2. **Presentation on Well Site Selection Planning**
Jim Arenz, Senior Project Manager (Mr. Arenz), introduced Ken Loy (Mr. Loy) with West Yost, who introduced Pete Delevalle (Mr. Delevalle) who went through a PowerPoint Presentation.
Chair Jones inquired if West Yost considered putting any of the District wells outside the District boundaries, what they refer to as the buffer zone.

Mr. Delevalle stated in the specific study they did not look beyond the District's boundaries.

Mr. Arenz noted that for this study staff is looking for well sites inside the District's boundaries; however, should West Yost be unsuccessful in finding well sites that meet the criteria then the District can search outside the boundaries with this tool.

Chair Jones inquired in the 2,000 feet buffer zone does the District have any active wells there now.

Mr. Delevalle stated that in some cases the District does have active wells in the 2,000 feet buffer zone.

Chair Jones inquired if school sites and park sites are included in the figure of 170 sites.

Mr. Delevalle clarified that school and park sites are included in the 170 potential qualifying site figure.

Chair Jones inquired if high resolution aerial photography is available now.

Mr. Delevalle stated that the aerial photography is available and is already in the data set program.

Chair Jones inquired if Mr. Delevalle has looked at sites smaller than the criteria or RD5 sites.

Mr. Delevalle stated that at this time they have not looked at sites outside of the criteria because they have sites that meet the District's criteria. Mr. Delevalle further noted that if the data came back with no matching sites, then they could change the perimeter criteria to a smaller lot size to see what comes up.

GM York inquired if staff knew what DDW's minimum well site requirements are.

Mr. Arenz stated that DDW does not have a minimum lot size; however, they do have restrictions on proximity to sewer and storm drains.

Chair Jones inquired if any other districts have used this system or tool.

Mr. Delevalle stated that the City of Santa Rosa has used the tool for well site selection and other property purchases.

Chair Jones inquired how hard it would be for other districts to use the system or tool once developed for the District.

Mr. Delevalle stated that if the District had the data available, the data can be expanded and available for adjacent Districts.

Chair Jones stated for the record that Director Wichert is present for the meeting at 11:17 a.m.

Chair Jones inquired how much the system or tool was going to cost.

Mr. Arenz stated the cost to develop the tool is $68,000.00 and would be paid for out of this year's budget.

The Facilities and Operations Committee (F&O) recommended taking the item to the full board as a Consent Item with a recommendation of approval.

Public comment from William Eubanks (Mr. Eubanks) requested some clarification on why this item needs to go to the full Board as a Consent Item for approval if the money has already been budgeted.

Chair Jones stated that taking the item to the full Board as a Consent Item moves the discussions along and having the item as a Consent Item informs the other Board members that the F&O Committee has reviewed the item with a recommendation of approval.

GM York further noted that the reason the item should go to the full Board as a Consent Item is to allow staff utilize the tool that has already been approved by the Board for future property purchases.

Mr. Eubanks further voiced that it seems extremely simple and straight forward and does not think the item should have to go to the full Board for approval to utilize the tool in the future.

3. Distribution Main Asset Management Plan Update

Dana Dean (Mr. Dean) presented the staff report.

Director Wichert stated that he was not in a position to make a decision on the agenda item.

Chair Jones noted that he has a lot of questions and comments on the whole progress and process in which he recently met with GM York on.

Mr. Dean noted that he would like to meet with Chair Jones to answer and address his questions and concerns.

GM York noted that October is the goal for recommendation of approval from the F&O Committee.

Director Wichert noted he would like a copy of Chair Jones comments and questions. The Committee did not have any recommendations at this time and is recommending the item be brought back to another F&O Committee meeting potentially in late August or early September.

4. 2017 Consumer Confidence Report Review

David Armand (Mr. Armand) presented the staff report.

Director Wichert inquired if there is clarification on the language that he was informed is required, but leaves the consumers in his view wondering what to do. Director Wichert further noted that he is suggesting staff has language on how the District's water has performed in the past and how it is performing in the future.

Mr. Armand expressed that he has never seen or heard of anyone inserting clarification text after the mandated language.

Director Wichert inquired if the District's water is safe for pregnant woman to drink.

Mr. Armand stated that he is not a physician so he cannot answer Director Wichert's question.

Director Jones inquired if there is anyone from the State that can provide a statement on the water that the District is serving.

Mr. Armand is not aware of anyone that could provide a statement.

GM Dan York clarified that for the next year's CCR the District can request that new or different language be added.

Mr. Armand noted that he has been working with other staff on language for next year's CCR regarding certain language on how the District's water stacks up against other districts.

Assistant General Manager Mike Huot (AGM Huot) stated that staff could provide Directors with the District's draft language for review and potentially take the draft language to the State for review and or approval.

Public comment from Mr. Eubanks. Mr. Eubanks stated that he would caution staff and Board members to be very careful on how specific you get if you modify language and not to single out groups and deviate from State mandated language. He further noted in doing so this could open up legality issues and would highly refrain from modifying any language at all.

GM York stated that whatever draft language is currently in the works from staff will be provided at the next F&O Committee meeting per Director Wichert's request.

Adjournment
Chair Jones adjourned the meeting at 11:52 p.m.

_____
Dan York
General Manager/Secretary
Sacramento Suburban Water District

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SACRAMENTO SUBURBAN WATER DISTRICT

Facilities and Operations Committee

Agenda Item: 2

Date: September 4, 2018

Subject: Distribution Main Asset Management Plan Update

Staff Contact: Dana Dean, P.E., Engineering Manager

Recommended Committee Action:
Review *Distribution Main Asset Management Plan* (Plan) update and provide input as appropriate. Direct staff to present the Plan, together with a Committee recommendation on acceptance, to the full Board of Directors at the October 15, 2018, regular Board meeting.

Background:
The Sacramento Suburban Water District (District) Board of Directors adopted the first Plan on November 21, 2005. Plans have been periodically updated with the most recent update being Board approved on October 20, 2014. This Plan is an update to the 2014 version, and includes information on pipe leak history, failure rate, and condition. The District has installed nearly 100 miles of distribution main since it began the distribution Main Replacement Program in 2004.

Discussion:
The District has a responsibility to provide its customers with a reliable and safe water distribution system. The Plan sets forth a strategy to replace aging, deteriorating, and undersized distribution mains throughout the District. The Plan is based on a ranking matrix derived from various criteria to identify areas in most need of main replacement, including pipe damage potential, pipe diameter, customer type, crossings, valve spacing, location, pipe age, pipe material, pipe failure rate, hydrant coverage, and hydrant type.

The Plan is adaptive and perpetual in that all main replacement areas are ranked in order of priority for replacement. The Plan is expected to be updated regularly at intervals of between 4 and 6 years with potential for priority areas changing as additional information becomes available and analyses evolve. With regular updates it will evolve as older lines are replaced, leak history changes, and system data is improved. Coordination between the Main Replacement and Meter Retrofit Programs is essential for efficient use of funds.

The Plan is a tool for communication between the Board and staff to prioritize areas in need of distribution main replacement. Furthermore, it is to be used as a planning tool during annual Capital Improvement Program (CIP) budget discussions with the Board. The Plan does not represent a financial commitment by the Board, other than those CIP funds already approved and

adopted, but provides a prioritization of main replacements for future planning. The Plan provides a strategy for the replacement of distribution mains.

The purpose and goals of the Plan are to:

- Continue providing a reliable and safe water distribution system.
- Provide a perpetual distribution main replacement projection that is adaptable to new and evolving technologies, management practices, and District needs.
- Prioritize distribution main replacements based on selected criteria to address areas with highest need.
- Coordinate with the District's long term CIP.
- Coordinate with the District's Meter Retrofit Program to ensure compliance with State requirements to have all services metered by January 1, 2025.

If the Board accepts the updated Plan, a final report will be issued to all Directors.

Summary of Significant Changes

- Updated distribution system data (e.g., leak history, material, etc.).
- Added a failure rate chart.
- Failure Rate – Added a criterion to the Likelihood of Failure (LOF) category to account for failure rate differences among the various main replacement areas.
- Pipe Condition – Added a discussion of ongoing efforts into evaluation of pipe material condition. This information was included in development of the Pipe Age and Pipe Material type criteria.
- Risk of Failure – Changed Risk of Failure (ROF) computation to be a product of the Consequence of Failure (COF) and Likelihood of Failure (LOF) rather than a summation. This approach is consistent with the *2017 Water System Master Plan's* recommendations to assess risk in future Distribution Main Asset Management Plans.
- Pipe Damage Factor – Added a criterion to the Consequence of Failure (COF) category to account for a higher severity of damage caused by failure of certain pipe types.
- Crossings – Added a criterion to the Consequence of Failure (COF) category to account for risks associated with failures likely to impact nearby waterways, roadways, and rail lines.
- Valve Spacing – Added a criterion to the Consequence of Failure (COF) category to account for risks associated with failures occurring on reaches with widely spaced valves and the likely higher impact to the environment and greater number of customers.

Fiscal Impact:

The Plan projects a capital need of about $300 million over the next 20 years (2018 dollars). However, as reflected by language in the Plan, it does not represent a financial commitment by the

Board, other than those CIP funds already approved and adopted. The Plan does provide a prioritization of distribution main replacements for future planning and is designed to be perpetual, as it will evolve as ranking priorities change and new information becomes available. The Plan will be used as a planning tool during annual CIP budget discussions with the Board.

Strategic Plan Alignment:

Water Supply – 1.B. Provide for the future needs of the District through prudent planning that will ensure sufficient capacity to serve all customers: Replacing old water mains that have outlived their useful life with new, larger water mains will help improve water system reliability, ensure distribution of adequate supply, provide sufficient pressure, and improve fire flows.

Facilities and Operations – 2.A. The District will utilize appropriate planning tools, identify financial resources necessary, and prioritize system requirements to protect and maintain District assets and attain water resource objectives: The updated Plan meets this goal because it is a planning tool that will guide where District funds would be allocated for replacement of water mains.

The updated Plan benefits District customers as it is a tool utilized to help determine where District funds should be spent on the replacement of old water mains that have outlived their useful life.

Attachment:

Exhibit 1 – Distribution Main Asset Management Plan

DISTRIBUTION MAIN ASSET MANAGEMENT PLAN

SACRAMENTO SUBURBAN WATER DISTRICT

CLEARLY REFRESHING SERVICE!

Sacramento Suburban Water District
3701 Marconi Avenue, Suite 100, Sacramento, California 95821
(916) 972-7171
sswd.org

DISTRIBUTION MAIN ASSET MANAGEMENT PLAN

Adopted by the Board of Directors: November 2005
Updated: _____2018

Approved By:

General Manager: _____
Dan York

Reviewed By:

Assistant General Manager: Mike Huot, P.E.

Prepared By:

Engineering Manager: Dana Dean, P.E.
Assistant Engineer: Mitchell McCarthy, E.I.T.
Engineering Intern: Tommy Moulton

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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

1.1 Purpose

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 (District) staff and the Board of Directors (Board) to prioritize distribution main replacement areas. 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 only 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 and management practices, and District needs.
- Prioritize distribution main replacement based on objective criteria according to greatest need.
- Coordinate with the District's long-term CIP.
- Coordinate with the District's Meter Retrofit Program to ensure compliance with the State's requirement to have all services metered by January 1, 2025.
- Provide a direction for future Plan revisions.

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

1.2 Scope

For the purpose of this Plan, a distribution main is 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 Business Park (Park). This Plan does not include Transmission Mains.

Section 2

BACKGROUND

2.1 Overview of Need for Distribution Main Replacement

The District has a responsibility to provide its customers with a reliable distribution system. The Plan sets forth a strategy to replace aging, deteriorating, and undersized distribution mains throughout the District 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 the District are older portions of the distribution system that date back prior to the 1920's. The District 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 deteriorated distribution mains. The District 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 the District'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 the District) resulting in service outages and heavy impact on Operations and Maintenance efforts. In summary, ODS has become unreliable and ranks highest in priority for replacement.

A significant portion of aging distribution mains are located in back-lot and side-lot 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 the District.

Today's standard for distribution main construction is to install the main in the public right-of-way fronting the customer's property. Access for service and repairs is significantly more convenient for the customer and more efficient for the District's Operations and Maintenance staff. However, 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 streams, and more stringent restoration of existing right-of-way improvements (e.g., pavement, and Americans with Disability Act requirements).

2.2 Distribution System Status Summary

There is about 627 miles of distribution main (sizes 4- to 14-inches in diameter) in the District, of which approximately 100 miles have been replaced within the last 25 years. Two key elements will direct the path of distribution main replacement for the next 10 to 20 years. First is the replacement of older pipe with waning integrity. These material types are comprised of ODS, Asbestos Cement (AC), and Mortar Lined Steel (MLS). Second is the replacement of distribution mains from backyards to public rights-of-way.

There are approximately 160 miles of backyard distribution main remaining in the District. For the remainder of the ODS pipe, there is about 13 miles left in service of which 5 miles 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 the District.

2.3 Plan History

The Board of Directors 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 in the future 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 system.

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 a distribution main is 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 the District'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, however, actual projects and the sequencing of those projects may depend on project size, available budget, and other factors (e.g., State metering mandate).

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 mains. A new District water service line will be installed in the public right of way from the new distribution main to either the existing or new meter. The District will coordinate with

customers as to suitable locations for new water meters. This coordination with customers encompasses the District's Value to "Respect customers while conducting District business through open and transparent governance and communication" (Sacramento Suburban Water District, 2017).

A significant factor affecting project approach is scheduling and sequencing with the County of Sacramento's Paving Program. Their Ordinance includes a moratorium on cuts in pavement within 3 years of being repaved and a significant fee levied for work in roads 4 to 5 years after paving. A project's priority may be adjusted accordingly.

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.

The District initiated a Distribution Main Replacement Program in 2004, which through 2017 has replaced nearly 100 miles of distribution main with a focus on Outside Diameter Steel (ODS) pipe backyard mains. The District continues to use Ductile Iron (DI) pipe for new distribution mains. The District 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 Replacement completed from 1993 through 2017 is summarized in Table 1 and Chart 1.

Table 1. Completed Distribution Main Replacement – (1993 – 2017)

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
Total	**104.2**	**-**	**8,177**

*Arcade Water District (AWD)

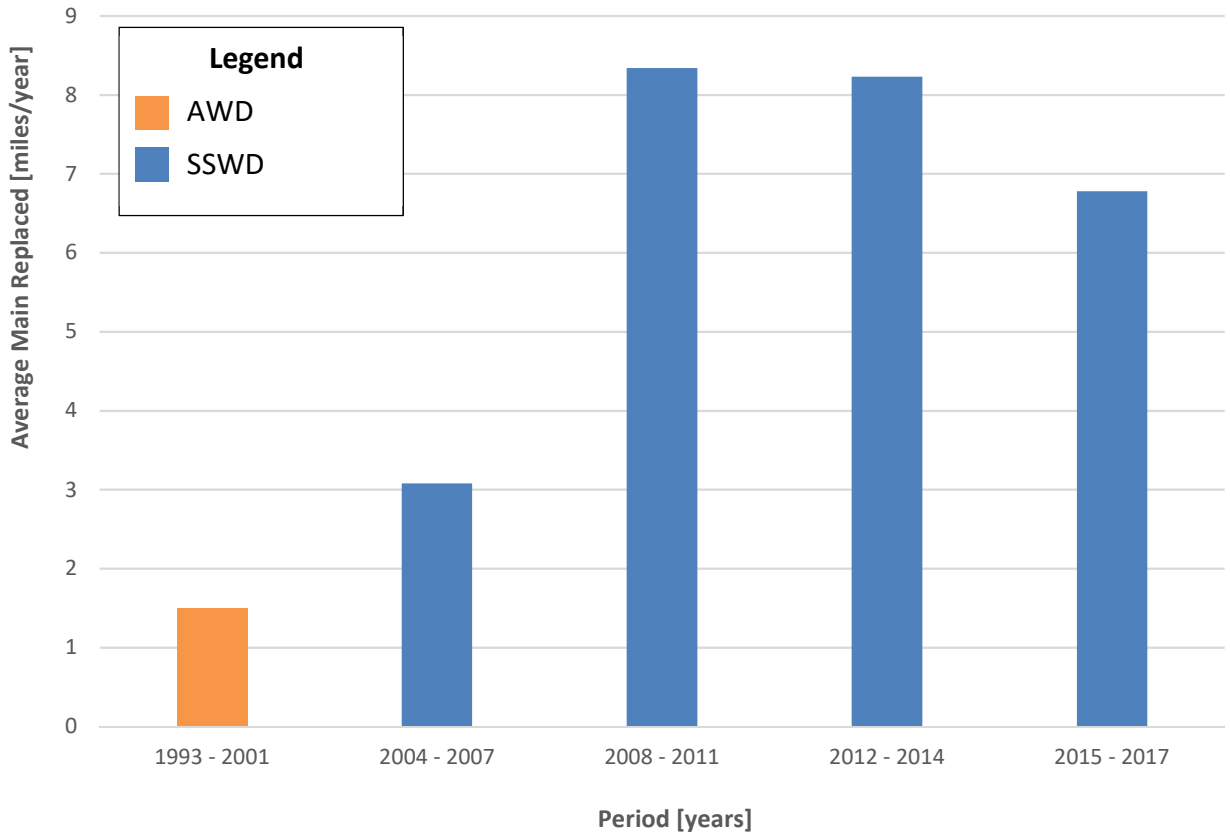


Chart 1. Average Main Replaced per Period

2.6 Active Distribution Main Inventory

There are approximately 627 miles of active distribution mains in the District. A breakdown by material type, length, and percentage of pipeline material type in service in the District 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)	324.9	52
Ductile Iron (DI)	136.5	22
Polyvinyl Chloride (PVC)	86.6	14
Mortar Lined Steel (MLS)	48.9	8
Outside Diameter Steel (ODS)	12.6	2
Cast Iron (CI)	9.2	1
Unknown (UNK)	7.8	1
Concrete Cylinder (CC)/Concrete (CONC)	0.4	<1
Total	**626.8**	**100**

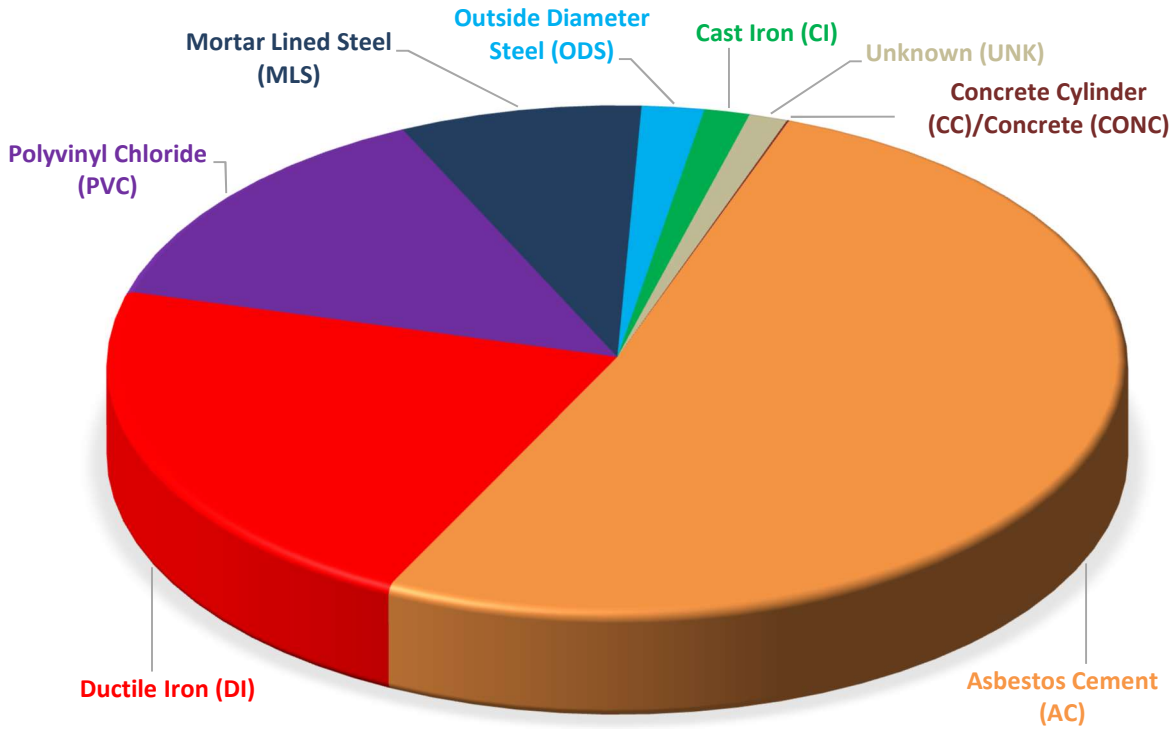


Chart 2. Quantity of Distribution Main by Material Type

Section 3

DISTRIBUTION MAIN REPLACEMENT STANDARDS

3.1 New Distribution Main Installation

For distribution main construction, the District installs Ductile Iron (DI) pipe based on a projected service life of modern DI pipe is at least 105 years (Ductile Iron Pipe Research Association, 2016). Other pipe material used in the distribution system can vary between 50 – 100 years, "depending on the pipe material, soil conditions, water quality, construction methods, and several other factors" (Brown and Caldwell, 2017).

Based on this information, to meet the District's plan to replace its distribution main system over 100-year intervals, approximately 7 miles of distribution main per year need to be replaced. Likewise, the District'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 2017 and 2018 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 $266 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 hydrants and wharf-type hydrants. Additional fire hydrants are installed to meet current spacing standards of local fire authority and District. Overall, this is expected to improve fire protection reliability and firefighting capability within the District. The projects will also provide for the installation of new control valves and sampling stations where required to meet current District Standards. Additionally, new in-tract service lines will extend from the outlet side of the meter to a point of connection with the customer. Included in the installation of the customer in-tract service will be a curb stop, water meter with meter setter, and a utility box.

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). District CIP budgeting has not permitted a pace of main replacement sufficient to achieve compliance by the Distribution Main Replacement Program alone. As a result, the District's Meter Retrofit Program (adopted by the Board in 2004) was implemented to ensure compliance and about 1,200 meters are being installed each year on mains 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 main is 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 main in a future main replacement project, thus requiring the existing backyard main to remain in service longer.

Section 4

EVALUATION METHODOLOGY

The number of Main Replacement Areas has changed since the original Plan due to the larger Main Replacement Areas being subdivided into Areas of a more manageable construction project size. In the 2014 Plan update, there were 191 Main Replacement Areas. Thenceforth, the District subdivided the 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.

Evaluation started by gathering pipe data contained in the District's Geographic Information System (GIS) database that pertained to the Main Replacement Areas. The data gathered was divided into four categories which also contained sub-criteria.

The Water Research Foundation states that "utilities should evaluate each risk to an asset and prioritize projects to lessen that risk" (Water Research Foundation, 2016). The two industry-standard categories are Consequence of Failure (COF) and Likelihood of Failure (LOF). When these categories are multiplied, the product is the Risk of Failure (ROF) for each of the Main Replacement Areas.

Consequence of Failure (COF)

COF was broken into five (5) sub-criteria: Pipe Damage, Pipe Diameter, Customer Type, Crossings, and Valve Spacing. It was considered that these sub-criteria would pose a significant liability to the District. These COF sub-criteria examine the "Triple Bottom Line" (Slaven, 2017) effects if a pipe asset failed. Slaven describes the Triple Bottom Line as:

- Economic – the additional capital and operating costs resulting from failure.
- Environmental – the additional cost of environmental degradation resulting from a failure.
- Social – the cost of community impacts resulting from a failure.

The sub criteria chosen within the COF category incorporate these industry standards in the Plan.

Likelihood of Failure (LOF)

The LOF category was broken into four sub criteria: Pipe Material, Pipe Age, Main Location, and Failure Rate. These four sub criteria were based on historical District and Industry data, and "performance standards" (Slaven, 2017) anticipating the chance a pipe would fail.

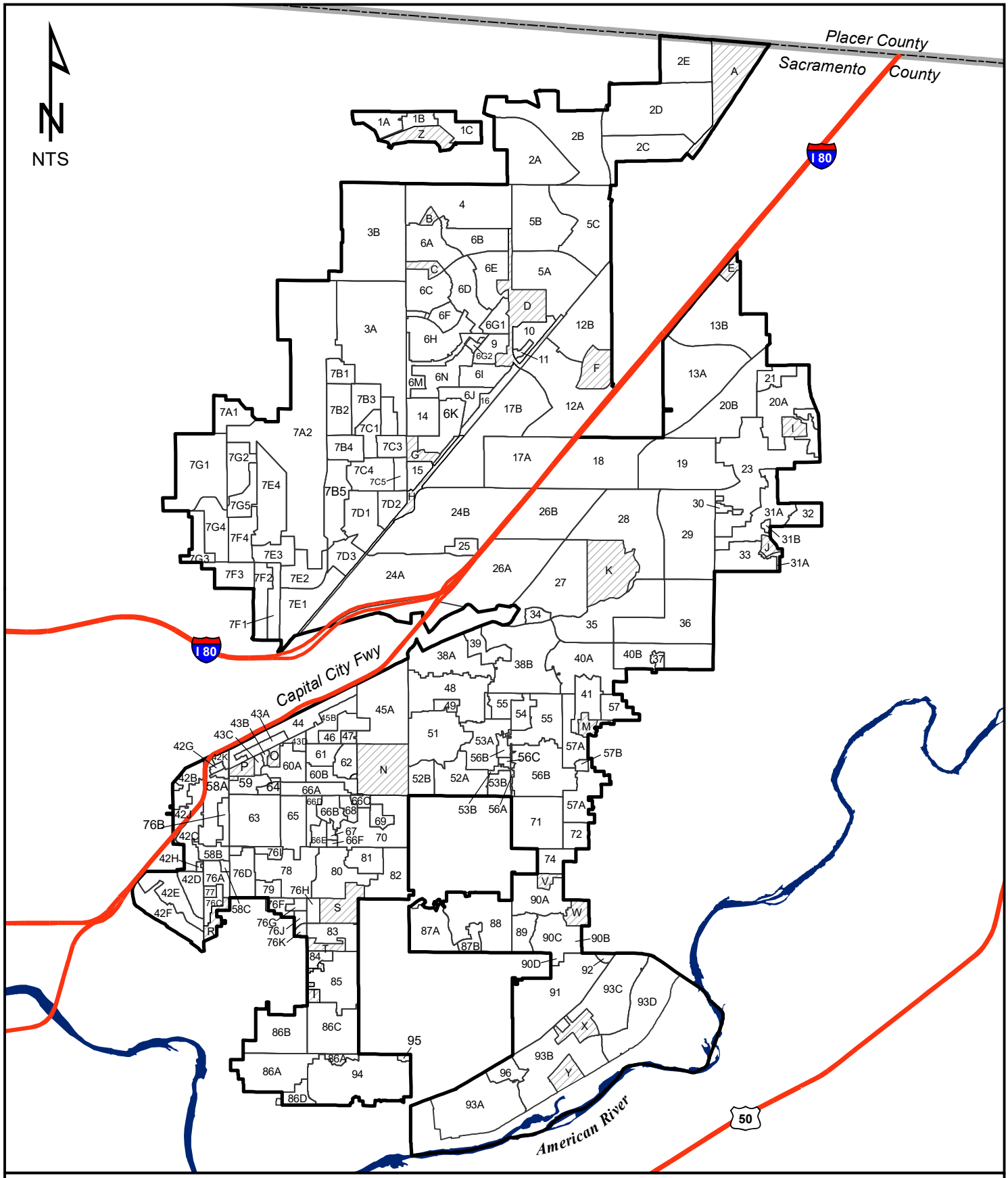
Risk of Failure (ROF)

The COF and LOF scores are multiplied to produce the ROF score, which calculates the Main Replacement Area's risk (Brown and Caldwell, 2017).

Modifier

Additionally, a category was included as a modifier to the ROF rank. The modifier is Safety Factors (previously called Hydraulic Factors), and includes hydrant coverage and the percent of wharf hydrants within a Main Replacement Area.

The evaluation methodology and purpose for each sub criteria within the COF and LOF are discussed in Section 4.2.1 and Section 4.2.2, respectively.


NTS
Placer County
Sacramento County
I 80
Capital City Fwy
American River
50
Legend
Distribution Main Areas
Single Service Large Parcels
SACRAMENTO SUBURBAN WATER DISTRICT
Distribution Main Asset Management Plan
_____ 2018
Figure 1
Distribution Main Areas

4.1 Material Condition Evaluation

The condition of the Pipe Material degrades with time from 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 Outside Diameter Steel (ODS), Asbestos Cement (AC), and Mortar Lined Steel (MLS) have proven to be the most problematic for the District. These materials have received additional investigations by District Staff and Consultants and are discussed in more detail below.

Consultant reports were used along with internally developed failure data (Chart 5. Active Distribution Main Leak History per Mile by Pipe Material & 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 Size. The condition assessments using the consultants' data correlates with the Failure Rate that was calculated in this Plan.

Pipe Material and Pipe Age sub-criteria were supported by the Material Condition Evaluation. The condition assessment produced from Failure Rate data as well as consultant reports, created the criteria scoring found in Table 8: Pipe Material Score (Page 4-17). Pipe Material Condition Evaluations help rank the Pipe Material by critical age and type. As appropriate, future evaluations should be done to support the Failure Rate data gathered by the District.

Outside Diameter Steel (ODS)

The District's 2014 Plan established a priority to replace all ODS pipe since it has been the least reliable material within the District. 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 will 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 evaluations from consultants 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 the District 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 the District's *Water System Master Plan* (Brown and Caldwell, 2017). The District's Failure Rate data (Chart 3. Active Distribution Main Leak History per Mile by Pipe Material & Size) confirms that the District'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 use today.

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 the District'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. The District's Engineering Department and Operations Department concluded that the MLS pipe removed for evaluation is in very good condition and likely has 20 plus years of service life remaining. Based on this evaluation, MLS is judged to have an upper bound service life of 80 years in the District.

4.2 Criteria Considered for Prioritizing Distribution Main Replacement Areas

Two categories generate the development of Risk of Failure (ROF) estimates for the Distribution Main Replacement Areas. An additional category was added as a "modifier" to the ROF. These categories are:

- Consequence of Failure (COF)
- Likelihood of Failure (LOF)
- Safety Factors (SF)

COF is one of the two factors used in the ROF analysis. COF assesses and aggregates factors in the Main Replacement Areas that will have financial and physical impact from a main failure.

LOF is the second factor used in the ROF analysis. LOF assesses and aggregates factors in the Main Replacement Areas that contribute to the probability of main failure.

The Category is a "modifier" to the ROF Score. Safety Factors (SF) (previously hydraulic factors) includes hydrant coverage and the percent of wharf hydrants within a Main Replacement Area. A Safety Score (SS) is calculated based on these values.

These two Categories and Modifier are composed of sub-criteria that capture the objectives within their respective Category. The entire process to determine the Total Score within a Main Replacement Area is shown in Chart 3.

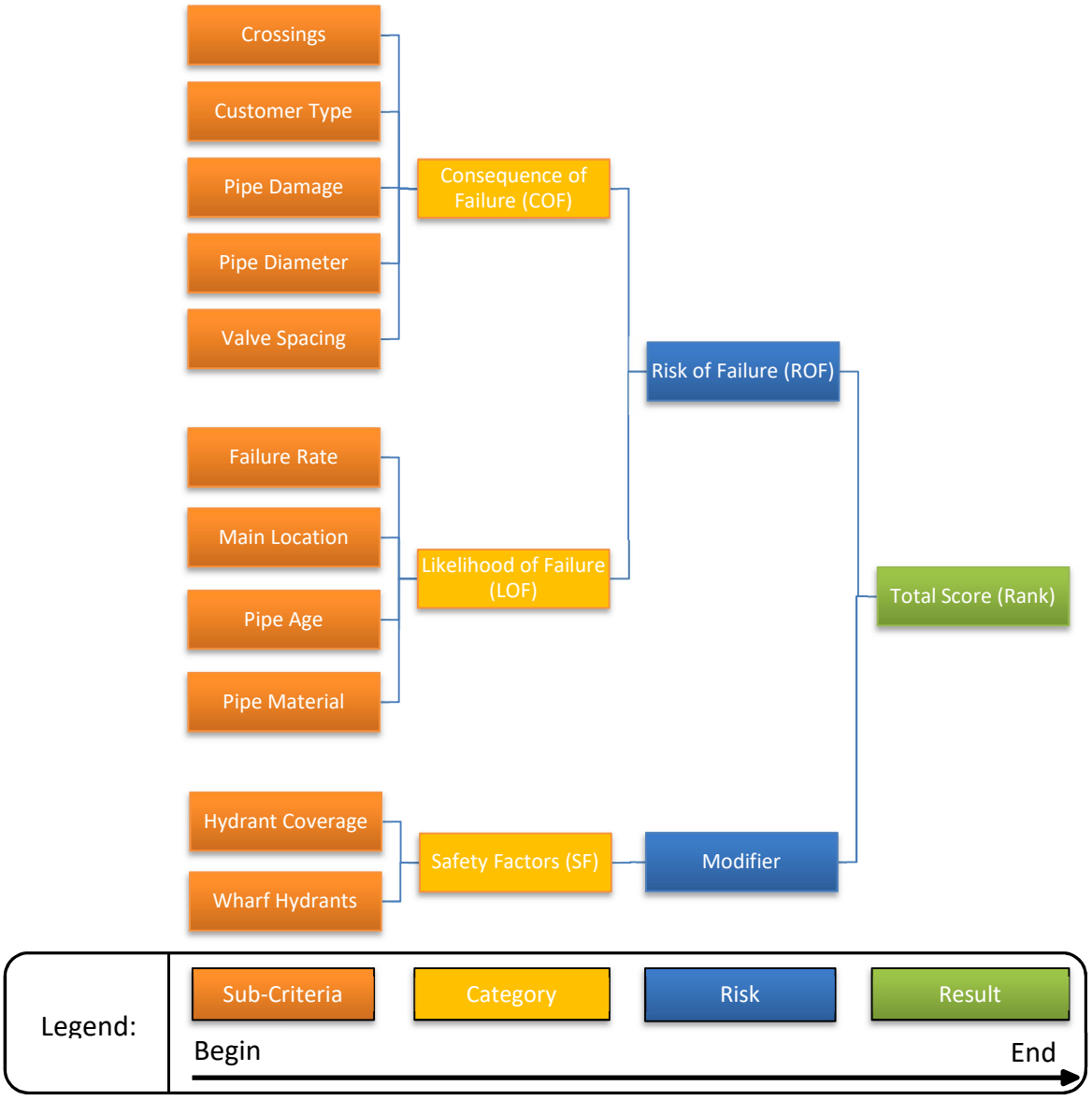


Chart 3. Ranking Flowchart

Each of the Main Replacement Areas were then ranked based on Total Score (see Equation 1). An Overall Rank of one (1) indicates the Main Replacement Area with the highest priority for replacement, while an Overall Rank of 197 indicates the lowest priority. Further description of the categories is given below.

Equation 1. Total Score by Main Replacement Area

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

4.2.1 Consequence of Failure (COF)

COF is one of the categories used in the ROF analysis. It evaluates data in the District's Main Replacement Areas that will have the highest financial and physical impact from a distribution main failure. COF consists of the following five sub-criteria:

- Pipe Damage
- Pipe Diameter
- Customer Type
- Crossings
- Valve Spacing

The COF score is normalized using Feature Scaling (Aksoy & Haralick, 2000). This sets the maximum value to one (1), which corresponds to the worst rating in each category. The COF is calculated using the following equation:

Equation 2. 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"

$Max(\sum COF\ Criteria\ Score)$ = Maximum COF score possible

An effective score is calculated for Pipe Damage and Pipe Diameter 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 statistic.

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

4.2.1.1 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 a District AC pipe is typically small and concentrated, and causes generally low to moderate levels of damage. Conversely, a leak on a District Mortar Line Steel (MLS) or Polyvinyl Chloride (PVC) pipe, is typically large and results in significant levels of damage.

Scoring

The Pipe Damage score is established primarily from input from the District's Operations Department personnel. Based on their experience and knowledge, leaks on MLS and PVC pipe cause significantly more damage than all other material types, and require immediate repair to prevent significant damage. Additionally, the maximum score was given to Unknown pipe material to be conservative in the protection of customers and public property. 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 ($PDaS_{ix}$) can be seen in Table 3 and is calculated using Equation 3. Results are shown in Appendix C.

Table 3. Pipe Damage Score

Pipe Material	Pipe Damage Score ($PDaS_{ix}$)
MLS, PVC, UNK	5
AC, CC, CI, CONC, DI, ODS	1

Equation 3. 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"

4.2.1.2 Pipe Diameter

Purpose

The Pipe Diameter criterion is used to classify Main Replacement Areas containing larger diameter distribution mains. Large distribution mains have the ability to cause substantially greater damage by way of having the ability to flow more water.

Scoring

The Pipe Diameter Scoring is established by assigning the smallest pipe size (4-inch) a score of one (1) and then adding one (1) point for every two-inch increase in pipe diameter. Thereafter, each Main Replacement Area's Pipe Diameter Score is calculated using Equation 4, by dividing the respective length of each distribution main size within the Distribution Main Replacement Area by the total length of distribution main within each main replacement area. Then it is multiplied by its respective $PiDS_{ix}$ (Table 4). Results are shown in Appendix D.

Table 4. Pipe Diameter Score

Pipe Diameter [in.]	Pipe Diameter Score Within Main Replacement Area ($PDiS_{ix}$)
10 ≤ 14	5
8 < 10	4
6 < 8	3
4 < 6	2
< 4	1

Equation 4. 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"

4.2.1.3 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 the District.

Scoring

The Customer Type score is established by taking the total number of Commercial Accounts and dividing it by the Total Accounts for each Main Replacement Area (Equation 5), then a score is given using Table 5. Results are shown in Appendix E.

Table 5. Customer Type Score

Commercial Accounts (PC_i) [%]	Customer Type Score
40 ≤ 100	5
30 < 40	4
20 < 30	3
10 < 20	2
< 10	1

Equation 5. Percent Commercial Accounts per Main Replacement Area

$$PC_i = \frac{CA_i}{TA_i}$$

PC_i = Percent Commercial per Main Replacement Area "i"

CA_i = Commercial Accounts per Main Replacement Area "i"

TA_i = Total Accounts per Main Replacement Area "i"

4.2.1.4 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 are expected to result in a higher liability and cost to repair for the District. 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, etc.), and a break under a freeway or railroad would cause major transportation issues in the respective areas, which creates greater risk for the District.

Scoring

The Crossings scoring was determined by taking the sum of Infrastructure Crossings from Equation 6 through Equation 12. Staff estimated the cost of 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 6. Results are shown in Appendix F.

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 6 through Equation 12) used to obtain the Crossings Score.

Table 6. Crossings Score

Crossing Value (CV_i)	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

Creek Crossings:

Equation 6. Creek Crossings Score* by *Main Replacement Area "i"

$$CCS_i = 3 + CC_i$$

Freeway Crossings:

Equation 7. Freeway Crossings Score* by *Main Replacement Area "i"

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

Railroad Crossings:

Equation 8. Railroad Crossings Score* by *Main Replacement Area "i"

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

Sum of Crossings per Area:

Equation 9. Sum of Crossings Score* by *Main Replacement Area "i"

$$SC_i = CCS_i + FWCS_i + RRCS_i$$

Crossing Score Upper Limit:

Equation 10. Crossings Score Upper Limit

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

Crossing Range Interval:

Equation 11. Crossings Score Range Interval

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

Crossing Value:

Equation 12. Crossings Value by Main Replacement Area "i"

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

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"

4.2.1.5 Valve Spacing

Purpose

The Valve Spacing criterion is used to account for District Improvement Standard 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 since a distribution main break can be isolated quicker and with fewer customers impacted by the break and repair work.

Scoring

The Valve Spacing Score was calculated with the valve density ($V_{500'_i}$) by using Equation 13. A valve density of one (1) indicates the minimum density being met, while all areas below this requirement received a score of five (5). Scoring for replacement areas that did not meet the standard are shown in Table 7, results can be seen in Appendix G.

Table 7. Valve Spacing Score

$V_{500'_i}$	**Valve Spacing Score**
<1	5
≥1	1

Equation 13. 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_i = Valves per *Main Replacement Area "i"*

L_i = Distribution Main Length per *Main Replacement Area "i"*

4.2.2 Likelihood of Failure (LOF)

LOF is the second category used in the ROF analysis. It evaluates data on the District's Main Replacement Areas that have the highest probability of a distribution main failure. LOF consists of the following four sub-criteria:

- Pipe Material
- Pipe Age
- Main Location
- Failure Rate

The LOF score is normalized using Feature Scaling (Aksoy & Haralick, 2000). This sets the maximum value to one (1), which corresponds to the worst rating in each category. The LOF is calculated using the following equation:

Equation 14. Likelihood of Failure (LOF) by 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"

$\sum$LOF Criteria Score$_i$ = Sum of all the LOF Criteria Scores per Main Replacement Area "i"

Max($\sum$LOF Criteria Score) = Maximum LOF score possible

An effective score is calculated for Pipe Material and Pipe Age 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 statistic.

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

4.2.2.1 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 calculated an Effective Pipe Material based on the percentage of each Pipe Material in a Main Replacement Area then multiplied it by the corresponding Pipe Material score (refer to Chart 3 and Section 5.1 for scoring justification). Pipe Material score ranges were determined from calculating the leaks/mile for each Pipe Material (Appendix H). The criteria and equations are shown below in Table 8 and Equation 15, respectively. Figure 2A shows all the Pipe Material used in the District, while Figures 2B – 2G isolates AC, CI, DI, MLS, ODS, and PVC pipe, respectively.

Table 8. Pipe Material Score

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

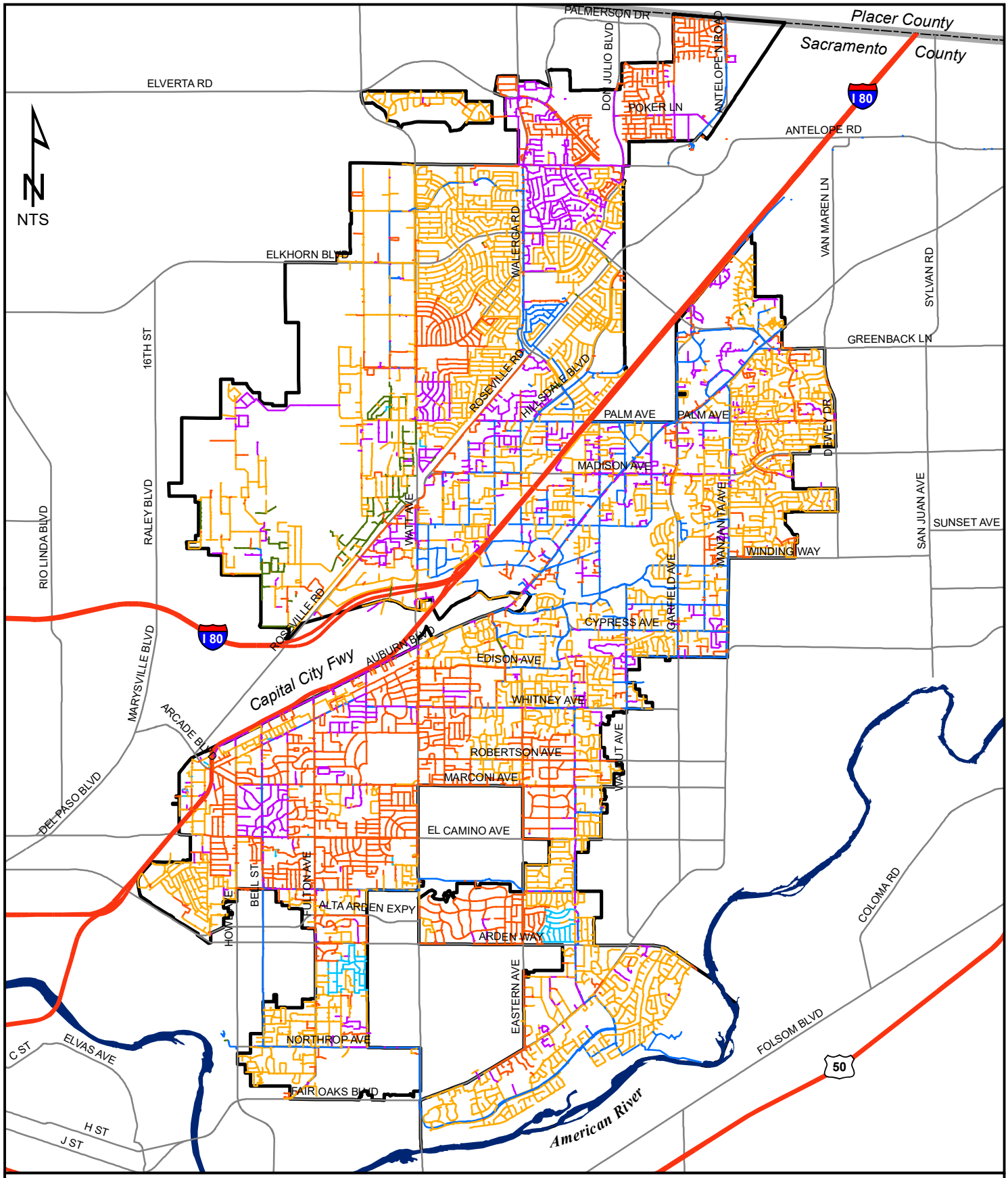
Equation 15. Effect Pipe Material Score by Main Replacement Area

$$\mathrm{EPM} = \sum (\%_{ACP} \times Score_{\mathrm{ACP}} + \%_{DI} \times Score_{DI} + \cdots + \%_{x} \times Score_{x})$$

EPM = Effective Pipe Material

$\%_x$ = Percentage of pipe material "x" within Main Replacement Area "i"

$Score_x$ = Corresponding Pipe Material Score (e.g. ACP = 4)



Legend

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

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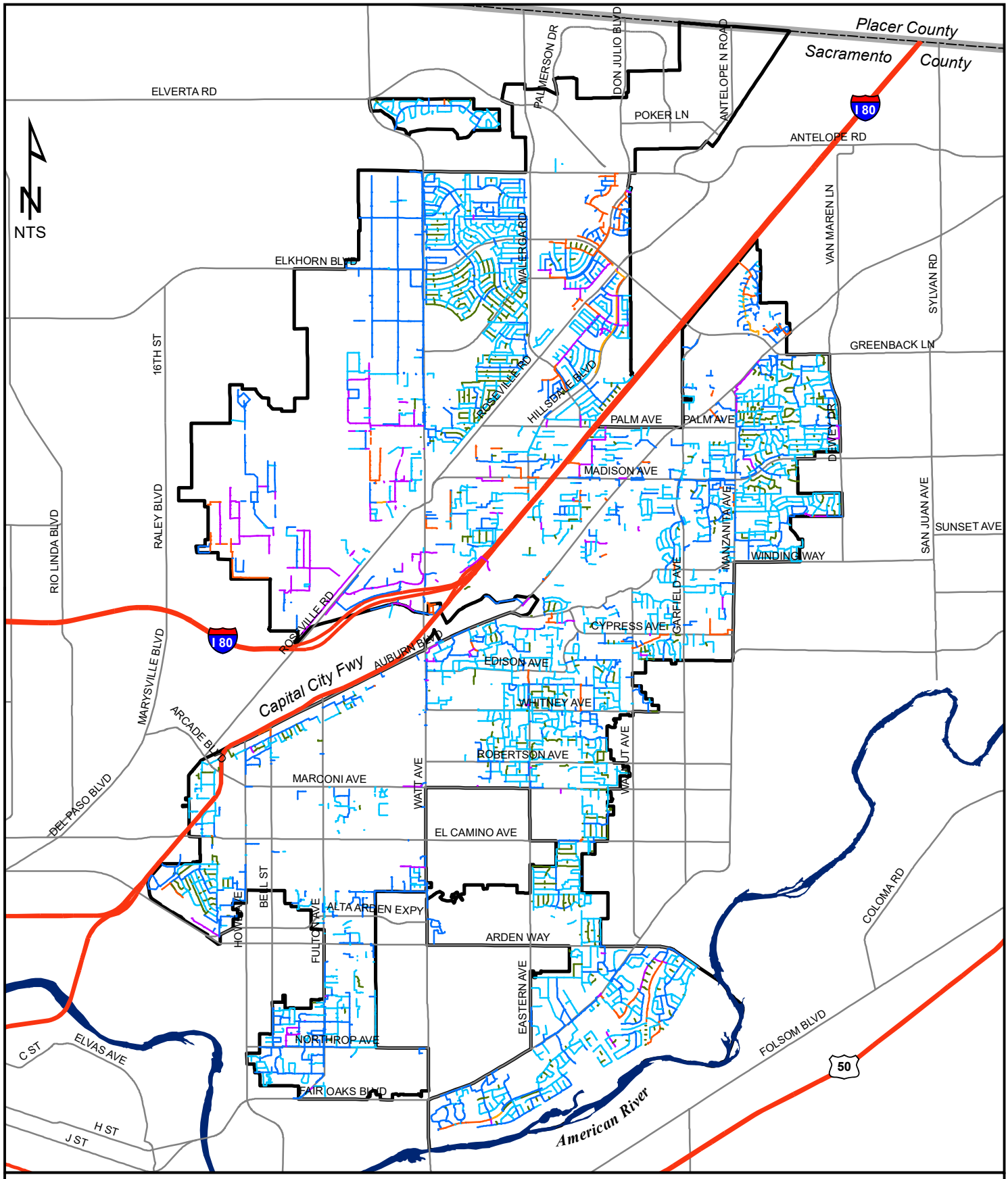
Figure 2A

Distribution Main by Material - All



Legend

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

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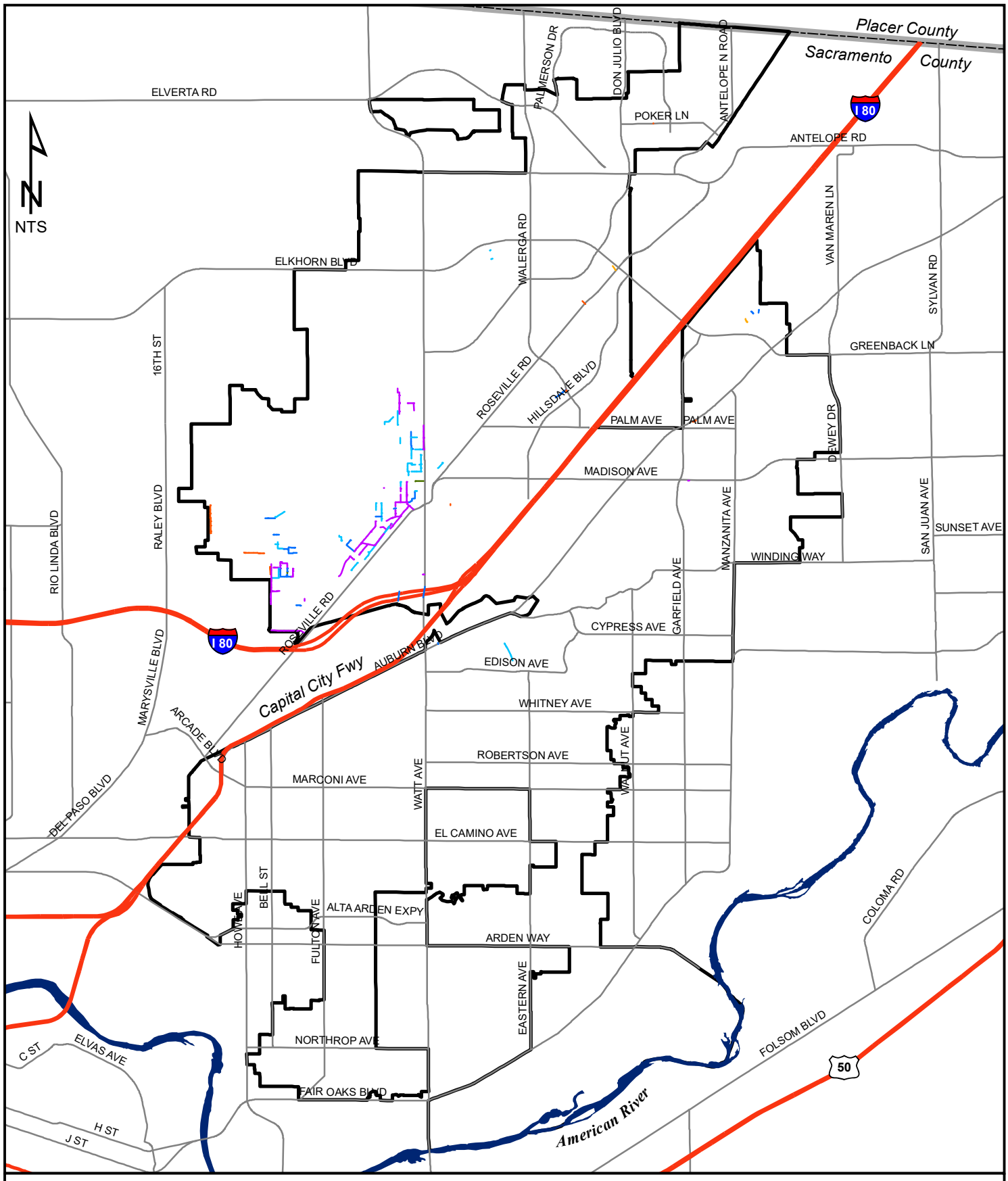
Figure 2B

Distribution Main by Material - AC



Legend

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

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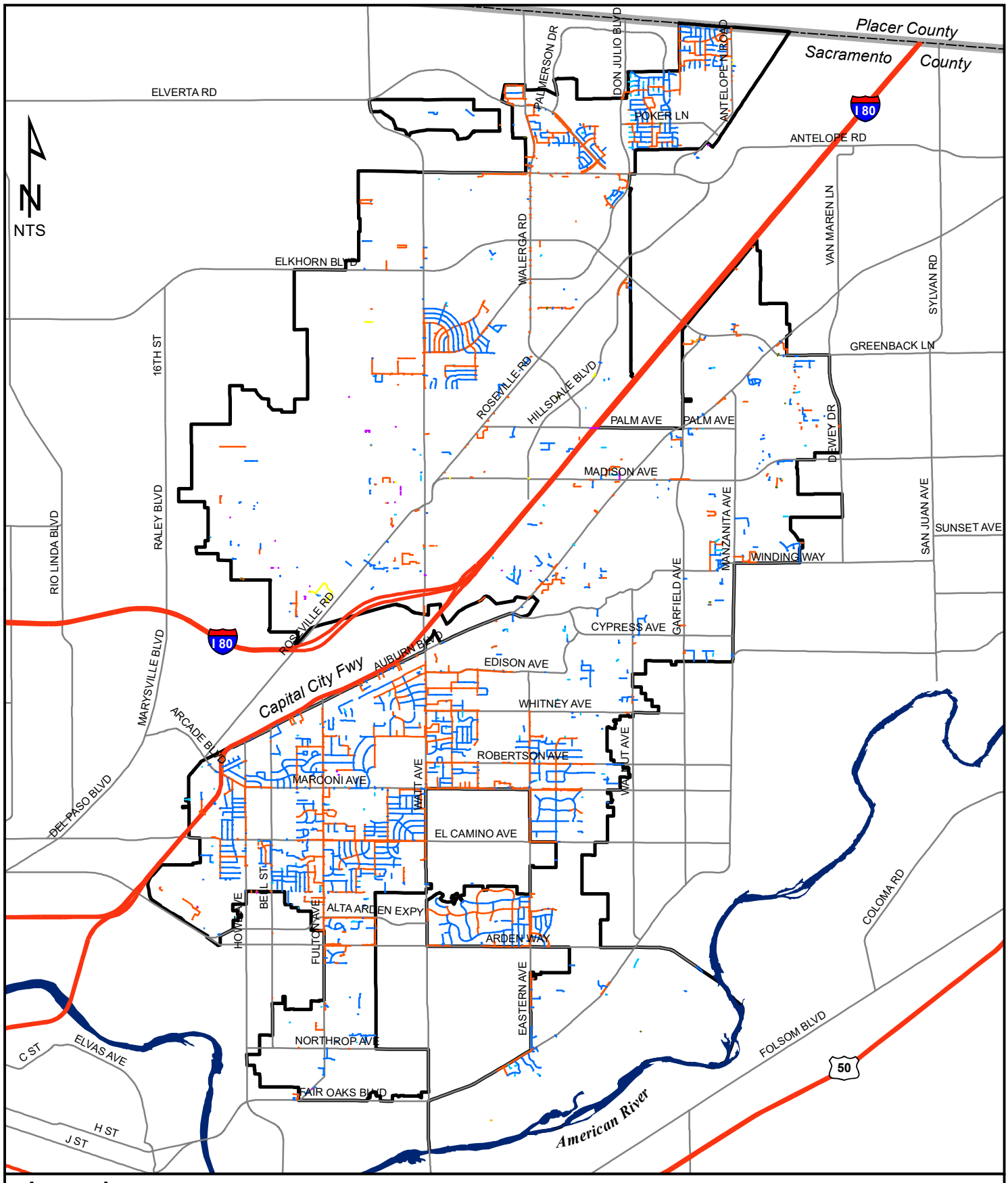
Figure 2C

Distribution Main by Material - CI



Legend

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

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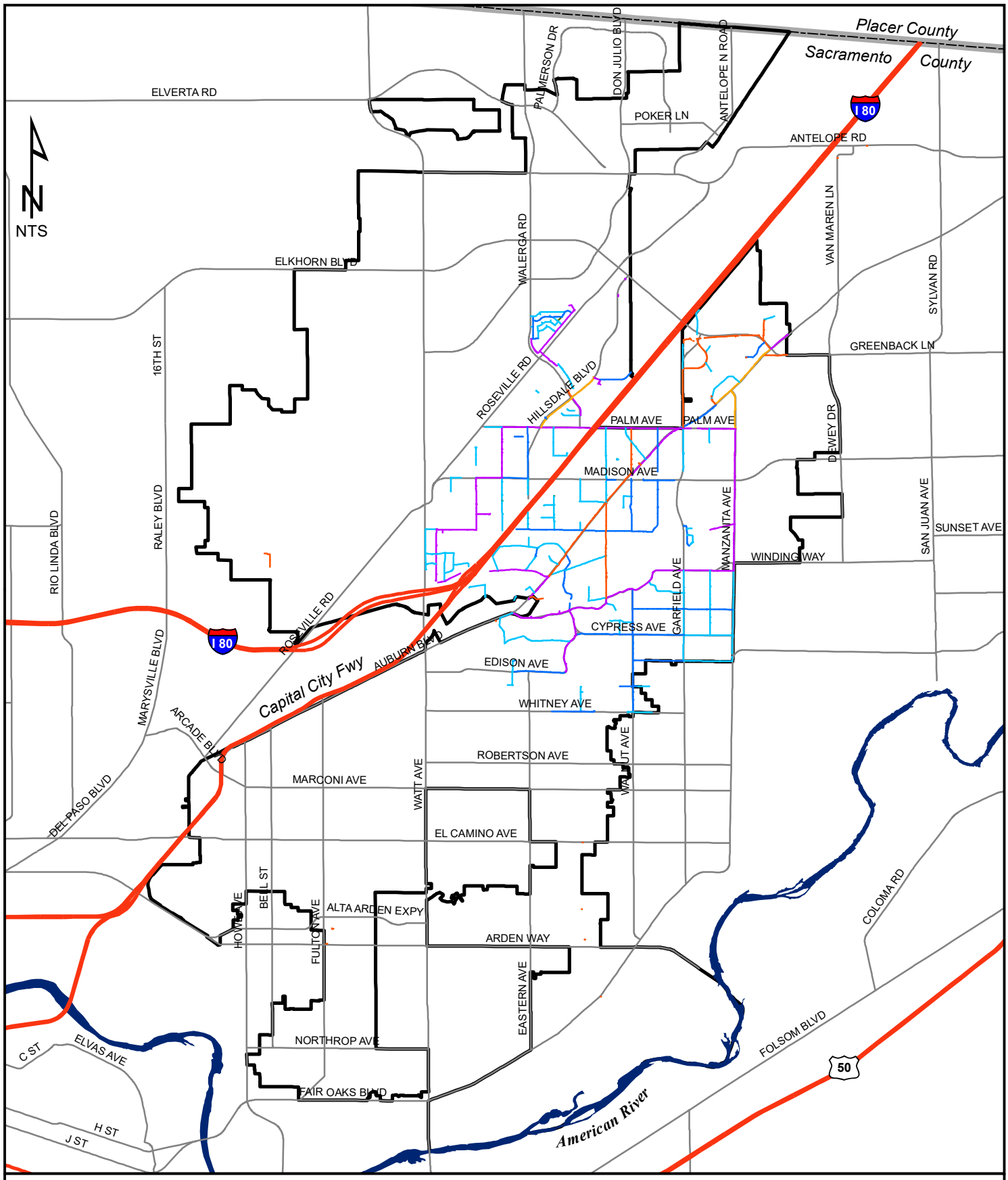
Figure 2D

Distribution Main by Material - DI



Legend

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

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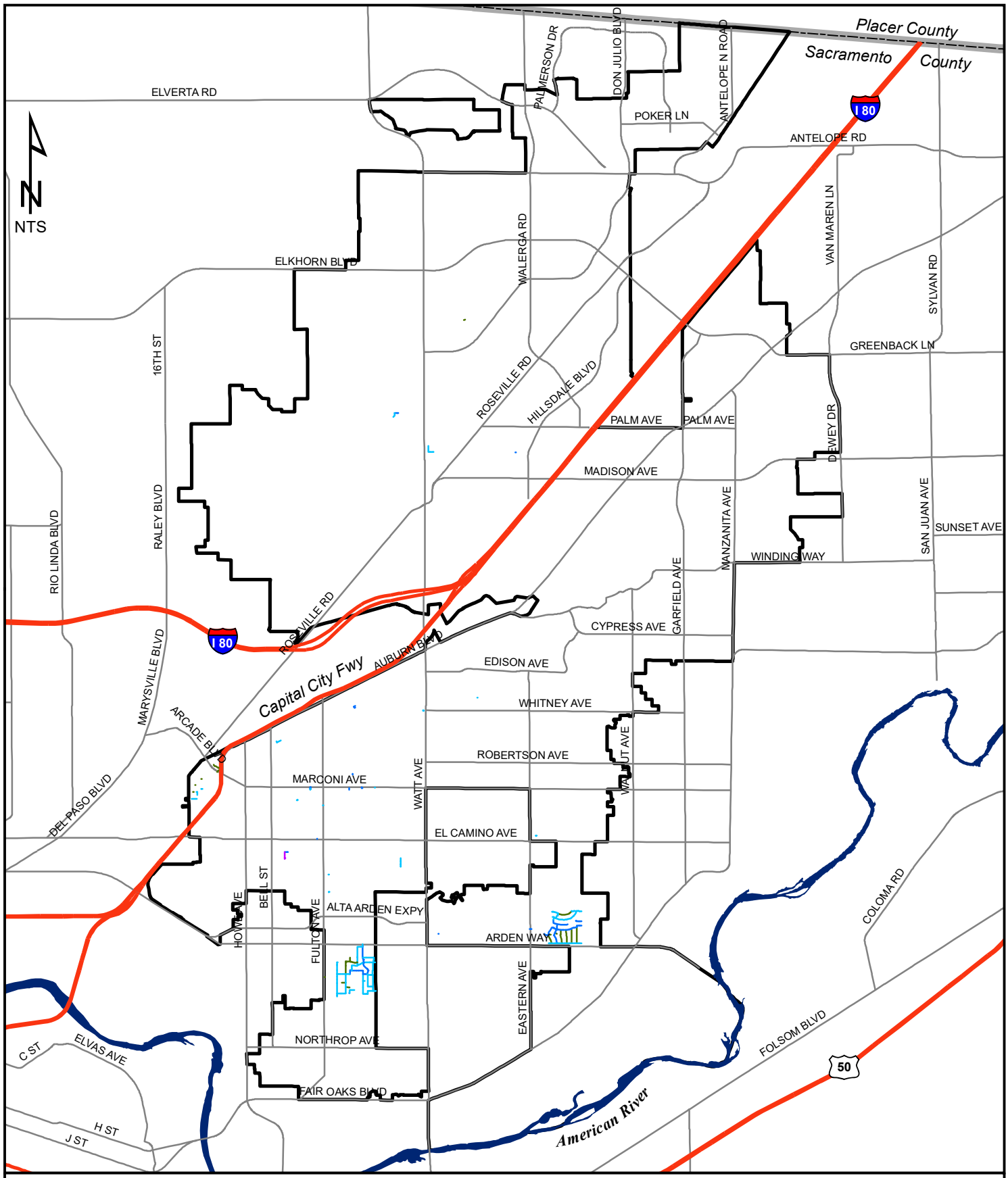
Figure 2E

Distribution Main by Material - MLS



Legend

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

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Distribution Main Asset Management Plan
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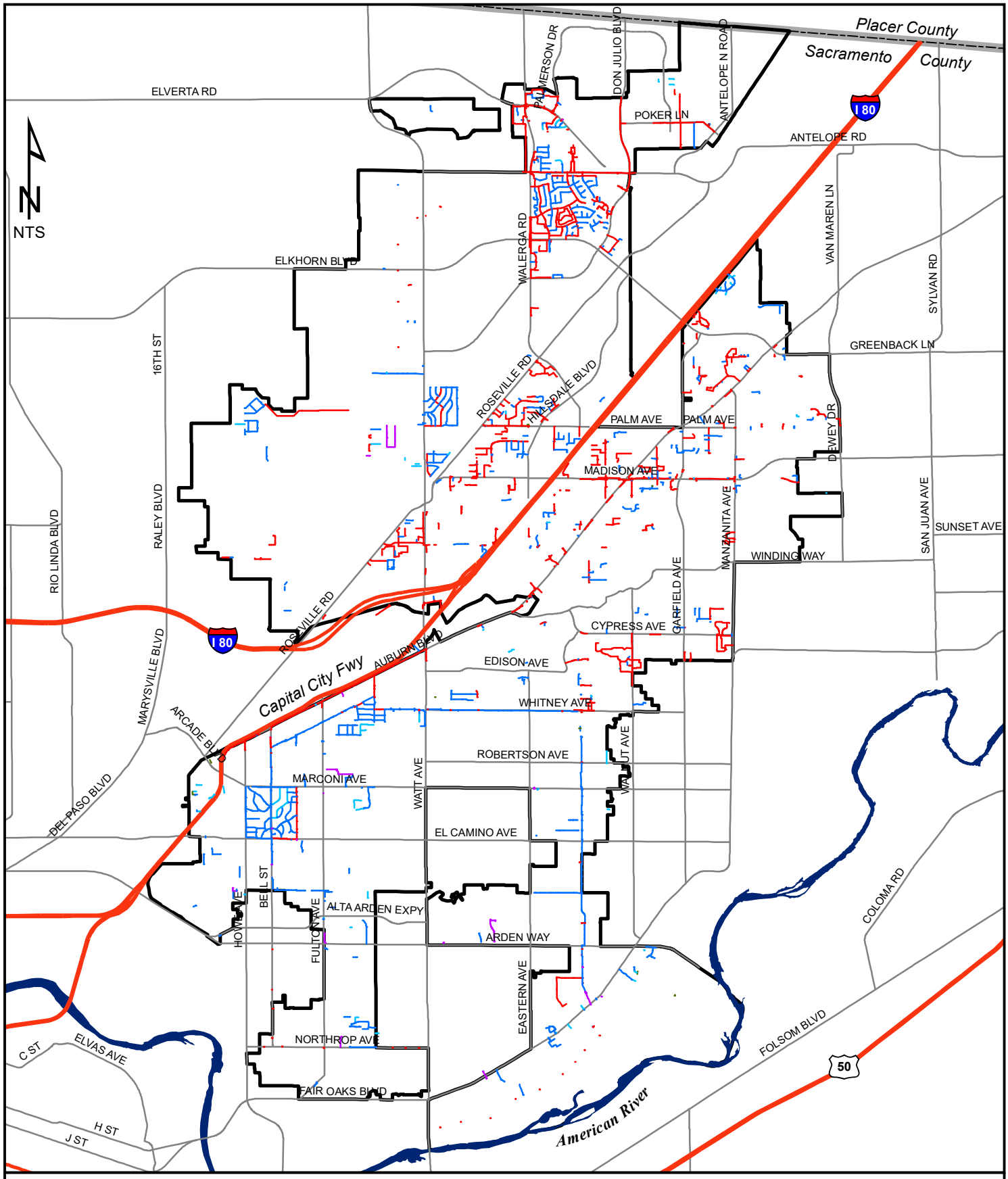
Figure 2F

Distribution Main by Material - ODS



Legend

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

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Distribution Main Asset Management Plan
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Figure 2G

Distribution Main by Material - PVC

4.2.2.2 Pipe Age

Purpose

The Pipe Age is indicative of potential failure since older pipe is generally more likely to experience a failure. As a pipe material ages, coating or protective materials degrade, causing pipes 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 (in years) for each pipe material and pipe diameter per Main Replacement Area. Average age was multiplied by the Pipe Material percentage within the distribution main area (Equation 16), which calculated the Weighted Age by Material for each area. The summation of the Weighted Age by Material gave us the effective Pipe Age for the Main Replacement Area, which was then scored using Table 9 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 the District's 2017 Water System Master Plan. Results are shown in Figure 3, and the detailed analysis can be seen in Appendix I.

Table 9. Pipe Age Score

Pipe Age [years]	Pipe Age Score
60 +	5
45 < 60	4
30 < 45	3
15 < 30	2
< 15	1

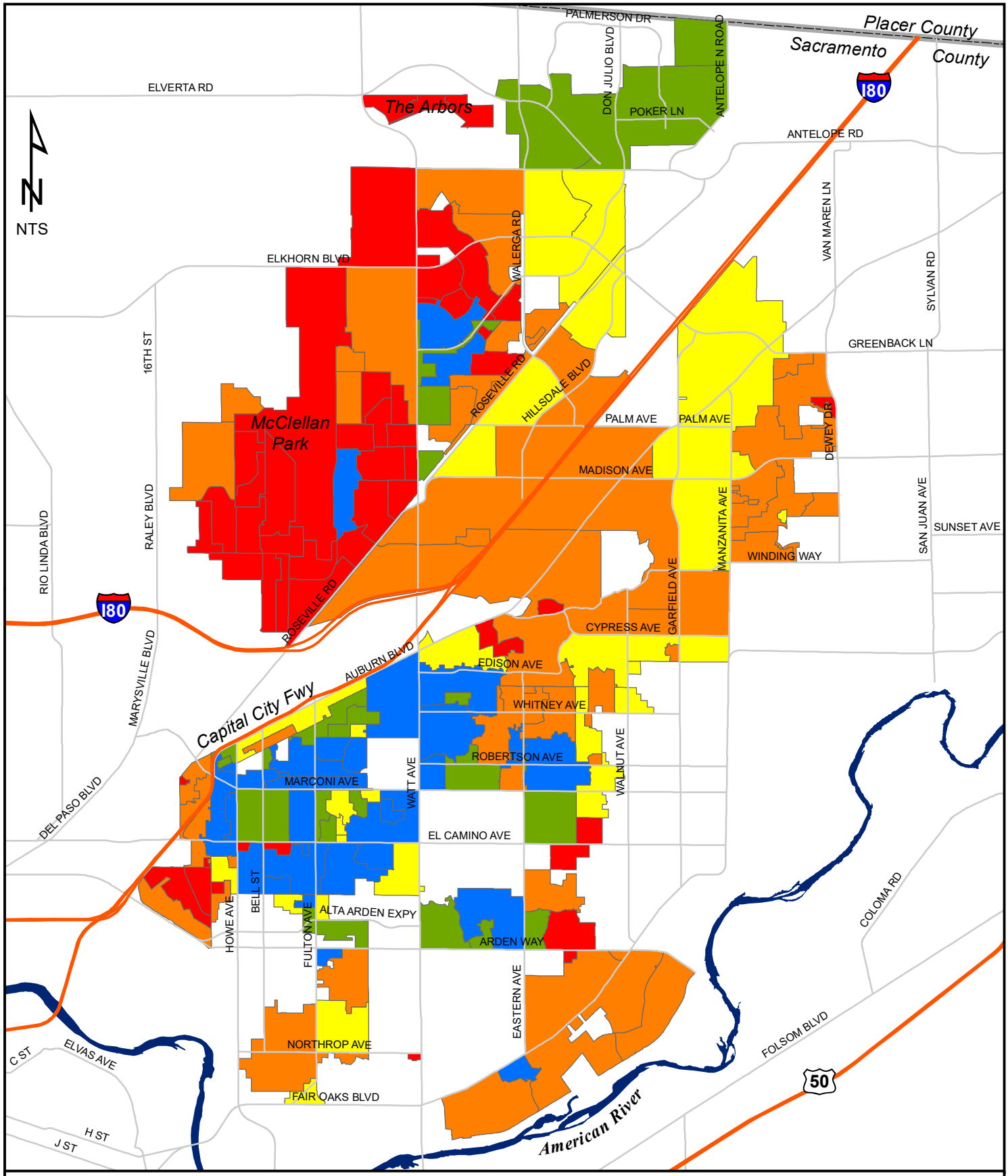
Equation 16. Effective Pipe Age by Main Replacement Area

$$EPA = \sum \left(\%_{Age_{0-15}} \times Score_{0-15} + \%_{15.01-30} \times Score_{15.01-30} + \cdots + \%_{x} \times Score_{y} \right)$$

EPA = Effective Pipe Age

$\%_{Agex}$ = Percentage of Pipe Age "x" within Main Replacement Area "i"

$Score_y$ = Corresponding Pipe Age Score (e.g. 60+ = 5)



Legend

- 60 +
- 45 < 60
- 30 < 45
- 15 < 30
- < 15

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Distribution Main Asset Management Plan
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Figure 3

Effective Age By Distribution Main Area

4.2.2.3 Main Location

Purpose

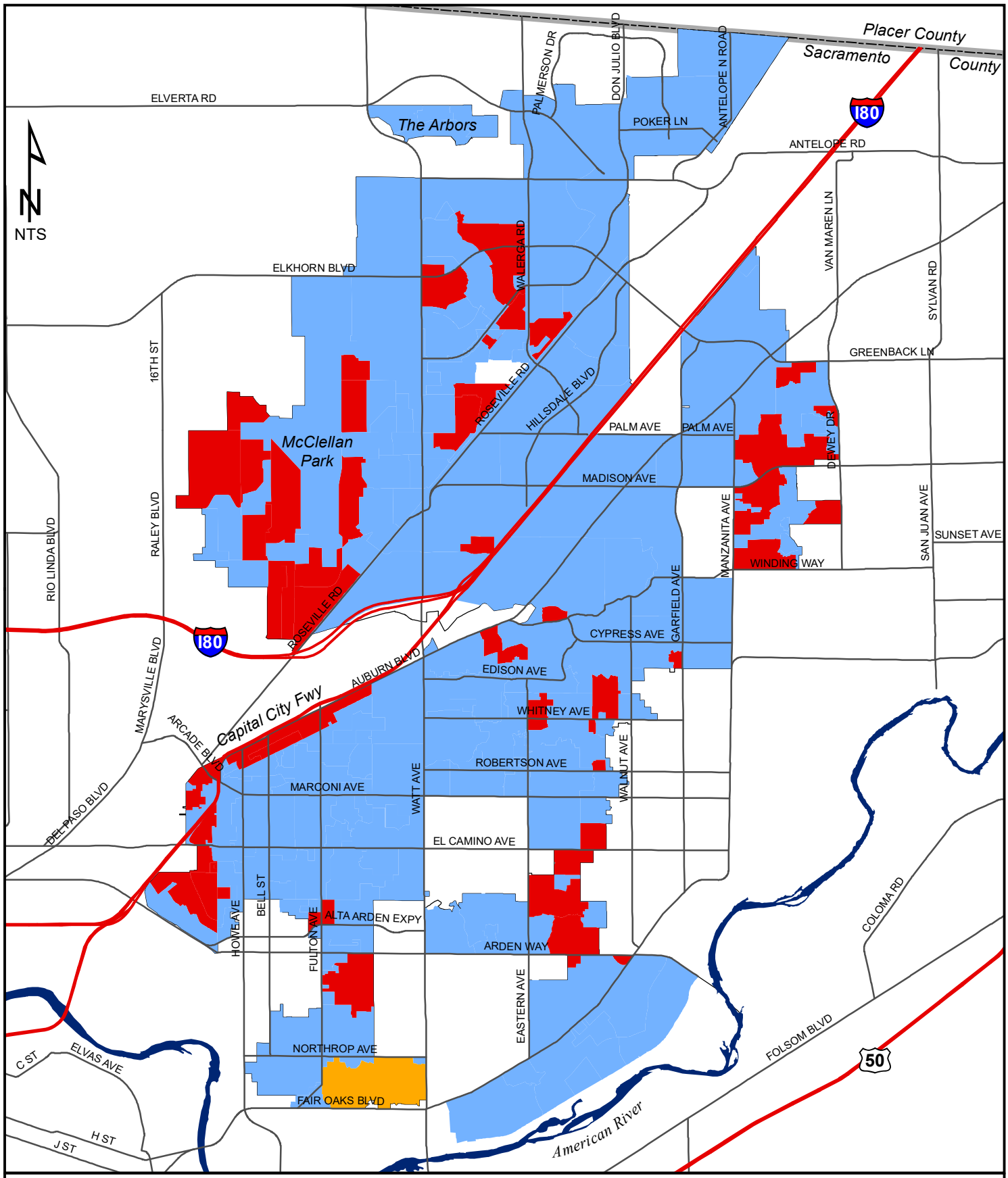
Main Location criterion was a critical factor in previous Distribution Main Asset Management Plans. Backyard mains are more prone to damage due to trees and various landscaping potentially growing directly on or around a distribution main. Backyard distribution mains also pose an access challenge for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

Scoring

Main Location scoring examined all distribution areas for front yard vs. backyard. If pipe was determined to be located in backyard, it received a score of two (2). If pipe was determined to be located in the front yard, it received a score of one (1). Results are shown in Table 10. Main locations are shown in Figure 4.

Table 10. Main Location Score

Main Location	Main Location Score
Backyard	2
Front Yard	1



Legend

- Backyard
- Front Yard
- No Service

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Figure 4

Front Yard and Backyard Distribution Main Areas

4.2.2.4 Failure Rate

Purpose

All leaks on active distribution mains within the District are shown in Figure 5. The leaks are categorized by pipe size and material type in Chart 4 (Active Distribution Main Leak History Totals by Pipe Material & Size). These numbers, however, do not account for the quantity of main within each Main Replacement Area. To make the Main Replacement Areas comparable, a normalized value for leaks per mile was used (Chart 5 Active Distribution Main Leak History - Leaks per Mile by Pipe Material & Size). This provides a uniform indicator of the pipe condition as Main Replacement Areas pipes with a large 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 17), and scored using Table 11. Results are shown in Appendix J.

Table 11. Failure Rate Score

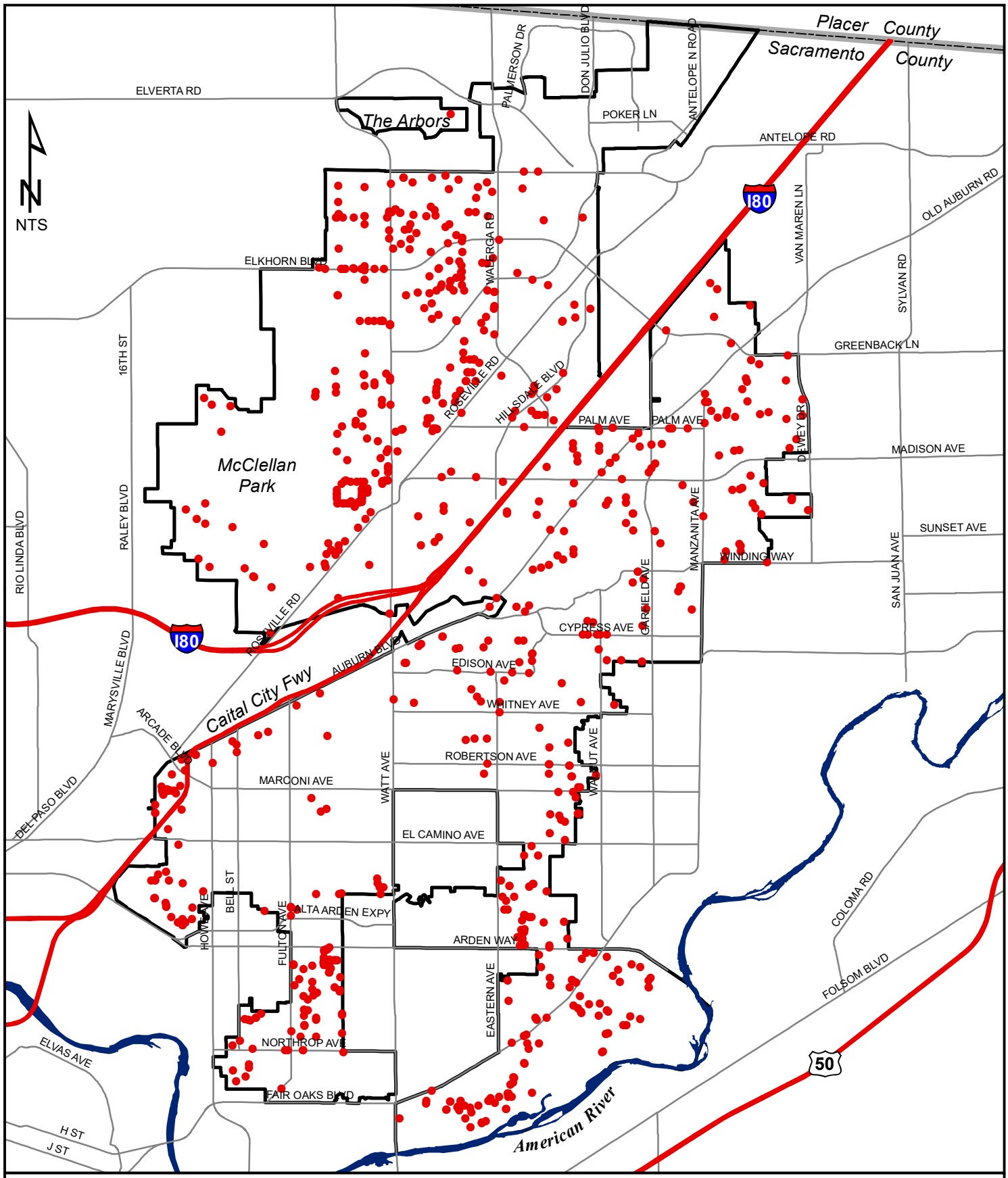
Failure Rate [leaks/mile]	Failure Rate Score
3 +	5
1 < 3	3
< 1	1

Equation 17: Leaks per Mile by Main Replacement Area

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

$Leaks_i$ = Total Leaks within the replacement area

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



Legend

- Leaks

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Distribution Main Asset Management Plan
_____ 2018

Figure 5

Active Distribution Main Leak History

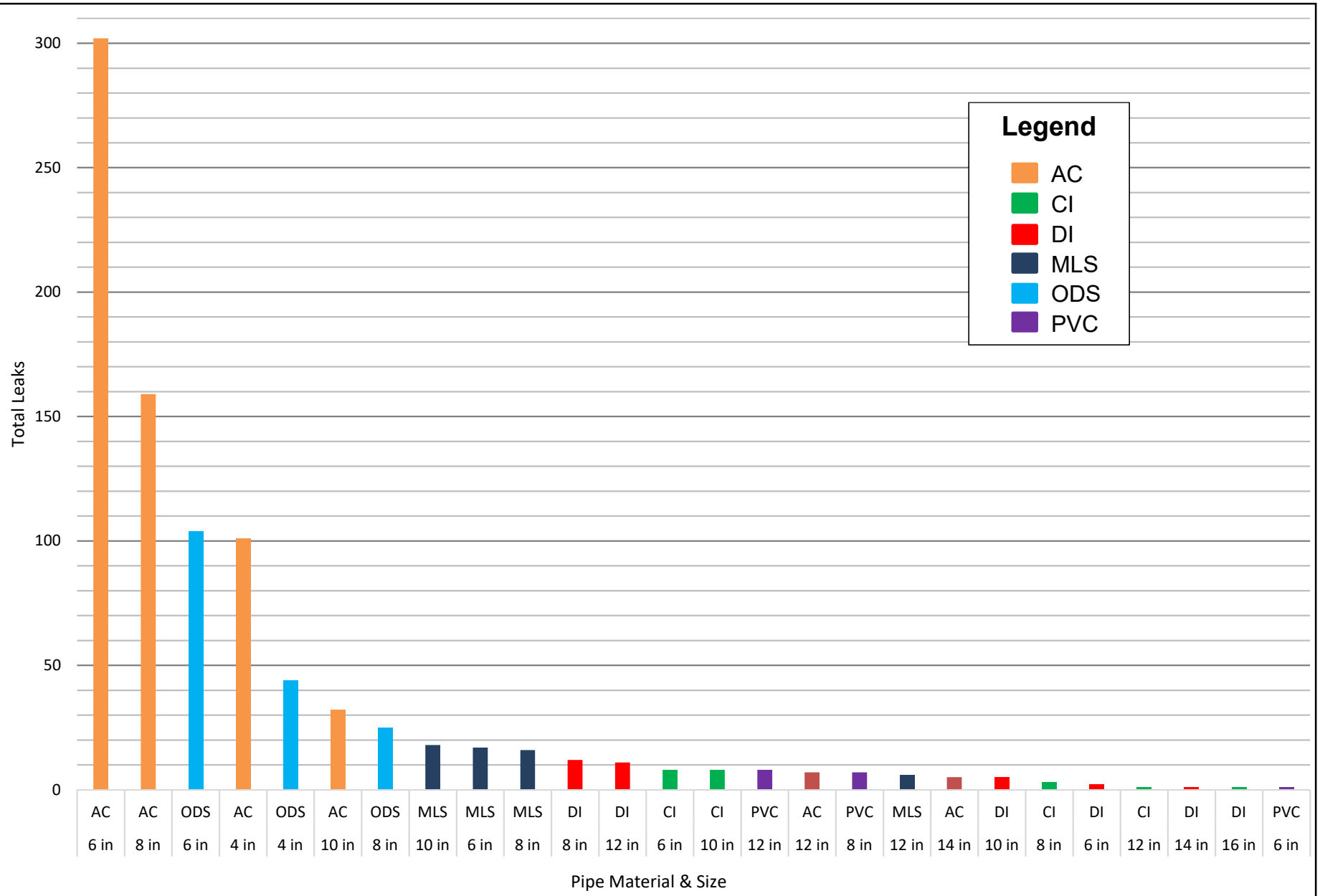

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Chart 4
Active Distribution Main
Leak History Totals by Pipe Material & Size

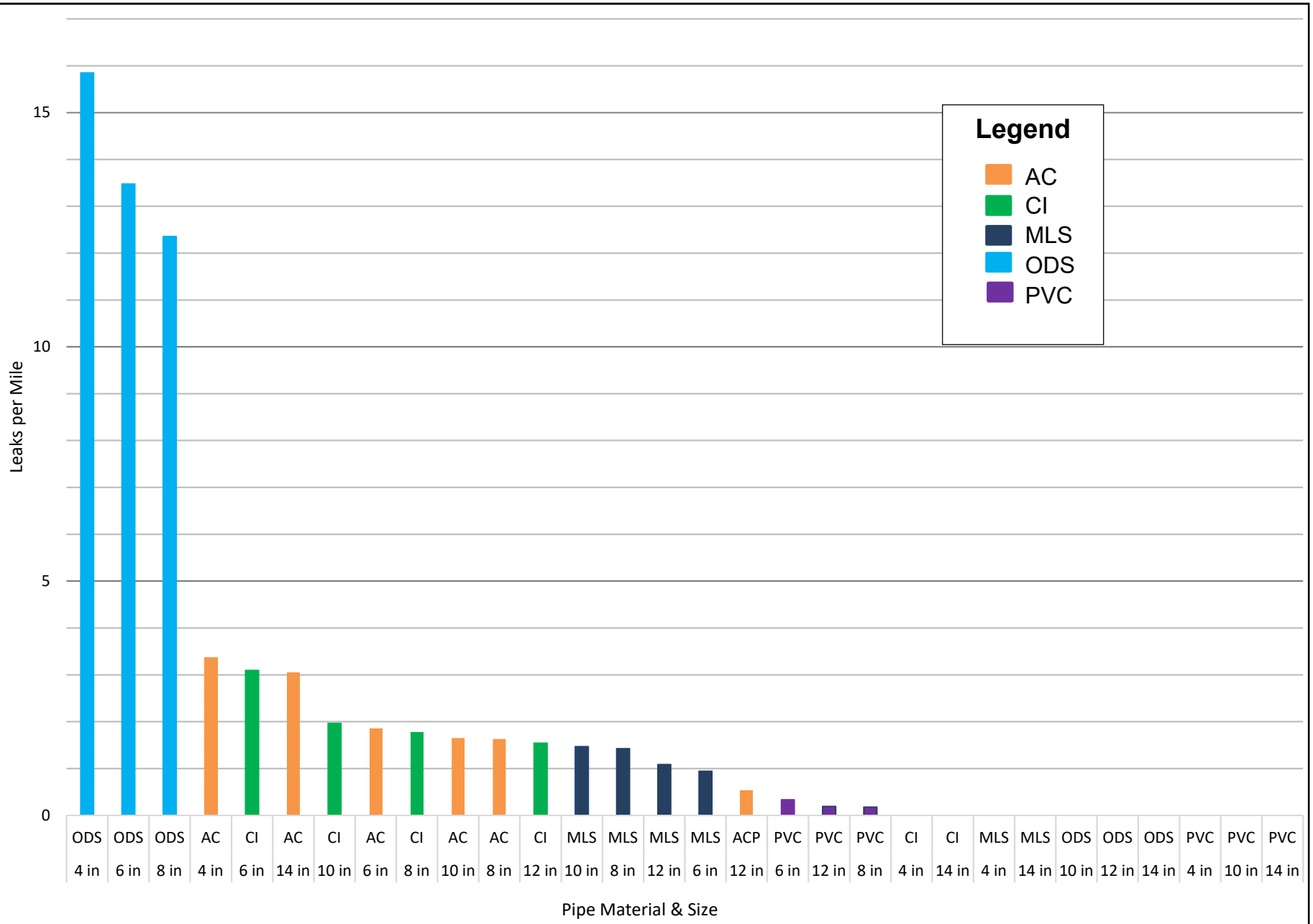

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Chart 5
Active Distribution Main Leak History
Leaks per Mile by Pipe Material & Size

4.2.3 Risk of Failure (ROF)

The ROF equation (Equation 18), calculates the Main Replacement Area's risk by multiplying the LOF by the COF (Brown and Caldwell, 2017).

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"

4.2.4 Safety Factors (SF)

Fire protection is an essential part of the District's distribution system, and cannot be accounted for solely using main pipe size and material type. Therefore, the Safety Score acts as a modifier to the ROF. The denominator, 15, is the total points available for the Safety Score. The Safety Factor score is determined using Equation 19, and then multiplied by the ROF score (Equation 20).

Equation 19. Safety Score per Main Replacement Area

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

Equation 20. Modified Safety Score

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

4.2.4.1 Hydrant Coverage

Purpose

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

Scoring

The Hydrant Coverage scoring analyzed the area not included inside the radius of hydrant coverage within each Main Replacement Area. This area was then divided by the total area of the Main Replacement Area. Hydrant Coverage Deficiencies, shown in Table 12, scored the Main Replacement Areas that did not have adequate coverage. Next, a weighted rank was created using a multiplying factor of two (2) due to the importance placed on fire hydrant coverage. Results can be seen in Appendix K.

Note: As a result of McClellan Business 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 Business Park were analyzed manually in GIS to evaluate the level of hydrant coverage within the developed portions.

Table 12. Hydrant Coverage Score by Distribution Main Area

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

4.2.4.2 Wharf Hydrants

A wharf hydrant is a type that is connected directly to a distribution main. A wharf hydrant assembly is composed of a single hydrant outlet that is secured to a 4-inch diameter pipe which is then tapped to the top of the 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.

Purpose

A wharf hydrant typically has only a single or double 2-½" outlet. Therefore, their ability to deliver fire flows are inferior to modern types of fire hydrants (steamer type) used today.

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 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 fire flow capability since wharf hydrant is still useful for fighting fires and is better than no hydrant at all (the latter is addressed by Hydrant Spacing). Results can be seen in Appendix L.

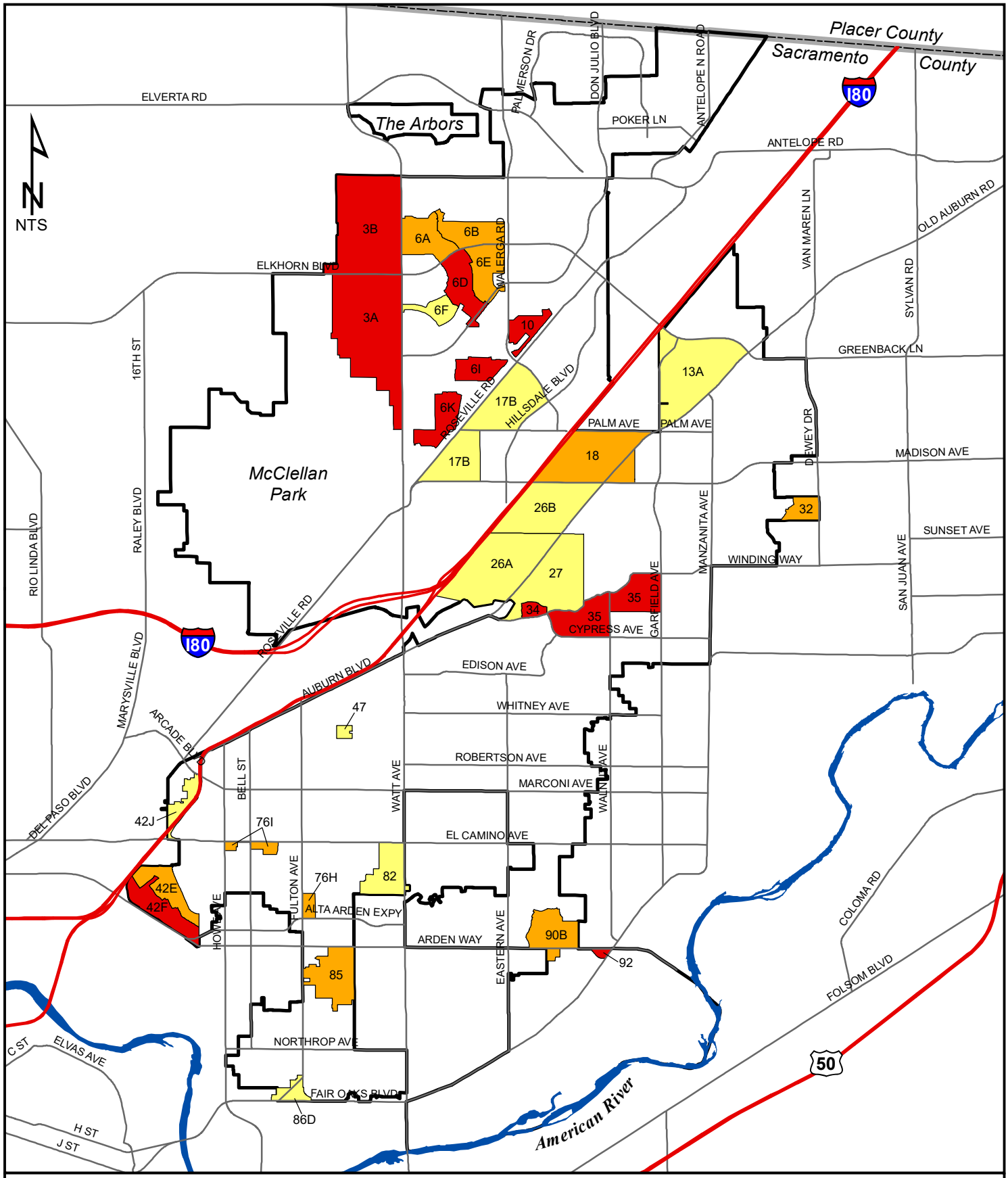
Table 13. Wharf Hydrant Score by Distribution Main Area

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

4.3 Distribution Main Areas Priority

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

Figures 6A and 6B represent the ROF results that was produced from District analysis on each Main Replacement Area. Due to the complexity and additional costs involved with McClellan Business Park, the top ranked Main Replacement Areas were separated in to two figures.



Legend

- ROF Rank 1-10
- ROF Rank 11-20
- ROF Rank 21-30

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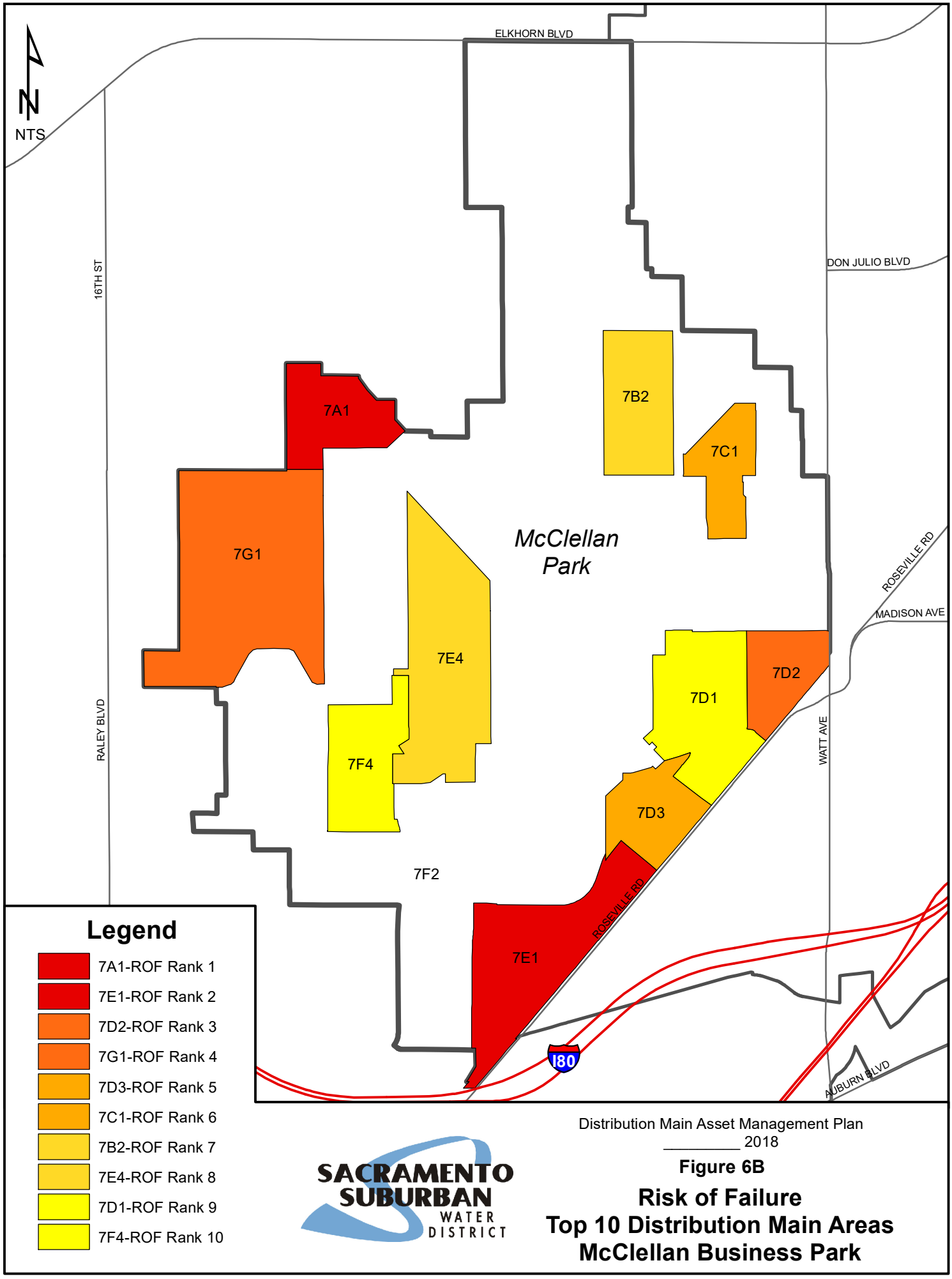
Figure 6A

Risk of Failure
Top 30 Distribution Main Areas
Excluding McClellan Business Park



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Distribution Main Asset Management Plan
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Figure 6B

Risk of Failure
Top 10 Distribution Main Areas
McClellan Business Park

4.4 Projected Timing and Cost of Distribution Main Replacement Plan

In 2006, the District began 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 the District'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 the District's rates. As stated previously, rates will generate approximately $19 million annually (2017 data) that can be scheduled for capital projects.

4.5 Alternative Contracting and Construction Methods

Prior to 2006, the District 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 sole source one or more contractors by giving them enough work for 3 - 5 years in exchange for a more competitive price to do 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, the District 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 a saddle for the customer's new service line; 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. The District received proposals from several contractors for both Requests. The District 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 Veerkamp General Engineering (Veerkamp) and Flowline Contractors (Flowline) has proved to be a cost effective tool for the main replacement program. The existing service contract for Veerkamp expires at the end of 2018; and Flowline's

contract expires in 2020, with a District option to extend to 2022. District staff has recommended continuing 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 the District purchase of materials.
- Using the service contract approach saves District costs associated with bidding and awarding contracts using traditional design-bid-build approach.
- The quality of work is high because the contractors that the District negotiates with have considerable experience and are very familiar with the District's Standards and requirements.
- The contractors make a considerable commitment to the District by committing resources (labor and equipment) towards the District's projects.
- Because the quality of the work is high, the County inspection costs are significantly less than traditional bid projects. In fact, the District's main replacement projects have become training grounds 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 the District, County, Contractor, and Customers.
- With the significant quantities of pipe, the District has been able to order large quantities achieving significant savings.

Staff continues to investigate alternatives for cost effective management of the design and construction of distribution main replacement projects. As cost savings benefit the ratepayers tremendously, this method allows staff to pursue more projects and complete them efficiently.

Other contracting and/or construction alternatives still being considered are as follows:

Design – Build

Under Design – Build, the District would hire a Design – Build Contractor. They are responsible under a single contract for the design, construction, and all permitting. The Contractor would work very closely with District staff to ensure District Standards and Specifications are met. Design plans would be advanced only to the level needed to secure permits. Design – Build projects are typically completed in a shorter period of time, however data is mixed as to cost savings. One risk associated with Design – Build is the potential for selection of a Contractor that under performs in terms of quality and/or schedule.

Distribution Main Replacement with Expanded Areas

Although projects have been getting bigger in terms of feet of new main installed, the District continues to respond to smaller areas in doing distribution main replacement projects. Combining the projects into larger Areas would attract larger construction firms, which may lower construction costs and get the projects completed in a shorter time period. Management of one larger project is more efficient than managing several smaller projects.

Use of Alternate Pipe Materials

The District currently specifies the use of Ductile Iron (DI) pipe for distribution main construction. DI pipe is slightly higher in cost than other pipe materials on the market. The District could potentially recognize a savings with the use of alternate pipe material such as Polyvinyl Chloride (PVC). Both DI and PVC have been used successfully in

distribution systems throughout the country. The reliability of the alternate pipe material is generally good. However, DI pipe provides the best reliability and has a design life of 100 years where PVC has an average service life of 70 years (American Water Works Association, 2012). In the last 5 years, the District has experienced four major PVC pipe failures resulting in significant costs to the District. It is anticipated that the cost savings for material purchases from using DI versus PVC pipe will rarely exceed 5% of the project costs with actual savings on the under of 2%.

Section 5

PUBLIC OUTREACH

Public communication, as noted in the District'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 the District's distribution main replacement projects. In the past few years, the level of public outreach between the District and our customers has increased considerably on these projects. The process currently used follows the steps outlined below.

- During the final design phase, a letter is sent to each customer property with an active water service within the project area explaining the need for the project and the proposed construction timeframe. This letter includes a sketch showing the homeowner the options for the new service line that will be installed as part of the project, a "Facts About Water Meters" flyer, and a District contact.

- Before design is completed, a District representative meets in person with the customer to discuss the project. The District's representative will have a service location sheet showing both the existing and proposed distribution system. The District's representative will discuss and determine with the homeowner the best location for the new water service connection and the water meter. The planned construction period is also discussed.

- After award of the construction contract, and three to four weeks prior to the start of construction, a letter is sent to all affected customers notifying them of the upcoming construction. This letter identifies the contractor that will be performing the work, the Construction Manager, Inspector, and District's Engineering Project Manager. The letter also provides a District contact name and phone number for questions.

- 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 are responded to in less than 24 hours and, if necessary, a face-to-face meeting is arranged with the customer.

- When the project is substantially complete, a project customer satisfaction survey card is sent to each customer with an active water service requesting that any deficiencies be noted for corrective action. Deficiencies are added to the contractor's "punch list" developed by District staff.

- Prior to the customer being converted from flat rate to metered rate, the District's Customer Service Department mails a final letter to each customer, which details the account changes starting the following month.

The District 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 project areas in the Plan include but are not limited to: improved recordkeeping systems, a better understating of pipe type'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 District policies. Additionally, it is anticipated that some projects may need to be constructed outside of Rank order due to unforeseen circumstances 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 priority/rank 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 priority list.

Section 7

CONCLUSIONS AND RECOMMENDATIONS

Replacing aging distribution mains allows the District to provide decades of reliable and cost effective service for our customers. The current direction is to replace backyard pipelines – first focusing on Outside Diameter Steel (ODS), then moving on to small diameter Asbestos Cement along with problem areas of Mortar Lined Steel – with new Ductile Iron pipe in the public right-of-way.

- This Plan provides a reasonable plan and strategy for replacing the District's distribution mains and coordinating 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 160 miles of distribution main located in back and side yards. Of these, approximately 5 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 2017 and 2018, 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.

- At a proposed replacement rate of approximately 7 miles per year, $226 to $280 million is projected over the next 20 years without inflation considered.

- Over the previous 5 years the District has averaged $19.2 million for its CIP budget. In the future, annual Budget increases of 3% to 5% are expected to maintain the recommended replacement rate. A large fraction of these funds will likely be allocated to distribution main replacement projects.

- 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.

- A prioritization list (Appendix A) has been established identifying the priority areas in need of 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.

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Appendix A: Ranks (Priority)

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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	5	4	1	1	5	7.2	10	0.506	0.861	0.436	10	1	0.733	0.756	1
7A1	6.7	3.3	5	3	5	2	4	6.1	6	0.767	0.671	0.515	6	1	0.467	0.755	2
03A	2.6	3.3	4	4	1	1	4	6.6	10	0.496	0.801	0.397	10	1	0.733	0.689	3
7E1	3.1	3.7	5	1	5	2	5	6.9	6	0.590	0.737	0.435	6	1	0.467	0.638	4
7D2	2.4	3.3	5	3	1	1	5	6.6	10	0.490	0.839	0.411	6	1	0.467	0.602	5
92	2.0	2.0	1	1	5	2	4	8.0	10	0.367	0.889	0.326	10	1	0.733	0.565	6
7G1	8.3	2.6	5	3	5	2	4	7.8	2	0.798	0.587	0.469	2	1	0.200	0.562	7
7D3	4.3	2.8	5	3	1	1	5	7.5	10	0.535	0.871	0.466	2	1	0.200	0.559	8
7C1	5.5	3.0	3	1	1	1	5	6.4	10	0.450	0.830	0.373	6	1	0.467	0.548	9
06D	2.0	1.7	1	2	5	2	5	7.9	10	0.391	0.922	0.361	2	5	0.467	0.529	10
7B2	3.6	3.8	5	1	5	2	4	7.3	6	0.613	0.714	0.438	2	1	0.200	0.526	11
7E4	4.7	2.5	5	3	1	2	5	8.7	2	0.541	0.654	0.354	6	1	0.467	0.519	12
10	9.5	2.9	1	3	5	2	4	5.9	2	0.714	0.514	0.367	2	4	0.400	0.514	13
35	6.1	2.5	1	2	5	2	4	6.8	6	0.551	0.698	0.385	2	3	0.333	0.513	14
06K	3.0	2.0	1	1	5	2	4	7.5	10	0.398	0.871	0.347	2	5	0.467	0.509	15
7D1	2.6	3.2	5	3	1	1	5	7.0	10	0.493	0.853	0.420	2	1	0.200	0.505	16
06I	2.1	1.9	1	1	5	2	5	7.8	10	0.368	0.918	0.337	2	5	0.467	0.495	17
34	3.7	2.4	1	1	5	2	5	7.6	6	0.439	0.762	0.335	2	5	0.467	0.491	18
42F	2.2	3.7	5	1	1	1	4	6.7	6	0.429	0.657	0.282	10	1	0.733	0.489	19
7F4	4.4	3.3	5	2	5	2	5	7.7	2	0.656	0.618	0.406	2	1	0.200	0.487	20
76I	2.9	3.6	5	2	1	1	5	6.1	10	0.484	0.818	0.396	2	1	0.200	0.475	21
42E	2.0	1.9	1	1	5	2	5	8.0	6	0.363	0.778	0.283	6	4	0.667	0.471	22
7F2	2.8	3.3	5	1	1	2	5	6.7	6	0.439	0.730	0.321	6	1	0.467	0.470	23
7F3	5.4	4.0	5	1	5	1	5	7.3	2	0.681	0.565	0.385	2	1	0.200	0.462	24
7B3	3.5	3.1	5	1	1	1	5	6.4	10	0.456	0.828	0.378	2	1	0.200	0.453	25
7G4	3.3	3.8	5	2	1	1	5	8.2	6	0.505	0.748	0.377	2	1	0.200	0.453	26
7C2	2.5	3.3	5	1	1	1	5	7.5	6	0.425	0.721	0.306	6	1	0.467	0.450	27
85	2.1	2.2	1	1	5	1	4	8.9	10	0.376	0.884	0.332	2	3	0.333	0.443	28
7A2	9.3	2.7	1	1	5	1	5	7.6	2	0.633	0.578	0.366	2	1	0.200	0.439	29
7B4	5.0	3.2	5	1	1	1	5	7.3	6	0.508	0.713	0.363	2	1	0.200	0.435	30
18	6.2	3.6	3	3	1	1	4	6.1	6	0.563	0.632	0.356	2	1	0.200	0.427	31
7C3	4.8	3.2	5	1	1	1	5	7.2	6	0.499	0.710	0.354	2	1	0.200	0.425	32
76H	3.7	2.9	5	1	1	2	3	6.1	10	0.453	0.781	0.354	2	1	0.200	0.425	33
7C4	3.9	3.3	5	1	1	1	5	7.8	6	0.472	0.732	0.346	2	1	0.200	0.415	34
90B	2.0	1.8	1	1	5	2	5	8.0	6	0.362	0.778	0.281	2	5	0.467	0.413	35
32	2.0	2.2	1	1	5	2	4	8.0	6	0.375	0.741	0.278	2	5	0.467	0.408	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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
06A	2.0	2.2	1	1	5	2	5	8.0	6	0.375	0.776	0.291	2	4	0.400	0.407	37
06B	2.0	2.2	1	1	5	2	4	8.0	6	0.375	0.741	0.278	2	5	0.467	0.407	38
06E	2.0	2.2	1	1	5	2	4	8.0	6	0.372	0.741	0.276	2	5	0.467	0.404	39
26A	6.7	3.1	2	4	1	1	4	5.5	2	0.560	0.464	0.260	6	2	0.533	0.399	40
47	9.9	2.0	1	1	1	1	3	4.0	10	0.498	0.666	0.332	2	1	0.200	0.398	41
7C5	3.0	2.1	5	1	1	1	5	6.2	10	0.404	0.821	0.332	2	1	0.200	0.398	42
82	2.0	3.3	4	3	1	1	3	6.4	6	0.445	0.606	0.269	6	1	0.467	0.395	43
7G2	3.7	2.9	4	2	5	1	5	6.9	2	0.587	0.550	0.323	2	1	0.200	0.387	44
13A	8.4	4.1	2	3	1	1	3	5.4	2	0.616	0.423	0.261	6	1	0.467	0.382	45
27	6.8	3.4	2	2	1	1	4	5.7	6	0.509	0.617	0.314	2	1	0.200	0.377	46
86D	2.5	3.0	5	1	1	1	3	6.5	6	0.415	0.610	0.253	6	1	0.467	0.372	47
90C	2.8	2.1	1	1	1	2	5	8.9	10	0.262	0.958	0.251	2	5	0.467	0.367	48
7E2	3.1	3.5	5	1	1	2	5	8.3	2	0.454	0.640	0.291	2	1	0.200	0.349	49
7F1	4.2	3.6	5	1	1	2	5	6.8	2	0.493	0.586	0.289	2	1	0.200	0.347	50
06F	2.0	1.7	1	2	1	2	5	7.8	10	0.256	0.919	0.235	2	5	0.467	0.345	51
7G3	2.6	4.1	5	2	1	1	5	7.7	2	0.491	0.580	0.285	2	1	0.200	0.342	52
17B	7.6	4.1	2	2	1	1	3	5.3	2	0.556	0.417	0.232	6	1	0.467	0.340	53
26B	6.0	2.9	2	1	1	2	4	6.4	2	0.432	0.534	0.230	6	1	0.467	0.338	54
42J	2.8	2.4	1	1	1	1	4	7.0	10	0.273	0.814	0.222	6	1	0.467	0.326	55
13B	4.7	3.5	1	4	1	1	3	6.7	2	0.473	0.469	0.222	6	1	0.467	0.325	56
06C	2.1	1.9	1	1	5	2	5	8.0	2	0.367	0.629	0.231	2	4	0.400	0.323	57
24A	5.1	3.4	3	1	1	1	4	6.3	2	0.448	0.491	0.220	6	1	0.467	0.323	58
41	2.4	2.2	1	1	5	2	4	7.8	2	0.388	0.586	0.228	2	4	0.400	0.319	59
24B	5.6	3.3	1	2	1	1	4	6.6	2	0.430	0.504	0.217	6	1	0.467	0.318	60
76C	3.9	3.0	1	1	1	1	4	6.6	10	0.331	0.800	0.264	2	1	0.200	0.317	61
11	3.2	2.3	1	1	5	1	4	7.7	2	0.415	0.545	0.226	2	4	0.400	0.317	62
28	5.7	3.0	1	4	1	1	4	6.7	2	0.491	0.507	0.249	2	2	0.267	0.315	63
19	5.8	3.2	1	2	1	1	3	6.2	6	0.432	0.599	0.259	2	1	0.200	0.311	64
86C	3.5	2.6	1	2	1	1	3	6.7	10	0.337	0.765	0.258	2	1	0.200	0.309	65
66B	3.9	2.4	4	1	1	1	3	6.8	6	0.408	0.623	0.254	2	1	0.200	0.305	66
74	3.1	1.9	1	2	1	2	5	7.5	6	0.299	0.758	0.227	2	3	0.333	0.303	67
44	5.4	4.0	5	2	1	2	3	4.7	2	0.579	0.435	0.252	2	1	0.200	0.302	68
6G1	2.0	1.6	1	1	1	2	5	8.0	10	0.221	0.926	0.204	2	5	0.467	0.300	69
76J	2.0	4.0	5	1	1	2	2	4.7	2	0.434	0.396	0.172	10	1	0.733	0.298	70
7G5	2.6	3.1	5	1	1	1	5	7.8	2	0.424	0.586	0.248	2	1	0.200	0.298	71
42K	4.9	3.9	3	1	1	2	2	4.5	6	0.462	0.535	0.248	2	1	0.200	0.297	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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
6G2	2.0	1.8	1	1	1	2	5	8.0	10	0.227	0.926	0.210	2	4	0.400	0.294	73
90A	3.1	2.1	1	1	1	2	4	7.4	6	0.273	0.718	0.196	2	5	0.467	0.288	74
93A	2.4	2.7	1	1	1	1	4	7.6	10	0.271	0.838	0.227	2	2	0.267	0.287	75
95	2.3	3.1	1	1	1	1	5	8.0	2	0.278	0.592	0.165	10	1	0.733	0.286	76
37	5.8	2.2	1	1	1	2	4	7.0	2	0.367	0.555	0.204	2	4	0.400	0.285	77
43A	3.6	2.4	1	1	1	2	4	7.2	6	0.298	0.710	0.211	2	3	0.333	0.282	78
42D	2.3	2.1	1	1	1	2	5	7.9	6	0.247	0.773	0.191	2	5	0.467	0.280	79
48	2.6	2.1	1	1	1	2	4	8.3	10	0.256	0.899	0.230	2	1	0.200	0.276	80
90D	3.2	2.0	1	1	1	2	4	7.4	6	0.274	0.719	0.197	2	4	0.400	0.276	81
06J	2.1	1.8	1	1	1	2	4	7.1	10	0.228	0.856	0.195	2	4	0.400	0.274	82
20A	2.2	2.1	1	3	1	1	4	7.7	6	0.310	0.693	0.215	2	2	0.267	0.272	83
17A	6.3	3.1	1	2	1	1	4	6.0	2	0.445	0.481	0.214	2	2	0.267	0.271	84
7B1	3.0	2.2	2	1	1	2	4	8.2	2	0.306	0.602	0.184	6	1	0.467	0.270	85
05A	3.5	3.4	1	5	1	1	3	7.2	2	0.461	0.488	0.225	2	1	0.200	0.270	86
72	2.4	1.9	1	1	1	2	5	7.8	6	0.244	0.770	0.188	2	4	0.400	0.263	87
09	2.0	2.3	1	3	1	1	4	7.9	6	0.310	0.701	0.217	2	1	0.200	0.261	88
22	2.3	2.2	1	1	1	2	5	7.8	6	0.252	0.772	0.194	2	3	0.333	0.259	89
42B	2.9	2.0	1	1	1	1	4	6.8	10	0.265	0.807	0.214	2	1	0.200	0.257	90
30	2.6	2.1	1	1	5	1	4	7.7	2	0.389	0.545	0.212	2	1	0.200	0.254	91
42C	2.8	2.4	2	1	1	2	4	6.6	6	0.306	0.690	0.212	2	1	0.200	0.254	92
05B	9.8	4.1	1	1	1	1	3	4.0	2	0.563	0.372	0.209	2	1	0.200	0.251	93
91	3.4	2.8	1	1	1	1	4	6.5	6	0.306	0.647	0.198	2	2	0.267	0.251	94
54	2.8	2.1	1	1	1	1	4	7.2	6	0.264	0.673	0.178	2	4	0.400	0.249	95
86B	2.0	2.8	1	2	1	1	4	7.8	6	0.295	0.696	0.205	2	1	0.200	0.246	96
7E3	3.4	3.4	2	1	1	1	5	7.3	2	0.361	0.566	0.205	2	1	0.200	0.245	97
38A	2.4	2.8	2	1	1	1	3	7.6	6	0.307	0.652	0.201	2	1	0.200	0.241	98
53B	2.0	2.7	2	1	1	1	4	6.6	6	0.290	0.653	0.189	2	2	0.267	0.240	99
1B	2.4	2.6	2	1	1	1	5	7.2	2	0.302	0.563	0.170	2	4	0.400	0.238	100
31A	2.5	2.3	1	2	1	1	4	7.3	6	0.292	0.680	0.198	2	1	0.200	0.238	101
46	9.8	3.1	1	3	1	1	2	4.0	2	0.597	0.332	0.198	2	1	0.200	0.238	102
86A	2.0	2.5	1	2	1	1	4	7.7	6	0.286	0.692	0.198	2	1	0.200	0.237	103
42I	2.0	1.0	1	1	5	1	5	8.0	2	0.333	0.593	0.198	2	1	0.200	0.237	104
93C	2.7	2.9	1	1	1	1	4	7.6	6	0.286	0.688	0.197	2	1	0.200	0.236	105
1C	2.0	2.3	1	2	1	1	5	7.7	2	0.275	0.583	0.161	2	5	0.467	0.236	106
53A	2.6	2.2	1	3	1	1	4	7.5	2	0.325	0.536	0.174	2	3	0.333	0.232	107
36	5.9	2.7	1	1	1	1	4	6.4	2	0.389	0.495	0.192	2	1	0.200	0.231	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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
38B	4.8	2.6	1	1	1	1	4	7.0	2	0.347	0.518	0.180	2	2	0.267	0.228	109
02B	5.2	4.5	2	1	1	1	2	2.8	2	0.455	0.289	0.131	10	1	0.733	0.227	110
33	2.0	2.7	1	1	1	2	4	6.9	6	0.255	0.702	0.179	2	2	0.267	0.227	111
29	4.1	3.1	1	3	1	1	3	6.5	2	0.408	0.463	0.189	2	1	0.200	0.227	112
45B	3.4	2.9	1	2	1	2	2	4.8	6	0.344	0.550	0.189	2	1	0.200	0.227	113
57A	3.3	2.4	1	1	1	1	3	6.4	6	0.293	0.608	0.178	2	2	0.267	0.225	114
77	2.0	2.3	1	1	1	2	5	8.0	2	0.244	0.630	0.153	2	5	0.467	0.225	115
39	2.3	2.2	1	1	1	2	5	7.6	2	0.249	0.615	0.153	2	5	0.467	0.224	116
68	9.8	3.0	2	1	1	1	2	4.0	2	0.558	0.333	0.186	2	1	0.200	0.223	117
23	2.1	2.1	1	2	1	2	4	7.7	2	0.273	0.581	0.159	2	4	0.400	0.222	118
40A	5.7	3.6	1	1	1	1	3	5.5	2	0.409	0.428	0.175	2	2	0.267	0.221	119
40B	5.2	3.0	2	1	1	1	3	6.3	2	0.405	0.454	0.184	2	1	0.200	0.221	120
12A	4.0	2.8	1	1	1	1	4	7.4	2	0.324	0.535	0.173	2	2	0.267	0.220	121
93D	2.0	2.4	1	1	1	1	4	7.9	6	0.246	0.701	0.173	2	2	0.267	0.219	122
49	9.9	3.3	1	1	1	1	2	4.0	2	0.542	0.335	0.182	2	1	0.200	0.218	123
25	3.4	2.3	1	1	1	1	4	7.3	2	0.293	0.529	0.155	2	4	0.400	0.217	124
20B	3.4	2.8	1	3	1	1	3	7.0	2	0.373	0.480	0.179	2	1	0.200	0.215	125
63	9.8	3.2	1	1	1	1	2	4.0	2	0.533	0.335	0.178	2	1	0.200	0.214	126
15	9.4	3.3	1	1	1	1	2	4.1	2	0.525	0.339	0.178	2	1	0.200	0.213	127
93B	2.4	2.3	1	1	1	1	4	7.7	6	0.255	0.691	0.176	2	1	0.200	0.212	128
04	2.0	2.7	1	1	1	1	4	7.6	6	0.256	0.690	0.176	2	1	0.200	0.212	129
1A	2.1	2.2	1	1	1	1	5	8.0	2	0.243	0.594	0.144	2	5	0.467	0.212	130
05C	4.9	4.0	1	1	1	1	3	5.8	2	0.397	0.438	0.174	2	1	0.200	0.209	131
57	5.2	2.8	1	2	1	1	3	5.7	2	0.400	0.432	0.173	2	1	0.200	0.207	132
14	8.3	3.3	1	1	1	1	2	4.6	2	0.486	0.354	0.172	2	1	0.200	0.207	133
12B	2.0	3.1	1	1	1	1	3	7.7	2	0.271	0.508	0.138	6	1	0.467	0.202	134
42G	2.0	2.7	1	1	1	1	2	3.8	10	0.257	0.621	0.160	2	1	0.200	0.191	135
43C	2.0	2.9	1	1	1	1	2	3.2	10	0.263	0.599	0.158	2	1	0.200	0.189	136
52A	2.0	3.7	1	2	1	1	2	4.2	6	0.323	0.487	0.158	2	1	0.200	0.189	137
76F	2.0	2.7	1	1	1	1	3	6.5	6	0.255	0.611	0.156	2	1	0.200	0.187	138
02A	6.2	4.2	1	3	1	1	2	3.1	2	0.512	0.301	0.154	2	1	0.200	0.185	139
42H	2.0	1.1	1	1	1	2	5	7.7	2	0.203	0.620	0.126	2	5	0.467	0.185	140
55	3.2	2.6	1	3	1	1	4	3.5	2	0.358	0.390	0.140	2	2	0.267	0.177	141
76K	2.3	4.0	5	1	1	1	2	3.9	2	0.444	0.330	0.147	2	1	0.200	0.176	142
43D	4.1	2.2	3	1	1	1	2	5.0	2	0.375	0.371	0.139	2	1	0.200	0.167	143
21	2.0	2.3	1	1	1	2	4	6.5	2	0.242	0.538	0.130	2	2	0.267	0.165	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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
66A	5.0	3.5	5	1	1	1	1	3.0	2	0.516	0.258	0.133	2	1	0.200	0.160	145
66D	2.0	4.3	5	1	1	1	2	3.1	2	0.445	0.299	0.133	2	1	0.200	0.160	146
89	2.0	3.4	1	1	1	1	2	3.8	6	0.280	0.475	0.133	2	1	0.200	0.160	147
31B	2.0	2.6	1	1	1	1	3	5.5	2	0.252	0.425	0.107	2	5	0.467	0.157	148
16	2.0	2.0	1	1	1	1	4	6.6	2	0.233	0.503	0.117	2	3	0.333	0.157	149
58C	2.0	2.8	1	1	1	1	4	6.3	2	0.261	0.494	0.129	2	1	0.200	0.155	150
87B	5.8	4.2	1	1	1	1	2	3.0	2	0.434	0.295	0.128	2	1	0.200	0.154	151
67	2.1	3.0	1	2	1	1	3	5.2	2	0.302	0.416	0.126	2	1	0.200	0.151	152
57B	2.0	1.0	1	1	1	1	4	8.0	2	0.201	0.556	0.112	2	3	0.333	0.149	153
02D	2.6	3.6	1	1	1	1	2	2.2	2	0.308	0.265	0.082	10	1	0.733	0.142	154
66C	2.0	2.4	1	1	1	1	3	6.7	2	0.248	0.469	0.116	2	1	0.200	0.139	155
66E	2.0	3.8	3	1	1	1	2	3.6	2	0.360	0.318	0.115	2	1	0.200	0.138	156
76G	2.0	4.6	5	1	1	1	1	2.7	2	0.453	0.249	0.113	2	1	0.200	0.135	157
87A	2.0	3.6	1	3	1	1	2	3.6	2	0.353	0.317	0.112	2	1	0.200	0.134	158
58A	2.5	3.5	1	1	1	1	1	2.1	6	0.298	0.375	0.111	2	1	0.200	0.134	159
83	2.8	3.6	1	2	1	1	2	3.5	2	0.348	0.317	0.110	2	1	0.200	0.132	160
02C	4.6	3.9	1	1	1	1	2	2.6	2	0.383	0.283	0.108	2	1	0.200	0.130	161
76A	2.3	3.4	1	1	1	1	3	4.1	2	0.290	0.373	0.108	2	1	0.200	0.130	162
76D	2.0	3.8	1	2	1	1	1	2.0	2	0.326	0.222	0.073	10	1	0.733	0.126	163
06M	2.0	3.7	1	2	1	1	2	3.5	2	0.324	0.315	0.102	2	1	0.200	0.123	164
45A	3.8	4.0	1	1	1	2	1	2.6	2	0.361	0.282	0.102	2	1	0.200	0.122	165
60B	4.4	3.9	2	1	1	1	1	2.7	2	0.409	0.246	0.101	2	1	0.200	0.121	166
66F	2.0	5.0	1	1	1	1	3	2.0	2	0.333	0.296	0.099	2	1	0.200	0.119	167
56A	2.0	4.0	1	1	1	1	2	3.8	2	0.300	0.324	0.097	2	1	0.200	0.117	168
78	3.1	3.8	2	2	1	1	1	2.6	2	0.394	0.243	0.096	2	1	0.200	0.115	169
65	2.0	3.7	2	3	1	1	1	2.6	2	0.391	0.243	0.095	2	1	0.200	0.114	170
84	2.2	4.1	4	1	1	1	1	2.1	2	0.411	0.225	0.092	2	1	0.200	0.111	171
71	3.1	3.6	1	1	1	1	2	2.7	2	0.321	0.287	0.092	2	1	0.200	0.111	172
88	2.1	4.0	1	4	1	1	1	2.0	2	0.403	0.224	0.090	2	1	0.200	0.108	173
56B	2.2	2.6	1	2	1	1	3	2.1	2	0.294	0.299	0.088	2	1	0.200	0.106	174
02E	2.0	4.0	1	2	1	1	2	2.0	2	0.332	0.259	0.086	2	1	0.200	0.103	175
79	4.0	2.9	1	1	1	1	1	2.8	2	0.332	0.252	0.084	2	1	0.200	0.101	176
51	2.6	3.7	1	2	1	1	1	2.4	2	0.344	0.236	0.081	2	1	0.200	0.097	177
61	2.2	4.0	2	1	1	1	1	2.2	2	0.342	0.230	0.078	2	1	0.200	0.094	178
59	3.1	3.5	1	1	1	1	1	2.5	2	0.322	0.241	0.078	2	1	0.200	0.093	179
06N	2.0	3.5	1	2	1	1	1	2.6	2	0.317	0.243	0.077	2	1	0.200	0.092	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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
58B	2.0	3.4	2	1	1	1	1	2.5	2	0.312	0.242	0.075	2	1	0.200	0.090	181
52B	2.0	4.1	1	2	1	1	1	2.0	2	0.336	0.222	0.075	2	1	0.200	0.090	182
76B	2.0	4.1	1	1	1	1	1	2.0	2	0.304	0.222	0.068	2	1	0.200	0.081	183
70	2.0	3.7	1	1	1	1	1	2.3	2	0.289	0.233	0.067	2	1	0.200	0.081	184
06H	2.0	3.8	1	1	1	1	1	2.0	2	0.294	0.224	0.066	2	1	0.200	0.079	185
81	2.0	3.5	1	1	1	1	1	2.3	2	0.283	0.232	0.066	2	1	0.200	0.079	186
80	2.1	3.6	1	1	1	1	1	2.0	2	0.291	0.223	0.065	2	1	0.200	0.078	187
64	2.0	3.5	1	1	1	1	1	2.0	2	0.283	0.222	0.063	2	1	0.200	0.075	188
69	2.0	3.3	1	1	1	1	1	2.0	2	0.278	0.222	0.062	2	1	0.200	0.074	189
96	2.0	3.3	1	1	1	1	1	2.0	2	0.276	0.224	0.062	2	1	0.200	0.074	190
60A	2.0	3.3	1	1	1	1	1	2.0	2	0.276	0.222	0.061	2	1	0.200	0.073	191
42A	2.0	3.1	1	1	1	1	1	2.0	2	0.272	0.222	0.060	2	1	0.200	0.072	192
62	2.0	3.1	1	1	1	1	1	2.0	2	0.272	0.222	0.060	2	1	0.200	0.072	193
43B	2.0	3.0	1	1	1	1	1	2.0	2	0.267	0.222	0.059	2	1	0.200	0.071	194
56C	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	195
60	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	196
7B5	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	197

Appendix B: Ranks (Areas)

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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	3	1	1	2	3.1	2	0.512	0.301	0.154	2	1	0.200	0.185	139
02B	5.2	4.5	2	1	1	1	2	2.8	2	0.455	0.289	0.131	10	1	0.733	0.227	110
02C	4.6	3.9	1	1	1	1	2	2.6	2	0.383	0.283	0.108	2	1	0.200	0.130	161
02D	2.6	3.6	1	1	1	1	2	2.2	2	0.308	0.265	0.082	10	1	0.733	0.142	154
02E	2.0	4.0	1	2	1	1	2	2.0	2	0.332	0.259	0.086	2	1	0.200	0.103	175
03A	2.6	3.3	4	4	1	1	4	6.6	10	0.496	0.801	0.397	10	1	0.733	0.689	3
03B	2.0	3.2	5	4	1	1	5	7.2	10	0.506	0.861	0.436	10	1	0.733	0.756	1
04	2.0	2.7	1	1	1	1	4	7.6	6	0.256	0.690	0.176	2	1	0.200	0.212	129
05A	3.5	3.4	1	5	1	1	3	7.2	2	0.461	0.488	0.225	2	1	0.200	0.270	86
05B	9.8	4.1	1	1	1	1	3	4.0	2	0.563	0.372	0.209	2	1	0.200	0.251	93
05C	4.9	4.0	1	1	1	1	3	5.8	2	0.397	0.438	0.174	2	1	0.200	0.209	131
06A	2.0	2.2	1	1	5	2	5	8.0	6	0.375	0.776	0.291	2	4	0.400	0.407	37
06B	2.0	2.2	1	1	5	2	4	8.0	6	0.375	0.741	0.278	2	5	0.467	0.407	38
06C	2.1	1.9	1	1	5	2	5	8.0	2	0.367	0.629	0.231	2	4	0.400	0.323	57
06D	2.0	1.7	1	2	5	2	5	7.9	10	0.391	0.922	0.361	2	5	0.467	0.529	10
06E	2.0	2.2	1	1	5	2	4	8.0	6	0.372	0.741	0.276	2	5	0.467	0.404	39
06F	2.0	1.7	1	2	1	2	5	7.8	10	0.256	0.919	0.235	2	5	0.467	0.345	51
06H	2.0	3.8	1	1	1	1	1	2.0	2	0.294	0.224	0.066	2	1	0.200	0.079	185
06I	2.1	1.9	1	1	5	2	5	7.8	10	0.368	0.918	0.337	2	5	0.467	0.495	17
06J	2.1	1.8	1	1	1	2	4	7.1	10	0.228	0.856	0.195	2	4	0.400	0.274	82
06K	3.0	2.0	1	1	5	2	4	7.5	10	0.398	0.871	0.347	2	5	0.467	0.509	15
06M	2.0	3.7	1	2	1	1	2	3.5	2	0.324	0.315	0.102	2	1	0.200	0.123	164
06N	2.0	3.5	1	2	1	1	1	2.6	2	0.317	0.243	0.077	2	1	0.200	0.092	180
09	2.0	2.3	1	3	1	1	4	7.9	6	0.310	0.701	0.217	2	1	0.200	0.261	88
10	9.5	2.9	1	3	5	2	4	5.9	2	0.714	0.514	0.367	2	4	0.400	0.514	13
11	3.2	2.3	1	1	5	1	4	7.7	2	0.415	0.545	0.226	2	4	0.400	0.317	62
12A	4.0	2.8	1	1	1	1	4	7.4	2	0.324	0.535	0.173	2	2	0.267	0.220	121
12B	2.0	3.1	1	1	1	1	3	7.7	2	0.271	0.508	0.138	6	1	0.467	0.202	134
13A	8.4	4.1	2	3	1	1	3	5.4	2	0.616	0.423	0.261	6	1	0.467	0.382	45
13B	4.7	3.5	1	4	1	1	3	6.7	2	0.473	0.469	0.222	6	1	0.467	0.325	56
14	8.3	3.3	1	1	1	1	2	4.6	2	0.486	0.354	0.172	2	1	0.200	0.207	133
15	9.4	3.3	1	1	1	1	2	4.1	2	0.525	0.339	0.178	2	1	0.200	0.213	127
16	2.0	2.0	1	1	1	1	4	6.6	2	0.233	0.503	0.117	2	3	0.333	0.157	149
17A	6.3	3.1	1	2	1	1	4	6.0	2	0.445	0.481	0.214	2	2	0.267	0.271	84
17B	7.6	4.1	2	2	1	1	3	5.3	2	0.556	0.417	0.232	6	1	0.467	0.340	53
18	6.2	3.6	3	3	1	1	4	6.1	6	0.563	0.632	0.356	2	1	0.200	0.427	31

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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	1	1	3	6.2	6	0.432	0.599	0.259	2	1	0.200	0.311	64
1A	2.1	2.2	1	1	1	1	5	8.0	2	0.243	0.594	0.144	2	5	0.467	0.212	130
1B	2.4	2.6	2	1	1	1	5	7.2	2	0.302	0.563	0.170	2	4	0.400	0.238	100
1C	2.0	2.3	1	2	1	1	5	7.7	2	0.275	0.583	0.161	2	5	0.467	0.236	106
20A	2.2	2.1	1	3	1	1	4	7.7	6	0.310	0.693	0.215	2	2	0.267	0.272	83
20B	3.4	2.8	1	3	1	1	3	7.0	2	0.373	0.480	0.179	2	1	0.200	0.215	125
21	2.0	2.3	1	1	1	2	4	6.5	2	0.242	0.538	0.130	2	2	0.267	0.165	144
22	2.3	2.2	1	1	1	2	5	7.8	6	0.252	0.772	0.194	2	3	0.333	0.259	89
23	2.1	2.1	1	2	1	2	4	7.7	2	0.273	0.581	0.159	2	4	0.400	0.222	118
24A	5.1	3.4	3	1	1	1	4	6.3	2	0.448	0.491	0.220	6	1	0.467	0.323	58
24B	5.6	3.3	1	2	1	1	4	6.6	2	0.430	0.504	0.217	6	1	0.467	0.318	60
25	3.4	2.3	1	1	1	1	4	7.3	2	0.293	0.529	0.155	2	4	0.400	0.217	124
26A	6.7	3.1	2	4	1	1	4	5.5	2	0.560	0.464	0.260	6	2	0.533	0.399	40
26B	6.0	2.9	2	1	1	2	4	6.4	2	0.432	0.534	0.230	6	1	0.467	0.338	54
27	6.8	3.4	2	2	1	1	4	5.7	6	0.509	0.617	0.314	2	1	0.200	0.377	46
28	5.7	3.0	1	4	1	1	4	6.7	2	0.491	0.507	0.249	2	2	0.267	0.315	63
29	4.1	3.1	1	3	1	1	3	6.5	2	0.408	0.463	0.189	2	1	0.200	0.227	112
30	2.6	2.1	1	1	5	1	4	7.7	2	0.389	0.545	0.212	2	1	0.200	0.254	91
31A	2.5	2.3	1	2	1	1	4	7.3	6	0.292	0.680	0.198	2	1	0.200	0.238	101
31B	2.0	2.6	1	1	1	1	3	5.5	2	0.252	0.425	0.107	2	5	0.467	0.157	148
32	2.0	2.2	1	1	5	2	4	8.0	6	0.375	0.741	0.278	2	5	0.467	0.408	36
33	2.0	2.7	1	1	1	2	4	6.9	6	0.255	0.702	0.179	2	2	0.267	0.227	111
34	3.7	2.4	1	1	5	2	5	7.6	6	0.439	0.762	0.335	2	5	0.467	0.491	18
35	6.1	2.5	1	2	5	2	4	6.8	6	0.551	0.698	0.385	2	3	0.333	0.513	14
36	5.9	2.7	1	1	1	1	4	6.4	2	0.389	0.495	0.192	2	1	0.200	0.231	108
37	5.8	2.2	1	1	1	2	4	7.0	2	0.367	0.555	0.204	2	4	0.400	0.285	77
38A	2.4	2.8	2	1	1	1	3	7.6	6	0.307	0.652	0.201	2	1	0.200	0.241	98
38B	4.8	2.6	1	1	1	1	4	7.0	2	0.347	0.518	0.180	2	2	0.267	0.228	109
39	2.3	2.2	1	1	1	2	5	7.6	2	0.249	0.615	0.153	2	5	0.467	0.224	116
40A	5.7	3.6	1	1	1	1	3	5.5	2	0.409	0.428	0.175	2	2	0.267	0.221	119
40B	5.2	3.0	2	1	1	1	3	6.3	2	0.405	0.454	0.184	2	1	0.200	0.221	120
41	2.4	2.2	1	1	5	2	4	7.8	2	0.388	0.586	0.228	2	4	0.400	0.319	59
42A	2.0	3.1	1	1	1	1	1	2.0	2	0.272	0.222	0.060	2	1	0.200	0.072	192
42B	2.9	2.0	1	1	1	1	4	6.8	10	0.265	0.807	0.214	2	1	0.200	0.257	90
42C	2.8	2.4	2	1	1	2	4	6.6	6	0.306	0.690	0.212	2	1	0.200	0.254	92
42D	2.3	2.1	1	1	1	2	5	7.9	6	0.247	0.773	0.191	2	5	0.467	0.280	79

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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	1	5	2	5	8.0	6	0.363	0.778	0.283	6	4	0.667	0.471	22
42F	2.2	3.7	5	1	1	1	4	6.7	6	0.429	0.657	0.282	10	1	0.733	0.489	19
42G	2.0	2.7	1	1	1	1	2	3.8	10	0.257	0.621	0.160	2	1	0.200	0.191	135
42H	2.0	1.1	1	1	1	2	5	7.7	2	0.203	0.620	0.126	2	5	0.467	0.185	140
42I	2.0	1.0	1	1	5	1	5	8.0	2	0.333	0.593	0.198	2	1	0.200	0.237	104
42J	2.8	2.4	1	1	1	1	4	7.0	10	0.273	0.814	0.222	6	1	0.467	0.326	55
42K	4.9	3.9	3	1	1	2	2	4.5	6	0.462	0.535	0.248	2	1	0.200	0.297	72
43A	3.6	2.4	1	1	1	2	4	7.2	6	0.298	0.710	0.211	2	3	0.333	0.282	78
43B	2.0	3.0	1	1	1	1	1	2.0	2	0.267	0.222	0.059	2	1	0.200	0.071	194
43C	2.0	2.9	1	1	1	1	2	3.2	10	0.263	0.599	0.158	2	1	0.200	0.189	136
43D	4.1	2.2	3	1	1	1	2	5.0	2	0.375	0.371	0.139	2	1	0.200	0.167	143
44	5.4	4.0	5	2	1	2	3	4.7	2	0.579	0.435	0.252	2	1	0.200	0.302	68
45A	3.8	4.0	1	1	1	2	1	2.6	2	0.361	0.282	0.102	2	1	0.200	0.122	165
45B	3.4	2.9	1	2	1	2	2	4.8	6	0.344	0.550	0.189	2	1	0.200	0.227	113
46	9.8	3.1	1	3	1	1	2	4.0	2	0.597	0.332	0.198	2	1	0.200	0.238	102
47	9.9	2.0	1	1	1	1	3	4.0	10	0.498	0.666	0.332	2	1	0.200	0.398	41
48	2.6	2.1	1	1	1	2	4	8.3	10	0.256	0.899	0.230	2	1	0.200	0.276	80
49	9.9	3.3	1	1	1	1	2	4.0	2	0.542	0.335	0.182	2	1	0.200	0.218	123
51	2.6	3.7	1	2	1	1	1	2.4	2	0.344	0.236	0.081	2	1	0.200	0.097	177
52A	2.0	3.7	1	2	1	1	2	4.2	6	0.323	0.487	0.158	2	1	0.200	0.189	137
52B	2.0	4.1	1	2	1	1	1	2.0	2	0.336	0.222	0.075	2	1	0.200	0.090	182
53A	2.6	2.2	1	3	1	1	4	7.5	2	0.325	0.536	0.174	2	3	0.333	0.232	107
53B	2.0	2.7	2	1	1	1	4	6.6	6	0.290	0.653	0.189	2	2	0.267	0.240	99
54	2.8	2.1	1	1	1	1	4	7.2	6	0.264	0.673	0.178	2	4	0.400	0.249	95
55	3.2	2.6	1	3	1	1	4	3.5	2	0.358	0.390	0.140	2	2	0.267	0.177	141
56A	2.0	4.0	1	1	1	1	2	3.8	2	0.300	0.324	0.097	2	1	0.200	0.117	168
56B	2.2	2.6	1	2	1	1	3	2.1	2	0.294	0.299	0.088	2	1	0.200	0.106	174
56C	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	195
57	5.2	2.8	1	2	1	1	3	5.7	2	0.400	0.432	0.173	2	1	0.200	0.207	132
57A	3.3	2.4	1	1	1	1	3	6.4	6	0.293	0.608	0.178	2	2	0.267	0.225	114
57B	2.0	1.0	1	1	1	1	4	8.0	2	0.201	0.556	0.112	2	3	0.333	0.149	153
58A	2.5	3.5	1	1	1	1	1	2.1	6	0.298	0.375	0.111	2	1	0.200	0.134	159
58B	2.0	3.4	2	1	1	1	1	2.5	2	0.312	0.242	0.075	2	1	0.200	0.090	181
58C	2.0	2.8	1	1	1	1	4	6.3	2	0.261	0.494	0.129	2	1	0.200	0.155	150
59	3.1	3.5	1	1	1	1	1	2.5	2	0.322	0.241	0.078	2	1	0.200	0.093	179
60	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	196

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
60A	2.0	3.3	1	1	1	1	1	2.0	2	0.276	0.222	0.061	2	1	0.200	0.073	191
60B	4.4	3.9	2	1	1	1	1	2.7	2	0.409	0.246	0.101	2	1	0.200	0.121	166
61	2.2	4.0	2	1	1	1	1	2.2	2	0.342	0.230	0.078	2	1	0.200	0.094	178
62	2.0	3.1	1	1	1	1	1	2.0	2	0.272	0.222	0.060	2	1	0.200	0.072	193
63	9.8	3.2	1	1	1	1	2	4.0	2	0.533	0.335	0.178	2	1	0.200	0.214	126
64	2.0	3.5	1	1	1	1	1	2.0	2	0.283	0.222	0.063	2	1	0.200	0.075	188
65	2.0	3.7	2	3	1	1	1	2.6	2	0.391	0.243	0.095	2	1	0.200	0.114	170
66A	5.0	3.5	5	1	1	1	1	3.0	2	0.516	0.258	0.133	2	1	0.200	0.160	145
66B	3.9	2.4	4	1	1	1	3	6.8	6	0.408	0.623	0.254	2	1	0.200	0.305	66
66C	2.0	2.4	1	1	1	1	3	6.7	2	0.248	0.469	0.116	2	1	0.200	0.139	155
66D	2.0	4.3	5	1	1	1	2	3.1	2	0.445	0.299	0.133	2	1	0.200	0.160	146
66E	2.0	3.8	3	1	1	1	2	3.6	2	0.360	0.318	0.115	2	1	0.200	0.138	156
66F	2.0	5.0	1	1	1	1	3	2.0	2	0.333	0.296	0.099	2	1	0.200	0.119	167
67	2.1	3.0	1	2	1	1	3	5.2	2	0.302	0.416	0.126	2	1	0.200	0.151	152
68	9.8	3.0	2	1	1	1	2	4.0	2	0.558	0.333	0.186	2	1	0.200	0.223	117
69	2.0	3.3	1	1	1	1	1	2.0	2	0.278	0.222	0.062	2	1	0.200	0.074	189
6G1	2.0	1.6	1	1	1	2	5	8.0	10	0.221	0.926	0.204	2	5	0.467	0.300	69
6G2	2.0	1.8	1	1	1	2	5	8.0	10	0.227	0.926	0.210	2	4	0.400	0.294	73
70	2.0	3.7	1	1	1	1	1	2.3	2	0.289	0.233	0.067	2	1	0.200	0.081	184
71	3.1	3.6	1	1	1	1	2	2.7	2	0.321	0.287	0.092	2	1	0.200	0.111	172
72	2.4	1.9	1	1	1	2	5	7.8	6	0.244	0.770	0.188	2	4	0.400	0.263	87
74	3.1	1.9	1	2	1	2	5	7.5	6	0.299	0.758	0.227	2	3	0.333	0.303	67
76A	2.3	3.4	1	1	1	1	3	4.1	2	0.290	0.373	0.108	2	1	0.200	0.130	162
76B	2.0	4.1	1	1	1	1	1	2.0	2	0.304	0.222	0.068	2	1	0.200	0.081	183
76C	3.9	3.0	1	1	1	1	4	6.6	10	0.331	0.800	0.264	2	1	0.200	0.317	61
76D	2.0	3.8	1	2	1	1	1	2.0	2	0.326	0.222	0.073	10	1	0.733	0.126	163
76F	2.0	2.7	1	1	1	1	3	6.5	6	0.255	0.611	0.156	2	1	0.200	0.187	138
76G	2.0	4.6	5	1	1	1	1	2.7	2	0.453	0.249	0.113	2	1	0.200	0.135	157
76H	3.7	2.9	5	1	1	2	3	6.1	10	0.453	0.781	0.354	2	1	0.200	0.425	33
76I	2.9	3.6	5	2	1	1	5	6.1	10	0.484	0.818	0.396	2	1	0.200	0.475	21
76J	2.0	4.0	5	1	1	2	2	4.7	2	0.434	0.396	0.172	10	1	0.733	0.298	70
76K	2.3	4.0	5	1	1	1	2	3.9	2	0.444	0.330	0.147	2	1	0.200	0.176	142
77	2.0	2.3	1	1	1	2	5	8.0	2	0.244	0.630	0.153	2	5	0.467	0.225	115
78	3.1	3.8	2	2	1	1	1	2.6	2	0.394	0.243	0.096	2	1	0.200	0.115	169
79	4.0	2.9	1	1	1	1	1	2.8	2	0.332	0.252	0.084	2	1	0.200	0.101	176
7A1	6.7	3.3	5	3	5	2	4	6.1	6	0.767	0.671	0.515	6	1	0.467	0.755	2

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
7A2	9.3	2.7	1	1	5	1	5	7.6	2	0.633	0.578	0.366	2	1	0.200	0.439	29
7B1	3.0	2.2	2	1	1	2	4	8.2	2	0.306	0.602	0.184	6	1	0.467	0.270	85
7B2	3.6	3.8	5	1	5	2	4	7.3	6	0.613	0.714	0.438	2	1	0.200	0.526	11
7B3	3.5	3.1	5	1	1	1	5	6.4	10	0.456	0.828	0.378	2	1	0.200	0.453	25
7B4	5.0	3.2	5	1	1	1	5	7.3	6	0.508	0.713	0.363	2	1	0.200	0.435	30
7B5	2.0	1.0	1	1	1	1	1	0.0	2	0.200	0.148	0.030	2	1	0.200	0.036	197
7C1	5.5	3.0	3	1	1	1	5	6.4	10	0.450	0.830	0.373	6	1	0.467	0.548	9
7C2	2.5	3.3	5	1	1	1	5	7.5	6	0.425	0.721	0.306	6	1	0.467	0.450	27
7C3	4.8	3.2	5	1	1	1	5	7.2	6	0.499	0.710	0.354	2	1	0.200	0.425	32
7C4	3.9	3.3	5	1	1	1	5	7.8	6	0.472	0.732	0.346	2	1	0.200	0.415	34
7C5	3.0	2.1	5	1	1	1	5	6.2	10	0.404	0.821	0.332	2	1	0.200	0.398	42
7D1	2.6	3.2	5	3	1	1	5	7.0	10	0.493	0.853	0.420	2	1	0.200	0.505	16
7D2	2.4	3.3	5	3	1	1	5	6.6	10	0.490	0.839	0.411	6	1	0.467	0.602	5
7D3	4.3	2.8	5	3	1	1	5	7.5	10	0.535	0.871	0.466	2	1	0.200	0.559	8
7E1	3.1	3.7	5	1	5	2	5	6.9	6	0.590	0.737	0.435	6	1	0.467	0.638	4
7E2	3.1	3.5	5	1	1	2	5	8.3	2	0.454	0.640	0.291	2	1	0.200	0.349	49
7E3	3.4	3.4	2	1	1	1	5	7.3	2	0.361	0.566	0.205	2	1	0.200	0.245	97
7E4	4.7	2.5	5	3	1	2	5	8.7	2	0.541	0.654	0.354	6	1	0.467	0.519	12
7F1	4.2	3.6	5	1	1	2	5	6.8	2	0.493	0.586	0.289	2	1	0.200	0.347	50
7F2	2.8	3.3	5	1	1	2	5	6.7	6	0.439	0.730	0.321	6	1	0.467	0.470	23
7F3	5.4	4.0	5	1	5	1	5	7.3	2	0.681	0.565	0.385	2	1	0.200	0.462	24
7F4	4.4	3.3	5	2	5	2	5	7.7	2	0.656	0.618	0.406	2	1	0.200	0.487	20
7G1	8.3	2.6	5	3	5	2	4	7.8	2	0.798	0.587	0.469	2	1	0.200	0.562	7
7G2	3.7	2.9	4	2	5	1	5	6.9	2	0.587	0.550	0.323	2	1	0.200	0.387	44
7G3	2.6	4.1	5	2	1	1	5	7.7	2	0.491	0.580	0.285	2	1	0.200	0.342	52
7G4	3.3	3.8	5	2	1	1	5	8.2	6	0.505	0.748	0.377	2	1	0.200	0.453	26
7G5	2.6	3.1	5	1	1	1	5	7.8	2	0.424	0.586	0.248	2	1	0.200	0.298	71
80	2.1	3.6	1	1	1	1	1	2.0	2	0.291	0.223	0.065	2	1	0.200	0.078	187
81	2.0	3.5	1	1	1	1	1	2.3	2	0.283	0.232	0.066	2	1	0.200	0.079	186
82	2.0	3.3	4	3	1	1	3	6.4	6	0.445	0.606	0.269	6	1	0.467	0.395	43
83	2.8	3.6	1	2	1	1	2	3.5	2	0.348	0.317	0.110	2	1	0.200	0.132	160
84	2.2	4.1	4	1	1	1	1	2.1	2	0.411	0.225	0.092	2	1	0.200	0.111	171
85	2.1	2.2	1	1	5	1	4	8.9	10	0.376	0.884	0.332	2	3	0.333	0.443	28
86A	2.0	2.5	1	2	1	1	4	7.7	6	0.286	0.692	0.198	2	1	0.200	0.237	103
86B	2.0	2.8	1	2	1	1	4	7.8	6	0.295	0.696	0.205	2	1	0.200	0.246	96
86C	3.5	2.6	1	2	1	1	3	6.7	10	0.337	0.765	0.258	2	1	0.200	0.309	65

Distribution Main
Risk of Failure Ranking by Areas

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 (1-5)	Crossings (1-5)	Valve Spacing (1-5)	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		
86D	2.5	3.0	5	1	1	1	3	6.5	6	0.415	0.610	0.253	6	1	0.467	0.372	47
87A	2.0	3.6	1	3	1	1	2	3.6	2	0.353	0.317	0.112	2	1	0.200	0.134	158
87B	5.8	4.2	1	1	1	1	2	3.0	2	0.434	0.295	0.128	2	1	0.200	0.154	151
88	2.1	4.0	1	4	1	1	1	2.0	2	0.403	0.224	0.090	2	1	0.200	0.108	173
89	2.0	3.4	1	1	1	1	2	3.8	6	0.280	0.475	0.133	2	1	0.200	0.160	147
90A	3.1	2.1	1	1	1	2	4	7.4	6	0.273	0.718	0.196	2	5	0.467	0.288	74
90B	2.0	1.8	1	1	5	2	5	8.0	6	0.362	0.778	0.281	2	5	0.467	0.413	35
90C	2.8	2.1	1	1	1	2	5	8.9	10	0.262	0.958	0.251	2	5	0.467	0.367	48
90D	3.2	2.0	1	1	1	2	4	7.4	6	0.274	0.719	0.197	2	4	0.400	0.276	81
91	3.4	2.8	1	1	1	1	4	6.5	6	0.306	0.647	0.198	2	2	0.267	0.251	94
92	2.0	2.0	1	1	5	2	4	8.0	10	0.367	0.889	0.326	10	1	0.733	0.565	6
93A	2.4	2.7	1	1	1	1	4	7.6	10	0.271	0.838	0.227	2	2	0.267	0.287	75
93B	2.4	2.3	1	1	1	1	4	7.7	6	0.255	0.691	0.176	2	1	0.200	0.212	128
93C	2.7	2.9	1	1	1	1	4	7.6	6	0.286	0.688	0.197	2	1	0.200	0.236	105
93D	2.0	2.4	1	1	1	1	4	7.9	6	0.246	0.701	0.173	2	2	0.267	0.219	122
95	2.3	3.1	1	1	1	1	5	8.0	2	0.278	0.592	0.165	10	1	0.733	0.286	76
96	2.0	3.3	1	1	1	1	1	2.0	2	0.276	0.224	0.062	2	1	0.200	0.074	190

Appendix C: Pipe Damage

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
02A	49,737	ACP	699	1.4	1	0.0	3.1
		DIP	23,015	46.2	1	0.5	
		PVC	26,023	52.3	5	2.6	
02B	26,187	DIP	15,774	60.2	1	0.6	2.6
		PVC	10,413	39.8	5	2.0	
02C	24,104	DIP	16,412	68.1	1	0.7	2.3
		PVC	7,693	31.9	5	1.6	
02D	32,298	CIP	30	0.1	1	0.0	1.3
		DIP	29,681	91.9	1	0.9	
		PVC	2,588	8.0	5	0.4	
02E	26,865	DIP	26,865	99.9	1	1.0	1.0
03A	34,221	ACP	25,565	74.7	1	0.7	1.3
		CIP	62	0.2	1	0.0	
		DIP	6,036	17.6	1	0.2	
		PVC	2,557	7.5	5	0.4	
03B	27,891	ACP	24,317	87.2	1	0.9	1.0
		DIP	3,458	12.4	1	0.1	
		PVC	75	0.3	5	0.0	
		UNK	41	0.1	5	0.0	
04	50,102	ACP	46,895	93.6	1	0.9	1.0
		DIP	3,172	6.3	1	0.1	
		UNK	35	0.1	5	0.0	
05A	43,592	ACP	34,706	79.6	1	0.8	1.7
		CIP	489	1.1	1	0.0	
		DIP	435	1.0	1	0.0	
		PVC	7,962	18.2	5	0.9	
05B	40,362	ACP	661	1.6	1	0.0	4.9
		DIP	505	1.3	1	0.0	
		PVC	39,196	97.0	5	4.9	
05C	45,827	ACP	23,384	51.0	1	0.5	2.5
		DIP	5,575	12.2	1	0.1	
		PVC	16,690	36.4	5	1.8	
		UNK	177	0.4	5	0.0	
06A	25,310	ACP	25,153	99.4	1	1.0	1.0
		DIP	131	0.5	1	0.0	
		PVC	26	0.1	5	0.0	
06B	19,061	ACP	19,061	100.0	1	1.0	1.0
06C	23,744	ACP	23,283	98.1	1	1.0	1.1
		DIP	154	0.6	1	0.0	
		UNK	307	1.3	5	0.1	
06D	28,174	ACP	27,653	98.1	1	1.0	1.0
		CIP	54	0.2	1	0.0	
		DIP	467	1.7	1	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
06E	21,882	ACP	21,877	100.0	1	1.0	1.0
		DIP	6	0.0	1	0.0	
06F	8,053	ACP	7,689	95.5	1	1.0	1.0
		DIP	292	3.6	1	0.0	
		ODS	71	0.9	1	0.0	
06H	24,782	ACP	191	0.8	1	0.0	1.0
		DIP	24,591	99.2	1	1.0	
06I	16,123	ACP	15,488	96.1	1	1.0	1.0
		DIP	463	2.9	1	0.0	
		PVC	172	1.1	5	0.1	
06J	12,448	ACP	10,547	84.7	1	0.8	1.0
		DIP	1,773	14.2	1	0.1	
		PVC	128	1.0	5	0.1	
06K	21,268	ACP	18,738	88.1	1	0.9	1.5
		PVC	2,531	11.9	5	0.6	
06M	15,079	ACP	3,761	24.9	1	0.2	1.0
		DIP	11,317	75.1	1	0.8	
06N	11,487	ACP	1,057	9.2	1	0.1	1.0
		DIP	10,430	90.8	1	0.9	
09	12,779	ACP	12,622	98.8	1	1.0	1.0
		DIP	157	1.2	1	0.0	
10	14,807	ACP	320	2.2	1	0.0	4.8
		DIP	562	3.8	1	0.0	
		MLS	13,925	94.0	5	4.7	
11	3,013	ACP	2,574	85.4	1	0.9	1.6
		MLS	438	14.6	5	0.7	
12A	49,075	ACP	36,656	74.7	1	0.7	2.0
		DIP	406	0.8	1	0.0	
		MLS	11,511	23.5	5	1.2	
		PVC	502	1.0	5	0.1	
12B	39,795	ACP	37,832	95.1	1	1.0	1.0
		DIP	1,811	4.6	1	0.0	
		MLS	152	0.4	5	0.0	
13A	38,705	ACP	5,185	13.4	1	0.1	4.2
		DIP	2,665	6.9	1	0.1	
		MLS	20,027	51.7	5	2.6	
		PVC	10,829	28.0	5	1.4	
13B	34,236	ACP	21,183	61.9	1	0.6	2.3
		CIP	517	1.5	1	0.0	
		DIP	1,100	3.2	1	0.0	
		MLS	3,706	10.8	5	0.5	
		PVC	7,730	22.6	5	1.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
14	14,469	ACP	2,417	16.7	1	0.2	4.1
		DIP	700	4.8	1	0.0	
		PVC	11,353	78.5	5	3.9	
15	5,808	CIP	410	7.1	1	0.1	4.7
		PVC	5,399	92.9	5	4.6	
16	5,486	ACP	4,191	76.4	1	0.8	1.0
		DIP	1,295	23.6	1	0.2	
17A	39,927	ACP	15,881	39.8	1	0.4	3.1
		DIP	2,815	7.0	1	0.1	
		MLS	10,616	26.6	5	1.3	
		ODS	14	0.0	1	0.0	
		PVC	10,583	26.5	5	1.3	
		UNK	18	0.0	5	0.0	
17B	45,942	ACP	11,430	24.9	1	0.2	3.8
		CIP	722	1.6	1	0.0	
		DIP	1,784	3.9	1	0.0	
		MLS	6,997	15.2	5	0.8	
		PVC	25,006	54.4	5	2.7	
		UNK	3	0.0	5	0.0	
18	53,659	ACP	22,317	41.6	1	0.4	3.1
		DIP	2,883	5.4	1	0.1	
		MLS	13,976	26.0	5	1.3	
		PVC	14,483	27.0	5	1.3	
19	48,684	ACP	22,223	45.6	1	0.5	2.9
		DIP	3,245	6.7	1	0.1	
		MLS	11,696	24.0	5	1.2	
		PVC	11,518	23.7	5	1.2	
		UNK	2	0.0	5	0.0	
1A	9,661	ACP	9,536	98.7	1	1.0	1.1
		UNK	125	1.3	5	0.1	
1B	6,461	ACP	5,484	84.9	1	0.8	1.2
		DIP	618	9.6	1	0.1	
		PVC	359	5.6	5	0.3	
1C	10,619	ACP	10,148	95.6	1	1.0	1.0
		DIP	463	4.4	1	0.0	
		UNK	8	0.1	5	0.0	
20A	31,012	ACP	29,305	94.5	1	0.9	1.1
		DIP	1,069	3.4	1	0.0	
		PVC	638	2.1	5	0.1	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
20B	47,397	ACP	34,609	73.0	1	0.7	1.7
		CIP	172	0.4	1	0.0	
		DIP	4,446	9.4	1	0.1	
		MLS	5,401	11.4	5	0.6	
		PVC	2,770	5.8	5	0.3	
21	8,090	ACP	6,096	75.4	1	0.8	1.0
		DIP	1,994	24.6	1	0.2	
22	4,125	ACP	3,959	96.0	1	1.0	1.2
		PVC	165	4.0	5	0.2	
23	66,345	ACP	62,784	94.6	1	0.9	1.0
		DIP	2,900	4.4	1	0.0	
		PVC	636	1.0	5	0.0	
		UNK	26	0.0	5	0.0	
24A	48,099	ACP	23,931	49.8	1	0.5	2.5
		CIP	1,135	2.4	1	0.0	
		DIP	4,591	9.5	1	0.1	
		MLS	9,937	20.7	5	1.0	
		PVC	8,465	17.6	5	0.9	
		UNK	41	0.1	5	0.0	
24B	53,615	ACP	28,707	53.5	1	0.5	2.8
		CIP	60	0.1	1	0.0	
		DIP	461	0.9	1	0.0	
		MLS	11,985	22.4	5	1.1	
		PVC	12,183	22.7	5	1.1	
		UNK	220	0.4	5	0.0	
25	6,598	ACP	5,409	82.0	1	0.8	1.7
		PVC	1,189	18.0	5	0.9	
26A	29,505	ACP	7,078	24.0	1	0.2	3.4
		DIP	4,938	16.7	1	0.2	
		MLS	13,482	45.7	5	2.3	
		PVC	4,006	13.6	5	0.7	
26B	40,689	ACP	18,216	44.8	1	0.4	3.0
		DIP	2,052	5.0	1	0.1	
		MLS	14,825	36.4	5	1.8	
		PVC	5,597	13.8	5	0.7	
27	32,113	ACP	7,828	24.4	1	0.2	3.4
		DIP	4,849	15.1	1	0.2	
		MLS	15,676	48.8	5	2.4	
		PVC	3,659	11.4	5	0.6	
		UNK	102	0.3	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
28	54,406	ACP	28,653	52.7	1	0.5	2.9
		DIP	254	0.5	1	0.0	
		MLS	16,018	29.4	5	1.5	
		PVC	9,481	17.4	5	0.9	
29	51,320	ACP	30,382	59.2	1	0.6	2.1
		CIP	74	0.1	1	0.0	
		DIP	7,333	14.3	1	0.1	
		MLS	10,954	21.3	5	1.1	
		PVC	2,577	5.0	5	0.3	
30	4,648	ACP	4,307	92.7	1	0.9	1.3
		PVC	341	7.3	5	0.4	
31A	24,694	ACP	21,520	87.1	1	0.9	1.2
		DIP	1,707	6.9	1	0.1	
		PVC	1,467	5.9	5	0.3	
31B	583	ACP	338	57.9	1	0.6	1.0
		DIP	246	42.1	1	0.4	
32	10,573	ACP	10,558	99.9	1	1.0	1.0
		PVC	15	0.1	5	0.0	
33	19,067	ACP	15,718	82.4	1	0.8	1.0
		DIP	3,349	17.6	1	0.2	
34	6,598	ACP	5,157	78.2	1	0.8	1.9
		MLS	1,441	21.8	5	1.1	
35	35,341	ACP	16,751	47.4	1	0.5	3.0
		DIP	572	1.6	1	0.0	
		MLS	17,228	48.7	5	2.4	
		PVC	790	2.2	5	0.1	
36	45,715	ACP	20,329	44.5	1	0.4	3.0
		DIP	2,720	5.9	1	0.1	
		MLS	16,321	35.4	5	1.8	
		PVC	6,345	13.9	5	0.7	
37	4,973	ACP	2,551	51.3	1	0.5	2.9
		DIP	45	0.9	1	0.0	
		MLS	2,376	47.8	5	2.4	
38A	21,842	ACP	19,884	91.0	1	0.9	1.2
		CIP	186	0.9	1	0.0	
		DIP	721	3.3	1	0.0	
		MLS	19	0.1	5	0.0	
		PVC	984	4.5	5	0.2	
		UNK	48	0.2	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
38B	47,410	ACP	29,259	61.7	1	0.6	2.4
		DIP	1,612	3.4	1	0.0	
		MLS	13,534	28.5	5	1.4	
		PVC	2,972	6.3	5	0.3	
		UNK	32	0.1	5	0.0	
39	12,431	ACP	10,847	87.3	1	0.9	1.1
		CIP	884	7.1	1	0.1	
		DIP	237	1.9	1	0.0	
		MLS	31	0.2	5	0.0	
		PVC	400	3.2	5	0.2	
		UNK	30	0.2	5	0.0	
40A	27,257	ACP	11,353	41.7	1	0.4	2.8
		DIP	3,359	12.3	1	0.1	
		MLS	1,693	6.2	5	0.3	
		PVC	10,853	39.8	5	2.0	
40B	28,494	ACP	14,350	50.4	1	0.5	2.6
		DIP	2,784	9.8	1	0.1	
		MLS	6,430	22.3	5	1.1	
		PVC	4,930	17.3	5	0.9	
41	18,918	ACP	17,810	94.1	1	0.9	1.2
		DIP	115	0.6	1	0.0	
		MLS	734	3.9	5	0.2	
		PVC	258	1.4	5	0.1	
42A	1,124	DIP	1,124	100.0	1	1.0	1.0
42B	7,823	ACP	4,628	59.2	1	0.6	1.5
		DIP	1,278	16.3	1	0.2	
		ODS	988	12.6	1	0.1	
		PVC	929	11.9	5	0.6	
42C	9,689	ACP	7,182	74.1	1	0.7	1.4
		DIP	1,572	16.2	1	0.2	
		PVC	935	9.7	5	0.5	
42D	11,170	ACP	10,788	96.6	1	1.0	1.1
		DIP	8	0.1	1	0.0	
		PVC	365	3.3	5	0.2	
		UNK	10	0.1	5	0.0	
42E	19,432	ACP	19,432	100.0	1	1.0	1.0
42F	11,906	ACP	9,278	77.9	1	0.8	1.1
		DIP	2,327	19.5	1	0.2	
		PVC	260	2.2	5	0.1	
		UNK	41	0.3	5	0.0	
42G	1,499	ACP	442	29.5	1	0.3	1.0
		DIP	1,057	70.5	1	0.7	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
42H	601	ACP	576	95.8	1	1.0	1.0
		DIP	25	4.2	1	0.0	
42I	301	ACP	301	100.0	1	1.0	1.0
42J	5,965	ACP	3,740	62.7	1	0.6	1.4
		DIP	872	14.6	1	0.1	
		ODS	760	12.7	1	0.1	
		PVC	593	9.9	5	0.5	
42K	3,973	ACP	1,114	28.0	1	0.3	2.5
		DIP	1,397	35.2	1	0.4	
		PVC	1,440	36.2	5	1.8	
		UNK	22	0.6	5	0.0	
43A	13,649	ACP	10,469	76.7	1	0.8	1.8
		DIP	205	1.5	1	0.0	
		ODS	284	2.1	1	0.0	
		PVC	2,679	19.6	5	1.0	
		UNK	12	0.1	5	0.0	
43B	88	DIP	88	100.0	1	1.0	1.0
43C	887	ACP	173	19.5	1	0.2	1.0
		DIP	714	80.5	1	0.8	
43D	572	ACP	238	41.6	1	0.4	2.0
		DIP	186	32.5	1	0.3	
		PVC	148	26.0	5	1.3	
44	20,073	ACP	6,386	31.8	1	0.3	2.7
		DIP	5,270	26.3	1	0.3	
		PVC	8,416	41.9	5	2.1	
45A	41,400	ACP	1,011	2.4	1	0.0	1.9
		DIP	31,005	74.9	1	0.7	
		ODS	13	0.0	1	0.0	
		PVC	9,349	22.6	5	1.1	
		UNK	23	0.1	5	0.0	
45B	11,288	ACP	4,486	39.7	1	0.4	1.7
		DIP	4,631	41.0	1	0.4	
		ODS	134	1.2	1	0.0	
		PVC	2,037	18.0	5	0.9	
46	10,206	DIP	242	2.4	1	0.0	4.9
		PVC	9,964	97.6	5	4.9	
47	1,523	DIP	15	1.0	1	0.0	5.0
		PVC	1,508	99.0	5	5.0	
48	35,406	ACP	15,364	43.4	1	0.4	1.3
		DIP	1,923	5.4	1	0.1	
		ODS	15,532	43.9	1	0.4	
		PVC	2,566	7.2	5	0.4	
		UNK	21	0.1	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
49	1,903	ODS	14	0.7	1	0.0	5.0
		PVC	1,889	99.3	5	5.0	
51	34,062	ACP	1,180	3.5	1	0.0	1.3
		DIP	30,169	88.6	1	0.9	
		PVC	2,713	8.0	5	0.4	
52A	16,552	ACP	5,942	35.9	1	0.4	1.0
		DIP	10,611	64.1	1	0.6	
52B	10,224	DIP	10,224	100.0	1	1.0	1.0
53A	21,627	ACP	19,235	88.9	1	0.9	1.3
		DIP	803	3.7	1	0.0	
		PVC	1,589	7.3	5	0.4	
53B	6,857	ACP	5,279	77.0	1	0.8	1.0
		DIP	1,578	23.0	1	0.2	
54	8,578	ACP	7,103	82.8	1	0.8	1.4
		DIP	566	6.6	1	0.1	
		PVC	909	10.6	5	0.5	
55	71,352	ACP	27,184	38.1	1	0.4	0.8
		DIP	3,256	4.6	1	0.0	
		MLS	2,974	4.2	5	0.2	
		PVC	2,209	3.1	5	0.2	
		UNK	53	0.1	5	0.0	
56A	3,122	ACP	914	29.3	1	0.3	1.0
		DIP	2,208	70.7	1	0.7	
56B	178,273	ACP	19,814	11.1	1	0.1	0.4
		DIP	21,889	12.3	1	0.1	
		ODS	16,324	9.2	1	0.1	
		PVC	1,398	0.8	5	0.0	
57	8,247	ACP	3,081	37.4	1	0.4	2.6
		DIP	1,889	22.9	1	0.2	
		MLS	2,556	31.0	5	1.5	
		PVC	723	8.8	5	0.4	
57A	38,947	ACP	26,219	67.3	1	0.7	1.7
		DIP	6,185	15.9	1	0.2	
		MLS	646	1.7	5	0.1	
		PVC	5,877	15.1	5	0.8	
		UNK	20	0.1	5	0.0	
57B	450	ACP	450	100.0	1	1.0	1.0
58A	14,811	ACP	2	0.0	1	0.0	1.2
		DIP	13,966	94.3	1	0.9	
		PVC	842	5.7	5	0.3	
58B	3,344	ACP	292	8.7	1	0.1	1.0
		DIP	3,053	91.3	1	0.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
58C	86	ACP	62	72.2	1	0.7	1.0
		DIP	24	27.8	1	0.3	
59	7,477	ACP	298	4.0	1	0.0	1.6
		DIP	6,150	82.2	1	0.8	
		PVC	1,029	13.8	5	0.7	
60A	11,070	DIP	11,070	100.0	1	1.0	1.0
60B	5,832	DIP	4,081	70.0	1	0.7	2.2
		ODS	33	0.6	1	0.0	
		PVC	1,700	29.2	5	1.5	
		UNK	17	0.3	5	0.0	
61	6,537	ACP	159	2.4	1	0.0	1.1
		DIP	6,203	94.9	1	0.9	
		PVC	175	2.7	5	0.1	
62	5,625	DIP	5,625	100.0	1	1.0	1.0
63	32,820	ACP	358	1.1	1	0.0	4.9
		DIP	320	1.0	1	0.0	
		ODS	9	0.0	1	0.0	
		PVC	32,090	97.8	5	4.9	
		UNK	43	0.1	5	0.0	
64	4,271	DIP	4,271	100.0	1	1.0	1.0
65	13,735	ACP	973	7.1	1	0.1	1.0
		DIP	12,513	91.1	1	0.9	
		ODS	249	1.8	1	0.0	
66A	5,825	ACP	79	1.4	1	0.0	2.5
		DIP	3,533	60.7	1	0.6	
		ODS	53	0.9	1	0.0	
		PVC	2,097	36.0	5	1.8	
		UNK	62	1.1	5	0.1	
66B	5,477	ACP	3,713	67.8	1	0.7	1.9
		DIP	376	6.9	1	0.1	
		ODS	90	1.6	1	0.0	
		PVC	1,160	21.2	5	1.1	
		UNK	137	2.5	5	0.1	
66C	2,359	ACP	1,832	77.7	1	0.8	1.0
		DIP	527	22.3	1	0.2	
66D	5,144	ACP	902	17.5	1	0.2	1.0
		DIP	4,219	82.0	1	0.8	
		PVC	24	0.5	5	0.0	
66E	3,079	ACP	818	26.6	1	0.3	1.0
		DIP	2,261	73.4	1	0.7	
66F	538	DIP	538	100.0	1	1.0	1.0

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
67	1,947	ACP	1,010	51.9	1	0.5	1.1
		DIP	909	46.7	1	0.5	
		UNK	28	1.4	5	0.1	
68	1,371	DIP	29	2.1	1	0.0	4.9
		ODS	10	0.7	1	0.0	
		PVC	1,332	97.2	5	4.9	
69	3,856	DIP	3,856	100.0	1	1.0	1.0
6G1	7,345	ACP	7,345	100.0	1	1.0	1.0
6G2	737	ACP	737	100.0	1	1.0	1.0
70	32,022	ACP	1,578	4.9	1	0.0	1.0
		DIP	30,444	95.1	1	1.0	
71	26,496	ACP	1,969	7.4	1	0.1	1.5
		DIP	20,863	78.7	1	0.8	
		ODS	117	0.4	1	0.0	
		PVC	3,546	13.4	5	0.7	
72	10,362	ACP	9,826	94.8	1	0.9	1.2
		DIP	4	0.0	1	0.0	
		PVC	520	5.0	5	0.3	
		UNK	13	0.1	5	0.0	
74	11,736	ACP	10,165	86.6	1	0.9	1.5
		DIP	10	0.1	1	0.0	
		MLS	5	0.0	5	0.0	
		PVC	1,554	13.2	5	0.7	
		UNK	3	0.0	5	0.0	
76A	12,044	ACP	3,977	33.0	1	0.3	1.2
		DIP	7,551	62.7	1	0.6	
		PVC	516	4.3	5	0.2	
76B	4,114	DIP	4,114	100.0	1	1.0	1.0
76C	3,323	ACP	2,276	68.5	1	0.7	2.0
		DIP	248	7.5	1	0.1	
		PVC	799	24.0	5	1.2	
76D	5,884	DIP	5,881	99.9	1	1.0	1.0
		PVC	4	0.1	5	0.0	
76F	3,142	ACP	2,359	75.1	1	0.8	1.0
		DIP	783	24.9	1	0.2	
76G	2,439	ACP	292	12.0	1	0.1	1.0
		DIP	2,147	88.0	1	0.9	
76H	4,066	ACP	2,444	60.1	1	0.6	1.9
		DIP	730	18.0	1	0.2	
		ODS	6	0.2	1	0.0	
		PVC	860	21.1	5	1.1	
		UNK	25	0.6	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
76I	1,194	ACP	579	48.5	1	0.5	1.5
		DIP	340	28.5	1	0.3	
		ODS	140	11.7	1	0.1	
		PVC	134	11.3	5	0.6	
76J	1,005	ACP	451	44.9	1	0.4	1.0
		DIP	554	55.1	1	0.6	
76K	1,317	ACP	402	30.5	1	0.3	1.1
		DIP	867	65.8	1	0.7	
		PVC	49	3.7	5	0.2	
77	774	ACP	774	100.0	1	1.0	1.0
78	22,333	ACP	568	2.5	1	0.0	1.5
		DIP	18,436	82.5	1	0.8	
		ODS	355	1.6	1	0.0	
		PVC	2,914	13.0	5	0.7	
		UNK	61	0.3	5	0.0	
79	7,373	ACP	339	4.6	1	0.0	2.0
		DIP	5,169	70.1	1	0.7	
		PVC	1,824	24.7	5	1.2	
		UNK	42	0.6	5	0.0	
7A1	9,862	ACP	4,021	40.8	1	0.4	3.4
		PVC	5,046	51.2	5	2.6	
		UNK	795	8.1	5	0.4	
7A2	10,101	ACP	485	4.8	1	0.0	4.7
		CIP	384	3.8	1	0.0	
		PVC	3,624	35.9	5	1.8	
		UNK	5,609	55.5	5	2.8	
7B1	5,341	ACP	4,680	87.6	1	0.9	1.5
		UNK	661	12.4	5	0.6	
7B2	8,145	ACP	6,480	79.6	1	0.8	1.8
		DIP	6	0.1	1	0.0	
		PVC	1,520	18.7	5	0.9	
		UNK	139	1.7	5	0.1	
7B3	7,806	ACP	4,660	59.7	1	0.6	1.8
		CIP	455	5.8	1	0.1	
		DIP	1,178	15.1	1	0.2	
		PVC	1,305	16.7	5	0.8	
		UNK	207	2.7	5	0.1	
7B4	8,220	ACP	4,751	57.8	1	0.6	2.5
		DIP	361	4.4	1	0.0	
		PVC	1,693	20.6	5	1.0	
		UNK	1,415	17.2	5	0.9	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7C1	5,378	ACP	1,244	23.1	1	0.2	2.7
		CIP	1,405	26.1	1	0.3	
		ODS	395	7.3	1	0.1	
		PVC	1,855	34.5	5	1.7	
		UNK	479	8.9	5	0.4	
7C2	5,053	ACP	3,081	61.0	1	0.6	1.2
		CIP	1,663	32.9	1	0.3	
		UNK	310	6.1	5	0.3	
7C3	5,949	ACP	1,682	28.3	1	0.3	2.4
		CIP	2,208	37.1	1	0.4	
		DIP	6	0.1	1	0.0	
		PVC	755	12.7	5	0.6	
		UNK	1,299	21.8	5	1.1	
7C4	13,990	ACP	8,163	58.4	1	0.6	2.0
		CCP	250	1.8	1	0.0	
		CIP	1,171	8.4	1	0.1	
		DIP	1,065	7.6	1	0.1	
		PVC	308	2.2	5	0.1	
		UNK	3,032	21.7	5	1.1	
7C5	6,039	ACP	1,700	28.2	1	0.3	1.5
		CIP	3,221	53.3	1	0.5	
		DIP	360	6.0	1	0.1	
		PVC	668	11.1	5	0.6	
		UNK	90	1.5	5	0.1	
7D1	17,022	ACP	7,958	46.8	1	0.5	1.3
		CIP	6,971	41.0	1	0.4	
		DIP	816	4.8	1	0.0	
		UNK	1,276	7.5	5	0.4	
7D2	8,007	ACP	2,471	30.9	1	0.3	1.2
		CIP	4,886	60.8	1	0.6	
		DIP	285	3.6	1	0.0	
		UNK	364	4.5	5	0.2	
7D3	10,313	ACP	2,306	22.0	1	0.2	2.1
		CIP	5,029	48.6	1	0.5	
		DIP	57	0.6	1	0.0	
		UNK	2,921	28.3	5	1.4	
7E1	16,670	ACP	9,426	56.5	1	0.6	1.5
		CIP	1,877	11.3	1	0.1	
		DIP	3,162	18.9	1	0.2	
		UNK	2,206	13.2	5	0.7	
7E2	2,538	ACP	2,181	85.9	1	0.9	1.6
		UNK	357	14.1	5	0.7	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7E3	8,596	ACP	4,998	58.1	1	0.6	1.7
		CIP	2,049	23.8	1	0.2	
		DIP	21	0.2	1	0.0	
		PVC	838	9.8	5	0.5	
		UNK	690	8.0	5	0.4	
7E4	9,777	ACP	4,815	49.3	1	0.5	2.4
		CIP	846	8.7	1	0.1	
		CONC	792	8.1	1	0.1	
		PVC	22	0.2	5	0.0	
		UNK	3,301	33.8	5	1.7	
7F1	7,544	ACP	2,764	36.6	1	0.4	2.1
		CIP	1,408	18.7	1	0.2	
		DIP	1,320	17.5	1	0.2	
		PVC	376	5.0	5	0.2	
		UNK	1,676	22.2	5	1.1	
7F2	9,451	ACP	1,602	16.9	1	0.2	1.4
		CIP	6,727	71.2	1	0.7	
		DIP	131	1.4	1	0.0	
		UNK	992	10.5	5	0.5	
7F3	9,263	ACP	4,491	48.5	1	0.5	2.7
		CIP	386	4.2	1	0.0	
		DIP	416	4.5	1	0.0	
		MLS	711	7.7	5	0.4	
		PVC	1,462	15.8	5	0.8	
		UNK	1,798	19.4	5	1.0	
7F4	7,990	ACP	3,507	43.9	1	0.4	2.2
		CIP	1,557	19.5	1	0.2	
		DIP	519	6.5	1	0.1	
		MLS	251	3.1	5	0.2	
		UNK	2,158	27.0	5	1.4	
7G1	6,060	DIP	1,270	21.0	1	0.2	4.2
		PVC	478	7.9	5	0.4	
		UNK	4,311	71.1	5	3.6	
7G2	4,803	ACP	3,170	66.0	1	0.7	1.8
		DIP	626	13.0	1	0.1	
		PVC	625	13.0	5	0.7	
		UNK	381	7.9	5	0.4	
7G3	9,148	ACP	6,731	73.6	1	0.7	1.3
		CIP	1,445	15.8	1	0.2	
		DIP	256	2.8	1	0.0	
		UNK	716	7.8	5	0.4	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7G4	8,708	ACP	5,926	68.1	1	0.7	1.7
		CCP	806	9.3	1	0.1	
		CIP	48	0.6	1	0.0	
		DIP	470	5.4	1	0.1	
		UNK	1,457	16.7	5	0.8	
7G5	4,690	ACP	4,316	92.0	1	0.9	1.3
		DIP	11	0.2	1	0.0	
		PVC	257	5.5	5	0.3	
		UNK	106	2.3	5	0.1	
80	24,930	DIP	24,634	98.8	1	1.0	1.0
		PVC	253	1.0	5	0.1	
		UNK	43	0.2	5	0.0	
81	12,011	ACP	4	0.0	1	0.0	1.0
		DIP	11,565	95.0	1	1.0	
		ODS	443	3.7	1	0.0	
82	14,783	ACP	10,702	72.4	1	0.7	1.0
		DIP	4,060	27.5	1	0.3	
		UNK	21	0.1	5	0.0	
83	14,222	ACP	3,108	21.9	1	0.2	1.4
		DIP	9,603	67.5	1	0.7	
		MLS	144	1.0	5	0.1	
		PVC	1,360	9.6	5	0.5	
		UNK	7	0.0	5	0.0	
84	4,906	ACP	5	0.1	1	0.0	1.1
		DIP	4,751	96.8	1	1.0	
		PVC	150	3.1	5	0.2	
85	27,675	ACP	9,059	32.7	1	0.3	1.0
		DIP	1,504	5.4	1	0.1	
		ODS	16,899	61.1	1	0.6	
		PVC	213	0.8	5	0.0	
86A	24,058	ACP	22,730	94.5	1	0.9	1.0
		DIP	1,268	5.3	1	0.1	
		PVC	59	0.2	5	0.0	
		UNK	1	0.0	5	0.0	
86B	26,243	ACP	25,312	96.4	1	1.0	1.0
		DIP	856	3.3	1	0.0	
		PVC	76	0.3	5	0.0	
86C	27,715	ACP	19,728	71.2	1	0.7	1.8
		DIP	2,721	9.8	1	0.1	
		PVC	5,260	19.0	5	0.9	
		UNK	7	0.0	5	0.0	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
86D	4,835	ACP	3,520	72.8	1	0.7	1.2
		DIP	1,037	21.5	1	0.2	
		PVC	277	5.7	5	0.3	
87A	15,768	ACP	4,045	25.7	1	0.3	1.0
		DIP	11,654	73.9	1	0.7	
		ODS	19	0.1	1	0.0	
		PVC	50	0.3	5	0.0	
87B	3,087	DIP	1,601	51.9	1	0.5	2.9
		PVC	1,485	48.1	5	2.4	
88	29,049	DIP	28,551	98.3	1	1.0	1.1
		ODS	69	0.2	1	0.0	
		PVC	429	1.5	5	0.1	
89	13,800	ACP	714	5.2	1	0.1	1.0
		DIP	10,493	76.0	1	0.8	
		ODS	2,593	18.8	1	0.2	
90A	29,524	ACP	25,002	84.7	1	0.8	1.6
		DIP	312	1.1	1	0.0	
		PVC	4,077	13.8	5	0.7	
		UNK	133	0.4	5	0.0	
90B	3,875	ACP	3,875	100.0	1	1.0	1.0
90C	17,273	ACP	4,726	27.4	1	0.3	1.4
		DIP	12	0.1	1	0.0	
		MLS	19	0.1	5	0.0	
		ODS	10,829	62.7	1	0.6	
		PVC	1,668	9.7	5	0.5	
		UNK	19	0.1	5	0.0	
90D	1,803	ACP	1,536	85.2	1	0.9	1.6
		PVC	267	14.8	5	0.7	
91	45,863	ACP	31,508	68.7	1	0.7	1.7
		DIP	6,428	14.0	1	0.1	
		PVC	7,926	17.3	5	0.9	
92	617	ACP	617	100.0	1	1.0	1.0
93A	38,757	ACP	35,676	92.0	1	0.9	1.2
		DIP	1,239	3.2	1	0.0	
		PVC	1,841	4.7	5	0.2	
		UNK	2	0.0	5	0.0	
93B	35,569	ACP	33,025	92.8	1	0.9	1.2
		DIP	900	2.5	1	0.0	
		PVC	1,643	4.6	5	0.2	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
93C	35,788	ACP	32,201	90.0	1	0.9	1.3
		DIP	498	1.4	1	0.0	
		MLS	4	0.0	5	0.0	
		PVC	3,052	8.5	5	0.4	
		UNK	33	0.1	5	0.0	
93D	33,692	ACP	33,250	98.7	1	1.0	1.0
		DIP	396	1.2	1	0.0	
		PVC	45	0.1	5	0.0	
95	673	ACP	648	96.3	1	1.0	1.1
		PVC	11	1.6	5	0.1	
		UNK	14	2.1	5	0.1	
96	5,710	ACP	44	0.8	1	0.0	1.0
		DIP	5,665	99.2	1	1.0	

**Corresponding score in Appendix A is doubly weighted*

Appendix D: Pipe Diameter

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
02A	49,737	4	59	0.1	1	0.0	4.2
		6	1,965	4.0	2	0.1	
		8	17,476	35.1	3	1.1	
		12	30,182	60.7	5	3.0	
		16	56	0.1	5	0.0	
02B	26,187	6	216	0.8	2	0.0	4.5
		8	6,806	26.0	3	0.8	
		10	4	0.0	4	0.0	
		12	19,161	73.2	5	3.7	
02C	24,104	4	10	0.0	1	0.0	3.9
		6	767	3.2	2	0.1	
		8	11,619	48.2	3	1.4	
		12	11,709	48.6	5	2.4	
02D	32,298	4	73	0.2	1	0.0	3.6
		6	3,265	10.1	2	0.2	
		8	17,501	54.2	3	1.6	
		12	11,458	35.5	5	1.8	
02E	26,865	8	13,969	52.0	3	1.6	4.0
		12	12,896	48.0	5	2.4	
03A	34,221	4	332	1.0	1	0.0	3.3
		6	1,713	5.0	2	0.1	
		8	26,234	76.7	3	2.3	
		10	62	0.2	4	0.0	
		12	5,512	16.1	5	0.8	
		16	368	1.1	5	0.1	
03B	27,891	6	1,117	4.0	2	0.1	3.2
		8	23,992	86.0	3	2.6	
		12	2,782	10.0	5	0.5	
04	50,102	4	531	1.1	1	0.0	2.7
		6	22,081	44.1	2	0.9	
		8	24,204	48.3	3	1.4	
		10	195	0.4	4	0.0	
		12	3,091	6.2	5	0.3	
05A	43,592	4	2,129	4.9	1	0.0	3.4
		6	10,730	24.6	2	0.5	
		8	12,815	29.4	3	0.9	
		10	4,820	11.1	4	0.4	
		12	12,780	29.3	5	1.5	
		14	317	0.7	5	0.0	
05B	40,362	8	17,468	43.3	3	1.3	4.1
		12	22,894	56.7	5	2.8	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
05C	45,827	5	177	0.4	2	0.0	4.0
		6	764	1.7	2	0.0	
		8	22,056	48.1	3	1.4	
		10	193	0.4	4	0.0	
		12	22,636	49.4	5	2.5	
06A	25,310	4	2,276	9.0	1	0.1	2.2
		6	14,855	58.7	2	1.2	
		8	8,145	32.2	3	1.0	
		12	35	0.1	5	0.0	
06B	19,061	6	14,361	75.3	2	1.5	2.2
		8	4,692	24.6	3	0.7	
		10	8	0.0	4	0.0	
06C	23,744	4	6,740	28.4	1	0.3	1.9
		5	307	1.3	2	0.0	
		6	12,000	50.5	2	1.0	
		8	4,697	19.8	3	0.6	
06D	28,174	4	11,649	41.3	1	0.4	1.7
		6	12,265	43.5	2	0.9	
		8	4,256	15.1	3	0.5	
		12	5	0.0	5	0.0	
06E	21,882	4	537	2.5	1	0.0	2.2
		6	17,335	79.2	2	1.6	
		8	4,010	18.3	3	0.5	
06F	8,053	4	3,424	42.5	1	0.4	1.7
		6	4,044	50.2	2	1.0	
		8	410	5.1	3	0.2	
		12	174	2.2	5	0.1	
06H	24,782	4	4	0.0	1	0.0	3.8
		6	82	0.3	2	0.0	
		8	14,470	58.4	3	1.8	
		12	10,227	41.3	5	2.1	
06I	16,123	4	4,934	30.6	1	0.3	1.9
		6	7,365	45.7	2	0.9	
		8	3,724	23.1	3	0.7	
		12	101	0.6	5	0.0	
06J	12,448	4	5,224	42.0	1	0.4	1.8
		6	5,323	42.8	2	0.9	
		8	1,667	13.4	3	0.4	
		12	234	1.9	5	0.1	
06K	21,268	4	6,866	32.3	1	0.3	2.0
		6	8,638	40.6	2	0.8	
		8	5,349	25.2	3	0.8	
		12	416	2.0	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
06M	15,079	4	474	3.1	1	0.0	3.7
		6	3,307	21.9	2	0.4	
		8	3,639	24.1	3	0.7	
		12	7,658	50.8	5	2.5	
06N	11,487	4	313	2.7	1	0.0	3.5
		6	779	6.8	2	0.1	
		8	6,750	58.8	3	1.8	
		12	3,645	31.7	5	1.6	
09	12,779	4	304	2.4	1	0.0	2.3
		6	8,366	65.5	2	1.3	
		8	4,109	32.2	3	1.0	
10	14,807	4	276	1.9	1	0.0	2.9
		6	6,157	41.6	2	0.8	
		8	3,773	25.5	3	0.8	
		10	4,010	27.1	4	1.1	
		12	591	4.0	5	0.2	
11	3,013	6	2,574	85.4	2	1.7	2.3
		10	438	14.6	4	0.6	
12A	49,075	4	1,734	3.5	1	0.0	2.8
		6	25,592	52.1	2	1.0	
		8	10,262	20.9	3	0.6	
		10	5,199	10.6	4	0.4	
		12	1,057	2.2	5	0.1	
		14	5,028	10.2	5	0.5	
		16	203	0.4	5	0.0	
12B	39,795	4	135	0.3	1	0.0	3.1
		6	16,695	42.0	2	0.8	
		8	9,241	23.2	3	0.7	
		10	6,765	17.0	4	0.7	
		12	3,177	8.0	5	0.4	
		14	3,781	9.5	5	0.5	
13A	38,705	6	7,111	18.4	2	0.4	4.1
		8	6,709	17.3	3	0.5	
		10	224	0.6	4	0.0	
		12	20,352	52.6	5	2.6	
		14	4,309	11.1	5	0.6	
13B	34,236	6	5,253	15.3	2	0.3	3.5
		8	16,865	49.3	3	1.5	
		10	844	2.5	4	0.1	
		12	8,586	25.1	5	1.3	
		14	2,686	7.8	5	0.4	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
14	14,469	4	5	0.0	1	0.0	3.3
		6	18	0.1	2	0.0	
		8	12,289	84.9	3	2.5	
		12	2,157	14.9	5	0.7	
15	5,808	6	548	9.4	2	0.2	3.3
		8	4,100	70.6	3	2.1	
		12	1,160	20.0	5	1.0	
16	5,486	4	1,331	24.3	1	0.2	2.0
		6	2,854	52.0	2	1.0	
		8	1,282	23.4	3	0.7	
		12	19	0.4	5	0.0	
17A	39,927	4	280	0.7	1	0.0	3.1
		6	10,363	26.0	2	0.5	
		8	19,614	49.1	3	1.5	
		10	4,355	10.9	4	0.4	
		12	5,271	13.2	5	0.7	
		16	45	0.1	5	0.0	
17B	45,942	4	617	1.3	1	0.0	4.1
		6	3,404	7.4	2	0.1	
		8	11,564	25.2	3	0.8	
		10	4,637	10.1	4	0.4	
		12	25,715	56.0	5	2.8	
		16	5	0.0	5	0.0	
18	53,659	4	328	0.6	1	0.0	3.6
		6	13,902	25.9	2	0.5	
		8	9,572	17.8	3	0.5	
		10	10,993	20.5	4	0.8	
		12	18,864	35.2	5	1.8	
19	48,684	4	921	1.9	1	0.0	3.2
		5	2	0.0	2	0.0	
		6	15,632	32.1	2	0.6	
		8	15,826	32.5	3	1.0	
		10	7,600	15.6	4	0.6	
		12	8,673	17.8	5	0.9	
		14	30	0.1	5	0.0	
1A	9,661	4	136	1.4	1	0.0	2.2
		6	7,572	78.4	2	1.6	
		8	1,953	20.2	3	0.6	
1B	6,461	4	162	2.5	1	0.0	2.6
		6	2,797	43.3	2	0.9	
		8	3,191	49.4	3	1.5	
		12	312	4.8	5	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
1C	10,619	4	65	0.6	1	0.0	2.3
		5	8	0.1	2	0.0	
		6	7,754	73.0	2	1.5	
		8	2,792	26.3	3	0.8	
20A	31,012	4	7,831	25.3	1	0.3	2.1
		6	14,320	46.2	2	0.9	
		8	6,778	21.9	3	0.7	
		10	1,299	4.2	4	0.2	
		12	783	2.5	5	0.1	
20B	47,397	4	5,550	11.7	1	0.1	2.8
		6	15,608	32.9	2	0.7	
		8	15,766	33.3	3	1.0	
		10	2,926	6.2	4	0.2	
		12	5,611	11.8	5	0.6	
		14	1,936	4.1	5	0.2	
21	8,090	4	1,356	16.8	1	0.2	2.3
		6	3,367	41.6	2	0.8	
		8	3,284	40.6	3	1.2	
		12	83	1.0	5	0.1	
22	4,125	4	592	14.3	1	0.1	2.2
		6	2,299	55.7	2	1.1	
		8	1,069	25.9	3	0.8	
		12	165	4.0	5	0.2	
23	66,345	4	9,795	14.8	1	0.1	2.1
		6	42,060	63.4	2	1.3	
		8	13,550	20.4	3	0.6	
		10	13	0.0	4	0.0	
		12	867	1.3	5	0.1	
		16	61	0.1	5	0.0	
24A	48,099	5	41	0.1	2	0.0	3.4
		6	10,622	22.1	2	0.4	
		8	15,970	33.2	3	1.0	
		10	13,884	28.9	4	1.2	
		12	7,582	15.8	5	0.8	
24B	53,615	4	1,385	2.6	1	0.0	3.3
		6	21,266	39.7	2	0.8	
		8	7,597	14.2	3	0.4	
		10	8,440	15.7	4	0.6	
		12	14,863	27.7	5	1.4	
		16	65	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
25	6,598	4	1,331	20.2	1	0.2	2.3
		6	3,926	59.5	2	1.2	
		8	202	3.1	3	0.1	
		12	1,139	17.3	5	0.9	
26A	29,505	4	788	2.7	1	0.0	3.1
		6	12,384	42.0	2	0.8	
		8	6,365	21.6	3	0.6	
		10	3,897	13.2	4	0.5	
		12	6,072	20.6	5	1.0	
26B	40,689	4	1,542	3.8	1	0.0	2.9
		6	19,408	47.7	2	1.0	
		8	9,679	23.8	3	0.7	
		10	393	1.0	4	0.0	
		12	9,668	23.8	5	1.2	
27	32,113	4	11	0.0	1	0.0	3.4
		6	10,416	32.4	2	0.6	
		8	8,055	25.1	3	0.8	
		10	2,895	9.0	4	0.4	
		12	10,736	33.4	5	1.7	
28	54,406	4	167	0.3	1	0.0	3.0
		6	20,379	37.5	2	0.7	
		8	22,310	41.0	3	1.2	
		10	3,261	6.0	4	0.2	
		12	8,289	15.2	5	0.8	
29	51,320	4	1,117	2.2	1	0.0	3.1
		6	13,126	25.6	2	0.5	
		8	21,785	42.4	3	1.3	
		10	8,614	16.8	4	0.7	
		12	6,678	13.0	5	0.7	
30	4,648	6	4,307	92.7	2	1.9	2.1
		8	341	7.3	3	0.2	
31A	24,694	4	2,440	9.9	1	0.1	2.3
		6	15,237	61.7	2	1.2	
		8	5,963	24.1	3	0.7	
		12	1,045	4.2	5	0.2	
		16	8	0.0	5	0.0	
31B	583	6	259	44.4	2	0.9	2.6
		8	325	55.6	3	1.7	
32	10,573	4	1,242	11.7	1	0.1	2.2
		6	6,956	65.8	2	1.3	
		8	1,052	9.9	3	0.3	
		10	1,153	10.9	4	0.4	
		12	170	1.6	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
33	19,067	4	825	4.3	1	0.0	2.7
		6	10,056	52.7	2	1.1	
		8	5,588	29.3	3	0.9	
		12	2,597	13.6	5	0.7	
34	6,598	4	1,145	17.4	1	0.2	2.4
		6	3,075	46.6	2	0.9	
		8	848	12.9	3	0.4	
		10	1,441	21.8	4	0.9	
		12	89	1.3	5	0.1	
35	35,341	4	211	0.6	1	0.0	2.5
		6	22,473	63.6	2	1.3	
		8	8,849	25.0	3	0.8	
		10	3,601	10.2	4	0.4	
		12	207	0.6	5	0.0	
36	45,715	4	568	1.2	1	0.0	2.7
		6	23,567	51.6	2	1.0	
		8	15,000	32.8	3	1.0	
		10	701	1.5	4	0.1	
		12	5,878	12.9	5	0.6	
37	4,973	4	239	4.8	1	0.0	2.2
		6	3,654	73.5	2	1.5	
		8	1,034	20.8	3	0.6	
		12	45	0.9	5	0.0	
38A	21,842	4	107	0.5	1	0.0	2.8
		6	10,008	45.8	2	0.9	
		8	7,275	33.3	3	1.0	
		10	2,188	10.0	4	0.4	
		12	2,263	10.4	5	0.5	
38B	47,410	4	774	1.6	1	0.0	2.6
		6	27,306	57.6	2	1.2	
		8	10,933	23.1	3	0.7	
		10	5,697	12.0	4	0.5	
		12	2,699	5.7	5	0.3	
39	12,431	4	1,460	11.7	1	0.1	2.2
		6	7,568	60.9	2	1.2	
		8	3,336	26.8	3	0.8	
		10	30	0.2	4	0.0	
		12	36	0.3	5	0.0	
40A	27,257	4	546	2.0	1	0.0	3.6
		6	5,137	18.8	2	0.4	
		8	10,317	37.9	3	1.1	
		10	662	2.4	4	0.1	
		12	10,594	38.9	5	1.9	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
40B	28,494	4	1,820	6.4	1	0.1	3.0
		6	11,813	41.5	2	0.8	
		8	6,993	24.5	3	0.7	
		10	566	2.0	4	0.1	
		12	7,301	25.6	5	1.3	
41	18,918	4	1,454	7.7	1	0.1	2.2
		6	12,144	64.2	2	1.3	
		8	5,096	26.9	3	0.8	
		12	224	1.2	5	0.1	
42A	1,124	6	69	6.1	2	0.1	3.1
		8	938	83.5	3	2.5	
		12	117	10.4	5	0.5	
42B	7,823	4	1,824	23.3	1	0.2	2.0
		6	4,837	61.8	2	1.2	
		8	775	9.9	3	0.3	
		12	387	5.0	5	0.2	
42C	9,689	4	887	9.2	1	0.1	2.4
		6	4,511	46.6	2	0.9	
		8	3,953	40.8	3	1.2	
		12	338	3.5	5	0.2	
42D	11,170	4	2,055	18.4	1	0.2	2.1
		5	3	0.0	2	0.0	
		6	5,406	48.4	2	1.0	
		8	3,706	33.2	3	1.0	
42E	19,432	4	6,438	33.1	1	0.3	1.9
		6	8,432	43.4	2	0.9	
		8	4,561	23.5	3	0.7	
42F	11,906	4	131	1.1	1	0.0	3.7
		5	12	0.1	2	0.0	
		6	809	6.8	2	0.1	
		8	5,503	46.2	3	1.4	
		10	1,753	14.7	4	0.6	
		12	3,698	31.1	5	1.6	
42G	1,499	6	442	29.5	2	0.6	2.7
		8	1,057	70.5	3	2.1	
42H	601	4	548	91.1	1	0.9	1.1
		6	48	7.9	2	0.2	
		8	6	1.0	3	0.0	
42I	301	4	301	100.0	1	1.0	1.0
42J	5,965	4	66	1.1	1	0.0	2.4
		6	4,962	83.2	2	1.7	
		8	209	3.5	3	0.1	
		12	729	12.2	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
42K	3,973	4	537	13.5	1	0.1	3.9
		6	577	14.5	2	0.3	
		8	177	4.5	3	0.1	
		10	22	0.6	4	0.0	
		12	2,660	66.9	5	3.3	
43A	13,649	4	2,505	18.3	1	0.2	2.4
		6	4,866	35.6	2	0.7	
		8	5,707	41.8	3	1.3	
		10	21	0.2	4	0.0	
		12	551	4.0	5	0.2	
43B	88	8	88	100.0	3	3.0	3.0
43C	887	6	85	9.6	2	0.2	2.9
		8	803	90.4	3	2.7	
43D	572	4	238	41.6	1	0.4	2.2
		8	334	58.4	3	1.8	
44	20,073	4	16	0.1	1	0.0	4.0
		6	1,872	9.3	2	0.2	
		8	6,857	34.2	3	1.0	
		10	571	2.8	4	0.1	
		12	10,757	53.6	5	2.7	
45A	41,400	6	794	1.9	2	0.0	4.0
		8	19,349	46.7	3	1.4	
		12	21,257	51.3	5	2.6	
45B	11,288	4	393	3.5	1	0.0	2.9
		6	1,820	16.1	2	0.3	
		8	8,516	75.4	3	2.3	
		12	559	5.0	5	0.2	
46	10,206	8	9,677	94.8	3	2.8	3.1
		12	529	5.2	5	0.3	
47	1,523	6	1,490	97.8	2	2.0	2.0
		8	34	2.2	3	0.1	
48	35,406	4	7,194	20.3	1	0.2	2.1
		6	21,123	59.7	2	1.2	
		8	5,079	14.3	3	0.4	
		10	109	0.3	4	0.0	
		12	1,901	5.4	5	0.3	
49	1,903	6	14	0.7	2	0.0	3.3
		8	1,583	83.2	3	2.5	
		12	306	16.1	5	0.8	
51	34,062	6	1,430	4.2	2	0.1	3.7
		8	20,293	59.6	3	1.8	
		12	12,340	36.2	5	1.8	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
52A	16,552	4	804	4.9	1	0.0	3.7
		6	2,599	15.7	2	0.3	
		8	5,156	31.1	3	0.9	
		10	148	0.9	4	0.0	
		12	7,846	47.4	5	2.4	
52B	10,224	6	207	2.0	2	0.0	4.1
		8	4,376	42.8	3	1.3	
		12	5,641	55.2	5	2.8	
53A	21,627	4	1,510	7.0	1	0.1	2.2
		6	16,408	75.9	2	1.5	
		8	3,099	14.3	3	0.4	
		12	609	2.8	5	0.1	
53B	6,857	4	328	4.8	1	0.0	2.7
		6	4,067	59.3	2	1.2	
		8	1,137	16.6	3	0.5	
		12	1,325	19.3	5	1.0	
54	8,578	4	2,007	23.4	1	0.2	2.1
		6	4,947	57.7	2	1.2	
		8	1,058	12.3	3	0.4	
		12	566	6.6	5	0.3	
55	71,352	4	1,657	2.3	1	0.0	1.3
		6	21,209	29.7	2	0.6	
		8	8,110	11.4	3	0.3	
		10	167	0.2	4	0.0	
		12	4,533	6.4	5	0.3	
56A	3,122	4	261	8.4	1	0.1	4.0
		6	600	19.2	2	0.4	
		8	135	4.3	3	0.1	
		10	52	1.7	4	0.1	
		12	2,073	66.4	5	3.3	
56B	178,273	4	5,722	3.2	1	0.0	0.9
		6	27,765	15.6	2	0.3	
		8	17,151	9.6	3	0.3	
		10	14	0.0	4	0.0	
		12	8,773	4.9	5	0.2	
57	8,247	4	291	3.5	1	0.0	2.8
		6	1,922	23.3	2	0.5	
		8	5,505	66.7	3	2.0	
		12	529	6.4	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
57A	38,947	4	4,190	10.8	1	0.1	2.4
		6	19,308	49.6	2	1.0	
		8	12,554	32.2	3	1.0	
		10	15	0.0	4	0.0	
		12	2,880	7.4	5	0.4	
57B	450	4	433	96.1	1	1.0	1.0
		6	17	3.9	2	0.1	
58A	14,811	4	2	0.0	1	0.0	3.5
		6	328	2.2	2	0.0	
		8	10,806	73.0	3	2.2	
		12	3,674	24.8	5	1.2	
58B	3,344	4	15	0.4	1	0.0	3.4
		6	142	4.3	2	0.1	
		8	2,499	74.7	3	2.2	
		12	688	20.6	5	1.0	
58C	86	6	62	72.2	2	1.4	2.8
		12	24	27.8	5	1.4	
59	7,477	8	5,444	72.8	3	2.2	3.5
		12	2,034	27.2	5	1.4	
60A	11,070	8	9,582	86.6	3	2.6	3.3
		12	1,487	13.4	5	0.7	
60B	5,832	8	2,413	41.4	3	1.2	3.9
		10	1,553	26.6	4	1.1	
		12	1,865	32.0	5	1.6	
61	6,537	4	2	0.0	1	0.0	4.0
		6	10	0.2	2	0.0	
		8	3,148	48.1	3	1.4	
		12	3,377	51.7	5	2.6	
62	5,625	8	5,216	92.7	3	2.8	3.1
		12	409	7.3	5	0.4	
63	32,820	5	7	0.0	2	0.0	3.2
		6	3,345	10.2	2	0.2	
		8	25,289	77.1	3	2.3	
		10	55	0.2	4	0.0	
		12	4,125	12.6	5	0.6	
64	4,271	8	3,226	75.5	3	2.3	3.5
		12	1,045	24.5	5	1.2	
65	13,735	6	339	2.5	2	0.0	3.7
		8	8,239	60.0	3	1.8	
		12	5,156	37.5	5	1.9	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
66A	5,825	6	187	3.2	2	0.1	3.5
		8	3,985	68.4	3	2.1	
		10	77	1.3	4	0.1	
		12	1,576	27.1	5	1.4	
66B	5,477	4	188	3.4	1	0.0	2.4
		5	85	1.6	2	0.0	
		6	3,058	55.8	2	1.1	
		8	2,145	39.2	3	1.2	
66C	2,359	6	1,952	82.8	2	1.7	2.4
		8	95	4.0	3	0.1	
		12	311	13.2	5	0.7	
66D	5,144	6	252	4.9	2	0.1	4.3
		8	1,342	26.1	3	0.8	
		10	24	0.5	4	0.0	
		12	3,526	68.5	5	3.4	
66E	3,079	6	821	26.7	2	0.5	3.8
		8	615	20.0	3	0.6	
		12	1,642	53.3	5	2.7	
66F	538	12	538	100.0	5	5.0	5.0
67	1,947	4	28	1.4	1	0.0	3.0
		6	415	21.3	2	0.4	
		8	1,312	67.4	3	2.0	
		12	192	9.9	5	0.5	
68	1,371	6	29	2.1	2	0.0	3.0
		8	1,342	97.9	3	2.9	
69	3,856	8	3,195	82.9	3	2.5	3.3
		12	661	17.1	5	0.9	
6G1	7,345	4	2,800	38.1	1	0.4	1.6
		6	4,545	61.9	2	1.2	
6G2	737	4	139	18.9	1	0.2	1.8
		6	598	81.1	2	1.6	
70	32,022	6	1,433	4.5	2	0.1	3.7
		8	18,926	59.1	3	1.8	
		12	11,663	36.4	5	1.8	
71	26,496	4	182	0.7	1	0.0	3.6
		6	550	2.1	2	0.0	
		8	17,736	66.9	3	2.0	
		10	269	1.0	4	0.0	
		12	7,758	29.3	5	1.5	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
72	10,362	4	3,514	33.9	1	0.3	1.9
		6	4,257	41.1	2	0.8	
		8	2,568	24.8	3	0.7	
		10	13	0.1	4	0.0	
		12	10	0.1	5	0.0	
74	11,736	4	3,364	28.7	1	0.3	1.9
		6	6,262	53.4	2	1.1	
		8	1,965	16.7	3	0.5	
		12	144	1.2	5	0.1	
76A	12,044	4	942	7.8	1	0.1	3.4
		6	515	4.3	2	0.1	
		8	7,244	60.1	3	1.8	
		12	3,343	27.8	5	1.4	
76B	4,114	8	1,801	43.8	3	1.3	4.1
		12	2,312	56.2	5	2.8	
76C	3,323	6	369	11.1	2	0.2	3.0
		8	2,604	78.4	3	2.4	
		10	350	10.5	4	0.4	
76D	5,884	6	153	2.6	2	0.1	3.8
		8	3,330	56.6	3	1.7	
		10	4	0.1	4	0.0	
		12	2,398	40.8	5	2.0	
76F	3,142	6	1,537	48.9	2	1.0	2.7
		8	1,380	43.9	3	1.3	
		12	225	7.1	5	0.4	
76G	2,439	6	322	13.2	2	0.3	4.6
		8	11	0.4	3	0.0	
		12	2,106	86.4	5	4.3	
76H	4,066	6	2,022	49.7	2	1.0	2.9
		8	1,332	32.8	3	1.0	
		12	712	17.5	5	0.9	
76I	1,194	6	11	0.9	2	0.0	3.6
		8	776	65.0	3	2.0	
		10	69	5.8	4	0.2	
		12	338	28.3	5	1.4	
76J	1,005	8	494	49.2	3	1.5	4.0
		12	511	50.8	5	2.5	
76K	1,317	4	14	1.0	1	0.0	4.0
		6	346	26.3	2	0.5	
		8	90	6.9	3	0.2	
		12	867	65.8	5	3.3	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
77	774	6	532	68.7	2	1.4	2.3
		8	242	31.3	3	0.9	
78	22,333	6	693	3.1	2	0.1	3.8
		8	12,608	56.5	3	1.7	
		10	409	1.8	4	0.1	
		12	8,622	38.6	5	1.9	
79	7,373	6	424	5.8	2	0.1	2.9
		8	6,902	93.6	3	2.8	
		10	47	0.6	4	0.0	
7A1	9,862	5	788	8.0	2	0.2	3.3
		6	602	6.1	2	0.1	
		8	6,452	65.4	3	2.0	
		12	2,020	20.5	5	1.0	
7A2	10,101	5	5,088	50.4	2	1.0	2.7
		6	390	3.9	2	0.1	
		8	3,484	34.5	3	1.0	
		12	1,140	11.3	5	0.6	
7B1	5,341	5	661	12.4	2	0.2	2.2
		6	4,151	77.7	2	1.6	
		10	530	9.9	4	0.4	
7B2	8,145	5	139	1.7	2	0.0	3.8
		6	523	6.4	2	0.1	
		8	2,039	25.0	3	0.8	
		10	3,924	48.2	4	1.9	
		12	1,520	18.7	5	0.9	
7B3	7,806	5	207	2.7	2	0.1	3.1
		6	1,940	24.9	2	0.5	
		8	2,489	31.9	3	1.0	
		10	3,164	40.5	4	1.6	
		12	6	0.1	5	0.0	
7B4	8,220	5	1,325	16.1	2	0.3	3.2
		6	1,533	18.7	2	0.4	
		8	2,031	24.7	3	0.7	
		10	1,930	23.5	4	0.9	
		12	1,400	17.0	5	0.9	
7C1	5,378	5	479	8.9	2	0.2	3.0
		6	1,712	31.8	2	0.6	
		8	899	16.7	3	0.5	
		10	2,288	42.5	4	1.7	
7C2	5,053	4	312	6.2	1	0.1	3.3
		5	310	6.1	2	0.1	
		6	1,081	21.4	2	0.4	
		10	3,350	66.3	4	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
7C3	5,949	4	20	0.3	1	0.0	3.2
		5	1,299	21.8	2	0.4	
		6	620	10.4	2	0.2	
		8	812	13.6	3	0.4	
		10	3,199	53.8	4	2.2	
7C4	13,990	5	2,731	19.5	2	0.4	3.3
		6	4,499	32.2	2	0.6	
		8	290	2.1	3	0.1	
		10	2,120	15.2	4	0.6	
		12	4,350	31.1	5	1.6	
7C5	6,039	4	402	6.7	1	0.1	2.1
		5	90	1.5	2	0.0	
		6	4,893	81.0	2	1.6	
		8	233	3.8	3	0.1	
		10	422	7.0	4	0.3	
7D1	17,022	5	1,219	7.2	2	0.1	3.2
		6	5,386	31.6	2	0.6	
		8	1,826	10.7	3	0.3	
		10	7,505	44.1	4	1.8	
		12	629	3.7	5	0.2	
		14	444	2.6	5	0.1	
		16	13	0.1	5	0.0	
7D2	8,007	4	59	0.7	1	0.0	3.3
		5	364	4.5	2	0.1	
		6	1,789	22.3	2	0.4	
		8	868	10.8	3	0.3	
		10	4,926	61.5	4	2.5	
7D3	10,313	5	2,921	28.3	2	0.6	2.8
		6	2,913	28.2	2	0.6	
		8	867	8.4	3	0.3	
		10	3,611	35.0	4	1.4	
7E1	16,670	5	2,206	13.2	2	0.3	3.7
		6	1,126	6.8	2	0.1	
		8	1,408	8.4	3	0.3	
		10	9,642	57.8	4	2.3	
		16	2,289	13.7	5	0.7	
7E2	2,538	5	357	14.1	2	0.3	3.5
		6	270	10.6	2	0.2	
		10	1,911	75.3	4	3.0	

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
7E3	8,596	5	690	8.0	2	0.2	3.4
		6	1,158	13.5	2	0.3	
		8	2,126	24.7	3	0.7	
		10	3,783	44.0	4	1.8	
		12	838	9.8	5	0.5	
7E4	9,777	5	3,301	33.8	2	0.7	2.5
		6	2,305	23.6	2	0.5	
		8	3,291	33.7	3	1.0	
		10	858	8.8	4	0.4	
		12	22	0.2	5	0.0	
7F1	7,544	5	1,002	13.3	2	0.3	3.6
		8	2,166	28.7	3	0.9	
		10	3,090	41.0	4	1.6	
		12	1,286	17.0	5	0.9	
7F2	9,451	4	77	0.8	1	0.0	3.3
		5	992	10.5	2	0.2	
		6	868	9.2	2	0.2	
		8	2,308	24.4	3	0.7	
		10	5,207	55.1	4	2.2	
7F3	9,263	4	51	0.5	1	0.0	4.0
		5	1,798	19.4	2	0.4	
		8	1,822	19.7	3	0.6	
		10	4	0.0	4	0.0	
		12	5,589	60.3	5	3.0	
7F4	7,990	5	1,751	21.9	2	0.4	3.3
		6	652	8.2	2	0.2	
		8	2,475	31.0	3	0.9	
		10	1,597	20.0	4	0.8	
		12	1,516	19.0	5	0.9	
7G1	6,060	5	4,311	71.1	2	1.4	2.6
		6	478	7.9	2	0.2	
		12	1,270	21.0	5	1.0	
7G2	4,803	6	381	7.9	2	0.2	2.9
		8	4,415	91.9	3	2.8	
		12	6	0.1	5	0.0	
7G3	9,148	5	716	7.8	2	0.2	4.1
		8	1,857	20.3	3	0.6	
		10	2,332	25.5	4	1.0	
		12	4,244	46.4	5	2.3	
7G4	8,708	5	1,457	16.7	2	0.3	3.8
		8	407	4.7	3	0.1	
		10	5,196	59.7	4	2.4	
		12	1,648	18.9	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
7G5	4,690	5	106	2.3	2	0.0	3.1
		6	11	0.2	2	0.0	
		8	4,042	86.2	3	2.6	
		10	531	11.3	4	0.5	
80	24,930	6	281	1.1	2	0.0	3.6
		8	16,399	65.8	3	2.0	
		10	43	0.2	4	0.0	
		12	8,207	32.9	5	1.6	
81	12,011	6	443	3.7	2	0.1	3.5
		8	8,199	68.3	3	2.0	
		10	4	0.0	4	0.0	
		12	3,366	28.0	5	1.4	
82	14,783	4	74	0.5	1	0.0	3.3
		6	2,369	16.0	2	0.3	
		8	8,018	54.2	3	1.6	
		10	1,303	8.8	4	0.4	
		12	3,020	20.4	5	1.0	
83	14,222	6	2,921	20.5	2	0.4	3.6
		8	5,727	40.3	3	1.2	
		12	5,574	39.2	5	2.0	
84	4,906	8	2,221	45.3	3	1.4	4.1
		12	2,685	54.7	5	2.7	
85	27,675	4	2,770	10.0	1	0.1	2.2
		6	16,901	61.1	2	1.2	
		8	7,711	27.9	3	0.8	
		12	293	1.1	5	0.1	
86A	24,058	6	10,955	45.5	2	0.9	2.5
		8	13,044	54.2	3	1.6	
		12	59	0.2	5	0.0	
86B	26,243	4	202	0.8	1	0.0	2.8
		6	8,340	31.8	2	0.6	
		8	14,440	55.0	3	1.7	
		10	2,404	9.2	4	0.4	
		12	857	3.3	5	0.2	
86C	27,715	4	459	1.7	1	0.0	2.6
		6	11,954	43.1	2	0.9	
		8	14,273	51.5	3	1.5	
		10	655	2.4	4	0.1	
		12	374	1.3	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
86D	4,835	4	10	0.2	1	0.0	3.0
		6	1,546	32.0	2	0.6	
		8	2,343	48.5	3	1.5	
		10	362	7.5	4	0.3	
		12	574	11.9	5	0.6	
87A	15,768	8	11,351	72.0	3	2.2	3.6
		10	50	0.3	4	0.0	
		12	4,367	27.7	5	1.4	
87B	3,087	8	548	17.8	3	0.5	4.2
		10	1,458	47.2	4	1.9	
		12	1,081	35.0	5	1.8	
88	29,049	8	15,097	52.0	3	1.6	4.0
		12	13,952	48.0	5	2.4	
89	13,800	4	723	5.2	1	0.1	3.4
		6	1,668	12.1	2	0.2	
		8	7,044	51.0	3	1.5	
		12	4,364	31.6	5	1.6	
90A	29,524	4	6,665	22.6	1	0.2	2.1
		6	15,046	51.0	2	1.0	
		8	7,457	25.3	3	0.8	
		10	39	0.1	4	0.0	
		12	317	1.1	5	0.1	
90B	3,875	4	733	18.9	1	0.2	1.8
		6	2,992	77.2	2	1.5	
		8	150	3.9	3	0.1	
90C	17,273	4	4,745	27.5	1	0.3	2.1
		6	7,217	41.8	2	0.8	
		8	5,102	29.5	3	0.9	
		12	208	1.2	5	0.1	
90D	1,803	4	196	10.9	1	0.1	2.0
		6	1,340	74.3	2	1.5	
		8	262	14.5	3	0.4	
		12	5	0.3	5	0.0	
91	45,863	4	1,876	4.1	1	0.0	2.8
		6	18,171	39.6	2	0.8	
		8	18,607	40.6	3	1.2	
		10	1,205	2.6	4	0.1	
		12	6,004	13.1	5	0.7	
92	617	6	617	100.0	2	2.0	2.0

Area	Total Length Within Area [feet]	Pipe Diameter [inches]	Length of Diameter [feet]	Diameter Within Area [%]	Diameter Score	Weighted Score	Total Weighted Score
93A	38,757	4	2,976	7.7	1	0.1	2.7
		6	12,481	32.2	2	0.6	
		8	18,822	48.6	3	1.5	
		10	734	1.9	4	0.1	
		12	2,975	7.7	5	0.4	
		14	770	2.0	5	0.1	
93B	35,569	4	1,791	5.0	1	0.1	2.3
		6	23,729	66.7	2	1.3	
		8	8,611	24.2	3	0.7	
		10	870	2.4	4	0.1	
		12	568	1.6	5	0.1	
93C	35,788	4	1,856	5.2	1	0.1	2.9
		6	14,106	39.4	2	0.8	
		8	12,066	33.7	3	1.0	
		10	2,086	5.8	4	0.2	
		12	5,675	15.9	5	0.8	
93D	33,692	4	2,002	5.9	1	0.1	2.4
		6	20,041	59.5	2	1.2	
		8	10,140	30.1	3	0.9	
		10	5	0.0	4	0.0	
		12	1,503	4.5	5	0.2	
95	673	8	648	96.3	3	2.9	3.1
		10	14	2.1	4	0.1	
		12	11	1.6	5	0.1	
96	5,710	6	940	16.5	2	0.3	3.3
		8	3,523	61.7	3	1.9	
		12	1,247	21.8	5	1.1	

Appendix E: Customer Type

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
83	02A	34	599	633	5.4	94.6	100	1
57	02B	22	165	187	11.8	88.2	100	2
133	02C	1	403	404	0.2	99.8	100	1
132	02D	2	590	592	0.3	99.7	100	1
140	02E	0	628	628	0.0	100.0	100	1
36	03A	75	122	197	38.1	61.9	100	4
33	03B	79	118	197	40.1	59.9	100	5
131	04	4	1006	1010	0.4	99.6	100	1
139	05A	1	837	838	0.1	99.9	100	1
111	05B	10	648	658	1.5	98.5	100	1
121	05C	9	1089	1098	0.8	99.2	100	1
124	06A	3	466	469	0.6	99.4	100	1
141	06B	0	415	415	0.0	100.0	100	1
84	06C	22	388	410	5.4	94.6	100	1
136	06D	1	438	439	0.2	99.8	100	1
137	06E	1	442	443	0.2	99.8	100	1
129	06F	1	205	206	0.5	99.5	100	1
119	06H	5	536	541	0.9	99.1	100	1
142	06I	0	337	337	0.0	100.0	100	1
143	06J	0	252	252	0.0	100.0	100	1
144	06K	0	463	463	0.0	100.0	100	1
99	06M	4	129	133	3.0	97.0	100	1
145	06N	0	311	311	0.0	100.0	100	1
146	09	0	218	218	0.0	100.0	100	1
147	10	0	240	240	0.0	100.0	100	1
148	11	0	42	42	0.0	100.0	100	1
79	12A	82	1291	1373	6.0	94.0	100	1
134	12B	2	842	844	0.2	99.8	100	1
45	13A	60	251	311	19.3	80.7	100	2
82	13B	32	561	593	5.4	94.6	100	1
97	14	10	284	294	3.4	96.6	100	1
149	15	0	83	83	0.0	100.0	100	1
117	16	1	96	97	1.0	99.0	100	1
112	17A	10	676	686	1.5	98.5	100	1
50	17B	58	347	405	14.3	85.7	100	2
43	18	82	313	395	20.8	79.2	100	3
70	19	50	566	616	8.1	91.9	100	1
76	1A	14	194	208	6.7	93.3	100	1
52	1B	14	93	107	13.1	86.9	100	2
71	1C	21	258	279	7.5	92.5	100	1
95	20A	21	506	527	4.0	96.0	100	1
69	20B	105	1181	1286	8.2	91.8	100	1
101	21	4	137	141	2.8	97.2	100	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
123	23	9	1169	1178	0.8	99.2	100	1
40	24A	69	191	260	26.5	73.5	100	3
68	24B	59	605	664	8.9	91.1	100	1
151	25	0	93	93	0.0	100.0	100	1
58	26A	37	279	316	11.7	88.3	100	2
54	26B	64	467	531	12.1	87.9	100	2
51	27	51	336	387	13.2	86.8	100	2
87	28	36	681	717	5.0	95.0	100	1
92	29	40	923	963	4.2	95.8	100	1
108	30	1	52	53	1.9	98.1	100	1
122	31A	3	386	389	0.8	99.2	100	1
152	31B	0	18	18	0.0	100.0	100	1
153	32	0	167	167	0.0	100.0	100	1
85	33	12	215	227	5.3	94.7	100	1
154	34	0	64	64	0.0	100.0	100	1
135	35	1	421	422	0.2	99.8	100	1
107	36	11	571	582	1.9	98.1	100	1
155	37	0	35	35	0.0	100.0	100	1
62	38A	34	304	338	10.1	89.9	100	2
138	38B	1	779	780	0.1	99.9	100	1
156	39	0	149	149	0.0	100.0	100	1
126	40A	2	345	347	0.6	99.4	100	1
56	40B	67	492	559	12.0	88.0	100	2
130	41	1	250	251	0.4	99.6	100	1
157	42A	0	36	36	0.0	100.0	100	1
65	42B	12	113	125	9.6	90.4	100	1
49	42C	19	106	125	15.2	84.8	100	2
158	42D	0	235	235	0.0	100.0	100	1
125	42E	2	316	318	0.6	99.4	100	1
20	42F	17	6	23	73.9	26.1	100	5
159	42G	0	36	36	0.0	100.0	100	1
160	42H	0	18	18	0.0	100.0	100	1
196	42I	0	0	0	0.0	0.0	0	1
106	42J	2	96	98	2.0	98.0	100	1
41	42K	2	7	9	22.2	77.8	100	3
161	43A	0	138	138	0.0	100.0	100	1
162	43B	0	11	11	0.0	100.0	100	1
163	43C	0	11	11	0.0	100.0	100	1
42	43D	4	15	19	21.1	78.9	100	3
29	44	40	40	80	50.0	50.0	100	5
73	45A	38	469	507	7.5	92.5	100	1
109	45B	4	220	224	1.8	98.2	100	1

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
164	46	0	203	203	0.0	100.0	100	1
165	47	0	51	51	0.0	100.0	100	1
110	48	6	350	356	1.7	98.3	100	1
166	49	0	70	70	0.0	100.0	100	1
115	51	7	558	565	1.2	98.8	100	1
91	52A	8	184	192	4.2	95.8	100	1
66	52B	15	143	158	9.5	90.5	100	1
167	53A	0	238	238	0.0	100.0	100	1
59	53B	9	69	78	11.5	88.5	100	2
168	54	0	126	126	0.0	100.0	100	1
105	55	10	427	437	2.3	97.7	100	1
169	56A	0	7	7	0.0	100.0	100	1
113	56B	8	580	588	1.4	98.6	100	1
170	56C	0	5	5	0.0	100.0	100	1
102	57	3	112	115	2.6	97.4	100	1
100	57A	10	335	345	2.9	97.1	100	1
171	57B	0	27	27	0.0	100.0	100	1
86	58A	14	261	275	5.1	94.9	100	1
61	58B	10	87	97	10.3	89.7	100	2
172	58C	0	22	22	0.0	100.0	100	1
120	59	1	114	115	0.9	99.1	100	1
173	60	0	6	6	0.0	100.0	100	1
75	60A	15	206	221	6.8	93.2	100	1
60	60B	8	68	76	10.5	89.5	100	2
53	61	11	80	91	12.1	87.9	100	2
174	62	0	73	73	0.0	100.0	100	1
89	63	21	426	447	4.7	95.3	100	1
175	64	0	50	50	0.0	100.0	100	1
46	65	31	134	165	18.8	81.2	100	2
31	66A	21	24	45	46.7	53.3	100	5
38	66B	18	38	56	32.1	67.9	100	4
72	66C	3	37	40	7.5	92.5	100	1
2	66D	20	0	20	100.0	0.0	100	5
39	66E	10	24	34	29.4	70.6	100	3
176	66F	0	3	3	0.0	100.0	100	1
177	67	0	30	30	0.0	100.0	100	1
47	68	3	13	16	18.8	81.3	100	2
178	69	0	73	73	0.0	100.0	100	1
179	6G1	0	199	199	0.0	100.0	100	1
180	6G2	0	41	41	0.0	100.0	100	1
67	70	39	386	425	9.2	90.8	100	1
80	71	17	271	288	5.9	94.1	100	1
77	72	9	126	135	6.7	93.3	100	1

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
88	74	6	120	126	4.8	95.2	100	1
181	76A	0	145	145	0.0	100.0	100	1
81	76B	6	105	111	5.4	94.6	100	1
78	76C	3	44	47	6.4	93.6	100	1
182	76D	0	105	105	0.0	100.0	100	1
183	76F	0	53	53	0.0	100.0	100	1
1	76G	31	0	31	100.0	0.0	100	5
24	76H	13	5	18	72.2	27.8	100	5
21	76I	8	3	11	72.7	27.3	100	5
8	76J	3	0	3	100.0	0.0	100	5
5	76K	14	0	14	100.0	0.0	100	5
184	77	0	50	50	0.0	100.0	100	1
55	78	50	367	417	12.0	88.0	100	2
185	79	0	133	133	0.0	100.0	100	1
14	7A1	8	1	9	88.9	11.1	100	5
186	7A2	0	3	3	0.0	100.0	100	1
63	7B1	1	9	10	10.0	90.0	100	2
18	7B2	15	4	19	78.9	21.1	100	5
16	7B3	22	4	26	84.6	15.4	100	5
11	7B4	11	1	12	91.7	8.3	100	5
197	7B5	0	0	0	0.0	0.0	0	1
44	7C1	3	12	15	20.0	80.0	100	3
19	7C2	14	4	18	77.8	22.2	100	5
32	7C3	10	14	24	41.7	58.3	100	5
17	7C4	34	7	41	82.9	17.1	100	5
26	7C5	26	12	38	68.4	31.6	100	5
10	7D1	53	4	57	93.0	7.0	100	5
13	7D2	33	4	37	89.2	10.8	100	5
25	7D3	10	4	14	71.4	28.6	100	5
27	7E1	8	4	12	66.7	33.3	100	5
9	7E2	2	0	2	100.0	0.0	100	5
48	7E3	2	9	11	18.2	81.8	100	2
15	7E4	7	1	8	87.5	12.5	100	5
28	7F1	13	7	20	65.0	35.0	100	5
22	7F2	8	3	11	72.7	27.3	100	5
6	7F3	10	0	10	100.0	0.0	100	5
23	7F4	8	3	11	72.7	27.3	100	5
30	7G1	1	1	2	50.0	50.0	100	5
37	7G2	3	6	9	33.3	66.7	100	4
7	7G3	10	0	10	100.0	0.0	100	5
3	7G4	20	0	20	100.0	0.0	100	5
4	7G5	16	0	16	100.0	0.0	100	5
104	80	10	403	413	2.4	97.6	100	1

Rank	Area	Commercial Accounts	Non-Commercial Accounts	Total Accounts in Area	Percent Commercial	Percent Non-Commercial	Percent Total	Score
128	81	1	204	205	0.5	99.5	100	1
34	82	30	46	76	39.5	60.5	100	4
64	83	16	145	161	9.9	90.1	100	1
35	84	19	30	49	38.8	61.2	100	4
90	85	16	353	369	4.3	95.7	100	1
103	86A	7	273	280	2.5	97.5	100	1
93	86B	13	305	318	4.1	95.9	100	1
94	86C	13	307	320	4.1	95.9	100	1
12	86D	32	3	35	91.4	8.6	100	5
74	87A	10	125	135	7.4	92.6	100	1
187	87B	0	32	32	0.0	100.0	100	1
96	88	10	244	254	3.9	96.1	100	1
116	89	2	186	188	1.1	98.9	100	1
188	90A	0	445	445	0.0	100.0	100	1
189	90B	0	69	69	0.0	100.0	100	1
190	90C	0	330	330	0.0	100.0	100	1
191	90D	0	24	24	0.0	100.0	100	1
118	91	4	425	429	0.9	99.1	100	1
192	92	0	9	9	0.0	100.0	100	1
114	93A	6	446	452	1.3	98.7	100	1
127	93B	3	563	566	0.5	99.5	100	1
98	93C	14	442	456	3.1	96.9	100	1
193	93D	0	597	597	0.0	100.0	100	1
194	95	0	6	6	0.0	100.0	100	1
195	96	0	84	84	0.0	100.0	100	1

Appendix F: Crossings

Rank	Area	Creek Crossings	Freeway Crossings	Railroad Crossings	Creek Crossing Score	Freeway Crossing Score	Railroad Crossing Score	Sum of Crossing Scores	Normalized Score
15	02A	4	0	0	7	1	1	9	3
61	02B	0	0	0	3	1	1	5	1
62	02C	0	0	0	3	1	1	5	1
63	02D	0	0	0	3	1	1	5	1
28	02E	2	0	0	5	1	1	7	2
4	03A	6	0	0	9	1	1	11	4
2	03B	7	0	0	10	1	1	12	4
64	04	0	0	0	3	1	1	5	1
1	05A	0	0	2	3	1	9	13	5
65	05B	0	0	0	3	1	1	5	1
66	05C	0	0	0	3	1	1	5	1
67	06A	0	0	0	3	1	1	5	1
68	06B	0	0	0	3	1	1	5	1
69	06C	0	0	0	3	1	1	5	1
29	06D	2	0	0	5	1	1	7	2
70	06E	0	0	0	3	1	1	5	1
43	06F	1	0	0	4	1	1	6	2
71	06H	0	0	0	3	1	1	5	1
72	06I	0	0	0	3	1	1	5	1
73	06J	0	0	0	3	1	1	5	1
74	06K	0	0	0	3	1	1	5	1
44	06M	1	0	0	4	1	1	6	2
45	06N	1	0	0	4	1	1	6	2
24	09	3	0	0	6	1	1	8	3
16	10	0	0	1	3	1	5	9	3
75	11	0	0	0	3	1	1	5	1
76	12A	0	0	0	3	1	1	5	1
77	12B	0	0	0	3	1	1	5	1
8	13A	5	0	0	8	1	1	10	3
5	13B	6	0	0	9	1	1	11	4
78	14	0	0	0	3	1	1	5	1
79	15	0	0	0	3	1	1	5	1
80	16	0	0	0	3	1	1	5	1
	17A	1	0	0	4	1	1	6	2
30	17B	2	0	0	5	1	1	7	2
9	18	0	1	0	3	6	1	10	3
46	19	1	0	0	4	1	1	6	2
81	1A	0	0	0	3	1	1	5	1
82	1B	0	0	0	3	1	1	5	1
31	1C	2	0	0	5	1	1	7	2
10	20A	5	0	0	8	1	1	10	3
17	20B	4	0	0	7	1	1	9	3
83	21	0	0	0	3	1	1	5	1
84	22	0	0	0	3	1	1	5	1
32	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
85	24A	0	0	0	3	1	1	5	1
33	24B	2	0	0	5	1	1	7	2
86	25	0	0	0	3	1	1	5	1
6	26A	1	1	0	4	6	1	11	4
87	26B	0	0	0	3	1	1	5	1
47	27	1	0	0	4	1	1	6	2
7	28	6	0	0	9	1	1	11	4
18	29	4	0	0	7	1	1	9	3
88	30	0	0	0	3	1	1	5	1
34	31A	2	0	0	5	1	1	7	2
89	31B	0	0	0	3	1	1	5	1
90	32	0	0	0	3	1	1	5	1
91	33	0	0	0	3	1	1	5	1
92	34	0	0	0	3	1	1	5	1
35	35	2	0	0	5	1	1	7	2
93	36	0	0	0	3	1	1	5	1
94	37	0	0	0	3	1	1	5	1
95	38A	0	0	0	3	1	1	5	1
96	38B	0	0	0	3	1	1	5	1
97	39	0	0	0	3	1	1	5	1
98	40A	0	0	0	3	1	1	5	1
99	40B	0	0	0	3	1	1	5	1
100	41	0	0	0	3	1	1	5	1
101	42A	0	0	0	3	1	1	5	1
102	42B	0	0	0	3	1	1	5	1
103	42C	0	0	0	3	1	1	5	1
104	42D	0	0	0	3	1	1	5	1
105	42E	0	0	0	3	1	1	5	1
106	42F	0	0	0	3	1	1	5	1
107	42G	0	0	0	3	1	1	5	1
108	42H	0	0	0	3	1	1	5	1
109	42I	0	0	0	3	1	1	5	1
110	42J	0	0	0	3	1	1	5	1
111	42K	0	0	0	3	1	1	5	1
112	43A	0	0	0	3	1	1	5	1
113	43B	0	0	0	3	1	1	5	1
114	43C	0	0	0	3	1	1	5	1
115	43D	0	0	0	3	1	1	5	1
48	44	1	0	0	4	1	1	6	2
116	45A	0	0	0	3	1	1	5	1
49	45B	1	0	0	4	1	1	6	2
11	46	5	0	0	8	1	1	10	3
117	47	0	0	0	3	1	1	5	1
118	48	0	0	0	3	1	1	5	1
119	49	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
50	51	1	0	0	4	1	1	6	2
51	52A	1	0	0	4	1	1	6	2
52	52B	1	0	0	4	1	1	6	2
12	53A	5	0	0	8	1	1	10	3
120	53B	0	0	0	3	1	1	5	1
121	54	0	0	0	3	1	1	5	1
19	55	4	0	0	7	1	1	9	3
122	56A	0	0	0	3	1	1	5	1
36	56B	2	0	0	5	1	1	7	2
123	56C	0	0	0	3	1	1	5	1
37	57	2	0	0	5	1	1	7	2
124	57A	0	0	0	3	1	1	5	1
125	57B	0	0	0	3	1	1	5	1
126	58A	0	0	0	3	1	1	5	1
127	58B	0	0	0	3	1	1	5	1
128	58C	0	0	0	3	1	1	5	1
129	59	0	0	0	3	1	1	5	1
130	60	0	0	0	3	1	1	5	1
131	60A	0	0	0	3	1	1	5	1
132	60B	0	0	0	3	1	1	5	1
133	61	0	0	0	3	1	1	5	1
134	62	0	0	0	3	1	1	5	1
135	63	0	0	0	3	1	1	5	1
136	64	0	0	0	3	1	1	5	1
13	65	5	0	0	8	1	1	10	3
137	66A	0	0	0	3	1	1	5	1
138	66B	0	0	0	3	1	1	5	1
139	66C	0	0	0	3	1	1	5	1
140	66D	0	0	0	3	1	1	5	1
141	66E	0	0	0	3	1	1	5	1
142	66F	0	0	0	3	1	1	5	1
53	67	1	0	0	4	1	1	6	2
143	68	0	0	0	3	1	1	5	1
144	69	0	0	0	3	1	1	5	1
145	6G1	0	0	0	3	1	1	5	1
146	6G2	0	0	0	3	1	1	5	1
147	70	0	0	0	3	1	1	5	1
148	71	0	0	0	3	1	1	5	1
149	72	0	0	0	3	1	1	5	1
54	74	1	0	0	4	1	1	6	2
150	76A	0	0	0	3	1	1	5	1
151	76B	0	0	0	3	1	1	5	1
152	76C	0	0	0	3	1	1	5	1
55	76D	1	0	0	4	1	1	6	2
153	76F	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
154	76G	0	0	0	3	1	1	5	1
155	76H	0	0	0	3	1	1	5	1
56	76I	1	0	0	4	1	1	6	2
156	76J	0	0	0	3	1	1	5	1
157	76K	0	0	0	3	1	1	5	1
158	77	0	0	0	3	1	1	5	1
38	78	2	0	0	5	1	1	7	2
159	79	0	0	0	3	1	1	5	1
14	7A1	5	0	0	8	1	1	10	3
160	7A2	0	0	0	3	1	1	5	1
161	7B1	0	0	0	3	1	1	5	1
162	7B2	0	0	0	3	1	1	5	1
163	7B3	0	0	0	3	1	1	5	1
164	7B4	0	0	0	3	1	1	5	1
165	7B5	0	0	0	3	1	1	5	1
166	7C1	0	0	0	3	1	1	5	1
167	7C2	0	0	0	3	1	1	5	1
168	7C3	0	0	0	3	1	1	5	1
169	7C4	0	0	0	3	1	1	5	1
170	7C5	0	0	0	3	1	1	5	1
25	7D1	3	0	0	6	1	1	8	3
20	7D2	0	0	1	3	1	5	9	3
21	7D3	0	0	1	3	1	5	9	3
171	7E1	0	0	0	3	1	1	5	1
172	7E2	0	0	0	3	1	1	5	1
173	7E3	0	0	0	3	1	1	5	1
22	7E4	4	0	0	7	1	1	9	3
174	7F1	0	0	0	3	1	1	5	1
175	7F2	0	0	0	3	1	1	5	1
176	7F3	0	0	0	3	1	1	5	1
57	7F4	1	0	0	4	1	1	6	2
23	7G1	4	0	0	7	1	1	9	3
39	7G2	2	0	0	5	1	1	7	2
40	7G3	2	0	0	5	1	1	7	2
58	7G4	1	0	0	4	1	1	6	2
177	7G5	0	0	0	3	1	1	5	1
178	80	0	0	0	3	1	1	5	1
179	81	0	0	0	3	1	1	5	1
26	82	3	0	0	6	1	1	8	3
41	83	2	0	0	5	1	1	7	2
180	84	0	0	0	3	1	1	5	1
181	85	0	0	0	3	1	1	5	1
59	86A	1	0	0	4	1	1	6	2
60	86B	1	0	0	4	1	1	6	2
42	86C	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
182	86D	0	0	0	3	1	1	5	1
27	87A	3	0	0	6	1	1	8	3
183	87B	0	0	0	3	1	1	5	1
3	88	7	0	0	10	1	1	12	4
184	89	0	0	0	3	1	1	5	1
185	90A	0	0	0	3	1	1	5	1
186	90B	0	0	0	3	1	1	5	1
187	90C	0	0	0	3	1	1	5	1
188	90D	0	0	0	3	1	1	5	1
189	91	0	0	0	3	1	1	5	1
190	92	0	0	0	3	1	1	5	1
191	93A	0	0	0	3	1	1	5	1
192	93B	0	0	0	3	1	1	5	1
193	93C	0	0	0	3	1	1	5	1
194	93D	0	0	0	3	1	1	5	1
195	95	0	0	0	3	1	1	5	1
196	96	0	0	0	3	1	1	5	1

Appendix G: Valve Spacing

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
63	02A	193	49,737	1.9	1
35	02B	112	26,187	2.1	1
53	02C	96	24,104	2.0	1
60	02D	126	32,298	2.0	1
65	02E	104	26,865	1.9	1
38	03A	145	34,221	2.1	1
154	03B	67	27,891	1.2	1
97	04	161	50,102	1.6	1
82	05A	151	43,592	1.7	1
73	05B	146	40,362	1.8	1
62	05C	178	45,827	1.9	1
177	06A	45	25,310	0.9	5
181	06B	32	19,061	0.8	5
191	06C	30	23,744	0.6	5
174	06D	52	28,174	0.9	5
175	06E	40	21,882	0.9	5
143	06F	20	8,053	1.2	1
92	06H	81	24,782	1.6	1
185	06I	25	16,123	0.8	5
142	06J	31	12,448	1.2	1
170	06K	42	21,268	1.0	5
36	06M	64	15,079	2.1	1
42	06N	48	11,487	2.1	1
125	09	37	12,779	1.4	1
189	10	20	14,807	0.7	5
168	11	6	3,013	1.0	5
130	12A	138	49,075	1.4	1
119	12B	117	39,795	1.5	1
116	13A	116	38,705	1.5	1
45	13B	140	34,236	2.0	1
24	14	68	14,469	2.3	1
57	15	23	5,808	2.0	1
123	16	16	5,486	1.5	1
109	17A	123	39,927	1.5	1
33	17B	199	45,942	2.2	1
89	18	178	53,659	1.7	1
96	19	157	48,684	1.6	1
162	1A	22	9,661	1.1	1
48	1B	26	6,461	2.0	1
105	1C	33	10,619	1.6	1
31	20A	138	31,012	2.2	1
50	20B	189	47,397	2.0	1
108	21	25	8,090	1.5	1
149	22	10	4,125	1.2	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
146	23	162	66,345	1.2	1
152	24A	116	48,099	1.2	1
74	24B	193	53,615	1.8	1
113	25	20	6,598	1.5	1
159	26A	68	29,505	1.2	1
58	26B	160	40,689	2.0	1
129	27	91	32,113	1.4	1
127	28	156	54,406	1.4	1
95	29	166	51,320	1.6	1
180	30	8	4,648	0.9	5
91	31A	81	24,694	1.6	1
16	31B	3	583	2.6	1
183	32	17	10,573	0.8	5
151	33	46	19,067	1.2	1
171	34	13	6,598	1.0	5
172	35	69	35,341	1.0	5
121	36	134	45,715	1.5	1
167	37	10	4,973	1.0	1
47	38A	89	21,842	2.0	1
148	38B	115	47,410	1.2	1
150	39	30	12,431	1.2	1
90	40A	90	27,257	1.7	1
84	40B	98	28,494	1.7	1
173	41	36	18,918	1.0	5
80	42A	4	1,124	1.8	1
11	42B	47	7,823	3.0	1
59	42C	38	9,689	2.0	1
165	42D	24	11,170	1.1	1
176	42E	35	19,432	0.9	5
132	42F	33	11,906	1.4	1
27	42G	7	1,499	2.3	1
19	42H	3	601	2.5	1
193	42I	0	301	0.0	5
71	42J	22	5,965	1.8	1
114	42K	12	3,973	1.5	1
122	43A	40	13,649	1.5	1
3	43B	1	88	5.7	1
163	43C	2	887	1.1	1
6	43D	5	572	4.4	1
34	44	86	20,073	2.1	1
52	45A	165	41,400	2.0	1
25	45B	53	11,288	2.3	1
49	46	41	10,206	2.0	1
29	47	7	1,523	2.3	1

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
124	48	103	35,406	1.5	1
40	49	8	1,903	2.1	1
70	51	126	34,062	1.8	1
79	52A	59	16,552	1.8	1
85	52B	35	10,224	1.7	1
157	53A	50	21,627	1.2	1
156	53B	16	6,857	1.2	1
93	54	28	8,578	1.6	1
94	55	232	71,352	1.6	1
8	56A	24	3,122	3.8	1
135	56B	474	178,273	1.3	1
195	56C	0	0	0.0	1
44	57	34	8,247	2.1	1
106	57A	121	38,947	1.6	1
32	57B	2	450	2.2	1
67	58A	56	14,811	1.9	1
5	58B	32	3,344	4.8	1
1	58C	4	86	23.2	1
43	59	31	7,477	2.1	1
196	60	0	0	0.0	1
61	60A	43	11,070	1.9	1
22	60B	28	5,832	2.4	1
55	61	26	6,537	2.0	1
158	62	13	5,625	1.2	1
28	63	152	32,820	2.3	1
111	64	13	4,271	1.5	1
99	65	44	13,735	1.6	1
7	66A	47	5,825	4.0	1
81	66B	19	5,477	1.7	1
37	66C	10	2,359	2.1	1
104	66D	16	5,144	1.6	1
137	66E	8	3,079	1.3	1
9	66F	4	538	3.7	1
17	67	10	1,947	2.6	1
72	68	5	1,371	1.8	1
12	69	22	3,856	2.9	1
166	6G1	15	7,345	1.0	1
134	6G2	2	737	1.4	1
103	70	101	32,022	1.6	1
75	71	95	26,496	1.8	1
164	72	23	10,362	1.1	1
144	74	29	11,736	1.2	1
78	76A	43	12,044	1.8	1
18	76B	21	4,114	2.6	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
39	76C	14	3,323	2.1	1
13	76D	32	5,884	2.7	1
23	76F	15	3,142	2.4	1
126	76G	7	2,439	1.4	1
10	76H	29	4,066	3.6	1
4	76I	12	1,194	5.0	1
54	76J	4	1,005	2.0	1
14	76K	7	1,317	2.7	1
138	77	2	774	1.3	1
69	78	83	22,333	1.9	1
15	79	39	7,373	2.6	1
190	7A1	13	9,862	0.7	5
184	7A2	16	10,101	0.8	5
136	7B1	14	5,341	1.3	1
188	7B2	12	8,145	0.7	5
83	7B3	27	7,806	1.7	1
112	7B4	25	8,220	1.5	1
197	7B5	0	0	0.0	1
118	7C1	16	5,378	1.5	1
139	7C2	13	5,053	1.3	1
66	7C3	23	5,949	1.9	1
161	7C4	32	13,990	1.1	1
56	7C5	24	6,039	2.0	1
68	7D1	64	17,022	1.9	1
64	7D2	31	8,007	1.9	1
115	7D3	31	10,313	1.5	1
169	7E1	33	16,670	1.0	5
155	7E2	6	2,538	1.2	1
145	7E3	21	8,596	1.2	1
140	7E4	25	9,777	1.3	1
77	7F1	27	7,544	1.8	1
141	7F2	24	9,451	1.3	1
179	7F3	16	9,263	0.9	5
187	7F4	12	7,990	0.8	5
192	7G1	7	6,060	0.6	5
182	7G2	8	4,803	0.8	5
160	7G3	21	9,148	1.1	1
133	7G4	24	8,708	1.4	1
101	7G5	15	4,690	1.6	1
98	80	80	24,930	1.6	1
30	81	55	12,011	2.3	1
41	82	62	14,783	2.1	1
46	83	58	14,222	2.0	1
26	84	23	4,906	2.3	1

Sacramento Suburban Water District
Valve Spacing Score

Rank	Area	Number of Isolation Valves	Main Length [feet]	Valves Per 500'	Score
178	85	48	27,675	0.9	5
110	86A	74	24,058	1.5	1
76	86B	94	26,243	1.8	1
86	86C	94	27,715	1.7	1
20	86D	24	4,835	2.5	1
87	87A	53	15,768	1.7	1
21	87B	15	3,087	2.4	1
100	88	93	29,049	1.6	1
51	89	55	13,800	2.0	1
153	90A	71	29,524	1.2	1
186	90B	6	3,875	0.8	5
147	90C	42	17,273	1.2	1
131	90D	5	1,803	1.4	1
128	91	131	45,863	1.4	1
194	92	0	617	0.0	5
107	93A	120	38,757	1.5	1
88	93B	119	35,569	1.7	1
102	93C	113	35,788	1.6	1
120	93D	99	33,692	1.5	1
2	95	8	673	5.9	1
117	96	17	5709.79	1.5	1

Appendix H: Pipe Material

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
02A	49,737	ACP	699	1.4	4	0.06	1.56
		DIP	23,015	46.2	1	0.46	
		PVC	26,023	52.3	2	1.05	
02B	26,187	DIP	15,774	60.2	1	0.60	1.40
		PVC	10,413	39.8	2	0.80	
02C	24,104	DIP	16,412	68.1	1	0.68	1.32
		PVC	7,693	31.9	2	0.64	
02D	32,298	CIP	30	0.1	3	0.00	1.08
		DIP	29,681	91.9	1	0.92	
		PVC	2,588	8.0	2	0.16	
02E	26,865	DIP	26,865	99.9	1	1.00	1.00
03A	34,221	ACP	25,565	74.7	4	2.99	3.32
		CIP	62	0.2	3	0.01	
		DIP	6,036	17.6	1	0.18	
		PVC	2,557	7.5	2	0.15	
03B	27,891	ACP	24,317	87.2	4	3.49	3.62
		DIP	3,458	12.4	1	0.12	
		PVC	75	0.3	2	0.01	
		UNK	41	0.1	5	0.01	
04	50,102	ACP	46,895	93.6	4	3.74	3.81
		DIP	3,172	6.3	1	0.06	
		UNK	35	0.1	5	0.00	
05A	43,592	ACP	34,706	79.6	4	3.18	3.59
		CIP	489	1.1	3	0.03	
		DIP	435	1.0	1	0.01	
		PVC	7,962	18.2	2	0.36	
05B	40,362	ACP	661	1.6	4	0.07	2.02
		DIP	505	1.3	1	0.01	
		PVC	39,196	97.0	2	1.94	
05C	45,827	ACP	23,384	51.0	4	2.04	2.91
		DIP	5,575	12.2	1	0.12	
		PVC	16,690	36.4	2	0.73	
		UNK	177	0.4	5	0.02	
06A	25,310	ACP	25,153	99.4	4	3.98	3.98
		DIP	131	0.5	1	0.01	
		PVC	26	0.1	2	0.00	
06B	19,061	ACP	19,061	100.0	4	4.00	4.00
06C	23,744	ACP	23,283	98.1	4	3.92	3.99
		DIP	154	0.6	1	0.01	
		UNK	307	1.3	5	0.06	
06D	28,174	ACP	27,653	98.1	4	3.93	3.95
		CIP	54	0.2	3	0.01	
		DIP	467	1.7	1	0.02	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
06E	21,882	ACP	21,877	100.0	4	4.00	4.00
		DIP	6	0.0	1	0.00	
06F	8,053	ACP	7,689	95.5	4	3.82	3.90
		DIP	292	3.6	1	0.04	
		ODS	71	0.9	5	0.04	
06H	24,782	ACP	191	0.8	4	0.03	1.02
		DIP	24,591	99.2	1	0.99	
06I	16,123	ACP	15,488	96.1	4	3.84	3.89
		DIP	463	2.9	1	0.03	
		PVC	172	1.1	2	0.02	
06J	12,448	ACP	10,547	84.7	4	3.39	3.55
		DIP	1,773	14.2	1	0.14	
		PVC	128	1.0	2	0.02	
06K	21,268	ACP	18,738	88.1	4	3.52	3.76
		PVC	2,531	11.9	2	0.24	
06M	15,079	ACP	3,761	24.9	4	1.00	1.75
		DIP	11,317	75.1	1	0.75	
06N	11,487	ACP	1,057	9.2	4	0.37	1.28
		DIP	10,430	90.8	1	0.91	
09	12,779	ACP	12,622	98.8	4	3.95	3.96
		DIP	157	1.2	1	0.01	
10	14,807	ACP	320	2.2	4	0.09	2.95
		DIP	562	3.8	1	0.04	
		MLS	13,925	94.0	3	2.82	
11	3,013	ACP	2,574	85.4	4	3.42	3.85
		MLS	438	14.6	3	0.44	
12A	49,075	ACP	36,656	74.7	4	2.99	3.72
		DIP	406	0.8	1	0.01	
		MLS	11,511	23.5	3	0.70	
		PVC	502	1.0	2	0.02	
12B	39,795	ACP	37,832	95.1	4	3.80	3.86
		DIP	1,811	4.6	1	0.05	
		MLS	152	0.4	3	0.01	
13A	38,705	ACP	5,185	13.4	4	0.54	2.72
		DIP	2,665	6.9	1	0.07	
		MLS	20,027	51.7	3	1.55	
		PVC	10,829	28.0	2	0.56	
13B	34,236	ACP	21,183	61.9	4	2.47	3.33
		CIP	517	1.5	3	0.05	
		DIP	1,100	3.2	1	0.03	
		MLS	3,706	10.8	3	0.32	
		PVC	7,730	22.6	2	0.45	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
14	14,469	ACP	2,417	16.7	4	0.67	2.29
		DIP	700	4.8	1	0.05	
		PVC	11,353	78.5	2	1.57	
15	5,808	CIP	410	7.1	3	0.21	2.07
		PVC	5,399	92.9	2	1.86	
16	5,486	ACP	4,191	76.4	4	3.06	3.29
		DIP	1,295	23.6	1	0.24	
17A	39,927	ACP	15,881	39.8	4	1.59	2.99
		DIP	2,815	7.0	1	0.07	
		MLS	10,616	26.6	3	0.80	
		ODS	14	0.0	5	0.00	
		PVC	10,583	26.5	2	0.53	
		UNK	18	0.0	5	0.00	
17B	45,942	ACP	11,430	24.9	4	1.00	2.63
		CIP	722	1.6	3	0.05	
		DIP	1,784	3.9	1	0.04	
		MLS	6,997	15.2	3	0.46	
		PVC	25,006	54.4	2	1.09	
		UNK	3	0.0	5	0.00	
18	53,659	ACP	22,317	41.6	4	1.66	3.04
		DIP	2,883	5.4	1	0.05	
		MLS	13,976	26.0	3	0.78	
		PVC	14,483	27.0	2	0.54	
19	48,684	ACP	22,223	45.6	4	1.83	3.09
		DIP	3,245	6.7	1	0.07	
		MLS	11,696	24.0	3	0.72	
		PVC	11,518	23.7	2	0.47	
		UNK	2	0.0	5	0.00	
1A	9,661	ACP	9,536	98.7	4	3.95	4.01
		UNK	125	1.3	5	0.06	
1B	6,461	ACP	5,484	84.9	4	3.40	3.60
		DIP	618	9.6	1	0.10	
		PVC	359	5.6	2	0.11	
1C	10,619	ACP	10,148	95.6	4	3.82	3.87
		DIP	463	4.4	1	0.04	
		UNK	8	0.1	5	0.00	
20A	31,012	ACP	29,305	94.5	4	3.78	3.86
		DIP	1,069	3.4	1	0.03	
		PVC	638	2.1	2	0.04	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
20B	47,397	ACP	34,609	73.0	4	2.92	3.48
		CIP	172	0.4	3	0.01	
		DIP	4,446	9.4	1	0.09	
		MLS	5,401	11.4	3	0.34	
		PVC	2,770	5.8	2	0.12	
21	8,090	ACP	6,096	75.4	4	3.01	3.26
		DIP	1,994	24.6	1	0.25	
22	4,125	ACP	3,959	96.0	4	3.84	3.92
		PVC	165	4.0	2	0.08	
23	66,345	ACP	62,784	94.6	4	3.79	3.85
		DIP	2,900	4.4	1	0.04	
		PVC	636	1.0	2	0.02	
		UNK	26	0.0	5	0.00	
24A	48,099	ACP	23,931	49.8	4	1.99	3.13
		CIP	1,135	2.4	3	0.07	
		DIP	4,591	9.5	1	0.10	
		MLS	9,937	20.7	3	0.62	
		PVC	8,465	17.6	2	0.35	
		UNK	41	0.1	5	0.00	
24B	53,615	ACP	28,707	53.5	4	2.14	3.30
		CIP	60	0.1	3	0.00	
		DIP	461	0.9	1	0.01	
		MLS	11,985	22.4	3	0.67	
		PVC	12,183	22.7	2	0.45	
		UNK	220	0.4	5	0.02	
25	6,598	ACP	5,409	82.0	4	3.28	3.64
		PVC	1,189	18.0	2	0.36	
26A	29,505	ACP	7,078	24.0	4	0.96	2.77
		DIP	4,938	16.7	1	0.17	
		MLS	13,482	45.7	3	1.37	
		PVC	4,006	13.6	2	0.27	
26B	40,689	ACP	18,216	44.8	4	1.79	3.21
		DIP	2,052	5.0	1	0.05	
		MLS	14,825	36.4	3	1.09	
		PVC	5,597	13.8	2	0.28	
27	32,113	ACP	7,828	24.4	4	0.98	2.83
		DIP	4,849	15.1	1	0.15	
		MLS	15,676	48.8	3	1.46	
		PVC	3,659	11.4	2	0.23	
		UNK	102	0.3	5	0.02	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
28	54,406	ACP	28,653	52.7	4	2.11	3.34
		DIP	254	0.5	1	0.00	
		MLS	16,018	29.4	3	0.88	
		PVC	9,481	17.4	2	0.35	
29	51,320	ACP	30,382	59.2	4	2.37	3.26
		CIP	74	0.1	3	0.00	
		DIP	7,333	14.3	1	0.14	
		MLS	10,954	21.3	3	0.64	
		PVC	2,577	5.0	2	0.10	
30	4,648	ACP	4,307	92.7	4	3.71	3.85
		PVC	341	7.3	2	0.15	
31A	24,694	ACP	21,520	87.1	4	3.49	3.67
		DIP	1,707	6.9	1	0.07	
		PVC	1,467	5.9	2	0.12	
31B	583	ACP	338	57.9	4	2.32	2.74
		DIP	246	42.1	1	0.42	
32	10,573	ACP	10,558	99.9	4	3.99	4.00
		PVC	15	0.1	2	0.00	
33	19,067	ACP	15,718	82.4	4	3.30	3.47
		DIP	3,349	17.6	1	0.18	
34	6,598	ACP	5,157	78.2	4	3.13	3.78
		MLS	1,441	21.8	3	0.66	
35	35,341	ACP	16,751	47.4	4	1.90	3.42
		DIP	572	1.6	1	0.02	
		MLS	17,228	48.7	3	1.46	
		PVC	790	2.2	2	0.04	
36	45,715	ACP	20,329	44.5	4	1.78	3.18
		DIP	2,720	5.9	1	0.06	
		MLS	16,321	35.4	3	1.06	
		PVC	6,345	13.9	2	0.28	
37	4,973	ACP	2,551	51.3	4	2.05	3.49
		DIP	45	0.9	1	0.01	
		MLS	2,376	47.8	3	1.43	
38A	21,842	ACP	19,884	91.0	4	3.64	3.80
		CIP	186	0.9	3	0.03	
		DIP	721	3.3	1	0.03	
		MLS	19	0.1	3	0.00	
		PVC	984	4.5	2	0.09	
		UNK	48	0.2	5	0.01	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
38B	47,410	ACP	29,259	61.7	4	2.47	3.49
		DIP	1,612	3.4	1	0.03	
		MLS	13,534	28.5	3	0.86	
		PVC	2,972	6.3	2	0.13	
		UNK	32	0.1	5	0.00	
39	12,431	ACP	10,847	87.3	4	3.49	3.81
		CIP	884	7.1	3	0.21	
		DIP	237	1.9	1	0.02	
		MLS	31	0.2	3	0.01	
		PVC	400	3.2	2	0.06	
		UNK	30	0.2	5	0.01	
40A	27,257	ACP	11,353	41.7	4	1.67	2.77
		DIP	3,359	12.3	1	0.12	
		MLS	1,693	6.2	3	0.19	
		PVC	10,853	39.8	2	0.80	
40B	28,494	ACP	14,350	50.4	4	2.01	3.13
		DIP	2,784	9.8	1	0.10	
		MLS	6,430	22.3	3	0.67	
		PVC	4,930	17.3	2	0.35	
41	18,918	ACP	17,810	94.1	4	3.77	3.92
		DIP	115	0.6	1	0.01	
		MLS	734	3.9	3	0.12	
		PVC	258	1.4	2	0.03	
42A	1,124	DIP	1,124	100.0	1	1.00	1.00
42B	7,823	ACP	4,628	59.2	4	2.37	3.40
		DIP	1,278	16.3	1	0.16	
		ODS	988	12.6	5	0.63	
		PVC	929	11.9	2	0.24	
42C	9,689	ACP	7,182	74.1	4	2.96	3.32
		DIP	1,572	16.2	1	0.16	
		PVC	935	9.7	2	0.19	
42D	11,170	ACP	10,788	96.6	4	3.86	3.93
		DIP	8	0.1	1	0.00	
		PVC	365	3.3	2	0.07	
		UNK	10	0.1	5	0.00	
42E	19,432	ACP	19,432	100.0	4	4.00	4.00
42F	11,906	ACP	9,278	77.9	4	3.12	3.37
		DIP	2,327	19.5	1	0.20	
		PVC	260	2.2	2	0.04	
		UNK	41	0.3	5	0.02	
42G	1,499	ACP	442	29.5	4	1.18	1.88
		DIP	1,057	70.5	1	0.71	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
42H	601	ACP	576	95.8	4	3.83	3.87
		DIP	25	4.2	1	0.04	
42I	301	ACP	301	100.0	4	4.00	4.00
42J	5,965	ACP	3,740	62.7	4	2.51	3.49
		DIP	872	14.6	1	0.15	
		ODS	760	12.7	5	0.64	
		PVC	593	9.9	2	0.20	
42K	3,973	ACP	1,114	28.0	4	1.12	2.23
		DIP	1,397	35.2	1	0.35	
		PVC	1,440	36.2	2	0.72	
		UNK	22	0.6	5	0.03	
43A	13,649	ACP	10,469	76.7	4	3.07	3.58
		DIP	205	1.5	1	0.02	
		ODS	284	2.1	5	0.10	
		PVC	2,679	19.6	2	0.39	
		UNK	12	0.1	5	0.00	
43B	88	DIP	88	100.0	1	1.00	1.00
43C	887	ACP	173	19.5	4	0.78	1.59
		DIP	714	80.5	1	0.80	
43D	572	ACP	238	41.6	4	1.66	2.51
		DIP	186	32.5	1	0.32	
		PVC	148	26.0	2	0.52	
44	20,073	ACP	6,386	31.8	4	1.27	2.37
		DIP	5,270	26.3	1	0.26	
		PVC	8,416	41.9	2	0.84	
45A	41,400	ACP	1,011	2.4	4	0.10	1.30
		DIP	31,005	74.9	1	0.75	
		ODS	13	0.0	5	0.00	
		PVC	9,349	22.6	2	0.45	
		UNK	23	0.1	5	0.00	
45B	11,288	ACP	4,486	39.7	4	1.59	2.42
		DIP	4,631	41.0	1	0.41	
		ODS	134	1.2	5	0.06	
		PVC	2,037	18.0	2	0.36	
46	10,206	DIP	242	2.4	1	0.02	1.98
		PVC	9,964	97.6	2	1.95	
47	1,523	DIP	15	1.0	1	0.01	1.99
		PVC	1,508	99.0	2	1.98	
48	35,406	ACP	15,364	43.4	4	1.74	4.13
		DIP	1,923	5.4	1	0.05	
		ODS	15,532	43.9	5	2.19	
		PVC	2,566	7.2	2	0.14	
		UNK	21	0.1	5	0.00	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
49	1,903	ODS	14	0.7	5	0.04	2.02
		PVC	1,889	99.3	2	1.99	
51	34,062	ACP	1,180	3.5	4	0.14	1.18
		DIP	30,169	88.6	1	0.89	
		PVC	2,713	8.0	2	0.16	
52A	16,552	ACP	5,942	35.9	4	1.44	2.08
		DIP	10,611	64.1	1	0.64	
52B	10,224	DIP	10,224	100.0	1	1.00	1.00
53A	21,627	ACP	19,235	88.9	4	3.56	3.74
		DIP	803	3.7	1	0.04	
		PVC	1,589	7.3	2	0.15	
53B	6,857	ACP	5,279	77.0	4	3.08	3.31
		DIP	1,578	23.0	1	0.23	
54	8,578	ACP	7,103	82.8	4	3.31	3.59
		DIP	566	6.6	1	0.07	
		PVC	909	10.6	2	0.21	
55	71,352	ACP	27,184	38.1	4	1.52	1.76
		DIP	3,256	4.6	1	0.05	
		MLS	2,974	4.2	3	0.13	
		PVC	2,209	3.1	2	0.06	
		UNK	53	0.1	5	0.00	
56A	3,122	ACP	914	29.3	4	1.17	1.88
		DIP	2,208	70.7	1	0.71	
56B	178,273	ACP	19,814	11.1	4	0.44	1.04
		DIP	21,889	12.3	1	0.12	
		ODS	16,324	9.2	5	0.46	
		PVC	1,398	0.8	2	0.02	
57	8,247	ACP	3,081	37.4	4	1.49	2.83
		DIP	1,889	22.9	1	0.23	
		MLS	2,556	31.0	3	0.93	
		PVC	723	8.8	2	0.18	
57A	38,947	ACP	26,219	67.3	4	2.69	3.21
		DIP	6,185	15.9	1	0.16	
		MLS	646	1.7	3	0.05	
		PVC	5,877	15.1	2	0.30	
		UNK	20	0.1	5	0.00	
57B	450	ACP	450	100.0	4	4.00	4.00
58A	14,811	ACP	2	0.0	4	0.00	1.06
		DIP	13,966	94.3	1	0.94	
		PVC	842	5.7	2	0.11	
58B	3,344	ACP	292	8.7	4	0.35	1.26
		DIP	3,053	91.3	1	0.91	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
58C	86	ACP	62	72.2	4	2.89	3.17
		DIP	24	27.8	1	0.28	
59	7,477	ACP	298	4.0	4	0.16	1.26
		DIP	6,150	82.2	1	0.82	
		PVC	1,029	13.8	2	0.28	
60A	11,070	DIP	11,070	100.0	1	1.00	1.00
60B	5,832	DIP	4,081	70.0	1	0.70	1.33
		ODS	33	0.6	5	0.03	
		PVC	1,700	29.2	2	0.58	
		UNK	17	0.3	5	0.01	
61	6,537	ACP	159	2.4	4	0.10	1.10
		DIP	6,203	94.9	1	0.95	
		PVC	175	2.7	2	0.05	
62	5,625	DIP	5,625	100.0	1	1.00	1.00
63	32,820	ACP	358	1.1	4	0.04	2.02
		DIP	320	1.0	1	0.01	
		ODS	9	0.0	5	0.00	
		PVC	32,090	97.8	2	1.96	
		UNK	43	0.1	5	0.01	
64	4,271	DIP	4,271	100.0	1	1.00	1.00
65	13,735	ACP	973	7.1	4	0.28	1.29
		DIP	12,513	91.1	1	0.91	
		ODS	249	1.8	5	0.09	
66A	5,825	ACP	79	1.4	4	0.05	1.48
		DIP	3,533	60.7	1	0.61	
		ODS	53	0.9	5	0.05	
		PVC	2,097	36.0	2	0.72	
		UNK	62	1.1	5	0.05	
66B	5,477	ACP	3,713	67.8	4	2.71	3.41
		DIP	376	6.9	1	0.07	
		ODS	90	1.6	5	0.08	
		PVC	1,160	21.2	2	0.42	
		UNK	137	2.5	5	0.13	
66C	2,359	ACP	1,832	77.7	4	3.11	3.33
		DIP	527	22.3	1	0.22	
66D	5,144	ACP	902	17.5	4	0.70	1.53
		DIP	4,219	82.0	1	0.82	
		PVC	24	0.5	2	0.01	
66E	3,079	ACP	818	26.6	4	1.06	1.80
		DIP	2,261	73.4	1	0.73	
66F	538	DIP	538	100.0	1	1.00	1.00

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
67	1,947	ACP	1,010	51.9	4	2.07	2.61
		DIP	909	46.7	1	0.47	
		UNK	28	1.4	5	0.07	
68	1,371	DIP	29	2.1	1	0.02	2.00
		ODS	10	0.7	5	0.04	
		PVC	1,332	97.2	2	1.94	
69	3,856	DIP	3,856	100.0	1	1.00	1.00
6G1	7,345	ACP	7,345	100.0	4	4.00	4.00
6G2	737	ACP	737	100.0	4	4.00	4.00
70	32,022	ACP	1,578	4.9	4	0.20	1.15
		DIP	30,444	95.1	1	0.95	
71	26,496	ACP	1,969	7.4	4	0.30	1.37
		DIP	20,863	78.7	1	0.79	
		ODS	117	0.4	5	0.02	
		PVC	3,546	13.4	2	0.27	
72	10,362	ACP	9,826	94.8	4	3.79	3.90
		DIP	4	0.0	1	0.00	
		PVC	520	5.0	2	0.10	
		UNK	13	0.1	5	0.01	
74	11,736	ACP	10,165	86.6	4	3.46	3.73
		DIP	10	0.1	1	0.00	
		MLS	5	0.0	3	0.00	
		PVC	1,554	13.2	2	0.26	
		UNK	3	0.0	5	0.00	
76A	12,044	ACP	3,977	33.0	4	1.32	2.03
		DIP	7,551	62.7	1	0.63	
		PVC	516	4.3	2	0.09	
76B	4,114	DIP	4,114	100.0	1	1.00	1.00
76C	3,323	ACP	2,276	68.5	4	2.74	3.30
		DIP	248	7.5	1	0.07	
		PVC	799	24.0	2	0.48	
76D	5,884	DIP	5,881	99.9	1	1.00	1.00
		PVC	4	0.1	2	0.00	
76F	3,142	ACP	2,359	75.1	4	3.00	3.25
		DIP	783	24.9	1	0.25	
76G	2,439	ACP	292	12.0	4	0.48	1.36
		DIP	2,147	88.0	1	0.88	
76H	4,066	ACP	2,444	60.1	4	2.40	3.05
		DIP	730	18.0	1	0.18	
		ODS	6	0.2	5	0.01	
		PVC	860	21.1	2	0.42	
		UNK	25	0.6	5	0.03	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
76I	1,194	ACP	579	48.5	4	1.94	3.04
		DIP	340	28.5	1	0.28	
		ODS	140	11.7	5	0.59	
		PVC	134	11.3	2	0.23	
76J	1,005	ACP	451	44.9	4	1.80	2.35
		DIP	554	55.1	1	0.55	
76K	1,317	ACP	402	30.5	4	1.22	1.95
		DIP	867	65.8	1	0.66	
		PVC	49	3.7	2	0.07	
77	774	ACP	774	100.0	4	4.00	4.00
78	22,333	ACP	568	2.5	4	0.10	1.28
		DIP	18,436	82.5	1	0.83	
		ODS	355	1.6	5	0.08	
		PVC	2,914	13.0	2	0.26	
		UNK	61	0.3	5	0.01	
79	7,373	ACP	339	4.6	4	0.18	1.41
		DIP	5,169	70.1	1	0.70	
		PVC	1,824	24.7	2	0.49	
		UNK	42	0.6	5	0.03	
7A1	9,862	ACP	4,021	40.8	4	1.63	3.06
		PVC	5,046	51.2	2	1.02	
		UNK	795	8.1	5	0.40	
7A2	10,101	ACP	485	4.8	4	0.19	3.80
		CIP	384	3.8	3	0.11	
		PVC	3,624	35.9	2	0.72	
		UNK	5,609	55.5	5	2.78	
7B1	5,341	ACP	4,680	87.6	4	3.50	4.12
		UNK	661	12.4	5	0.62	
7B2	8,145	ACP	6,480	79.6	4	3.18	3.64
		DIP	6	0.1	1	0.00	
		PVC	1,520	18.7	2	0.37	
		UNK	139	1.7	5	0.09	
7B3	7,806	ACP	4,660	59.7	4	2.39	3.18
		CIP	455	5.8	3	0.17	
		DIP	1,178	15.1	1	0.15	
		PVC	1,305	16.7	2	0.33	
		UNK	207	2.7	5	0.13	
7B4	8,220	ACP	4,751	57.8	4	2.31	3.63
		DIP	361	4.4	1	0.04	
		PVC	1,693	20.6	2	0.41	
		UNK	1,415	17.2	5	0.86	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7C1	5,378	ACP	1,244	23.1	4	0.93	3.21
		CIP	1,405	26.1	3	0.78	
		ODS	395	7.3	5	0.37	
		PVC	1,855	34.5	2	0.69	
		UNK	479	8.9	5	0.45	
7C2	5,053	ACP	3,081	61.0	4	2.44	3.73
		CIP	1,663	32.9	3	0.99	
		UNK	310	6.1	5	0.31	
7C3	5,949	ACP	1,682	28.3	4	1.13	3.59
		CIP	2,208	37.1	3	1.11	
		DIP	6	0.1	1	0.00	
		PVC	755	12.7	2	0.25	
		UNK	1,299	21.8	5	1.09	
7C4	13,990	ACP	8,163	58.4	4	2.33	3.88
		CCP	250	1.8	5	0.09	
		CIP	1,171	8.4	3	0.25	
		DIP	1,065	7.6	1	0.08	
		PVC	308	2.2	2	0.04	
		UNK	3,032	21.7	5	1.08	
7C5	6,039	ACP	1,700	28.2	4	1.13	3.08
		CIP	3,221	53.3	3	1.60	
		DIP	360	6.0	1	0.06	
		PVC	668	11.1	2	0.22	
		UNK	90	1.5	5	0.07	
7D1	17,022	ACP	7,958	46.8	4	1.87	3.52
		CIP	6,971	41.0	3	1.23	
		DIP	816	4.8	1	0.05	
		UNK	1,276	7.5	5	0.37	
7D2	8,007	ACP	2,471	30.9	4	1.23	3.32
		CIP	4,886	60.8	3	1.82	
		DIP	285	3.6	1	0.04	
		UNK	364	4.5	5	0.23	
7D3	10,313	ACP	2,306	22.0	4	0.88	3.76
		CIP	5,029	48.6	3	1.46	
		DIP	57	0.6	1	0.01	
		UNK	2,921	28.3	5	1.42	
7E1	16,670	ACP	9,426	56.5	4	2.26	3.45
		CIP	1,877	11.3	3	0.34	
		DIP	3,162	18.9	1	0.19	
		UNK	2,206	13.2	5	0.66	
7E2	2,538	ACP	2,181	85.9	4	3.44	4.14
		UNK	357	14.1	5	0.70	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7E3	8,596	ACP	4,998	58.1	4	2.33	3.64
		CIP	2,049	23.8	3	0.71	
		DIP	21	0.2	1	0.00	
		PVC	838	9.8	2	0.20	
		UNK	690	8.0	5	0.40	
7E4	9,777	ACP	4,815	49.3	4	1.97	4.33
		CIP	846	8.7	3	0.26	
		CONC	792	8.1	5	0.41	
		PVC	22	0.2	2	0.00	
		UNK	3,301	33.8	5	1.69	
7F1	7,544	ACP	2,764	36.6	4	1.47	3.41
		CIP	1,408	18.7	3	0.56	
		DIP	1,320	17.5	1	0.17	
		PVC	376	5.0	2	0.10	
		UNK	1,676	22.2	5	1.11	
7F2	9,451	ACP	1,602	16.9	4	0.68	3.35
		CIP	6,727	71.2	3	2.14	
		DIP	131	1.4	1	0.01	
		UNK	992	10.5	5	0.52	
7F3	9,263	ACP	4,491	48.5	4	1.94	3.63
		CIP	386	4.2	3	0.13	
		DIP	416	4.5	1	0.04	
		MLS	711	7.7	3	0.23	
		PVC	1,462	15.8	2	0.32	
		UNK	1,798	19.4	5	0.97	
7F4	7,990	ACP	3,507	43.9	4	1.76	3.85
		CIP	1,557	19.5	3	0.58	
		DIP	519	6.5	1	0.06	
		MLS	251	3.1	3	0.09	
		UNK	2,158	27.0	5	1.35	
7G1	6,060	DIP	1,270	21.0	1	0.21	3.92
		PVC	478	7.9	2	0.16	
		UNK	4,311	71.1	5	3.56	
7G2	4,803	ACP	3,170	66.0	4	2.64	3.43
		DIP	626	13.0	1	0.13	
		PVC	625	13.0	2	0.26	
		UNK	381	7.9	5	0.40	
7G3	9,148	ACP	6,731	73.6	4	2.94	3.84
		CIP	1,445	15.8	3	0.47	
		DIP	256	2.8	1	0.03	
		UNK	716	7.8	5	0.39	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
7G4	8,708	ACP	5,926	68.1	4	2.72	4.09
		CCP	806	9.3	5	0.46	
		CIP	48	0.6	3	0.02	
		DIP	470	5.4	1	0.05	
		UNK	1,457	16.7	5	0.84	
7G5	4,690	ACP	4,316	92.0	4	3.68	3.91
		DIP	11	0.2	1	0.00	
		PVC	257	5.5	2	0.11	
		UNK	106	2.3	5	0.11	
80	24,930	DIP	24,634	98.8	1	0.99	1.02
		PVC	253	1.0	2	0.02	
		UNK	43	0.2	5	0.01	
81	12,011	ACP	4	0.0	4	0.00	1.14
		DIP	11,565	95.0	1	0.95	
		ODS	443	3.7	5	0.18	
82	14,783	ACP	10,702	72.4	4	2.90	3.18
		DIP	4,060	27.5	1	0.27	
		UNK	21	0.1	5	0.01	
83	14,222	ACP	3,108	21.9	4	0.87	1.77
		DIP	9,603	67.5	1	0.68	
		MLS	144	1.0	3	0.03	
		PVC	1,360	9.6	2	0.19	
		UNK	7	0.0	5	0.00	
84	4,906	ACP	5	0.1	4	0.00	1.03
		DIP	4,751	96.8	1	0.97	
		PVC	150	3.1	2	0.06	
85	27,675	ACP	9,059	32.7	4	1.31	4.43
		DIP	1,504	5.4	1	0.05	
		ODS	16,899	61.1	5	3.05	
		PVC	213	0.8	2	0.02	
86A	24,058	ACP	22,730	94.5	4	3.78	3.84
		DIP	1,268	5.3	1	0.05	
		PVC	59	0.2	2	0.00	
		UNK	1	0.0	5	0.00	
86B	26,243	ACP	25,312	96.4	4	3.86	3.90
		DIP	856	3.3	1	0.03	
		PVC	76	0.3	2	0.01	
86C	27,715	ACP	19,728	71.2	4	2.85	3.33
		DIP	2,721	9.8	1	0.10	
		PVC	5,260	19.0	2	0.38	
		UNK	7	0.0	5	0.00	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
86D	4,835	ACP	3,520	72.8	4	2.91	3.24
		DIP	1,037	21.5	1	0.21	
		PVC	277	5.7	2	0.11	
87A	15,768	ACP	4,045	25.7	4	1.03	1.78
		DIP	11,654	73.9	1	0.74	
		ODS	19	0.1	5	0.01	
		PVC	50	0.3	2	0.01	
87B	3,087	DIP	1,601	51.9	1	0.52	1.48
		PVC	1,485	48.1	2	0.96	
88	29,049	DIP	28,551	98.3	1	0.98	1.02
		ODS	69	0.2	5	0.01	
		PVC	429	1.5	2	0.03	
89	13,800	ACP	714	5.2	4	0.21	1.91
		DIP	10,493	76.0	1	0.76	
		ODS	2,593	18.8	5	0.94	
90A	29,524	ACP	25,002	84.7	4	3.39	3.70
		DIP	312	1.1	1	0.01	
		PVC	4,077	13.8	2	0.28	
		UNK	133	0.4	5	0.02	
90B	3,875	ACP	3,875	100.0	4	4.00	4.00
90C	17,273	ACP	4,726	27.4	4	1.09	4.43
		DIP	12	0.1	1	0.00	
		MLS	19	0.1	3	0.00	
		ODS	10,829	62.7	5	3.13	
		PVC	1,668	9.7	2	0.19	
		UNK	19	0.1	5	0.01	
90D	1,803	ACP	1,536	85.2	4	3.41	3.70
		PVC	267	14.8	2	0.30	
91	45,863	ACP	31,508	68.7	4	2.75	3.23
		DIP	6,428	14.0	1	0.14	
		PVC	7,926	17.3	2	0.35	
92	617	ACP	617	100.0	4	4.00	4.00
93A	38,757	ACP	35,676	92.0	4	3.68	3.81
		DIP	1,239	3.2	1	0.03	
		PVC	1,841	4.7	2	0.09	
		UNK	2	0.0	5	0.00	
93B	35,569	ACP	33,025	92.8	4	3.71	3.83
		DIP	900	2.5	1	0.03	
		PVC	1,643	4.6	2	0.09	

Area	Total Length Within Area [feet]	Material	Length of Material [feet]	Material Within Area [%]	Material Score	Weighted Score	Total Weighted Score*
93C	35,788	ACP	32,201	90.0	4	3.60	3.79
		DIP	498	1.4	1	0.01	
		MLS	4	0.0	3	0.00	
		PVC	3,052	8.5	2	0.17	
		UNK	33	0.1	5	0.00	
93D	33,692	ACP	33,250	98.7	4	3.95	3.96
		DIP	396	1.2	1	0.01	
		PVC	45	0.1	2	0.00	
95	673	ACP	648	96.3	4	3.85	3.99
		PVC	11	1.6	2	0.03	
		UNK	14	2.1	5	0.11	
96	5,710	ACP	44	0.8	4	0.03	1.02
		DIP	5,665	99.2	1	0.99	

**Corresponding score in Appendix A is doubly weighted*

Appendix I: Pipe Age

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	49,737	ACP	33.0	699	1.4	0.5	21.4	2
		DIP	18.4	23,015	46.2	8.5		
		PVC	22.6	26,023	52.3	12.4		
02B	26,187	DIP	15.9	15,774	60.2	9.2	18.5	2
		PVC	21.6	10,413	39.8	9.2		
02C	24,104	DIP	16.6	16,412	68.1	11.2	20.5	2
		PVC	28.8	7,693	31.9	9.3		
02D	32,298	CIP	20.0	30	0.1	0.0	22.1	2
		DIP	21.2	29,681	91.9	19.6		
		PVC	29.8	2,588	8.0	2.5		
02E	26,865	DIP	16.9	26,865	99.9	16.9	16.9	2
03A	34,221	ACP	72.0	25,565	74.7	53.8	57.6	4
		CIP	78.0	62	0.2	0.1		
		DIP	11.6	6,036	17.6	1.8		
		PVC	21.6	2,557	7.5	2.0		
03B	27,891	ACP	72.0	24,317	87.2	62.8	66.6	5
		DIP	30.6	3,458	12.4	3.6		
		PVC	16.0	75	0.3	0.0		
		UNK	72.0	41	0.1	0.1		
04	50,102	ACP	49.9	46,895	93.6	46.5	47.3	4
		DIP	13.0	3,172	6.3	0.8		
		UNK	16.0	35	0.1	0.0		
05A	43,592	ACP	40.9	34,706	79.6	32.5	38.8	3
		CIP	40.0	489	1.1	0.4		
		DIP	26.4	435	1.0	0.3		
		PVC	30.5	7,962	18.2	5.6		
05B	40,362	ACP	38.0	661	1.6	0.6	33.6	3
		DIP	24.5	505	1.3	0.4		
		PVC	33.6	39,196	97.0	32.6		
05C	45,827	ACP	37.8	23,384	51.0	19.3	34.0	3
		DIP	19.7	5,575	12.2	2.3		
		PVC	33.5	16,690	36.4	12.2		
		UNK	32.0	177	0.4	0.1		
06A	25,310	ACP	60.1	25,153	99.4	59.7	60.1	5
		DIP	62.0	131	0.5	0.3		
		PVC	16.0	26	0.1	0.0		
06B	19,061	ACP	56.4	19,061	100.0	56.4	56.4	4
06C	23,744	ACP	63.0	23,283	98.1	61.7	62.6	5
		DIP	5.0	154	0.6	0.0		
		UNK	62.0	307	1.3	0.8		
06D	28,174	ACP	62.6	27,653	98.1	61.5	61.8	5
		CIP	35.0	54	0.2	0.0		
		DIP	24.8	467	1.7	0.2		

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
06E	21,882	ACP	59.2	21,877	100.0	59.1	59.1	4
		DIP	9.0	6	0.0	0.0		
06F	8,053	ACP	64.0	7,689	95.5	61.1	61.9	5
		DIP	5.0	292	3.6	0.2		
		ODS	64.0	71	0.9	0.6		
06H	24,782	ACP	63.7	191	0.8	0.5	6.1	1
		DIP	5.6	24,591	99.2	5.6		
06I	16,123	ACP	63.9	15,488	96.1	61.4	62.1	5
		DIP	19.8	463	2.9	0.6		
		PVC	13.0	172	1.1	0.1		
06J	12,448	ACP	63.6	10,547	84.7	53.7	54.6	4
		DIP	5.0	1,773	14.2	0.7		
		PVC	20.0	128	1.0	0.2		
06K	21,268	ACP	64.1	18,738	88.1	56.4	58.8	4
		PVC	20.0	2,531	11.9	2.4		
06M	15,079	ACP	64.5	3,761	24.9	15.9	21.0	2
		DIP	6.8	11,317	75.1	5.1		
06N	11,487	ACP	65.0	1,057	9.2	6.0	10.6	1
		DIP	5.3	10,430	90.8	4.6		
09	12,779	ACP	47.2	12,622	98.8	46.7	46.8	4
		DIP	5.0	157	1.2	0.1		
10	14,807	ACP	55.7	320	2.2	1.2	56.5	4
		DIP	2.0	562	3.8	0.1		
		MLS	58.8	13,925	94.0	55.1		
11	3,013	ACP	58.0	2,574	85.4	49.6	58.0	4
		MLS	58.5	438	14.6	8.5		
12A	49,075	ACP	49.9	36,656	74.7	37.0	48.6	4
		DIP	19.3	406	0.8	0.2		
		MLS	44.7	11,511	23.5	11.0		
		PVC	33.5	502	1.0	0.3		
12B	39,795	ACP	44.0	37,832	95.1	41.9	43.8	3
		DIP	38.0	1,811	4.6	1.7		
		MLS	42.0	152	0.4	0.2		
13A	38,705	ACP	48.5	5,185	13.4	6.3	43.3	3
		DIP	25.2	2,665	6.9	1.7		
		MLS	48.4	20,027	51.7	25.4		
		PVC	36.0	10,829	28.0	10.0		
13B	34,236	ACP	39.2	21,183	61.9	24.2	38.0	3
		CIP	39.0	517	1.5	0.6		
		DIP	14.3	1,100	3.2	0.4		
		MLS	49.1	3,706	10.8	5.1		
		PVC	32.3	7,730	22.6	7.7		

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
14	14,469	ACP	69.0	2,417	16.7	11.5	27.5	2
		DIP	5.0	700	4.8	0.2		
		PVC	20.0	11,353	78.5	15.7		
15	5,808	CIP	20.0	410	7.1	1.4	20.0	2
		PVC	20.0	5,399	92.9	18.6		
16	5,486	ACP	63.4	4,191	76.4	48.4	54.1	4
		DIP	15.5	1,295	23.6	5.7		
17A	39,927	ACP	49.5	15,881	39.8	20.8	45.8	4
		DIP	25.5	2,815	7.0	1.8		
		MLS	54.5	10,616	26.6	14.2		
		ODS	62.0	14	0.0	0.0		
		PVC	34.3	10,583	26.5	9.1		
		UNK	39.0	18	0.0	0.0		
17B	45,942	ACP	40.9	11,430	24.9	10.1	39.1	3
		CIP	38.8	722	1.6	0.6		
		DIP	27.2	1,784	3.9	0.9		
		MLS	52.9	6,997	15.2	8.4		
		PVC	34.9	25,006	54.4	19.1		
		UNK	33.0	3	0.0	0.0		
18	53,659	ACP	45.5	22,317	41.6	19.1	45.8	4
		DIP	32.2	2,883	5.4	1.9		
		MLS	58.1	13,976	26.0	14.8		
		PVC	37.1	14,483	27.0	10.0		
19	48,684	ACP	47.9	22,223	45.6	22.2	43.8	3
		DIP	17.2	3,245	6.7	1.0		
		MLS	56.1	11,696	24.0	13.5		
		PVC	27.9	11,518	23.7	7.0		
		UNK	60.0	2	0.0	0.0		
1A	9,661	ACP	78.0	9,536	98.7	77.0	77.8	5
		UNK	60.0	125	1.3	0.8		
1B	6,461	ACP	78.0	5,484	84.9	66.2	67.1	5
		DIP	6.0	618	9.6	0.6		
		PVC	6.0	359	5.6	0.3		
1C	10,619	ACP	78.0	10,148	95.6	74.5	74.8	5
		DIP	5.0	463	4.4	0.2		
		UNK	78.0	8	0.1	0.1		
20A	31,012	ACP	55.3	29,305	94.5	52.3	54.4	4
		DIP	34.0	1,069	3.4	1.5		
		PVC	29.3	638	2.1	0.6		
20B	47,397	ACP	46.6	34,609	73.0	34.4	44.6	3
		CIP	60.0	172	0.4	0.2		
		DIP	22.6	4,446	9.4	1.9		
		MLS	55.1	5,401	11.4	6.0		
		PVC	33.4	2,770	5.8	2.1		

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
21	8,090	ACP	58.9	6,096	75.4	44.7	48.0	4
		DIP	16.8	1,994	24.6	3.3		
22	4,125	ACP	60.3	3,959	96.0	58.1	60.5	5
		PVC	60.0	165	4.0	2.4		
23	66,345	ACP	57.9	62,784	94.6	54.6	55.9	4
		DIP	21.9	2,900	4.4	0.8		
		PVC	43.3	636	1.0	0.5		
		UNK	61.0	26	0.0	0.0		
24A	48,099	ACP	52.5	23,931	49.8	26.6	48.3	4
		CIP	46.6	1,135	2.4	1.1		
		DIP	15.9	4,591	9.5	1.2		
		MLS	67.6	9,937	20.7	14.0		
		PVC	32.7	8,465	17.6	5.5		
		UNK	38.0	41	0.1	0.0		
24B	53,615	ACP	45.5	28,707	53.5	24.5	45.3	4
		CIP	34.0	60	0.1	0.0		
		DIP	14.2	461	0.9	0.1		
		MLS	58.7	11,985	22.4	13.2		
		PVC	31.9	12,183	22.7	7.3		
		UNK	46.7	220	0.4	0.2		
25	6,598	ACP	61.0	5,409	82.0	50.4	51.3	4
		PVC	7.4	1,189	18.0	1.0		
26A	29,505	ACP	55.8	7,078	24.0	13.9	48.2	4
		DIP	19.5	4,938	16.7	3.0		
		MLS	58.3	13,482	45.7	26.8		
		PVC	32.2	4,006	13.6	4.4		
26B	40,689	ACP	48.1	18,216	44.8	22.2	50.1	4
		DIP	28.2	2,052	5.0	1.5		
		MLS	58.6	14,825	36.4	21.6		
		PVC	35.7	5,597	13.8	4.9		
27	32,113	ACP	48.6	7,828	24.4	11.7	45.7	4
		DIP	20.9	4,849	15.1	3.2		
		MLS	56.0	15,676	48.8	27.3		
		PVC	30.2	3,659	11.4	3.4		
		UNK	4.0	102	0.3	0.0		
28	54,406	ACP	51.1	28,653	52.7	28.5	50.9	4
		DIP	35.8	254	0.5	0.2		
		MLS	54.8	16,018	29.4	16.0		
		PVC	35.9	9,481	17.4	6.3		
29	51,320	ACP	46.3	30,382	59.2	27.7	44.3	3
		CIP	44.0	74	0.1	0.1		
		DIP	13.5	7,333	14.3	2.0		
		MLS	59.3	10,954	21.3	12.8		
		PVC	31.5	2,577	5.0	1.7		

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
30	4,648	ACP	46.8	4,307	92.7	43.5	47.9	4
		PVC	61.0	341	7.3	4.5		
31A	24,694	ACP	52.1	21,520	87.1	45.2	48.0	4
		DIP	19.8	1,707	6.9	2.4		
		PVC	13.7	1,467	5.9	0.4		
31B	583	ACP	57.0	338	57.9	33.0	34.3	3
		DIP	3.0	246	42.1	1.3		
32	10,573	ACP	58.1	10,558	99.9	58.3	58.4	4
		PVC	58.0	15	0.1	0.1		
33	19,067	ACP	59.9	15,718	82.4	49.7	56.5	4
		DIP	43.8	3,349	17.6	6.8		
34	6,598	ACP	60.2	5,157	78.2	47.3	60.6	5
		MLS	61.0	1,441	21.8	13.3		
35	35,341	ACP	53.5	16,751	47.4	25.3	55.3	4
		DIP	14.0	572	1.6	0.3		
		MLS	59.0	17,228	48.7	28.9		
		PVC	34.3	790	2.2	0.8		
36	45,715	ACP	44.1	20,329	44.5	20.1	46.0	4
		DIP	18.5	2,720	5.9	1.1		
		MLS	55.9	16,321	35.4	20.1		
		PVC	34.4	6,345	13.9	4.8		
37	4,973	ACP	56.3	2,551	51.3	29.2	57.4	4
		DIP	58.0	45	0.9	0.5		
		MLS	58.0	2,376	47.8	27.7		
38A	21,842	ACP	42.6	19,884	91.0	38.6	40.6	3
		CIP	48.5	186	0.9	0.4		
		DIP	11.3	721	3.3	0.3		
		MLS	36.5	19	0.1	0.0		
		PVC	26.0	984	4.5	1.1		
		UNK	36.3	48	0.2	0.1		
38B	47,410	ACP	52.4	29,259	61.7	32.8	51.8	4
		DIP	23.3	1,612	3.4	0.8		
		MLS	57.2	13,534	28.5	16.3		
		PVC	29.5	2,972	6.3	1.8		
		UNK	16.0	32	0.1	0.0		
39	12,431	ACP	62.1	10,847	87.3	54.4	60.8	5
		CIP	62.0	884	7.1	4.4		
		DIP	11.0	237	1.9	0.2		
		MLS	16.0	31	0.2	0.0		
		PVC	46.0	400	3.2	1.8		
		UNK	16.0	30	0.2	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
40A	27,257	ACP	52.6	11,353	41.7	22.1	39.3	3
		DIP	16.6	3,359	12.3	1.7		
		MLS	58.1	1,693	6.2	3.6		
		PVC	28.4	10,853	39.8	11.9		
40B	28,494	ACP	47.0	14,350	50.4	24.0	45.0	3
		DIP	30.7	2,784	9.8	3.5		
		MLS	55.4	6,430	22.3	12.3		
		PVC	32.7	4,930	17.3	5.2		
41	18,918	ACP	58.7	17,810	94.1	55.2	57.8	4
		DIP	18.5	115	0.6	0.1		
		MLS	45.6	734	3.9	2.1		
		PVC	32.9	258	1.4	0.5		
42A	1,124	DIP	2.6	1,124	100.0	1.0	1.0	1
42B	7,823	ACP	70.7	4,628	59.2	41.7	54.8	4
		DIP	8.8	1,278	16.3	1.5		
		ODS	71.0	988	12.6	9.0		
		PVC	22.5	929	11.9	2.6		
42C	9,689	ACP	62.5	7,182	74.1	46.4	53.7	4
		DIP	14.4	1,572	16.2	1.8		
		PVC	57.0	935	9.7	5.5		
42D	11,170	ACP	64.0	10,788	96.6	61.8	63.7	5
		DIP	11.0	8	0.1	0.0		
		PVC	57.0	365	3.3	1.9		
		UNK	60.5	10	0.1	0.1		
42E	19,432	ACP	63.6	19,432	100.0	63.4	63.4	5
42F	11,906	ACP	55.9	9,278	77.9	43.8	49.4	4
		DIP	23.2	2,327	19.5	4.8		
		PVC	29.9	260	2.2	0.6		
		UNK	55.0	41	0.3	0.2		
42G	1,499	ACP	64.0	442	29.5	18.9	23.1	2
		DIP	6.0	1,057	70.5	4.2		
42H	601	ACP	64.0	576	95.8	61.3	61.8	5
		DIP	12.0	25	4.2	0.5		
42I	301	ACP	71.0	301	100.0	71.0	71.0	5
42J	5,965	ACP	71.0	3,740	62.7	44.5	56.1	4
		DIP	8.8	872	14.6	1.2		
		ODS	75.2	760	12.7	9.1		
		PVC	19.4	593	9.9	1.3		
42K	3,973	ACP	64.0	1,114	28.0	18.0	27.7	2
		DIP	8.8	1,397	35.2	3.1		
		PVC	17.2	1,440	36.2	6.6		
		UNK	19.0	22	0.6	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
43A	13,649	ACP	65.1	10,469	76.7	49.9	53.8	4
		DIP	18.5	205	1.5	0.2		
		ODS	64.0	284	2.1	1.3		
		PVC	16.5	2,679	19.6	2.4		
		UNK	64.0	12	0.1	0.1		
43B	88	DIP	9.0	88	100.0	9.0	9.0	1
43C	887	ACP	72.0	173	19.5	14.1	21.3	2
		DIP	9.0	714	80.5	7.2		
43D	572	ACP	38.4	238	41.6	14.4	19.8	2
		DIP	9.0	186	32.5	2.9		
		PVC	9.3	148	26.0	2.5		
44	20,073	ACP	62.9	6,386	31.8	20.2	36.4	3
		DIP	12.7	5,270	26.3	3.4		
		PVC	29.0	8,416	41.9	12.8		
45A	41,400	ACP	62.1	1,011	2.4	1.5	10.3	1
		DIP	5.6	31,005	74.9	3.9		
		ODS	71.0	13	0.0	0.0		
		PVC	20.2	9,349	22.6	4.8		
		UNK	10.5	23	0.1	0.0		
45B	11,288	ACP	51.3	4,486	39.7	20.3	25.4	2
		DIP	5.9	4,631	41.0	2.3		
		ODS	62.5	134	1.2	0.8		
		PVC	7.5	2,037	18.0	2.0		
46	10,206	DIP	8.9	242	2.4	0.2	21.8	2
		PVC	19.9	9,964	97.6	21.7		
47	1,523	DIP	12.0	15	1.0	0.1	33.8	3
		PVC	34.0	1,508	99.0	33.7		
48	35,406	ACP	60.3	15,364	43.4	25.1	56.5	4
		DIP	8.0	1,923	5.4	1.3		
		ODS	63.1	15,532	43.9	28.5		
		PVC	19.6	2,566	7.2	1.6		
		UNK	16.0	21	0.1	0.0		
49	1,903	ODS	67.0	14	0.7	0.5	20.6	2
		PVC	24.2	1,889	99.3	20.1		
51	34,062	ACP	68.8	1,180	3.5	2.1	8.1	1
		DIP	6.1	30,169	88.6	5.5		
		PVC	6.9	2,713	8.0	0.5		
52A	16,552	ACP	56.4	5,942	35.9	20.4	25.1	2
		DIP	7.6	10,611	64.1	4.7		
52B	10,224	DIP	6.6	10,224	100.0	6.4	6.4	1
53A	21,627	ACP	57.2	19,235	88.9	51.2	55.8	4
		DIP	4.1	803	3.7	0.1		
		PVC	59.6	1,589	7.3	4.5		

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
53B	6,857	ACP	56.9	5,279	77.0	45.6	47.2	4
		DIP	7.3	1,578	23.0	1.5		
54	8,578	ACP	59.8	7,103	82.8	49.3	58.6	4
		DIP	42.0	566	6.6	2.8		
		PVC	62.0	909	10.6	6.6		
55	71,352	ACP	52.6	27,184	38.1	20.6	23.7	2
		DIP	22.1	3,256	4.6	1.0		
		MLS	43.6	2,974	4.2	1.5		
		PVC	27.8	2,209	3.1	0.7		
		UNK	47.8	53	0.1	0.0		
56A	3,122	ACP	59.9	914	29.3	18.3	19.8	2
		DIP	2.7	2,208	70.7	1.5		
56B	178,273	ACP	60.2	19,814	11.1	7.0	13.2	1
		DIP	2.4	21,889	12.3	0.2		
		ODS	64.7	16,324	9.2	5.9		
		PVC	20.6	1,398	0.8	0.2		
57	8,247	ACP	43.3	3,081	37.4	16.0	40.2	3
		DIP	16.4	1,889	22.9	4.3		
		MLS	53.7	2,556	31.0	17.1		
		PVC	32.0	723	8.8	2.8		
57A	38,947	ACP	49.1	26,219	67.3	33.7	39.6	3
		DIP	8.4	6,185	15.9	0.6		
		MLS	49.8	646	1.7	0.7		
		PVC	32.3	5,877	15.1	4.5		
		UNK	16.0	20	0.1	0.0		
57B	450	ACP	58.5	450	100.0	57.2	57.2	4
58A	14,811	ACP	64.0	2	0.0	0.0	9.1	1
		DIP	10.2	13,966	94.3	8.6		
		PVC	9.3	842	5.7	0.5		
58B	3,344	ACP	73.8	292	8.7	6.6	14.9	1
		DIP	9.2	3,053	91.3	8.2		
58C	86	ACP	72.0	62	72.2	52.0	55.3	4
		DIP	12.0	24	27.8	3.3		
59	7,477	ACP	72.0	298	4.0	2.9	14.5	1
		DIP	11.9	6,150	82.2	9.9		
		PVC	12.9	1,029	13.8	1.8		
60A	11,070	DIP	9.3	11,070	100.0	9.1	9.1	1
60B	5,832	DIP	9.1	4,081	70.0	6.5	9.6	1
		ODS	79.0	33	0.6	0.4		
		PVC	9.3	1,700	29.2	2.7		
		UNK	9.0	17	0.3	0.0		
61	6,537	ACP	73.0	159	2.4	1.8	12.8	1
		DIP	11.0	6,203	94.9	10.7		
		PVC	9.8	175	2.7	0.3		

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
62	5,625	DIP	11.6	5,625	100.0	11.5	11.5	1
63	32,820	ACP	80.3	358	1.1	0.9	21.1	2
		DIP	11.3	320	1.0	0.1		
		ODS	22.0	9	0.0	0.0		
		PVC	20.7	32,090	97.8	20.0		
		UNK	25.0	43	0.1	0.0		
64	4,271	DIP	11.9	4,271	100.0	11.7	11.7	1
65	13,735	ACP	52.9	973	7.1	3.5	13.5	1
		DIP	10.9	12,513	91.1	9.0		
		ODS	63.8	249	1.8	1.1		
66A	5,825	ACP	73.0	79	1.4	0.8	10.1	1
		DIP	8.8	3,533	60.7	5.6		
		ODS	27.0	53	0.9	0.3		
		PVC	9.3	2,097	36.0	3.3		
		UNK	9.0	62	1.1	0.1		
66B	5,477	ACP	54.4	3,713	67.8	38.4	43.2	3
		DIP	12.0	376	6.9	0.8		
		ODS	56.0	90	1.6	0.9		
		PVC	8.0	1,160	21.2	1.7		
		UNK	56.0	137	2.5	1.4		
66C	2,359	ACP	39.9	1,832	77.7	30.9	41.7	3
		DIP	19.5	527	22.3	10.8		
66D	5,144	ACP	67.3	902	17.5	11.4	16.5	2
		DIP	7.6	4,219	82.0	5.0		
		PVC	8.0	24	0.5	0.0		
66E	3,079	ACP	70.0	818	26.6	18.6	20.1	2
		DIP	2.6	2,261	73.4	1.5		
66F	538	DIP	24.6	538	100.0	32.9	32.9	3
67	1,947	ACP	61.3	1,010	51.9	31.4	35.9	3
		DIP	8.0	909	46.7	3.7		
		UNK	54.0	28	1.4	0.8		
68	1,371	DIP	8.0	29	2.1	0.2	29.8	2
		ODS	12.0	10	0.7	0.1		
		PVC	18.4	1,332	97.2	29.5		
69	3,856	DIP	12.8	3,856	100.0	11.2	11.2	1
6G1	7,345	ACP	61.7	7,345	100.0	61.5	61.5	5
6G2	737	ACP	63.0	737	100.0	63.0	63.0	5
70	32,022	ACP	70.8	1,578	4.9	3.7	11.5	1
		DIP	8.3	30,444	95.1	7.7		
71	26,496	ACP	79.2	1,969	7.4	5.7	15.7	2
		DIP	10.4	20,863	78.7	8.0		
		ODS	75.3	117	0.4	0.4		
		PVC	12.9	3,546	13.4	1.6		

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
72	10,362	ACP	63.7	9,826	94.8	60.4	61.8	5
		DIP	37.0	4	0.0	0.0		
		PVC	19.8	520	5.0	1.3		
		UNK	64.0	13	0.1	0.1		
74	11,736	ACP	63.0	10,165	86.6	54.6	60.8	5
		DIP	63.0	10	0.1	0.1		
		MLS	63.0	5	0.0	0.0		
		PVC	27.8	1,554	13.2	6.2		
		UNK	63.0	3	0.0	0.0		
76A	12,044	ACP	68.5	3,977	33.0	22.6	30.2	3
		DIP	11.4	7,551	62.7	7.1		
		PVC	11.0	516	4.3	0.5		
76B	4,114	DIP	8.7	4,114	100.0	8.6	8.6	1
76C	3,323	ACP	65.4	2,276	68.5	43.8	52.5	4
		DIP	11.0	248	7.5	0.8		
		PVC	31.2	799	24.0	7.8		
76D	5,884	DIP	3.9	5,881	99.9	3.3	3.3	1
		PVC	3.0	4	0.1	0.0		
76F	3,142	ACP	44.8	2,359	75.1	35.1	36.2	3
		DIP	7.5	783	24.9	1.1		
76G	2,439	ACP	49.7	292	12.0	6.0	12.0	1
		DIP	6.6	2,147	88.0	6.0		
76H	4,066	ACP	55.4	2,444	60.1	33.2	40.4	3
		DIP	5.6	730	18.0	1.0		
		ODS	68.0	6	0.2	0.1		
		PVC	27.8	860	21.1	6.0		
		UNK	17.3	25	0.6	0.1		
76I	1,194	ACP	100.0	579	48.5	51.1	67.8	5
		DIP	14.2	340	28.5	1.9		
		ODS	64.0	140	11.7	7.5		
		PVC	50.8	134	11.3	7.3		
76J	1,005	ACP	56.1	451	44.9	24.7	28.9	2
		DIP	7.6	554	55.1	4.2		
76K	1,317	ACP	72.0	402	30.5	22.0	28.4	2
		DIP	10.0	867	65.8	6.1		
		PVC	11.0	49	3.7	0.4		
77	774	ACP	69.0	774	100.0	69.0	69.0	5
78	22,333	ACP	34.5	568	2.5	0.6	7.4	1
		DIP	5.6	18,436	82.5	3.7		
		ODS	67.4	355	1.6	1.1		
		PVC	16.3	2,914	13.0	2.0		
		UNK	48.7	61	0.3	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
79	7,373	ACP	57.0	339	4.6	2.1	14.4	1
		DIP	9.9	5,169	70.1	7.3		
		PVC	14.3	1,824	24.7	4.6		
		UNK	68.0	42	0.6	0.4		
7A1	9,862	ACP	68.0	4,021	40.8	27.7	52.6	4
		PVC	38.0	5,046	51.2	19.4		
		UNK	68.0	795	8.1	5.5		
7A2	10,101	ACP	68.0	485	4.8	3.3	67.5	5
		CIP	76.0	384	3.8	2.6		
		PVC	65.1	3,624	35.9	23.9		
		UNK	68.7	5,609	55.5	37.8		
7B1	5,341	ACP	55.0	4,680	87.6	48.2	55.0	4
		UNK	55.0	661	12.4	6.8		
7B2	8,145	ACP	56.8	6,480	79.6	44.3	55.5	4
		DIP	10.0	6	0.1	0.0		
		PVC	55.0	1,520	18.7	10.3		
		UNK	55.0	139	1.7	0.9		
7B3	7,806	ACP	78.0	4,660	59.7	46.6	60.4	5
		CIP	78.0	455	5.8	4.5		
		DIP	10.6	1,178	15.1	1.7		
		PVC	33.0	1,305	16.7	5.5		
		UNK	78.0	207	2.7	2.1		
7B4	8,220	ACP	78.0	4,751	57.8	45.1	69.4	5
		DIP	38.0	361	4.4	1.7		
		PVC	42.0	1,693	20.6	9.2		
		UNK	75.4	1,415	17.2	13.4		
7C1	5,378	ACP	78.0	1,244	23.1	18.0	64.2	5
		CIP	78.0	1,405	26.1	20.4		
		ODS	78.0	395	7.3	5.7		
		PVC	38.0	1,855	34.5	13.1		
		UNK	78.0	479	8.9	6.9		
7C2	5,053	ACP	78.0	3,081	61.0	47.6	78.0	5
		CIP	78.0	1,663	32.9	25.7		
		UNK	78.0	310	6.1	4.8		
7C3	5,949	ACP	78.0	1,682	28.3	22.0	72.6	5
		CIP	78.0	2,208	37.1	29.0		
		DIP	11.0	6	0.1	0.0		
		PVC	38.0	755	12.7	4.8		
		UNK	73.3	1,299	21.8	16.8		

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
7C4	13,990	ACP	78.0	8,163	58.4	45.5	73.5	5
		CCP	78.0	250	1.8	1.4		
		CIP	78.0	1,171	8.4	6.5		
		DIP	27.7	1,065	7.6	2.3		
		PVC	38.0	308	2.2	0.8		
		UNK	78.0	3,032	21.7	16.9		
7C5	6,039	ACP	78.0	1,700	28.2	22.0	70.0	5
		CIP	76.5	3,221	53.3	41.6		
		DIP	20.8	360	6.0	1.1		
		PVC	38.0	668	11.1	4.2		
		UNK	78.0	90	1.5	1.2		
7D1	17,022	ACP	77.6	7,958	46.8	36.5	75.6	5
		CIP	78.0	6,971	41.0	31.9		
		DIP	27.3	816	4.8	1.4		
		UNK	78.0	1,276	7.5	5.8		
7D2	8,007	ACP	78.0	2,471	30.9	24.1	75.2	5
		CIP	78.0	4,886	60.8	47.4		
		DIP	6.4	285	3.6	0.2		
		UNK	78.0	364	4.5	3.5		
7D3	10,313	ACP	78.0	2,306	22.0	17.2	77.0	5
		CIP	78.0	5,029	48.6	37.9		
		DIP	26.5	57	0.6	0.1		
		UNK	74.4	2,921	28.3	21.8		
7E1	16,670	ACP	78.0	9,426	56.5	44.1	64.4	5
		CIP	78.0	1,877	11.3	8.8		
		DIP	4.9	3,162	18.9	1.2		
		UNK	78.0	2,206	13.2	10.3		
7E2	2,538	ACP	78.0	2,181	85.9	67.0	78.0	5
		UNK	78.0	357	14.1	11.0		
7E3	8,596	ACP	78.0	4,998	58.1	45.3	73.9	5
		CIP	78.0	2,049	23.8	18.6		
		DIP	2.0	21	0.2	0.0		
		PVC	38.0	838	9.8	3.7		
		UNK	78.0	690	8.0	6.3		
7E4	9,777	ACP	68.6	4,815	49.3	33.6	68.2	5
		CIP	68.0	846	8.7	5.9		
		CONC	68.0	792	8.1	5.5		
		PVC	38.0	22	0.2	0.1		
		UNK	69.0	3,301	33.8	23.1		
7F1	7,544	ACP	78.0	2,764	36.6	28.6	63.5	5
		CIP	73.9	1,408	18.7	14.5		
		DIP	8.1	1,320	17.5	1.4		
		PVC	38.0	376	5.0	1.9		
		UNK	72.6	1,676	22.2	17.1		

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
7F2	9,451	ACP	76.9	1,602	16.9	12.9	70.1	5
		CIP	68.9	6,727	71.2	49.2		
		DIP	38.0	131	1.4	0.5		
		UNK	69.5	992	10.5	7.5		
7F3	9,263	ACP	78.0	4,491	48.5	37.8	70.8	5
		CIP	78.0	386	4.2	3.3		
		DIP	7.8	416	4.5	0.3		
		MLS	78.0	711	7.7	6.0		
		PVC	48.9	1,462	15.8	8.3		
		UNK	78.0	1,798	19.4	15.1		
7F4	7,990	ACP	69.2	3,507	43.9	30.3	66.4	5
		CIP	75.1	1,557	19.5	14.5		
		DIP	20.7	519	6.5	0.8		
		MLS	78.0	251	3.1	2.4		
		UNK	68.0	2,158	27.0	18.4		
7G1	6,060	DIP	38.0	1,270	21.0	8.0	59.3	4
		PVC	38.0	478	7.9	3.0		
		UNK	68.0	4,311	71.1	48.4		
7G2	4,803	ACP	68.0	3,170	66.0	44.9	61.2	5
		DIP	38.0	626	13.0	5.0		
		PVC	48.0	625	13.0	6.0		
		UNK	68.0	381	7.9	5.4		
7G3	9,148	ACP	68.0	6,731	73.6	50.0	66.4	5
		CIP	68.0	1,445	15.8	10.7		
		DIP	11.5	256	2.8	0.3		
		UNK	68.0	716	7.8	5.3		
7G4	8,708	ACP	68.3	5,926	68.1	46.6	65.4	5
		CCP	70.5	806	9.3	6.3		
		CIP	78.0	48	0.6	0.4		
		DIP	13.1	470	5.4	0.6		
		UNK	68.0	1,457	16.7	11.4		
7G5	4,690	ACP	68.0	4,316	92.0	62.6	66.2	5
		DIP	20.0	11	0.2	0.0		
		PVC	38.0	257	5.5	2.1		
		UNK	68.0	106	2.3	1.5		
80	24,930	DIP	3.2	24,634	98.8	2.6	3.2	1
		PVC	48.0	253	1.0	0.6		
		UNK	35.0	43	0.2	0.1		
81	12,011	ACP	68.0	4	0.0	0.0	13.8	1
		DIP	11.8	11,565	95.0	11.3		
		ODS	68.0	443	3.7	2.5		
82	14,783	ACP	47.0	10,702	72.4	35.0	37.5	3
		DIP	9.8	4,060	27.5	2.5		
		UNK	33.4	21	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
83	14,222	ACP	56.9	3,108	21.9	11.5	20.2	2
		DIP	11.1	9,603	67.5	7.5		
		MLS	11.0	144	1.0	0.1		
		PVC	11.0	1,360	9.6	1.1		
		UNK	11.0	7	0.0	0.0		
84	4,906	ACP	41.0	5	0.1	0.0	11.0	1
		DIP	11.0	4,751	96.8	10.7		
		PVC	11.0	150	3.1	0.3		
85	27,675	ACP	53.1	9,059	32.7	17.5	57.5	4
		DIP	9.9	1,504	5.4	0.4		
		ODS	64.3	16,899	61.1	39.3		
		PVC	42.0	213	0.8	0.3		
86A	24,058	ACP	48.9	22,730	94.5	46.5	47.3	4
		DIP	14.0	1,268	5.3	0.8		
		PVC	25.5	59	0.2	0.1		
		UNK	42.0	1	0.0	0.0		
86B	26,243	ACP	47.7	25,312	96.4	46.0	46.5	4
		DIP	17.6	856	3.3	0.5		
		PVC	20.8	76	0.3	0.1		
86C	27,715	ACP	46.6	19,728	71.2	33.4	38.5	3
		DIP	11.5	2,721	9.8	1.1		
		PVC	21.9	5,260	19.0	4.1		
		UNK	45.0	7	0.0	0.0		
86D	4,835	ACP	40.5	3,520	72.8	28.6	33.0	3
		DIP	12.3	1,037	21.5	2.6		
		PVC	31.0	277	5.7	1.8		
87A	15,768	ACP	70.2	4,045	25.7	18.3	25.8	2
		DIP	8.7	11,654	73.9	7.4		
		ODS	70.0	19	0.1	0.1		
		PVC	19.0	50	0.3	0.1		
87B	3,087	DIP	4.0	1,601	51.9	2.1	15.5	2
		PVC	28.0	1,485	48.1	13.5		
88	29,049	DIP	4.2	28,551	98.3	4.1	4.7	1
		ODS	67.0	69	0.2	0.2		
		PVC	28.0	429	1.5	0.4		
89	13,800	ACP	64.5	714	5.2	3.3	23.4	2
		DIP	9.7	10,493	76.0	7.6		
		ODS	67.0	2,593	18.8	12.6		
90A	29,524	ACP	63.2	25,002	84.7	53.5	56.0	4
		DIP	4.0	312	1.1	0.0		
		PVC	16.3	4,077	13.8	2.3		
		UNK	40.0	133	0.4	0.2		
90B	3,875	ACP	62.4	3,875	100.0	62.2	62.2	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
90C	17,273	ACP	64.5	4,726	27.4	17.6	61.1	5
		DIP	16.0	12	0.1	0.0		
		MLS	40.0	19	0.1	0.0		
		ODS	66.3	10,829	62.7	41.6		
		PVC	23.3	1,668	9.7	1.9		
		UNK	64.0	19	0.1	0.1		
90D	1,803	ACP	57.0	1,536	85.2	48.6	51.4	4
		PVC	19.0	267	14.8	2.8		
91	45,863	ACP	61.3	31,508	68.7	43.1	48.6	4
		DIP	14.7	6,428	14.0	1.6		
		PVC	24.5	7,926	17.3	4.0		
92	617	ACP	59.0	617	100.0	59.0	59.0	4
93A	38,757	ACP	51.9	35,676	92.0	48.2	49.9	4
		DIP	10.1	1,239	3.2	0.1		
		PVC	32.5	1,841	4.7	1.5		
		UNK	52.0	2	0.0	0.0		
93B	35,569	ACP	52.5	33,025	92.8	48.3	49.6	4
		DIP	4.5	900	2.5	0.1		
		PVC	23.2	1,643	4.6	1.2		
93C	35,788	ACP	52.7	32,201	90.0	47.2	49.7	4
		DIP	7.0	498	1.4	0.1		
		MLS	16.0	4	0.0	0.0		
		PVC	30.0	3,052	8.5	2.5		
		UNK	51.7	33	0.1	0.0		
93D	33,692	ACP	53.5	33,250	98.7	52.6	52.8	4
		DIP	14.8	396	1.2	0.1		
		PVC	58.0	45	0.1	0.1		
95	673	ACP	72.0	648	96.3	69.3	69.9	5
		PVC	16.0	11	1.6	0.3		
		UNK	16.0	14	2.1	0.3		
96	5,710	ACP	56.0	44	0.8	0.4	3.4	1
		DIP	2.9	5,665	99.2	3.0		

Appendix J: Failure Rate

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
125	02A	2	49,737	0.21	1
130	02B	0	26,187	0.00	1
131	02C	0	24,104	0.00	1
132	02D	0	32,298	0.00	1
133	02E	0	26,865	0.00	1
20	03A	27	34,221	4.17	5
13	03B	31	27,891	5.87	5
44	04	21	50,102	2.21	3
111	05A	4	43,592	0.48	1
121	05B	2	40,362	0.26	1
129	05C	1	45,827	0.12	1
32	06A	14	25,310	2.92	3
77	06B	4	19,061	1.11	3
89	06C	4	23,744	0.89	1
29	06D	17	28,174	3.19	5
49	06E	8	21,882	1.93	3
26	06F	5	8,053	3.28	5
124	06H	1	24,782	0.21	1
19	06I	13	16,123	4.26	5
24	06J	8	12,448	3.39	5
28	06K	13	21,268	3.23	5
134	06M	0	15,079	0.00	1
135	06N	0	11,487	0.00	1
39	09	6	12,779	2.48	3
136	10	0	14,807	0.00	1
137	11	0	3,013	0.00	1
85	12A	9	49,075	0.97	1
98	12B	5	39,795	0.66	1
127	13A	1	38,705	0.14	1
97	13B	5	34,236	0.77	1
138	14	0	14,469	0.00	1
139	15	0	5,808	0.00	1
140	16	0	5,486	0.00	1
120	17A	2	39,927	0.26	1
91	17B	7	45,942	0.80	1
69	18	14	53,659	1.38	3
71	19	12	48,684	1.30	3
141	1A	0	9,661	0.00	1
142	1B	0	6,461	0.00	1
108	1C	1	10,619	0.50	1
75	20A	7	31,012	1.19	3
94	20B	7	47,397	0.78	1
100	21	1	8,090	0.65	1
72	22	1	4,125	1.28	3
93	23	10	66,345	0.80	1

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
123	24A	2	48,099	0.22	1
109	24B	5	53,615	0.49	1
92	25	1	6,598	0.80	1
117	26A	2	29,505	0.36	1
87	26B	7	40,689	0.91	1
76	27	7	32,113	1.15	3
95	28	8	54,406	0.78	1
115	29	4	51,320	0.41	1
143	30	0	4,648	0.00	1
82	31A	5	24,694	1.07	3
144	31B	0	583	0.00	1
46	32	4	10,573	2.00	3
78	33	4	19,067	1.11	3
40	34	3	6,598	2.40	3
60	35	11	35,341	1.64	3
90	36	7	45,715	0.81	1
145	37	0	4,973	0.00	1
48	38A	8	21,842	1.93	3
88	38B	8	47,410	0.89	1
114	39	1	12,431	0.42	1
96	40A	4	27,257	0.77	1
105	40B	3	28,494	0.56	1
119	41	1	18,918	0.28	1
146	42A	0	1,124	0.00	1
9	42B	11	7,823	7.42	5
61	42C	3	9,689	1.63	3
67	42D	3	11,170	1.42	3
36	42E	10	19,432	2.72	3
57	42F	4	11,906	1.77	3
3	42G	3	1,499	10.56	5
147	42H	0	601	0.00	1
148	42I	0	301	0.00	1
7	42J	9	5,965	7.97	5
38	42K	2	3,973	2.66	3
64	43A	4	13,649	1.55	3
149	43B	0	88	0.00	1
11	43C	1	887	5.95	5
150	43D	0	572	0.00	1
106	44	2	20,073	0.53	1
128	45A	1	41,400	0.13	1
68	45B	3	11,288	1.40	3
151	46	0	10,206	0.00	1
23	47	1	1,523	3.47	5
5	48	60	35,406	8.95	5
152	49	0	1,903	0.00	1

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
118	51	2	34,062	0.31	1
34	52A	9	16,552	2.87	3
153	52B	0	10,224	0.00	1
110	53A	2	21,627	0.49	1
65	53B	2	6,857	1.54	3
74	54	2	8,578	1.23	3
113	55	3	71,352	0.22	1
154	56A	0	3,122	0.00	1
16	56B	0	178,273	0.00	1
155	56C	0	0	0.00	1
101	57	1	8,247	0.64	1
52	57A	14	38,947	1.90	3
156	57B	0	450	0.00	1
81	58A	3	14,811	1.07	3
157	58B	0	3,344	0.00	1
158	58C	0	86	0.00	1
159	59	0	7,477	0.00	1
160	60	0	0	0.00	1
112	60A	1	11,070	0.48	1
161	60B	0	5,832	0.00	1
162	61	0	6,537	0.00	1
163	62	0	5,625	0.00	1
164	63	0	32,820	0.00	1
165	64	0	4,271	0.00	1
166	65	0	13,735	0.00	1
167	66A	0	5,825	0.00	1
33	66B	3	5,477	2.89	3
168	66C	0	2,359	0.00	1
169	66D	0	5,144	0.00	1
170	66E	0	3,079	0.00	1
171	66F	0	538	0.00	1
172	67	0	1,947	0.00	1
173	68	0	1,371	0.00	1
174	69	0	3,856	0.00	1
18	6G1	6	7,345	4.31	5
2	6G2	2	737	14.33	5
175	70	0	32,022	0.00	1
126	71	1	26,496	0.20	1
45	72	4	10,362	2.04	3
70	74	3	11,736	1.35	3
176	76A	0	12,044	0.00	1
177	76B	0	4,114	0.00	1
30	76C	2	3,323	3.18	5
178	76D	0	5,884	0.00	1
58	76F	1	3,142	1.68	3

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
179	76G	0	2,439	0.00	1
14	76H	4	4,066	5.19	5
17	76I	1	1,194	4.42	5
180	76J	0	1,005	0.00	1
181	76K	0	1,317	0.00	1
182	77	0	774	0.00	1
122	78	1	22,333	0.24	1
183	79	0	7,373	0.00	1
63	7A1	3	9,862	1.61	3
107	7A2	1	10,101	0.52	1
84	7B1	1	5,341	0.99	1
47	7B2	3	8,145	1.94	3
25	7B3	5	7,806	3.38	5
50	7B4	3	8,220	1.93	3
184	7B5	0	0	0.00	1
12	7C1	6	5,378	5.89	5
83	7C2	1	5,053	1.04	3
37	7C3	3	5,949	2.66	3
53	7C4	5	13,990	1.89	3
8	7C5	9	6,039	7.87	5
4	7D1	29	17,022	9.00	5
21	7D2	6	8,007	3.96	5
15	7D3	9	10,313	4.61	5
73	7E1	4	16,670	1.27	3
185	7E2	0	2,538	0.00	1
102	7E3	1	8,596	0.61	1
186	7E4	0	9,777	0.00	1
187	7F1	0	7,544	0.00	1
59	7F2	3	9,451	1.68	3
104	7F3	1	9,263	0.57	1
99	7F4	1	7,990	0.66	1
188	7G1	0	6,060	0.00	1
189	7G2	0	4,803	0.00	1
103	7G3	1	9,148	0.58	1
55	7G4	3	8,708	1.82	3
190	7G5	0	4,690	0.00	1
191	80	0	24,930	0.00	1
192	81	0	12,011	0.00	1
56	82	5	14,783	1.79	3
116	83	1	14,222	0.37	1
193	84	0	4,906	0.00	1
6	85	44	27,675	8.39	5
79	86A	5	24,058	1.10	3
43	86B	11	26,243	2.21	3
27	86C	17	27,715	3.24	5

Rank	Area	Number of Leaks	Main Length [feet]	Leaks per Mile	Score*
80	86D	1	4,835	1.09	3
194	87A	0	15,768	0.00	1
195	87B	0	3,087	0.00	1
196	88	0	29,049	0.00	1
66	89	4	13,800	1.53	3
62	90A	9	29,524	1.61	3
35	90B	2	3,875	2.73	3
10	90C	23	17,273	7.03	5
31	90D	1	1,803	2.93	3
54	91	16	45,863	1.84	3
1	92	3	617	25.69	5
22	93A	29	38,757	3.95	5
42	93B	15	35,569	2.23	3
51	93C	13	35,788	1.92	3
41	93D	15	33,692	2.35	3
197	95	0	673	0.00	1
86	96	1	5,710	0.92	1

**Corresponding score in Appendix A is doubly weighted*

Appendix K: Hydrant Coverage

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
56	02A	298,834	9,904,486	3.0	1
2	02B	5,404,087	13,219,750	40.9	5
52	02C	222,738	6,231,884	3.6	1
4	02D	4,799,301	14,884,159	32.2	5
91	02E	15,804	6,123,401	0.3	1
7	03A	5,116,434	19,627,888	26.1	5
9	03B	3,461,558	16,965,902	20.4	5
75	04	128,848	11,314,904	1.1	1
84	05A	43,355	18,850,749	0.5	1
104	05B	235	8,736,415	0.0	1
53	05C	340,942	10,179,369	3.3	1
108	06A	0	4,544,498	0.0	1
109	06B	0	4,067,509	0.0	1
110	06C	0	4,381,118	0.0	1
111	06D	0	4,538,763	0.0	1
112	06E	0	4,286,935	0.0	1
113	06F	0	1,990,666	0.0	1
114	06H	0	5,488,156	0.0	1
115	06I	0	2,599,318	0.0	1
116	06J	0	2,238,554	0.0	1
117	06K	0	3,567,541	0.0	1
65	06M	55,893	2,540,512	2.2	1
72	06N	54,913	3,902,273	1.4	1
118	09	0	2,000,190	0.0	1
119	10	0	2,280,522	0.0	1
120	11	0	373,485	0.0	1
63	12A	288,484	12,410,479	2.3	1
29	12B	482,171	9,233,779	5.2	3
19	13A	1,633,986	13,209,357	12.4	3
15	13B	1,756,482	12,285,976	14.3	3
121	14	0	3,263,481	0.0	1
107	15	0	1,344,337	0.0	1
122	16	0	2,185,279	0.0	1
55	17A	300,458	19,455,224	3.1	1
25	17B	919,242	13,923,023	6.6	3
57	18	329,765	23,203,610	2.8	1
74	19	150,836	22,813,470	1.3	1
70	1A	40,887	2,521,084	1.6	1
105	1B	13	1,436,542	0.0	1
89	1C	8,710	2,521,301	0.3	1
123	20A	0	7,959,281	0.0	1
88	20B	35,997	9,309,333	0.4	1
124	21	0	1,684,906	0.0	1
48	22	29,692	697,318	4.3	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
125	23	0	13,298,716	0.0	1
18	24A	2,098,319	32,138,345	13.1	3
26	24B	1,172,569	36,125,632	6.5	3
126	25	0	1,215,757	0.0	1
20	26A	1,657,152	27,232,659	12.2	3
28	26B	534,302	9,826,213	5.4	3
61	27	256,460	20,399,195	2.5	1
78	28	109,269	13,323,451	0.8	1
49	29	489,434	12,633,788	3.9	1
127	30	0	593,926	0.0	1
92	31A	8,961	5,704,373	0.2	1
128	31B	0	235,411	0.0	1
129	32	0	1,850,465	0.0	1
83	33	18,913	3,931,331	0.5	1
130	34	0	873,657	0.0	1
51	35	341,259	9,429,465	3.6	1
79	36	95,147	11,852,405	0.8	1
131	37	0	520,621	0.0	1
64	38A	137,612	6,228,747	2.2	1
106	38B	22	11,694,575	0.0	1
132	39	0	2,306,869	0.0	1
77	40A	64,635	7,389,401	0.9	1
133	40B	0	6,248,309	0.0	1
134	41	0	3,062,098	0.0	1
135	42A	0	318,382	0.0	1
81	42B	12,071	2,065,499	0.6	1
59	42C	70,350	2,548,438	2.8	1
136	42D	0	2,172,594	0.0	1
24	42E	257,157	3,782,105	6.8	3
3	42F	1,448,769	4,258,578	34.0	5
137	42G	0	276,544	0.0	1
138	42H	0	145,897	0.0	1
58	42I	4,417	157,644	2.8	1
27	42J	130,358	2,204,306	5.9	3
100	42K	231	790,396	0.0	1
139	43A	0	1,280,331	0.0	1
140	43B	0	203,062	0.0	1
141	43C	0	419,336	0.0	1
142	43D	0	715,577	0.0	1
50	44	183,973	4,877,708	3.8	1
93	45A	12,279	9,497,494	0.1	1
143	45B	0	2,289,376	0.0	1
144	46	0	2,107,691	0.0	1
145	47	0	522,828	0.0	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
62	48	181,959	7,681,829	2.4	1
146	49	0	760,440	0.0	1
147	51	0	7,192,041	0.0	1
148	52A	0	4,625,889	0.0	1
149	52B	0	2,278,955	0.0	1
97	53A	1,999	4,576,405	0.0	1
150	53B	0	1,495,151	0.0	1
151	54	0	1,760,129	0.0	1
152	55	0	6,523,863	0.0	1
153	56A	0	267,217	0.0	1
96	56B	3,926	8,825,282	0.0	1
154	56C	0	284,774	0.0	1
155	57	0	1,995,814	0.0	1
95	57A	5,406	7,451,127	0.1	1
156	57B	0	376,099	0.0	1
157	58A	0	3,711,493	0.0	1
158	58B	0	1,315,219	0.0	1
159	58C	0	266,637	0.0	1
160	59	0	1,658,992	0.0	1
161	60	0	104,183	0.0	1
162	60A	0	2,855,683	0.0	1
102	60B	206	1,831,579	0.0	1
163	61	0	1,779,338	0.0	1
164	62	0	1,854,222	0.0	1
165	63	0	7,031,305	0.0	1
166	64	0	629,779	0.0	1
103	65	410	3,772,897	0.0	1
54	66A	76,033	2,408,039	3.2	1
167	66B	0	1,713,222	0.0	1
168	66C	0	566,612	0.0	1
169	66D	0	1,274,271	0.0	1
170	66E	0	987,608	0.0	1
171	66F	0	200,056	0.0	1
172	67	0	406,582	0.0	1
173	68	0	893,029	0.0	1
174	69	0	1,068,907	0.0	1
175	6G1	0	1,806,891	0.0	1
176	6G2	0	410,994	0.0	1
177	70	0	6,896,503	0.0	1
178	71	0	7,098,137	0.0	1
179	72	0	1,778,801	0.0	1
101	74	285	2,126,722	0.0	1
85	76A	7,325	1,659,422	0.4	1
180	76B	0	1,196,761	0.0	1

Rank	Replacement Area	Area W/O Coverage [sq. feet]	Total Area [sq. feet]	Unprotected Percent	Score*
68	76C	19,337	1,006,931	1.9	1
8	76D	717,086	3,103,177	23.1	5
181	76F	0	1,100,184	0.0	1
182	76G	0	572,104	0.0	1
80	76H	5,647	852,515	0.7	1
94	76I	871	1,063,205	0.1	1
5	76J	159,183	494,160	32.2	5
90	76K	1,064	359,827	0.3	1
183	77	0	392,726	0.0	1
184	78	0	5,905,316	0.0	1
185	79	1,176,221	1,176,221	0.0	1
11	7A1	934,996	2,805,943	33.3	3
30	7A2	31,986,840	36,356,072	88.0	1
16	7B1	234,349	1,680,662	13.9	3
45	7B2	232,958	3,383,858	6.9	1
35	7B3	1,089,467	2,682,679	40.6	1
40	7B4	254,903	2,421,813	10.5	1
32	7B5	3,846,227	4,710,366	81.7	1
13	7C1	549,011	2,117,098	25.9	3
14	7C2	288,661	1,531,691	18.8	3
67	7C3	35,525	1,712,843	2.1	1
46	7C4	262,156	3,827,766	6.8	1
186	7C5	1,136,030	1,136,030	0.0	1
39	7D1	540,725	4,723,104	11.4	1
22	7D2	244,420	2,181,171	11.2	3
73	7D3	32,696	4,822,454	1.4	1
21	7E1	683,416	23,144,151	11.8	3
33	7E2	2,025,738	6,528,820	62.1	1
43	7E3	203,019	2,400,113	8.5	1
10	7E4	4,226,526	13,610,647	62.1	3
41	7F1	231,877	2,286,888	10.1	1
12	7F2	914,127	3,122,545	29.3	3
36	7F3	845,346	2,956,109	28.6	1
37	7F4	794,501	9,589,353	24.9	1
31	7G1	8,559,092	10,076,724	84.9	1
34	7G2	1,386,483	3,228,269	42.9	1
42	7G3	215,430	2,245,230	9.6	1
44	7G4	304,206	7,607,583	8.0	1
38	7G5	358,903	2,268,497	15.8	1
187	80	5,154,129	5,154,129	0.0	1
188	81	2,344,672	2,344,672	0.0	1
23	82	351,523	4,472,343	7.9	3
189	83	2,787,630	2,787,630	0.0	1
190	84	882,120	882,120	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*
87	85	22,920	5,798,182	0.4	1
47	86A	357,983	7,596,346	4.7	1
82	86B	34,132	6,207,330	0.5	1
60	86C	177,184	6,528,890	2.7	1
17	86D	201,040	1,463,136	13.7	3
76	87A	50,375	4,972,453	1.0	1
191	87B	1,263,488	1,263,488	0.0	1
71	88	121,542	8,399,058	1.4	1
98	89	777	2,227,192	0.0	1
192	90A	5,021,470	5,021,470	0.0	1
193	90B	906,175	906,175	0.0	1
194	90C	3,481,981	3,481,981	0.0	1
195	90D	381,197	381,197	0.0	1
69	91	250,593	26,261,218	1.9	1
1	92	241,016	708,389	68.0	5
66	93A	232,844	10,957,414	2.1	1
99	93B	2,963	9,853,778	0.0	1
86	93C	34,893	8,518,565	0.4	1
196	93D	8,618,863	8,618,863	0.0	1
6	95	67,380	461,690	29.2	5
197	96	1,701,757	1,701,757	0.0	1

*Corresponding score in Appendix A is doubly weighted

Appendix L: Wharf Hydrant

Sacramento Suburban Water District
Wharf Hydrant Score

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
94	02A	101	1	102	1.0	1
95	02B	61	0	61	0.0	1
96	02C	45	0	45	0.0	1
97	02D	61	0	61	0.0	1
98	02E	48	0	48	0.0	1
99	03A	60	0	60	0.0	1
100	03B	61	0	61	0.0	1
101	04	73	0	73	0.0	1
102	05A	64	0	64	0.0	1
103	05B	74	0	74	0.0	1
104	05C	73	0	73	0.0	1
21	06A	8	24	32	75.0	4
9	06B	3	26	29	89.7	5
25	06C	9	24	33	72.7	4
11	06D	5	27	32	84.4	5
12	06E	5	26	31	83.9	5
7	06F	1	12	13	92.3	5
105	06H	49	0	49	0.0	1
1	06I	0	18	18	100.0	5
22	06J	4	12	16	75.0	4
19	06K	5	21	26	80.8	5
106	06M	23	0	23	0.0	1
90	06N	26	1	27	3.7	1
59	09	13	3	16	18.8	1
20	10	3	11	14	78.6	4
27	11	2	4	6	66.7	4
46	12A	42	22	64	34.4	2
82	12B	53	3	56	5.4	1
89	13A	74	3	77	3.9	1
107	13B	78	0	78	0.0	1
108	14	29	0	29	0.0	1
109	15	9	0	9	0.0	1
38	16	4	4	8	50.0	3
58	17A	54	14	68	20.6	2
93	17B	112	2	114	1.8	1
87	18	110	5	115	4.3	1
72	19	92	9	101	8.9	1
17	1A	4	18	22	81.8	5
26	1B	4	9	13	69.2	4
8	1C	2	23	25	92.0	5
45	20A	31	17	48	35.4	2
91	20B	78	2	80	2.5	1
51	21	7	3	10	30.0	2
39	22	1	1	2	50.0	3
34	23	29	50	79	63.3	4

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
66	24A	81	11	92	12.0	1
80	24B	118	8	126	6.3	1
28	25	3	6	9	66.7	4
57	26A	46	12	58	20.7	2
75	26B	71	6	77	7.8	1
85	27	62	3	65	4.6	1
52	28	74	28	102	27.5	2
69	29	91	10	101	9.9	1
110	30	5	0	5	0.0	1
73	31A	41	4	45	8.9	1
2	31B	0	1	1	100.0	5
13	32	2	10	12	83.3	5
53	33	19	7	26	26.9	2
14	34	1	5	6	83.3	5
35	35	22	28	50	56.0	3
70	36	73	8	81	9.9	1
29	37	1	2	3	66.7	4
77	38A	41	3	44	6.8	1
47	38B	45	23	68	33.8	2
3	39	0	10	10	100.0	5
56	40A	49	13	62	21.0	2
68	40B	48	6	54	11.1	1
32	41	7	13	20	65.0	4
111	42A	3	0	3	0.0	1
74	42B	11	1	12	8.3	1
65	42C	14	2	16	12.5	1
15	42D	3	15	18	83.3	5
24	42E	7	19	26	73.1	4
112	42F	18	0	18	0.0	1
113	42G	1	0	1	0.0	1
4	42H	0	1	1	100.0	5
114	42I	0	0	0	0.0	1
115	42J	6	0	6	0.0	1
62	42K	6	1	7	14.3	1
37	43A	6	7	13	53.8	3
116	43B	2	0	2	0.0	1
117	43C	4	0	4	0.0	1
118	43D	9	0	9	0.0	1
119	44	56	0	56	0.0	1
120	45A	86	0	86	0.0	1
121	45B	23	0	23	0.0	1
122	46	13	0	13	0.0	1
123	47	6	0	6	0.0	1
63	48	90	15	105	14.3	1
124	49	4	0	4	0.0	1

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
86	51	63	3	66	4.5	1
79	52A	29	2	31	6.5	1
125	52B	21	0	21	0.0	1
36	53A	10	12	22	54.5	3
54	53B	12	4	16	25.0	2
23	54	3	9	12	75.0	4
49	55	28	13	41	31.7	2
126	56A	2	0	2	0.0	1
43	56B	59	40	99	0.0	1
127	56C	3	0	3	0.0	1
78	57	14	1	15	6.7	1
55	57A	47	15	62	24.2	2
40	57B	2	2	4	50.0	3
128	58A	38	0	38	0.0	1
129	58B	13	0	13	0.0	1
130	58C	1	0	1	0.0	1
131	59	9	0	9	0.0	1
132	60	0	0	0	0.0	1
133	60A	30	0	30	0.0	1
134	60B	13	0	13	0.0	1
135	61	12	0	12	0.0	1
136	62	7	0	7	0.0	1
88	63	44	2	46	4.3	1
137	64	5	0	5	0.0	1
138	65	38	0	38	0.0	1
139	66A	18	0	18	0.0	1
71	66B	10	1	11	9.1	1
140	66C	8	0	8	0.0	1
141	66D	20	0	20	0.0	1
142	66E	12	0	12	0.0	1
143	66F	1	0	1	0.0	1
144	67	2	0	2	0.0	1
61	68	5	1	6	16.7	1
145	69	8	0	8	0.0	1
10	6G1	1	8	9	88.9	5
30	6G2	1	2	3	66.7	4
146	70	69	0	69	0.0	1
147	71	48	0	48	0.0	1
33	72	4	7	11	63.6	4
41	74	8	8	16	50.0	3
67	76A	15	2	17	11.8	1
148	76B	12	0	12	0.0	1
149	76C	7	0	7	0.0	1
150	76D	16	0	16	0.0	1
151	76F	10	0	10	0.0	1

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
152	76G	7	0	7	0.0	1
153	76H	13	0	13	0.0	1
154	76I	4	0	4	0.0	1
155	76J	2	0	2	0.0	1
156	76K	4	0	4	0.0	1
5	77	0	2	2	100.0	5
157	78	66	0	66	0.0	1
158	79	14	0	14	0.0	1
159	7A1	12	0	12	0.0	1
160	7A2	20	0	20	0.0	1
161	7B1	12	0	12	0.0	1
162	7B2	19	0	19	0.0	1
163	7B3	15	0	15	0.0	1
83	7B4	18	1	19	5.3	1
164	7B5	2	0	2	0.0	1
165	7C1	7	0	7	0.0	1
166	7C2	10	0	10	0.0	1
167	7C3	16	0	16	0.0	1
168	7C4	36	0	36	0.0	1
169	7C5	14	0	14	0.0	1
170	7D1	31	0	31	0.0	1
171	7D2	17	0	17	0.0	1
172	7D3	22	0	22	0.0	1
173	7E1	37	0	37	0.0	1
174	7E2	7	0	7	0.0	1
175	7E3	28	0	28	0.0	1
176	7E4	14	0	14	0.0	1
177	7F1	20	0	20	0.0	1
178	7F2	16	0	16	0.0	1
179	7F3	15	0	15	0.0	1
180	7F4	15	0	15	0.0	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	32	0	32	0.0	1
189	83	26	0	26	0.0	1
190	84	13	0	13	0.0	1
42	85	19	16	35	45.7	3
81	86A	49	3	52	5.8	1
64	86B	53	8	61	13.1	1
76	86C	48	4	52	7.7	1

Rank	Replacement Area	Steamers	Wharfs	Total Hydrants	Percent Wharfs	Score
191	86D	13	0	13	0.0	1
192	87A	32	0	32	0.0	1
193	87B	5	0	5	0.0	1
194	88	54	0	54	0.0	1
84	89	20	1	21	4.8	1
18	90A	8	34	42	81.0	5
6	90B	0	6	6	100.0	5
16	90C	5	24	29	82.8	5
31	90D	1	2	3	66.7	4
48	91	42	20	62	32.3	2
195	92	0	0	0	0.0	1
50	93A	41	19	60	31.7	2
60	93B	49	10	59	16.9	1
92	93C	53	1	54	1.9	1
44	93D	41	23	64	35.9	2
196	95	2	0	2	0.0	1
197	96	14	0	14	0.0	1

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SACRAMENTO SUBURBAN WATER DISTRICT

Facilities & Operations Committee
Agenda Item: 3

Date: August 23, 2018

Subject: Review Draft Language for 2018 Consumer Confidence Report

Staff Contact: David Armand, Environmental Compliance Supervisor

Recommended Committee Action:
Review draft letter to Division of Drinking Water (DDW) requesting approval to supplement required language in the 2018 Consumer Confidence Report and direct staff as appropriate.

Discussion:
At the July 16, 2018, Board meeting, a Director requested that this topic be added to the agenda for discussion at the August 1, 2018, Facilities and Operations Committee Meeting. A discussion ensued and staff was directed to draft a letter to DDW requesting approval to supplement required language in the 2018 Consumer Confidence Report. A copy of the draft letter is included as Exhibit 1.

Attachment:
Exhibit 1 – Request to Supplement Mandatory Language in the Sacramento Suburban Water District 2018 Consumer Confidence Report

Exhibit 1

September xx, 2018

Mr. Bruce Berger
Sanitary Engineer
Division of Drinking Water
Sacramento District Office
1001 I Street, 17th Floor
Sacramento, CA 95814

SUBJECT: REQUEST TO SUPPLEMENT MANDATORY LANGUAGE IN THE SACRAMENTO SUBURBAN WATER DISTRICT 2018 CONSUMER CONFIDENCE REPORT

Dear Mr. Berger:

Every year Sacramento Suburban Water District (District) receives calls from concerned customers about some of the mandatory language in the Consumer Confidence Report (CCR) and our Board is questioning it as well. In an effort to alleviate some of those concerns, the District would like to include some informational text before or after the mandatory text in the 2018 CCR. The District believes inclusion of the additional information would provide customers with more comfort about their drinking water.

Nitrate – the mandatory text for nitrate over one-half of the maximum contaminant level (MCL) below is followed by information that the District proposes to include in the 2018 CCR:

> *Nitrate in drinking water at levels above 10 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 10 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider.*
>
> Nitrate levels in water supplied by the District are below 10 mg/L. Nitrate monitoring is performed at least annually and, in many cases, quarterly. If there is an indication that the nitrate level in a well may reach the 10 mg/L regulatory threshold, it is immediately removed from service.

Lead – the mandatory text for lead below is followed by information that the District proposes to include in the 2018 CCR:

> *If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The*

District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline, or at: www.epa.gov/lead.

Monitoring that was performed in accordance with USEPA's lead and copper monitoring requirements show that drinking water provided by the District overall does not facilitate the dissolution of lead. However, due to the variety of materials used in some customer's plumbing systems (including home water treatment units) lead results may vary. If you are concerned about the potential impact the internal plumbing system in your home or business may have on lead levels in your drinking water, SSWD will refer you to a laboratory that you can utilize to test your water.

Overview of Drinking Water - the District proposes to include the information below before the mandatory text concerning sources of drinking water that follows:

The United States Environmental Protection Agency and the State Water Resources Control Board, Division of Drinking Water (DDW) require the educational language below to be included in all public water system's CCRs. For a complete list of detected contaminants and their potential sources, please see the tables in the section titled, "Summary of Detected Constituents."

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity."

The District believes that including this information makes the mandatory text more relevant to the water that the District provides its customers. Please confirm that DDW has no concerns or objections with the District providing the additional suggested (or similar) information. If you have any questions or concerns regarding this request, please feel free to contact me at (916) 679-2887, or via email at *munderwood@sswd.org*.

Sincerely,

Matt Underwood
Operations Manager

Copy: Dan York, General Manager
Mike Huot, Assistant General Manager
David Armand, Environmental Compliance Supervisor

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SACRAMENTO SUBURBAN WATER DISTRICT

Facilities and Operations Committee

Agenda Item: 4

Date: September 6, 2018

Subject: McClellan Business Park Update

Staff Contact: Dave Morrow, P.E., Senior Engineer

Recommended Committee Action:
Receive presentation by the Engineering Department related to the McClellan Business Park history, ongoing coordination for new Successor Agreement, and future projects.

Background:
McClellan Air Force Base is 3,452 acres and was active from 1935 to 2001, serving primarily as a supply and logistics facility. In 1993, the United States Congress identified the base for future closure. Local government developed a privatization plan to mitigate loss of government jobs impacting the economy.

Northridge Water District (NWD) accepted control of the McClellan Business Park (formerly the United States Air Force's *McClellan Air Force Base*) water system in 2000 based on an agreement ("2000 Agreement") with Sacramento County. In 2016 the Sacramento Suburban Water District (District) and McClellan Business Park/Sacramento County began meeting to create a new agreement ("Successor Agreement").

Discussion:
The 2000 Agreement included provisions for water system infrastructure upgrades to current (non-military) standards, as follows:

- Installation of water meters on all existing services;
- Installation of backflow protection on all private fire lines;
- Installation of water meters at the former Capehart Housing complex;
- Replacement/upgrades of fire hydrants;
- Inspection and cleaning of water storage tanks;
- Inspection/upgrade of groundwater wells;
- Installation of altitude valve on water storage tanks;
- Preparation of a water quality sampling plan;
- Installation of two transmission mains; and
- Securing legal descriptions of all easements.

The District has completed the following 2000 Agreement items:

- Installation of water meters at Capehart;
- Improving fire hydrants:
- Storage tank inspection/cleaning;
- Well inspection/upgrade;
- Altitude valve installation;
- Water sampling plan; and
- Transmission main construction.

Remaining 2000 Agreement items to be completed are:

- Installation of water meters (*Status: in-progress; expected to be completed by January 1, 2025*);
- Installation of backflow protection on fire lines (*Status: pending terms of Successor Agreement*); and
- Secure legal descriptions for easements (*Status: in-progress; expected to be completed in late 2019*).

This presentation (Exhibit 1) provides a brief overview of the McClellan Water System, a history timeline, and example projects.

Attachment:
Exhibit 1 – McClellan Business Park Update PowerPoint presentation

Exhibit 1

McClellan Business Park Update

Dave Morrow, P.E.
Senior Engineer
September 5, 2018

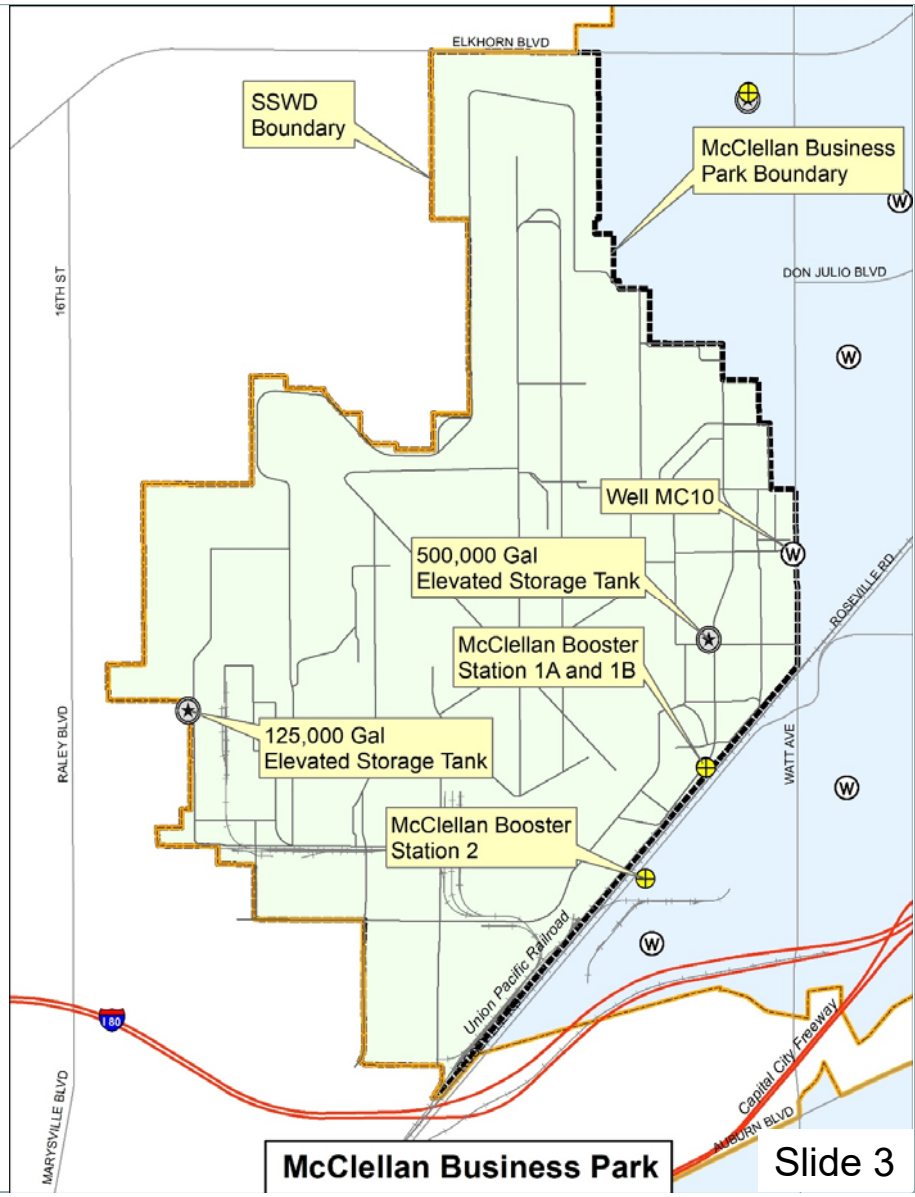
A Short History Lesson

- 1988 – First discussions with Northridge Water District (NWD) to provide emergency water service to the Base.
- 1995-2000 – NWD negotiated with the Air Force to operate the Base water system.
- 1999 – The Base and Capehart turned over to the County and McClellan Business Park.
- 2000 – Agreement with Sacramento County: NWD took over operation and maintenance of the Base and Capehart water system.
- 2001 – McClellan Business Park acquired rights from Sacramento County for privatization.
- 2002 – NWD and Arcade Water District (AWD) consolidated to become SSWD.
- 2016 – SSWD and McClellan Business Park / County began meeting for the new agreement.
- 2017 – Draft Successor Agreement received from McClellan Business Park.
- 2018 – County is requesting an agreement with SSWD.

McClellan Business Park Quick Facts

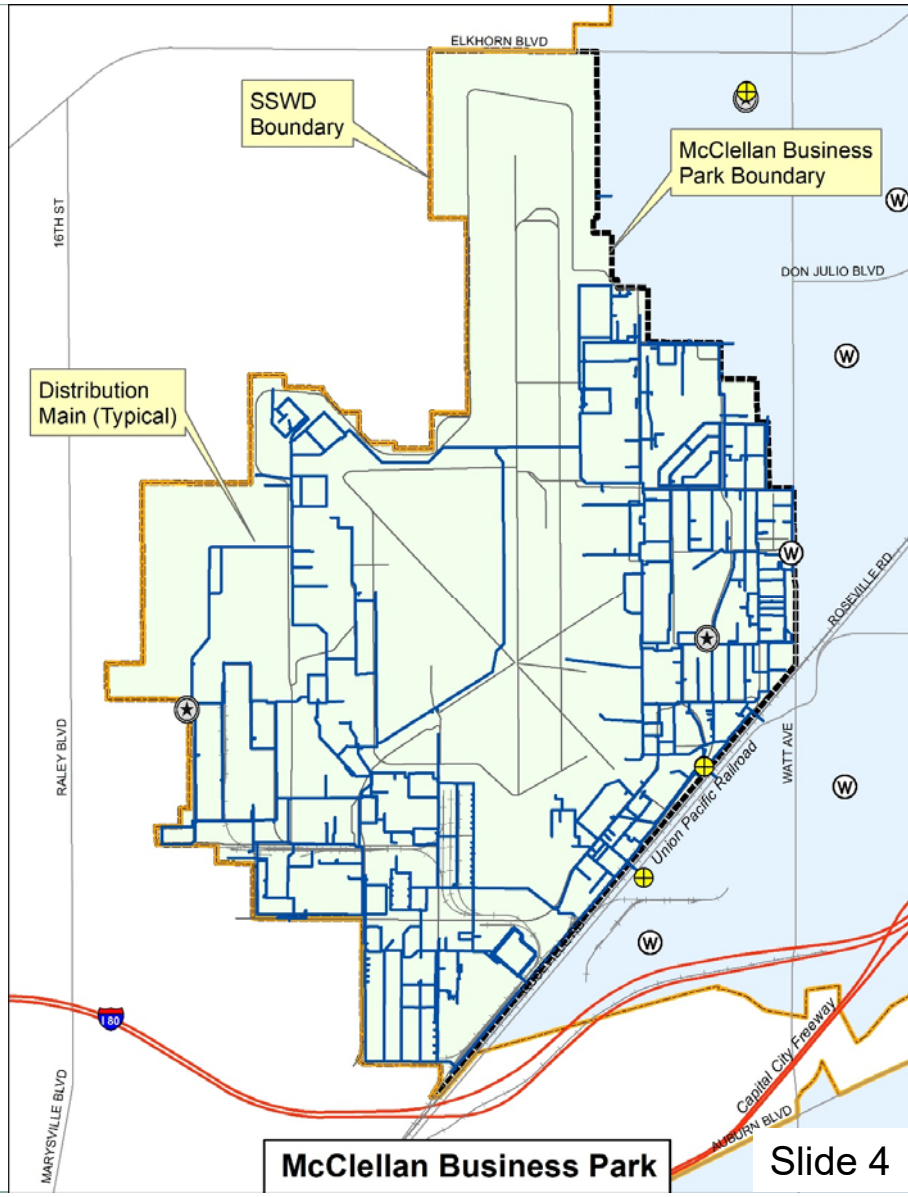
- Number of Parcels: ~190
- Well Capacity (1): 700 gpm
- Elevated Reservoirs (2): 650k gal.
- Booster Capacity (2): 6,000 gpm

Key: gpm = gallons per minute, k = 1,000, gal = gallons



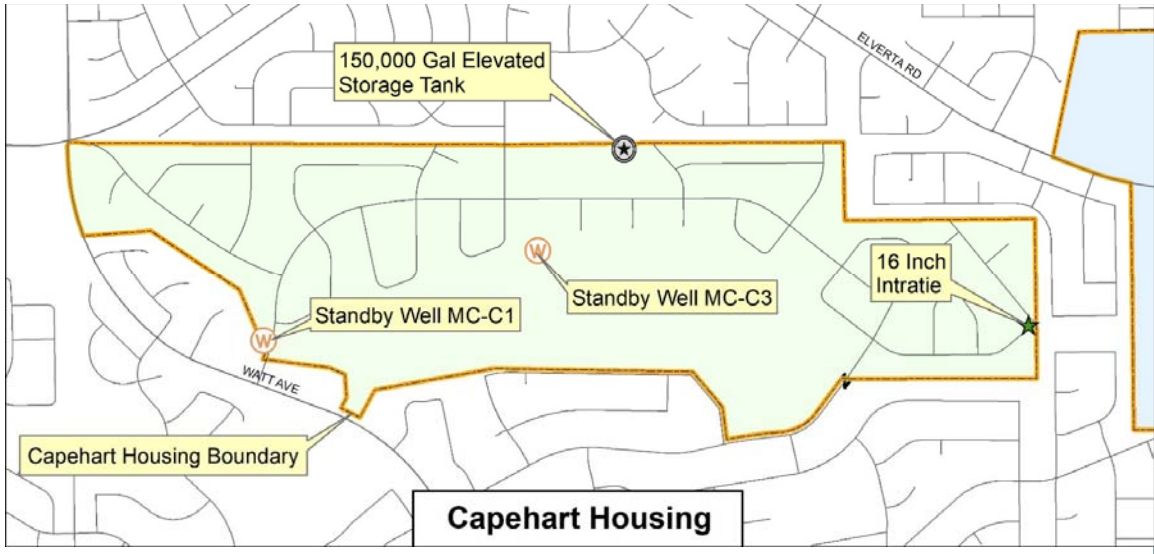
McClellan Business Park Pipelines

- Pipeline Sizes: 6- to 16-inch
- Pipelines: ~45 miles
- Pipe Material: Asbestos Cement



Capehart Housing Quick Facts

- Number of Homes: ~400
- Pipeline Sizes: 6- to 12-inch
- Elevated Reservoir: 150k gal.
- Intratie with SSWD North Service Area
- Well Capacity (2): 1,400 gpm (Standby)
- Pipe Materials: Asbestos Cement
- Known as the Arbors at Antelope



Key: gal = gallons, gpm = gallons per minute

Required Capital Improvement Program

(2000 Agreement with Sacramento County)

1. Installation of water meters on all existing services.
2. Installation of backflow protection on all private fire lines.
3. Installation of water meters at Capehart Housing complex.
4. Fire hydrant upgrade and replacement.
5. Storage tank inspection and cleaning.

Required Capital Improvement Program

(2000 Agreement with Sacramento County)

6. Groundwater well inspection and upgrade.
7. Installation of altitude valve on the storage tanks.
8. Preparation of a water quality sampling plan.
9. Installation of two transmission pipelines.
10. Secure legal descriptions for all easements.
11. Exhibit C of agreement committed $5.1 million of CIP items.
12. Exhibit C CIP investment to date is approximately $7 million.

Completed Capital Improvement Projects

(Based on the 2000 Agreement)

1. Installation of water meters at Capehart Housing complex.
2. Replace and Upgrade fire hydrants.
3. Inspection and cleaning storage tanks.
4. Inspection and upgrade of water wells.
5. Installation of altitude valve on the storage tanks.
6. Prepare of a water quality sampling plan.
7. Install 7,200-ft of transmission pipelines.

Remaining Projects To Be Completed

(Based on the 2000 Agreement)

1. Installation of water meters on all existing services.

   Status: In progress; to be completed by January 1, 2025.

2. Installation of backflow protection on all private fire lines.

   Status: In progress; pending outcome of successor agreement terms.

3. Secure legal descriptions for all easements.

   Status: In progress; expected to be completed in late 2019.

2017 Successor Agreement Projects

(McClellan Business Park)

1. Installation of water meters on all existing services. (2000 Agreement)
2. Determine cost to install 107 backflow devices on fire services. (2000 Agreement)
3. Secure legal descriptions for all easements. (2000 Agreement)
4. Inventory of water services (credits) to each parcel. (NEW)

Completion Schedule

(Based on the 2017 Draft Successor Agreement)

2018 - Inventory of water services (credits) to each parcel.

2018 - Develop cost estimate for backflow device on fire service lines.

2019 - Secure legal descriptions for all easements.

2023 - Installation of water meters on all existing services.

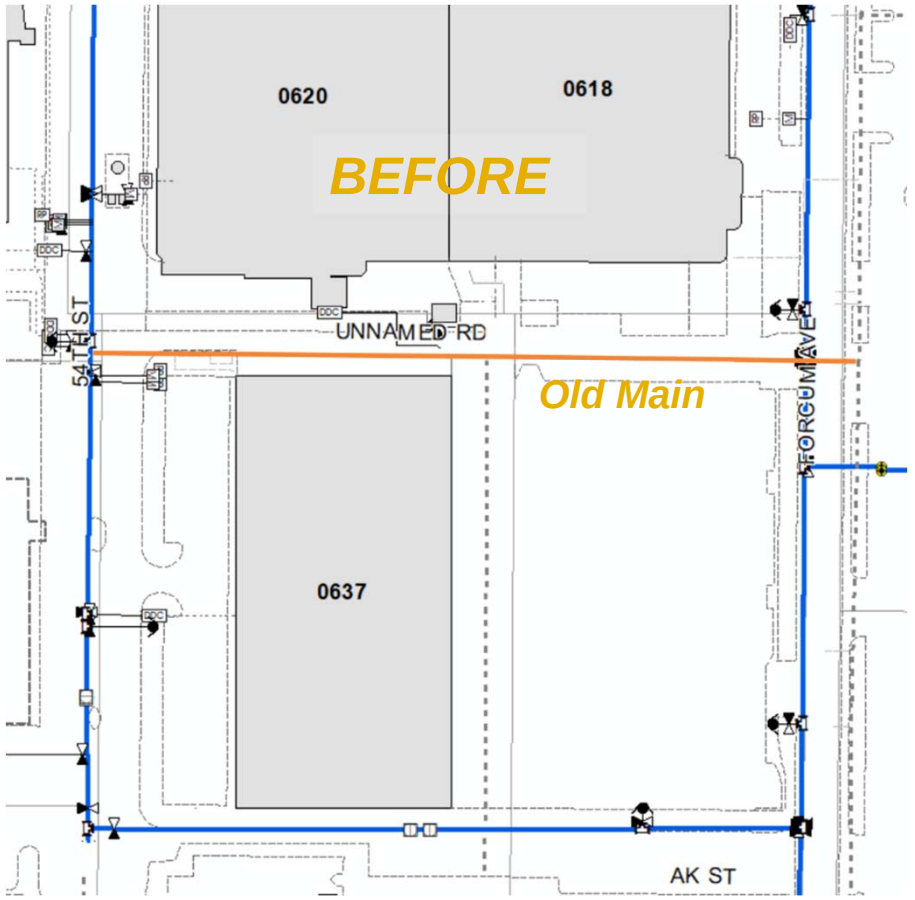
Example

Projects

Example Project 1 - *Before*

Building 0637 Project Review

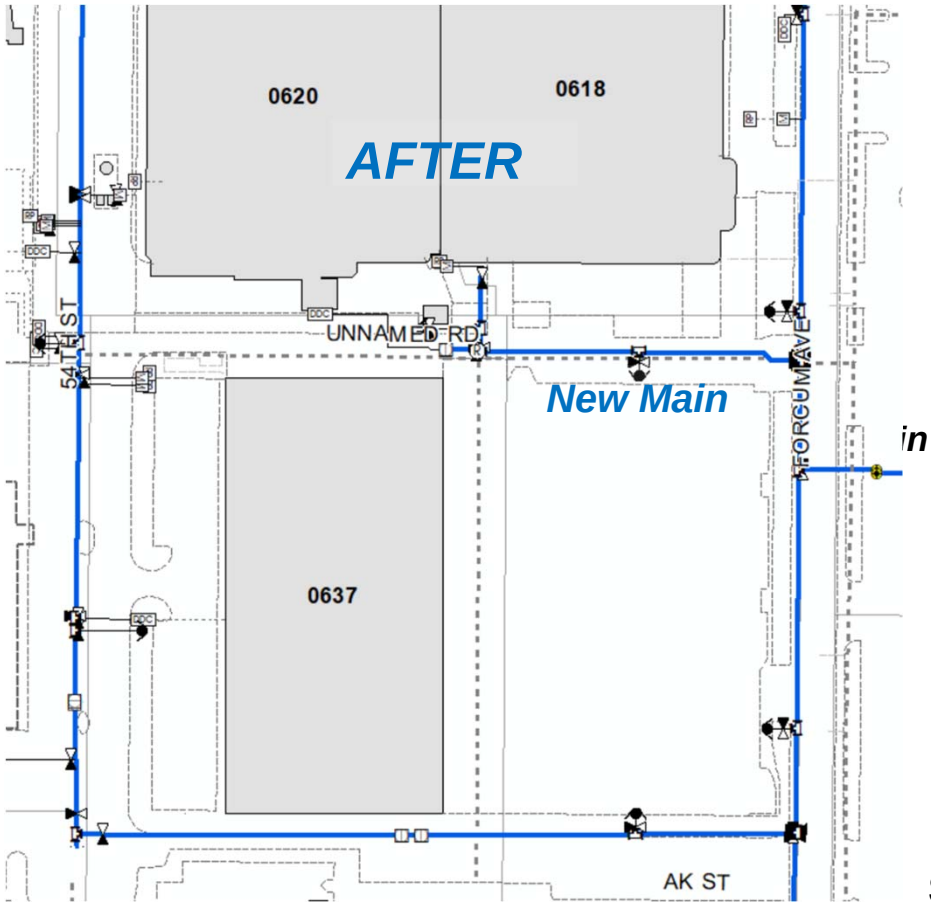
1. New Development Process
2. Coordination with McClellan Business Park
3. Replaced old, undersized 8-inch main with new 12-inch main
4. Maintain existing services
5. Credit for existing services
6. Upgraded backflow devices
7. New fire hydrants



Example Project 1 - *After*

Building 0637 Project Review

1. New Development Process
2. Coordination with McClellan Business Park
3. Replaced old, undersized 8-inch main with new 12-inch main
4. Maintain existing services
5. Credit for existing services
6. Upgraded backflow devices
7. New fire hydrants



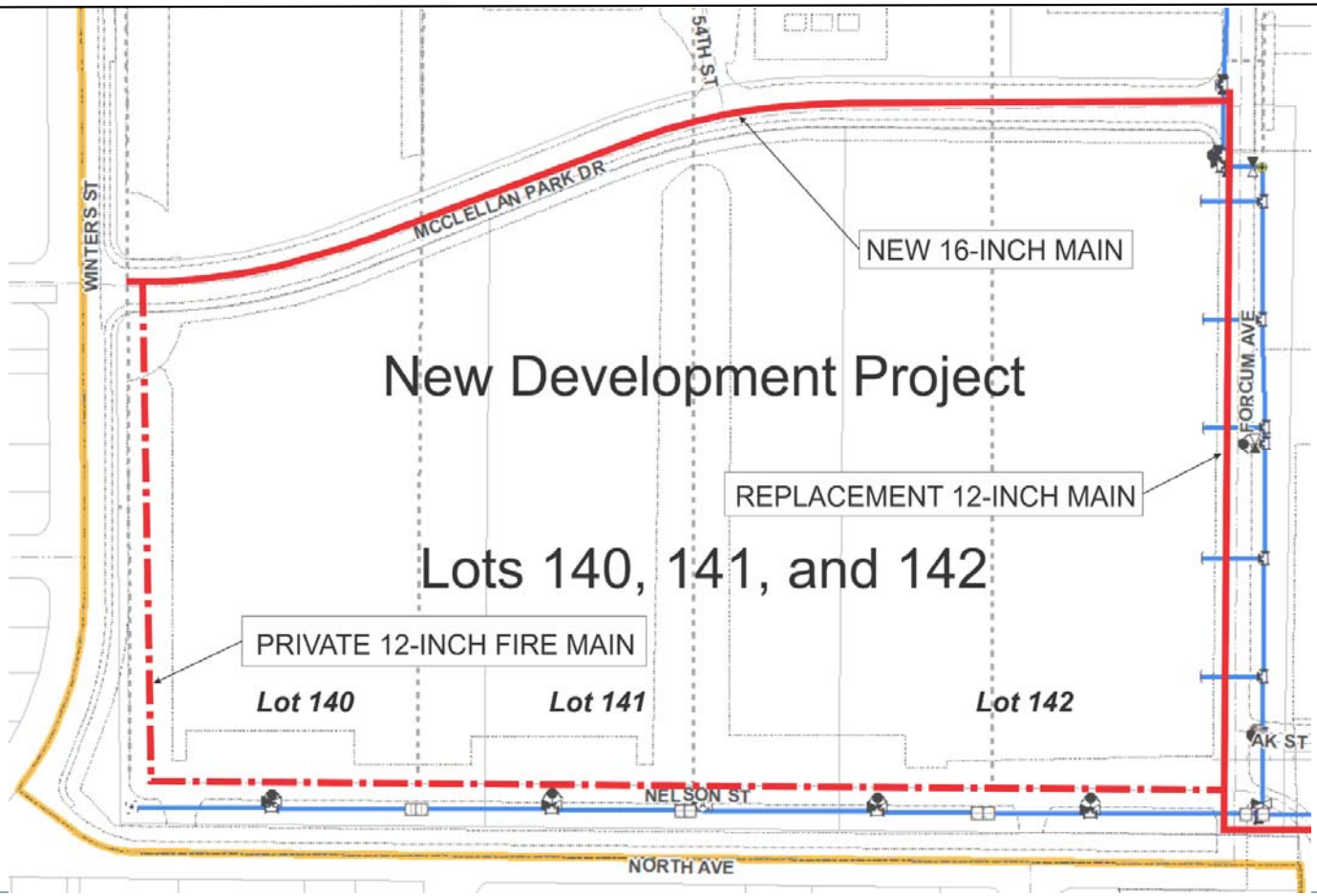
Example Project 2

McClellan Park Drive Project Review

1. New Development Process
2. Coordination with McClellan Business Park
3. New 12- and 16-inch mains
4. Credit for existing services
5. New fire hydrants

Example Project 2

McClellan Park Drive Project Review



Thank You.

Questions?

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SACRAMENTO SUBURBAN WATER DISTRICT

Facilities and Operations Committee
Agenda Item: 5

Date: September 5, 2018

Subject: Antelope Gardens

Staff Contact: Matt Underwood, Operations Manager

Recommended Committee Action:
Receive report regarding Antelope Gardens.

Background:
The District has had a rich history of promoting landscape water use efficiency. Antelope Gardens (Garden) was commissioned in the late 1990's in an effort to demonstrate and teach the water use efficiencies the District promoted for nearly 5 decades. Though the Garden has served as the District's banner of efficient use of landscape water and public education, the time has come to review its current purpose. Currently, there is an abundance of information and resources available to the public providing them with many different avenues for information regarding landscape water use efficiency. Thus, at a Regular Board meeting held on November 20, 2017, the Board of Directors (Directors) discussed the proposed $70,000 maintenance study of the Garden. The Board requested that District staff review the purpose and use of the Garden and bring those findings to the Facilities and Operations Committee. The following is the result of staff's findings.

Discussion:
An Antelope Gardens Ad Hoc Committee (Committee) was formed to evaluate the current use of the Garden, and determine the best use of the Garden going forward.

The Committee consists of the following members:

Greg Bundesen, Water Conservation Supervisor (Chair)
Dave Morrow, Senior Engineer
Dan Bills, Finance Director
Michelle Hirt, Facilities and Fleet Specialist
Kerry Smith, Customer Service Representative

The Committee met to discuss the costs and benefits of the Garden. Though the Garden has some public education benefits, based on the excessive required repair and maintenance costs and the low public turnout when it is open to the public, the Committee feels that the Garden no

longer provides the benefit it once did. The items in need of attention are the gazebo structures, roofing of the buildings, waterfall repair and maintenance, irrigation system repair and maintenance, irrigation system controllers replacement, and the replanting of various plants is estimated to cost approximately $280,000+. The annual maintenance cost is approximately $32,000. When the high cost of maintenance in mind, the Committee came to the conclusion that it is time to move on from the Garden and that it be demolished and repurposed for other District use. The Committee recommends that funds for demolishing the Garden be budgeted in the CY2019 budget.

The Committee recommends limiting activities at the Garden to "as necessary" business meetings (i.e. SAWWA, RWEPAC, etc.) and closed to the public permanently beginning November 1, 2018. If approved, the Community Outreach Committee will notify the public by generating a tribute article for what the Garden was and what the facility will become in a future bill insert.

The Committee will continue to meet and discuss alternate use for the site and develop an Alternate Use Report (Report) for review by June 1, 2019. The Report will cover some of the ideas the Committee discussed at its meeting and will include details outlining the conceptual designs of the new ideas, the cost of the new ideas, and an implementation timeline. Based on the Committee's report and the General Manager review, a recommendation can be generated for the Board's consideration as part of the CY2020 budget year.

Fiscal Impact:
Demolition of the Garden is estimated to cost $47,780 plus inspection fees (see Exhibit 1). The estimated cost does not include surface restoration (i.e. paving).

Strategic Plan Alignment:
Facilities and Operations – 2.A. The District will utilize appropriate planning tools, identify financial resources necessary, and prioritize system requirements to protect and maintain District assets and attain water resource objectives incorporating resource sustainability and lifecycle cost analysis into the framework.

Attachment:
Exhibit 1 – Proposal from GW Demolition Inc.

Exhibit 1

PROPOSAL
GW DEMOLITION INC.

P. O. Box 37, Rio Linda, CA 95673
Phone (916) 992-0741 Fax (916) 991-9246
Lic. # 831594 DIR# 1000010451

TO: Sacramento Suburban Water District
PHONE: (916) 416-8438
EMAIL: mhirt@sswd.org

August 20, 2018

We hereby submit specifications and estimates for: Proposal# 180820.01

7800 Antelope North Road

Demolition of structures (gazebos, bathroom and sheds), remove waterfall, gardens, concrete and abandon one septic tank.

Permits and notifications can be added at cost.
Owner to provide an asbestos survey and report, any necessary abatement to be completed by others prior to demolition.

Prices are based on prevailing wages, standard construction, commercial property and standard operating hours M – F 7 AM – 2 PM. Any work not specifically outlined above is not included in this proposal and will be an extra charge over and above the price of this proposal. This bid specifically excludes any fencing (temporary or otherwise), tanks, testing, inspections, asbestos, lead based paint, PCB's, mercury, Freon, salvage, stripping of grass and vegetation, excavation, saw cutting, asphalt, additional concrete, backfill, compaction, additional septic tanks, leach lines, wells, SWPPP, WPCP, BMP's, erosion control, and/or hydro seeding.
G W Demolition Inc. retains all salvage rights.
When compaction is included in the proposal, compaction is only guaranteed for 90% unless otherwise stated.
Performance, payment bonds and/or waiver of subrogation are not included in this proposal, but are available at an additional charge.
Removal of resulting debris excludes materials 3 inch minus.
Owner will supply all necessary permits including, but not limited to access, building, encroachment, environmental, etc.
Owner is responsible for disconnecting all utilities prior to demolition.
***GW DEMOLITION IS NOT RESPONSIBLE FOR ANY HAZARDOUS WASTE AND/OR MATERIALS.**
***GW DEMOLITION IS NOT RESPONSIBLE FOR DAMAGE TO SIDEWALKS, DRIVEWAYS OR CONCRETE.**

All material is guaranteed to be as specified. All work to be completed in a workman like manner according to standard practices. All prices based on standard construction any alteration or deviation from above specifications involving extra costs and/or change orders will be executed only upon written orders, and may become an extra charge over and above the estimate. All agreements are contingent upon strikes, accidents or delays beyond our control. Owner to carry fire and other necessary insurance. Our workers are fully covered by workmen's Compensation Insurance.
If utilities are not disconnected or site is not ready prior to scheduled show up, a mobilization fee of $800.00 will be charged.

WE PROPOSE hereby to furnish material and labor – complete in accordance with these specifications, for the sum of:
Forty seven thousand seven hundred eighty Dollars ($47,780.00).
Payable on completion.

Authorized Signature Crystal Smith

NOTE: We may withdraw this proposal if not accepted within Thirty days, or if any changes are made to the proposal. Prices are only guaranteed by this proposal for 30 days.

ACCEPTANCE OF PROPOSAL- The prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to the work as specified. Payment will be made as outlined above. A 2% late fee will be charged per month on all unpaid and overdue invoices. Customer agrees to pay all attorney fees if suit is brought for collection. Customer also agrees to pay all lien and collection fees. The signature(s) on this proposal, if transmitted by facsimile machine, will be acceptable and binding as if it were the original.

Signature_____ Date _____ Signature_____ Date_____

Print Name _____ Title_____ Print Name_____ Title_____