Great Lakes Water Supply Program

GREAT WATER ALLIANCE



4-110 D1 WisDOT Interstate 43 Hardship Application

May 2019

Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

GREELEY AND HANSEN

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PROGRAM TEAM MEMBER CONSULTANTS:

EXECUTIVE SUMMARY

The City of Waukesha Water Utility (WWU) provides water treatment and distribution services to a service area that includes the City of Waukesha (Waukesha), and portions of the Town of Waukesha and the City of Pewaukee. The St. Peter Sandstone aquifer, which has been the primary source of drinking water for Waukesha, has been severely depleted and is contaminated with naturally-occurring radium. Waukesha needs a long-term, sustainable alternative to its existing water supply to protect public health. After study efforts and public engagement, the Great Lakes-St. Lawrence River Basin Water Resources Council (Compact Council) issued its Final Decision unanimously approving Waukesha's Application to source water from Lake Michigan. WWU subsequently commissioned the Great Water Alliance (Program) to transition Waukesha's water supply. As part of the Program, approximately 23-miles of main (referred to as the "Return Flow Pipeline") is required per the Final Decision to achieve a net zero water balance in the Great Lakes–St. Lawrence River Basin by returning highly treated effluent to the Root River, which ultimately discharges into Lake Michigan.

Approximately two-miles of the Return Flow Pipeline is proposed to be located in the Interstate 43 right-of-way between Racine Avenue and about 1,800-feet east of Calhoun Road in the City of New Berlin (New Berlin). The purpose of this Hardship Application is to receive an exception to 23 CFR 1.23 (c) to locate the Return Flow Pipeline in that portion of the Interstate 43 right-of-way. Coordination to receive the exception has occurred as follows:

- May 17, 2018: A first draft of the Hardship Application was submitted to the Wisconsin Department of Transportation (WisDOT).
- June 28, 2018: Comments were received from WisDOT on the first draft of the Hardship Application.
- July 20, 2018: The Program team and WisDOT discussed the comments and gained consensus on the responses and the reorganization of the Hardship Application.
- August 23, 2018: A second draft of the Hardship Application was submitted to WisDOT, updated per comments received.
- October 5, 2018: Comments were received from WisDOT and the Federal Highway Administration (FHWA) on the second draft of the Hardship Application.
- October 23, 2018: The Waukesha Water Utility I-43 Hardship Application Meeting was held in Madison, WI with the members of the Program, Wisconsin Department of Natural Resources (WDNR), Public Service Commission (PSC), WisDOT, and FHWA to discuss the comments and gain consensus on the responses and the second reorganization of the Hardship Application.
- October 25, 2018: An outline of the third draft of the Hardship Application was reviewed with WisDOT and updated based on comments received. Consensus was gained on third outline of the Hardship Application.
- November 15, 2018: The Program team submitted the third draft of the Hardship Application to WisDOT.
- January 17, 2019: The Program Submitted National Environmental Protection Act (NEPA) Categorical Exclusion Checklist (CEC) to WisDOT. Comments were received from FHWA on the third draft of the Hardship Application submitted November 15, 2018.
- February 27, 2019: The Program team submitted supplementary information to address comments from FHWA received January 17, 2019.

- April 5, 2019: The Program team received approval from FHWA and WisDOT for the Hardship Application.
- April 8, 2019: The Program received approval from WisDOT for the NEPA CEC.

The enclosed Hardship Application summarizes the economic and non-economic evaluation of 12 route alternatives near the Interstate 43 corridor. Conclusions are summarized as follows:

- Of the route alternatives presented in Open House Meetings, Route Alternative 9 is the only route the public did not voice concern over.
- Route Alternative 9, which utilizes the Interstate 43 right-of-way, has lower Class 3 and 4 Opinion of Probable Construction Costs (OPCCs) than the other route alternatives evaluated. The OPCC for Route Alternative 9 is approximately $1.3M and $6.7M less than the other route alternatives. The other route alternatives evaluated would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.
- Route Alternative 9 has a lower or equal anticipated Additional Total Road User Cost due to fewer detours than any other route alternative except Route Alternative 2, which departs public right-of-way and requires the acquisition of 11 easements. Route Alternative 9's anticipated Additional Total Road User Cost is less than these other route alternatives by up to $10.6M. These other route alternatives would result in a greater Additional Total Road User Cost due to detours to local traffic in New Berlin, a neighboring community that will not benefit from the Program.
- Route Alternative 9 requires one easement in the area evaluated as part of this Hardship Application, which is fewer easements than Route Alternatives 1-8. More easements increase the coordination with the property owners and increase the likelihood WWU will be required to exercise eminent domain. Coordination with property owners and utilization of the eminent domain process is a hardship for WWU for the following reasons:
  - Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way.
  - Waukesha ratepayers will incur additional costs to construct permanent access roads for pipeline maintenance purposes. Additionally, New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to a reduced harvestable area.
  - There is a negative public perception associated with exercising eminent domain in New Berlin, a neighboring community whose residents will not benefit from the Program. WWU is endeavoring to maintain good relationships with the neighboring communities who are being impacted during the construction of the infrastructure to serve the community of Waukesha.
  - New Berlin has expressed concern over reconstructing recently rebuilt roads in their community. Refer to Appendix B for a letter from the Mayor of New Berlin expressing concern regarding the impact to the residents of New Berlin. In addition to WWU's desire to maintain good relationships with their neighboring communities, New Berlin City Ordinance 275-15 gives the planning commission the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin, which has the potential to delay the Program.
- If approval is granted by WisDOT, the Return Flow Pipeline would be located along the northern right-of-way line. In the unlikely event of a failure of the Return Flow Pipeline, there will be minimal risk to the traffic along Interstate 43.
- The wetlands along Route Alternative 9 have been field-delineated and documentation has been prepared for the Wetlands and Waterways Individual Permits Application. Route changes would delay design and

submittal of the Wetlands and Waterways Individual Permits Application. Wetland delineation has seasonal constraints; the growing seasons in 2017 and 2018 began in April and ended in late October of each year. Wetland delineation and survey had proceeded in advance of approval of this Hardship Application in order to maintain the schedule stipulated in the July 2017 Amended Stipulation and Order for Amended Judgment, refer to Appendix G and accommodate the seasonal restriction. Per that court order, if the new water supply project is not under contract and certified to be 50% complete by May 1, 2022, WWU must initiate construction of interim radium treatment. Further delays on approval or denial of this Hardship Application will progressively put the Program at risk for not meeting the schedule. Construction of interim radium treatment caused by further delays would increase the financial burden on Waukesha ratepayers for the interim treatment but not eliminate the need for the new water supply project.

The Return Flow Pipeline route alternatives evaluated that do not utilize the Interstate 43 corridor would create a hardship for WWU, Waukesha, Waukesha ratepayers, and the residents of New Berlin. Waukesha ratepayers will already incur rate increases on the order of three times current rates due to the water supply transition to Lake Michigan water. Route alternatives other than Route Alternative 9, which uses the Interstate 43 corridor, would cause additional costs to be incurred to Waukesha ratepayers. Furthermore, locating the Return Flow Pipeline in the Interstate 43 corridor would minimize impacts to the residents of New Berlin. The documentation herein supports the conclusion for an exception to 23 CFR 1.23 (c) to locate the Return Flow Pipeline in a portion of the Interstate 43 right-of-way.

Appendix K includes the comments received from WisDOT and FHWA on the Hardship Application and the responses provided by the Program.

SECTION 1 Introduction

1.1 Purpose

Under the Wisconsin Department of Transportation (WisDOT) Utility Accommodation Policy, water facilities are not allowed to longitudinally occupy limited access highway (e.g., freeway/expressway) right-of-way unless an exception is granted to 23 CFR 1.23 (c) that is "in the public interest and will not impair the highway or interfere with the free and safe flow of traffic thereon." The purpose of this Hardship Application is to receive an exception to 23 CFR 1.23 (c) to use the right-of-way of Interstate 43 between Racine Avenue and approximately 1,800-feet east of Calhoun Road in the City of New Berlin (New Berlin) for the Return Flow Pipeline being implemented as part of the Great Water Alliance (Program). This Hardship Application summarizes the route alternatives considered for the Return Flow Pipeline near the Interstate 43 corridor. The Hardship Application provides advantages and disadvantages for each route alternative, including the route alternative utilizing the Interstate 43 right-of-way. This Hardship Application evaluates and requests approval to utilize Interstate 43 right-of-way for the Program as it is in the public interest and will not impair the highway nor the free and safe flow of traffic.

1.2 Great Water Alliance Overview

The City of Waukesha Water Utility (WWU) provides water treatment and distribution services to a service area that includes the City of Waukesha (Waukesha), and portions of the Town of Waukesha and the City of Pewaukee. The St. Peter Sandstone aquifer, which has been the primary source of water for Waukesha has been severely depleted in Southeast Wisconsin and is contaminated with naturally occurring radium. This is due in large part to a natural layer of shale rock that restricts groundwater recharge. Depletion of the St. Peter Sandstone aquifer has caused increases in the concentrations of radium and other contaminants. As a result, Waukesha needs a long-term, sustainable alternative to its existing water supply to protect public health.

In 2009, the Department of Justice (DOJ) issued a Stipulation and Order for Judgment to WWU to enforce state drinking water radionuclide standards. In October 2013, following study efforts and public engagement, Waukesha resubmitted its Application for Lake Michigan Diversion with Return Flow (Application) to the Wisconsin Department of Natural Resources (WDNR). In it, Lake Michigan water was determined to be the only reasonable sustainable source of water that protects both the environment and public health. WDNR concurred that Waukesha's proposal met the criteria of the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact) and submitted the Application to the Great Lakes-St. Lawrence River Basin Water Resources Council (Compact Council) for review. In its Final Decision, dated June 21, 2016, the Compact Council unanimously approved Waukesha's Application to source water from Lake Michigan as Waukesha's only reasonable water supply alternative.

Per a July 2017 Amended Stipulation and Order for Amended Judgment, refer to Appendix G, Waukesha's water supply transition must be completed by September 1, 2023. Per that court order, if the new water supply project is not under contract and certified to be 50% complete by May 1, 2022, WWU must initiate construction of interim radium treatment. Bidding and construction of interim radium treatment would increase the financial burden on Waukesha ratepayers for the interim treatment but not eliminate the need for the new water supply project. A hardcopy of the Amended Stipulation and Order to Amended Judgement was supplied to WisDOT at the October 23, 2018 meeting.

WWU commissioned a team to implement the Program to transition Waukesha's water supply to Lake Michigan water. The purpose of the Program is to plan, design, construct, and commission infrastructure with a 100-year useful life necessary to transition Waukesha's water supply. As part of the Final Decision, approximately 13-miles of transmission main (referred to as the "Water Supply Pipeline") with pumping facilities, water reservoirs, and chemical treatment will deliver water from Lake Michigan to Waukesha from the City of Milwaukee (Milwaukee). Approximately 23-miles of main (referred to as the "Return Flow Pipeline") is required by the Compact Council's Final Decision to achieve a net zero water balance in the Great Lakes–St. Lawrence River Basin. The 30-inch Water Supply Pipeline will begin at the connection to Milwaukee's distribution system. The Water Supply Pipeline will continue west on Oklahoma Avenue and Coffee Road, then south on Swartz Road, northwest on Racine Avenue, and west on Sunset Drive until the connection to WWU's distribution system. The Return Flow Pipeline will begin at a new Return Flow Pumping Station (RFPS) at Waukesha's Clean Water Plant (CWP). As stipulated in the Final Decision, the Return Flow Pipeline will discharge into the Root River on Parcel 9489998001, southeast of the intersection of Oakwood Road and 60th Street in the City of Franklin. The Root River ultimately discharges into Lake Michigan thereby returning the borrowed water back to the source.

Route studies have been conducted to identify a preferred route to supply Waukesha with a new, sustainable water supply from a water supply connection to Milwaukee, and a preferred route to return highly treated effluent to Lake Michigan via the Root River. The preferred Return Flow Pipeline route includes approximately two-miles within the Interstate 43 right-of-way. Figure 1-1 illustrates the preferred route for the Water Supply and Return Flow Pipelines.

1.3 Stakeholder Feedback

Open House Meetings were held in the municipalities which would be traversed by the pipelines. The purpose of the Open House Meetings was to engage the public and gain stakeholder feedback on the route alternatives for both the Water Supply and Return Flow Pipelines. Further discussion on the feedback from the Open House Meetings is found in the evaluation of non-economic criteria in Section 4.2.7. The dates and locations of the Open House Meetings are listed below:

- June 27, 2017 – City of Franklin
- June 28, 2017 – City of Muskego
- June 29, 2017 – New Berlin
- September 6, 2017 – Waukesha
- November 28, 2017 – Waukesha
- November 29, 2017 – Waukesha
- November 30, 2017 – Waukesha
- February 12, 2018 – City of West Allis
- February 14, 2018 – City of Greenfield
- February 15, 2018 – New Berlin
- April 4, 2018 – Milwaukee

In addition to the Open House Meetings, coordination meetings with municipalities affected by the pipeline have occurred, and are ongoing, to receive feedback on the route alternatives and Program. Approximately 40% of the overall pipeline length for the Program is located in New Berlin. As such, the Program has been coordinating with New Berlin to minimize impact and receive feedback from New Berlin officials. Meetings with the officials to coordinate the Return Flow Pipeline route alternatives took place throughout 2017 and 2018:

- July 18, 2017
- August 30, 2017
- February 22, 2018
- June 27, 2018
- September 26, 2018

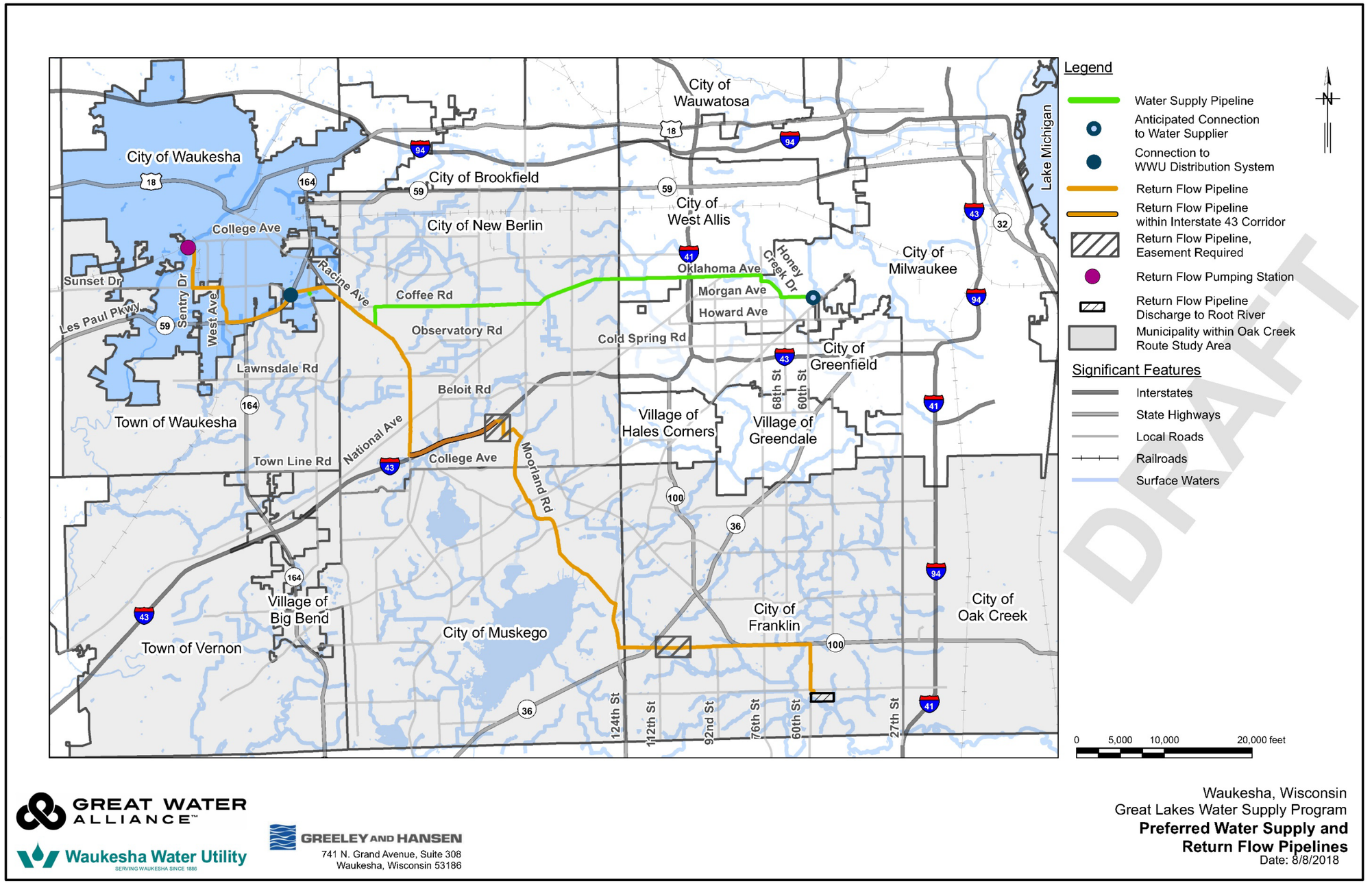


Figure 1-1 Preferred Water Supply and Return Flow Pipelines

SECTION 2 Construction Method and Strategy

Construction methods for each route were developed to support the economic and non-economic evaluation. The construction methods are based on the design of the Return Flow Pipeline, including size and materials.

2.1 Construction Methods

Pipeline materials that were evaluated, including ductile iron pipe (DIP), pre-stressed concrete cylinder pipe (PCCP), steel pipe, polyvinyl chloride (PVC) pipe, and high density polyethylene (HDPE) pipe. The Program determined that the pipe material for both the Water Supply and Return Flow Pipelines will be DIP. The decision was made for the following key reasons:

- Quotes were received from pipe manufacturers shown in Table 2-1. DIP is the most economic material for the pipe diameter and rated working pressures for the Program.

Table 2-1 Material Costs For Pipe Rated for 200 psi Working Pressure

DIP[1]	HDPE Pipe[2]	PVC Pipe[3]	PCCP[4]	Steel Pipe[5]
$89/LF	$181/LF	$99/LF	$115/LF	$131/LF

Notes:
1. Quote provided by United States Pipe and Foundry Company, 30-inch nominal diameter push-on joint pipe, pressure class 200, June 2018.
2. Quote provided by Core & Main, 30-inch nominal diameter fusible joint pipe, DR 11, October 2018.
3. Quote provided by Core & Main, 30-inch nominal diameter push-on joint pipe, DR 21, October 2018.
4. Quote provided by Thompson Pipe Group, 30-inch nominal diameter push-on joint pipe, pressure class 200, January 2018.
5. Quote provided by Northwest Pipe Company, 30-inch nominal diameter push-on joint pipe, ¼-inch thickness, June 2018.

- WWU staff are familiar with operating and maintaining DIP.
- DIP has a larger inner diameter than HDPE and PVC pipe shown in Table 2-2. The larger inner diameter requires less head to convey flow at the RFPS.

Table 2-2 Nominal 30-inch DIP, HDPE Pipe, and PVC Pipe Geometry for 200 psi Working Pressure

DIP (inch)[1]			HDPE Pipe (inch)[3]			PVC Pipe (inch)[4]		
OD	t[2]	ID	OD	t	ID	OD	t	ID
32.00	0.51	30.98	32.00	3.08	25.83	32.00	1.62	28.77

Notes:
1. Dimensions sourced from United States Pipe and Foundry Company, TYTON JOINT Pipe.
2. Includes 0.38-inch wall thickness and 1/8-inch cement-mortar lining thickness.
3. Dimensions sourced from Performance Pipe, 4000 DIPS, DR 11 based on an average t rounded to the nearest hundredths of an inch.
4. Dimensions sourced from JM Eagle, BIG BLUE, DR 21 based on an average t rounded to the nearest hundredths of an inch.

A hydraulic analysis was completed and determined that the Return Flow Pipeline will be 30-inches in diameter. The construction methods described in the following subsections are based on a Return Flow Pipeline constructed of DIP with HDPE pipe used for segments requiring trenchless construction via HDD.

2.1.1 Open-Cut Construction

Open-cut construction consists of excavating a trench, laying the pipe, and backfilling the pipe to finished grade. This method requires surface restoration in the form of pavement or landscape restoration for the disturbed surface above the trench. The typical sections shown in Figure 2-1 for open-cut construction beneath and beyond pavement were developed per applicable municipal and state standards.

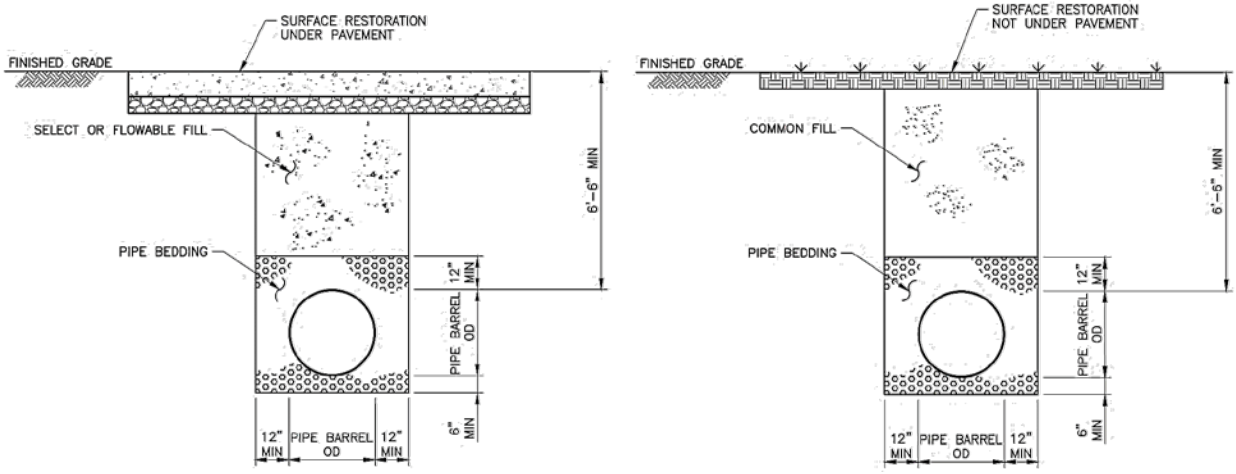


Figure 2-1 Pipeline Sections Beneath and Beyond Pavement

It is less expensive to construct pipelines beyond pavement, as it eliminates the cost for pavement restoration. Open-cut construction beyond pavement allows the use of common fill, which is typically readily obtained from excavated spoils and less expensive than flowable or select fill required beneath pavement. For the purpose of this Hardship Application, the pipeline was aligned beyond pavement in each route alternative where feasible.

The limits of open-cut construction were quantified to provide a basis for maintenance of traffic requirements. The limits of open-cut construction for a single pipeline are anticipated to be a maximum of 50-feet wide as described below and as shown in Figure 2-2:

- Two-foot wide traffic barrels and a two-foot width between the traffic barrels and dump truck.
- A 10-foot wide dump truck.
- A 12-foot wide excavator above the pipe trench with four-feet on either side to account for tail swing.
- A 10-foot wide staging area for materials.
- Two, 3-feet wide workspace buffers to the limits of construction.

The minimum limits of construction for a single pipeline will be set at a minimum of 22-feet wide. The contractor will have to locate the dump truck longitudinally with the excavator, eliminate the workspace buffers and reduce the traffic barrel width, and staging materials elsewhere. It is anticipated the limits of construction will be larger than the minimum width of 22-feet where pipeline appurtenances are required, such as blow-off assemblies, air valves, and isolation valves. The limits of construction will be increased if the Water Supply and Return Flow Pipelines are located in the same corridor and utilize open-cut construction. The anticipated limits of open-cut construction for two pipelines is shown for the applicable route alternative in Section 4.3.1 in Figure 4-2.

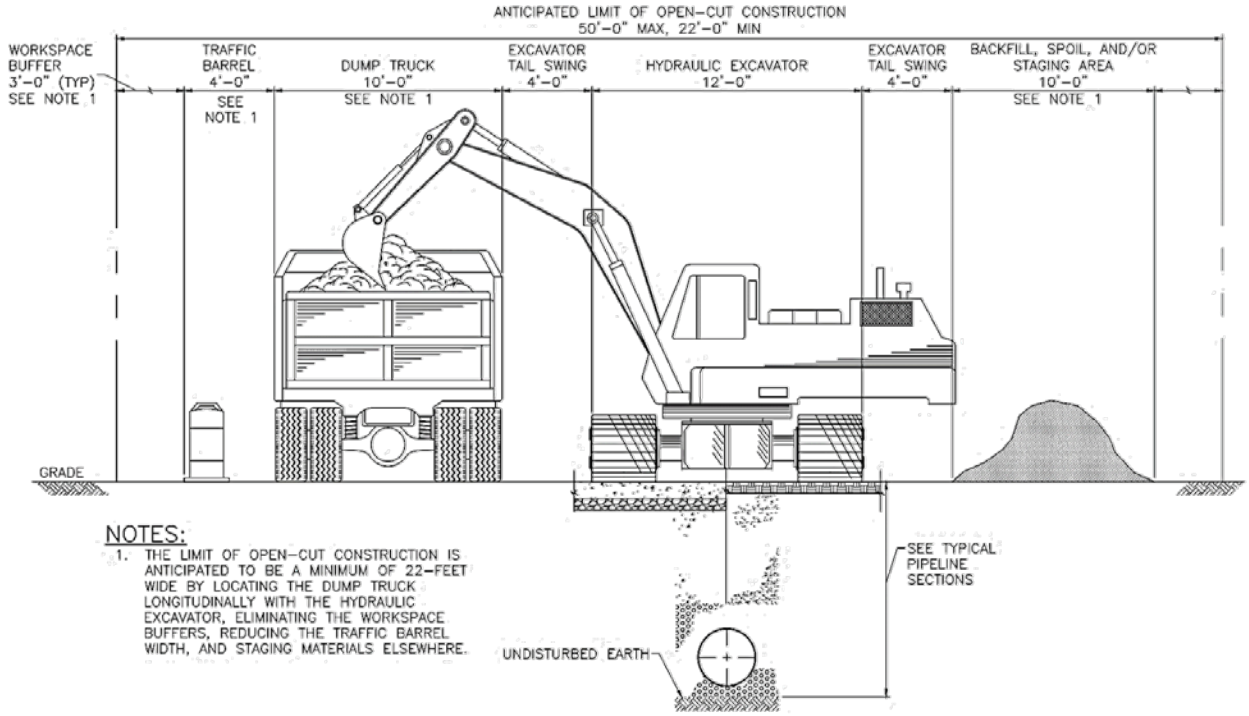


Figure 2-2 Anticipated Limits of Open-Cut Construction

Note that the contract documents will include the limits of construction, not the staging of specific equipment. The contractor will have the autonomy to setup equipment in a manner so as to efficiently and effectively complete the work. The contractor may elect to stage in a different manner than that shown in this Hardship Application.

2.1.2 Trenchless Construction

Trenchless construction is typically utilized as a means of mitigating disruption to the surface and minimizing surface restoration requirements along the length of the trenchless installation. Two trenchless construction methods have been considered, the jack and bore and horizontal directional drilling (HDD) methods. The jack and bore method is typically required when the pipeline crosses a railroad or as a means to mitigate traffic disruption when crossing a major roadway. The bore length is usually typically than 400-feet. HDD is used for longer trenchless installations beyond that of the jack and bore method. For the purposes of this Hardship Application, all trenchless construction via HDD are assumed to be comprised of 36-inch HDPE pipe, while all trenchless construction via jack and bore are assumed to be comprised of 30-inch DIP inside a 48-inch steel casing. The larger HDPE pipe diameter is used to accommodate HDPE pipe's wall thickness, thereby maintaining a comparable inner diameter to 30-inch DIP.

Studies have compared costs for open-cut and trenchless construction, and generally indicate that trenchless construction costs vary based on the application, locality, and diameter.[1] Recent bid tabs in Southeast Wisconsin were reviewed to compare costs of open-cut vs trenchless construction via HDD, refer to Appendix D.

[1] Apeldoorn, S. (n.d.). Comparing The Costs - Trenchless Versus Traditional Methods. New Zealand Councilor, Australasian Society for Trenchless Technology. Retrieved October 26, 2018, from https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=1344.

It was determined that trenchless construction via HDD has higher per linear foot unit cost than open-cut construction beneath pavement in the diameter ranges required for the pipelines for the Program on average, even when considering surface restoration for open-cut construction. For the purposes of this Hardship Application, open-cut construction was utilized where feasible. Trenchless construction was considered along each route alternative to mitigate the following:

- Impacts to waterways crossing route alternatives.
- Traffic disruption where the pipeline is anticipated to be located under major roads, highways, and railroads.

The Program has been working with the WDNR in preparation for a Wetlands and Waterways Individual Permits Application. A practicable alternatives analysis is being used to demonstrate the required minimization of wetland impacts. Trenchless construction is typically not considered a practicable alternative to avoid wetlands due to the higher cost required for the construction method.

In response to WisDOT's comments on the initial 4-110 D1 Draft WisDOT Interstate 43 Hardship Application dated May 2018, trenchless construction was added along select lengths of each route alternative to mitigate the following:

- Disruption to the public based on information received from stakeholders.
- Impacts to treed areas or forests on private property.

If space within the right-of-way permits, then equipment, pits, and materials used for trenchless construction via the jack and bore method could be staged beyond pavement to reduce maintenance of traffic requirements. If space within the right-of-way beyond pavement is limited, then limits of trenchless construction via the jack and bore method are anticipated to utilize the 22-foot width of a two-lane, two-way road assuming the following equipment and material are staged behind the pits:

- Two-foot wide traffic barrels.
- 20-foot wide working and receiving pits.

If space within the right-of-way permits, equipment and materials used for trenchless construction via HDD can be staged beyond pavement to reduce maintenance of traffic requirements. If space within the right-of-way beyond pavement is limited, then the limits of HDD construction for a single pipeline are anticipated to utilize the 22-foot width of a two-lane, two-way road assuming the following as shown in Figure 2-3:

- Two-foot wide traffic barrels and a two-foot width between the traffic barrels and HDD rig.
- An eight-foot wide HDD rig.
- A 10-foot wide staging area for materials and equipment supporting HDD operations.

Potential for substantial reduction of the trenchless construction width down to one lane of traffic is limited for the following reasons:

- It is desirable to stage the operator house adjacent to the entry pit so the drilling can be safely observed.
- Additional space is required where pipeline appurtenances are located, such as blow-off assemblies, air valves, and isolation valves that require manholes. Blow-off assemblies and air valves will require outlets routed to the right-of-way beyond pavement.

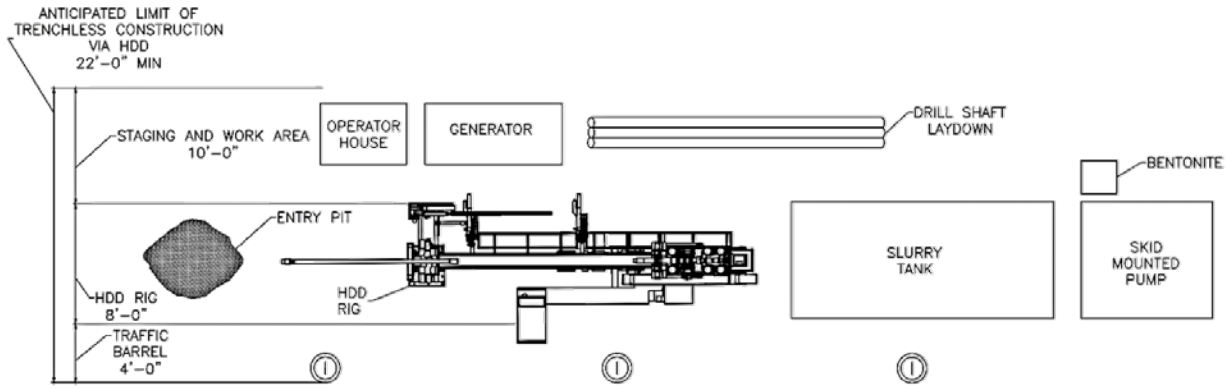


Figure 2-3 Anticipated Limits of Trenchless Construction via HDD

Workspace for HDD construction is required simultaneously on both ends of the trenchless segment. When using HDPE pipe, the pipe joints are typically heat-fused at the surface and laid out for the length of the intended trenchless segment beyond the exit point of the trenchless segment. Figure 2-4 demonstrates the potential setup for constructing a 1,000-foot HDD segment along Beloit Road, one of the corridors considered for HDD construction as part of this Hardship Application. Potential staging during construction is shown and overlaid upon aerial imagery collected in Fall 2016.

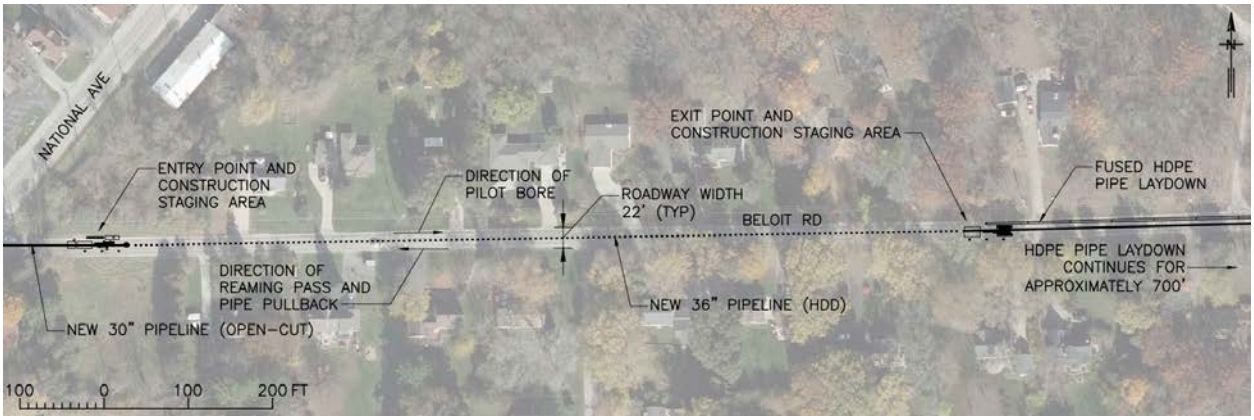


Figure 2-4 Potential Construction Staging for Trenchless Construction via HDD along Beloit Road

Even with the use of HDD, road closures are still anticipated on many two-lane, two-way roads with limited right-of-way available beyond pavement, as demonstrated in the above example in Figure 2-4. It is likely the contractor would leave the equipment in place rather than incurring the additional cost for multiple mobilizations and demobilizations from the area in successive HDD segments.
The above information, desktop resources, field reconnaissance, and stakeholder feedback were utilized to determine the construction methods and anticipate maintenance of traffic requirements for each route alternative as described in Section 4.3.

2.1.3 Minimum Horizontal Separation

Some route alternatives for the Return Flow Pipeline would be located in the same corridor as the Water Supply Pipeline. The Wisconsin Administration Code, NR 811.74, requires water mains to be laid a minimum of eight-feet

horizontally, center to center, from any existing or proposed sanitary sewer main. Discussions with the WDNR have indicated the WDNR will classify the Return Flow Pipeline as a sanitary sewer force main.

The horizontal separation was discussed with WDNR during the Pipeline Horizontal Separation Meeting (4-300 M-03) held on October 17, 2017 and WDNR confirmed the minimum allowable horizontal separation distance. The horizontal separation was also discussed during the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, Public Service Commission (PSC), WisDOT, and Federal Highway Administration (FHWA) on October 23, 2018. Consensus was gained that no exception to the minimum horizontal separation of eight-feet is allowed for a sanitary sewer force main unless shallow bedrock is the reason for the narrower separation as per NR 811.74 (5).

WWU reviewed the minimum horizontal separation requirements. The Return Flow Pipeline is being designed as a force main and will be pressurized. In the unlikely event of pipe breakage, the Water Supply or Return Flow Pipeline would be at a greater risk of being damaged by the other pipeline if a narrower separation was provided. The Water Supply Pipeline will be Waukesha's primary source of potable water. WWU has made the decision to maintain a minimum horizontal separation of eight-feet, centerline to centerline between the two pipelines to protect their water supply. The limits of construction and maintenance of traffic for the route alternatives that would contain both pipelines in the same corridor were developed based on a minimum horizontal separation of eight-feet.

2.2 Construction Strategy

2.2.1 Overall Construction Strategy and Methodology

This subsection describes aspects of the pipeline construction within any WisDOT right-of-way that contractors would incorporate into their construction plans, including within the Interstate 43 corridor if the Hardship Application were to be approved. The individual contractor will employ their own means and methods within the limits of the requirements as part of WisDOT and FHWA regulations and permits.

2.2.1.1 Sequence of Construction

Sequencing of construction would be required to coordinate with other Program contract packages to minimize adverse impacts on the Program's schedule. A sequence of construction schedule would be prepared during design. The Program's schedule would be coordinated with WisDOT to minimize traffic impacts.

2.2.1.2 Hours of Construction

Hours of construction would be coordinated with WisDOT. It is anticipated that the hours of construction would be sunrise to sunset on weekdays, with weekend work being allowed upon approval from WisDOT. No work would take place during nighttime hours unless authorized by WisDOT.

2.2.1.3 Contractor Staging

To minimize disruption and create efficient workflow, the contractor would be required to develop a staging plan within the limits of construction shown on the drawings. The contractors may identify and obtain permission for their own additional staging or storage areas outside the right-of-way apart from those that may be permitted by WisDOT. These areas would be utilized by the contractors to store vehicles, equipment and materials during non-work times.

2.2.1.4 Erosion and Sediment Controls

The contractor would be required to prepare and submit an Erosion and Sediment Control Plan per the most recent requirements of NR 216.46 of the Wisconsin Pollution Discharge Elimination System. The Erosion and Sediment Control Plan would include a narrative of the best management practices that are to be in place before construction begins. Work near roadside drainage ditches would require erosion and sedimentation controls. Necessary steps would be taken to prevent soil from getting into nearby waterways by protecting excavated areas with silt fence, hay bales, or other erosion control devices. Dirt and debris tracked on to adjacent local roadways and pavement would be removed. If work were to occur within the Interstate 43 right-of-way, dirt and debris would not be tracked onto Interstate 43, as the limits of construction would be wholly beyond pavement. Fine grading and restoration would return the ditch profile to existing conditions or greater to promote ditch drainage per the applicable requirements.

Site reporting and monitoring would comprise of recurring site reports including weekly inspections or after every 0.5-inch rain event. Additional reports including occurrences of non-compliance must be documented and submitted to the WDNR, with copies to WisDOT.

2.2.1.5 Excavation Methods

It is anticipated that the pipeline excavations would require the use of a trench box. In some space-constrained areas, it is possible that sheeting/shoring could be used on one or both sides of the trench at the contractor's discretion. If used, the contract documents will require contractor to have sheeting and shoring designed by a professional engineer licensed in the State of Wisconsin. Trenchless construction may be required to cross roads or waterways that cross Interstate 43.

2.2.1.6 Material Management Plan

The contract documents would require the contractor to stockpile suitable materials during construction for use as pipe bedding or backfill. Unsuitable or excess materials would be the responsibility of the contractor for hauling and disposal at appropriately licensed disposal facilities. No topsoil or other excavated piles of soil shall be deposited in any manner that interferes with the Clear Zone on Interstate 43.

2.2.1.7 Protection of Trees and Vegetation

To the extent practicable, trees and native vegetation would be protected and/or restored to existing conditions after completion of construction. No trees would be removed without prior approval by WisDOT.

2.2.1.8 Reclamation of Right-of-Way

Upon daily completion of construction, any disturbed WisDOT right-of-way would be temporarily stabilized within 24-hours, with permanent restoration to take place on or before October 15 of the construction year. If not completed before October 15 of the construction year, then permanent stabilization measures would be installed in the following growing season.

SECTION 3 Operation and Maintenance Requirements of the Pipeline

The operation and maintenance requirements of the Return Flow Pipeline are summarized in the following subsections. Aspects of the design pertinent to the Interstate 43 right-of-way are included in the event the Return Flow Pipeline is located in the Interstate 43 right-of-way.

3.1 Operation Requirements

The Return Flow Pipeline is required to return the volume of water conveyed to Waukesha back to the Great Lakes-St. Lawrence River Basin. Flows through the Return Flow Pipeline are anticipated to reflect Waukesha's water demand as follows:

- Minimum Flow Rate: The Return Flow Pipeline is not required to operate continuously. The minimum flow rate through the Return Flow Pipeline is anticipated to be 0.0-million gallons per day (MGD).
- Median Initial Flow Rate: The initial median flow rate will be approximately 6.6 MGD, which is the median water demand observed in Waukesha from January 2007 through December 2016.
- Average Ultimate Flow Rate: The average flow rate is anticipated to reach an ultimate value of 8.2 MGD, which is the average day demand approved by the Compact Council for WWU.
- Maximum Flow Rate: The maximum flow rate is anticipated to be 13.6 MGD, which is the maximum day demand anticipated during a year where the average day demand is 8.2 MGD.

The Return Flow Pipeline requires a single pumping facility, referred to as the RFPS, to provide the head necessary to overcome adverse topography and friction along the pipeline. The RFPS will be located at Waukesha's CWP. The pipeline will not require intermittent lift stations along its length. Regular access to and maintenance along the Return Flow Pipeline will not be required. The design team will try to locate pipeline appurtenances outside of the Interstate 43 right-of-way to limit access by WWU staff to the right-of-way.

3.2 Maintenance Requirements

The Return Flow Pipeline is designed per American Water Works Association (AWWA) Standards. Design provisions in excess of AWWA Standards are being implemented to provide for a 100-year service life. Key provisions are listed as follows:

- The Return Flow Pipeline would be designed with Standard Pressure Class 150 DIP within the Interstate 43 right-of-way. The maximum normal operating pressure for the Return Flow Pipeline within the Interstate 43 right-of-way would be approximately 80-pounds per square inch (psi). DIP is manufactured with a net thickness based on two times the maximum normal operating pressure with a 100 psi surge allowance, as per AWWA C150, or to an effective maximum pressure of 500 psi. A Standard Pressure Class 150 DIP

would provide the Return Flow Pipeline with a minimum factor of safety on pressure within the Interstate 43 right-of-way of approximately 6.25.

- Corrosion is a common mechanism that can reduce the service life of any metallic pipe, including DIP. The Return Flow Pipeline will include provisions for corrosion control in excess of AWWA standards to mitigate the potential for corrosion as follows:

  - AWWA C105 requires a single layer of polyethylene encasement to protect against soil and groundwater-induced corrosion. The Return Flow Pipeline will be fitted with two layers of polyethylene encasement. The inner layer will consist of V-bio® Enhanced Polyethylene Encasement, which includes a biological layer to mitigate corrosion derived from any soil and/or groundwater that could have migrated into the annular space between the outside of the DIP and the V-bio® Enhanced Polyethylene Encasement during installation. The outer layer will consist of standard polyethylene encasement required by AWWA C105.
  - The Return Flow Pipeline will be fitted with buried sacrificial magnesium anodes. In the presence of a corrosion mechanisms, magnesium corrodes preferentially to iron. Should the two layers of polyethylene encasement become locally compromised, the magnesium anodes will corrode preferentially to the DIP. Sacrificial anodes are not required per AWWA Standards.
  - The Return Flow Pipeline will be installed with bonded DIP joints and test stations. The test stations will be used during the life of the pipeline to monitor for readings that could indicate corrosion. If any readings demonstrate corrosive signatures, the pipeline would be uncovered and inspected, and efforts implemented to mitigate corrosion. Bonded joints and test stations are not required per AWWA Standards.

The above provisions serve to reduce the likelihood that the Return Flow Pipeline will require maintenance during operations. The potential for failure or breakage that would require future maintenance; however, cannot be eliminated. The following provisions for future maintenance are being incorporated into the contract documents:

1. A flow or pressure measurement device would be provided downstream to the Interstate 43 right-of-way to monitor for a break or leak. The meter will be connected to the RFPS.
2. Buried isolation valves will be located along the pipeline so that segments requiring maintenance can be hydraulically isolated.
3. Buried blow-off assemblies will be located between isolation valves at low points along the pipeline so that segments requiring maintenance can be drained.

In the unlikely event of pipe breakage of failure, the flow or pressure measurement device will sense a break or leak and signal pumps at the RFPS to turnoff. The pressure along the pipeline will subsequently dissipate to static conditions as the isolation valves upstream and downstream of the break or leak are closed. The pipeline will be drained through the local blow-off assembly in accordance with applicable requirements. The pipeline would then be repaired in a timely manner in coordination and accordance with the requirements of the local authority(ies) having jurisdiction, including WisDOT.

3.3 Pipe Breakage Evaluation

Due to the number of variables that could cause pipe breakage, including soil conditions, pipe installation, geographic location, operation of the pipeline system, and additional protection against pipe breakage provided above and

beyond standard design practices, a risk analysis has not been completed for the Return Flow Pipeline. These variables have been considered and mitigation measures have been included in the design of the Return Flow Pipeline. The studies that have been reviewed for historical pipe breakage rates for ductile iron pipe have conflicting conclusions and the service conditions of a distribution pipe are not the same as a transmission main with no intermediate connections.

One article published in AWWA's Opflow studied pipe failures in distribution systems. Refer to Appendix H. The article found that larger diameter pipe is less likely to fail than small diameter pipe, and pipe over 50 years old is more likely to fail than pipe under 50 years old. The article is not exactly applicable to the Return Flow Pipeline as the Return Flow Pipeline is a force main and will be operated differently than distribution system piping and the Return Flow Pipeline is expected to have fewer breaks due to how the pipeline will be operated and installed.

A study published by Utah State University that evaluated water main breaks has been provided in Appendix I. The study reviewed data and provided findings for different metrics of analyzing distribution system pipe breakage. It should be noted that the study was completed with support from the Uni-Bell PVC Pipe Association. The results from this study indicate PVC pipe has the lowest break rates of all materials that were studied but ductile iron performed in-line with PVC and better than other pipe materials.

The findings indicate available documented studies have either conflicting information or are skewed towards the material they represent. In the comparisons of the two studies, ductile iron pipe performed favorably in each of the metrics in comparison to other pipe materials. Due to the conflicting information available, a risk analysis has not been completed. Discussed below are the effects of a pipe breakage event and the steps taken to further reduce the likelihood of a breakage event.

As discussed in Section 3.2, the Return Flow Pipeline is being designed for a 100-year service life by implementing design provisions in excess of AWWA Standards. In the unlikely event of pipe breakage, it is anticipated that the impact to I-43 right-of-way would be minimal due to:

- The Return Flow Pipeline will be located approximately 65-feet horizontally from the centerline of the Return Flow Pipeline to the edge of pavement of the north shoulder of the westbound lanes of I-43. The crown of the Return Flow Pipeline will be approximately 2' to 29' vertically below the north shoulder of the westbound lanes of I-43. See Figure 3-1 and Figure 3-2 for the horizontal and maximum and minimum vertical separation from the Return Flow Pipeline to the shoulder. The horizontal and vertical separation from the edge of pavement to the pipeline minimizes the potential of pipeline breakage impacting the interstate.
- A pressure transmitter will measure the pressure within the pipeline along Racine Avenue just north of I-43. In the unlikely event of a pipe breakage, a low pressure signal from the pressure transmitter to the Return Flow Pumping Station will turn off the pumps.
- The topography of the alignment within the I-43 right-of-way would minimize the potential impacts to I-43 if a pipe breakage occurred. The Return Flow Pipeline within the I-43 right-of-way is located in a localized valley with localized highpoints on either side outside of the I-43 right-of-way. See Figure 3-3 for the overall Return Flow Pipeline and I-43 elevations. The flow in the pipeline will drain into the soil at the pipe break along I-43. If the flow daylights to the surface, the flow would be conveyed through the existing drainage ditches to the low point of the localized valley, which is an unnamed waterway.
- If a pipe breakage were to occur along the Return Flow Pipeline, the location that would generate the largest volume of discharge would be located at the low point. The low point is located at approximately mile 10.20 and shown on Figure 3-3. Approximately 370,000 gallons of highly treated effluent would drain from the Return Flow Pipeline after the Return Flow Pumping Station pumps have been shutdown. For reference, a

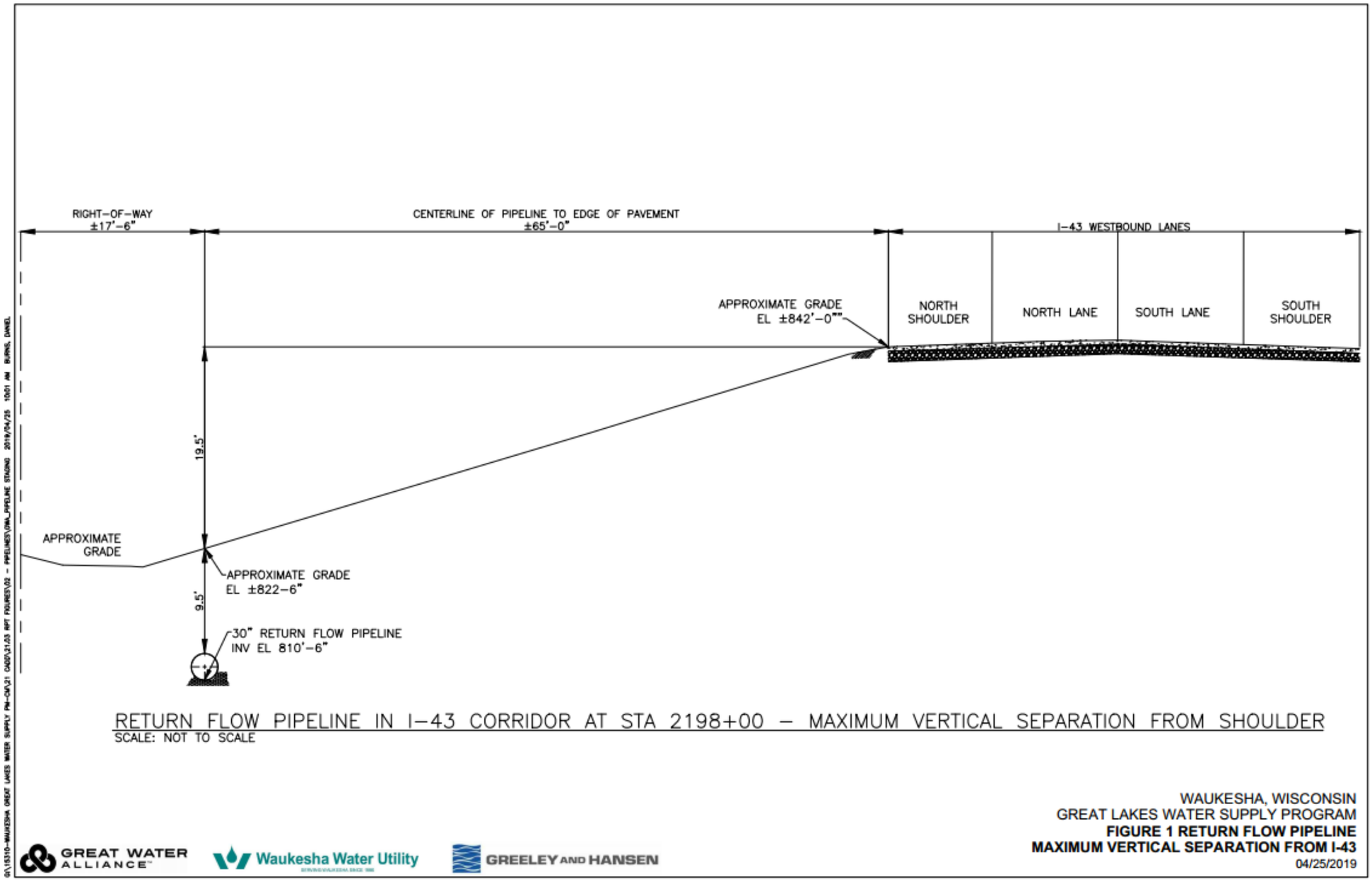


Figure 3-1 Return Flow Pipeline Maximum Vertical Separation From I-43

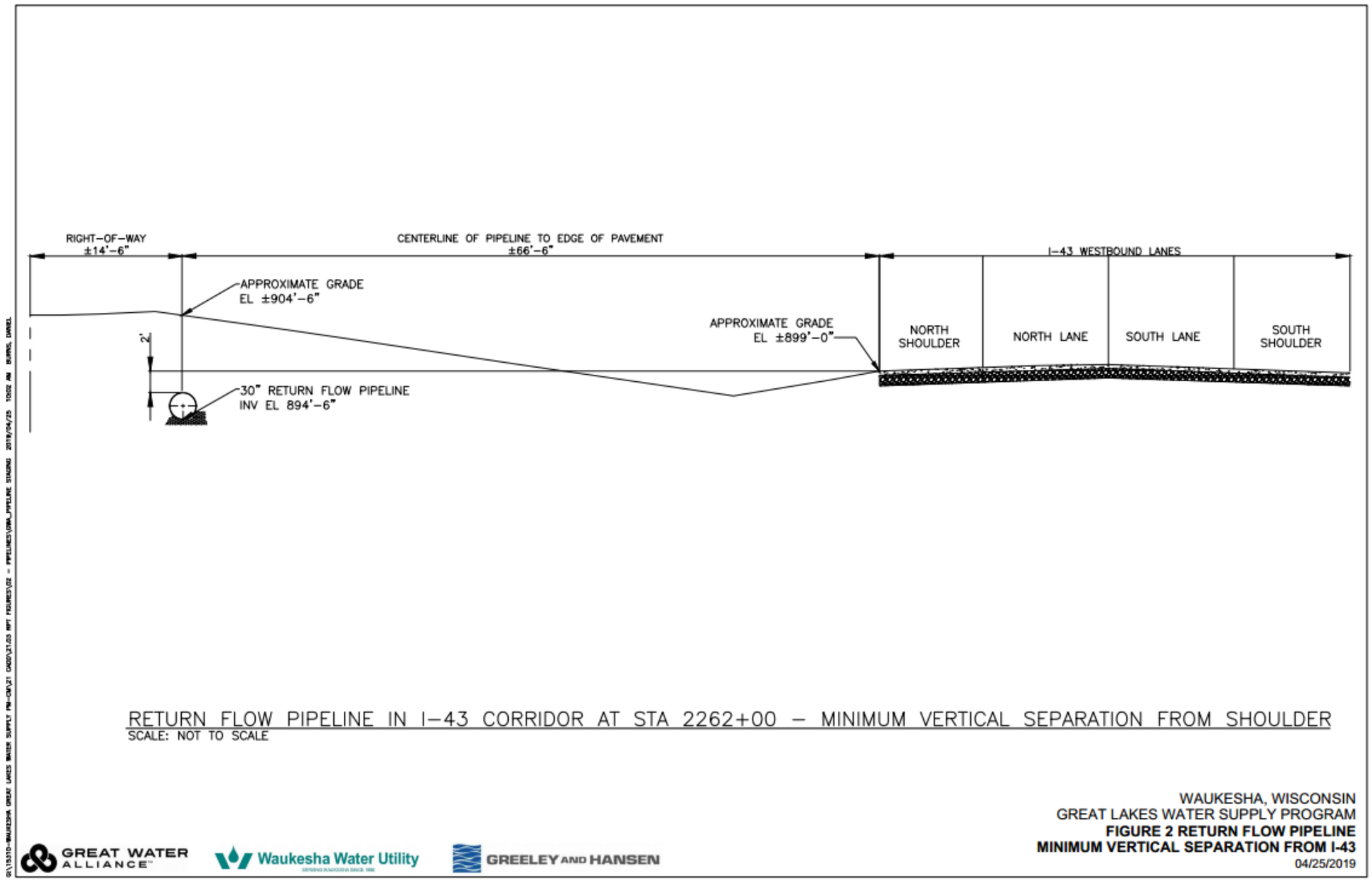


Figure 3-2 Return Flow Pipeline Minimum Vertical Separation From I-43

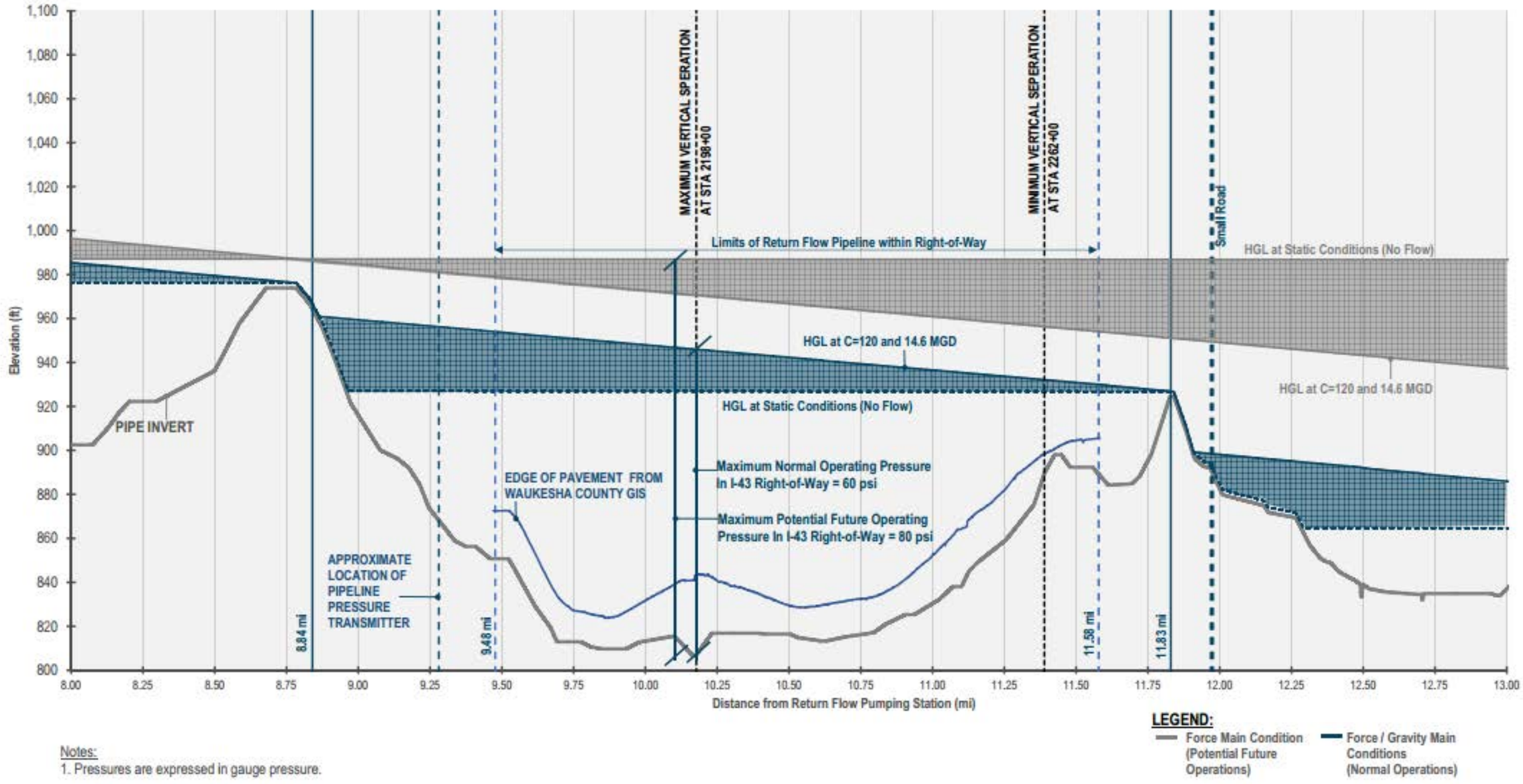


Figure 3-3 Return Flow Pipeline Hydraulic Grade Lines (HGL) In I-43 Corridor

100-year 24-hour storm event would generate approximately 1,756,000 gallons of runoff from the pavement of the westbound lanes of I-43 for the 1.9-mile stretch parallel to the Return Flow Pipeline. The storm event data is from Bulletin 71 Data for design storm depths in current use in southeastern Wisconsin, provided by US Department of Commerce, Weather Bureau.

The likelihood of a pipe breakage occurring is minimal. Common causes of pipe breakage and the provisions the Program are implementing to mitigate risk are listed below:

- Pipe breakage cause: Pipeline Corrosion:
  - Provisions to mitigate risk:
    - The pipeline will include corrosion protection beyond the requirements of AWWA as discussed in Section 3.2 and as follows:
      - AWWA C105 recommends a single layer of polyethylene encasement to protect against soil and groundwater-induced corrosion. The Return Flow Pipeline will be fitted with two layers of polyethylene encasement. The inner layer will consist of V-bio® Enhanced Polyethylene Encasement, which includes a biological layer to mitigate corrosion derived from any soil and/or groundwater that could have migrated into the annular space between the outside of the ductile iron pipe and the V-bio® Enhanced Polyethylene Encasement during installation. The outer layer will consist of standard polyethylene encasement required by AWWA C105. The Ductile Iron Pipe Research Association (DIPRA), for example, states that any concerns of corrosive soils having a negative impact towards the useful life of the pipe can be mitigated from the provided DIPRA study on polyethylene encasement that is included for reference as Appendix J.
      - The Return Flow Pipeline will be fitted with buried sacrificial magnesium anodes. In the presence of corrosion mechanisms, magnesium corrodes preferentially to iron. Should the two layers of polyethylene encasement become locally compromised, the magnesium anodes will corrode preferentially to the ductile iron pipe. Sacrificial anodes are not required per AWWA Standards.
      - The Return Flow Pipeline will be installed with bonded ductile iron pipe joints and test stations. The test stations will be used throughout the life of the pipeline to monitor for readings that could indicate corrosion. If any readings demonstrate corrosive signatures, the pipeline would be inspected in coordination with WisDOT, and additional corrosion mitigation measures may be implements. This could include the addition of additional magnesium anodes. Bonded joints and test stations are not required per AWWA Standards. This method allows for corrosion that occurs to be directed to anodes and not the ductile iron pipe, reducing the potential for pipe breakage.
- Pipe breakage cause: Poor contractor installation
  - Provisions to mitigate risk:
    - Prior to construction, the contractor will be required to participate in training to provide proper techniques and methods for installation required by the Contract Documents.
    - The Construction Manager for the Program will be onsite to witness that installation meets the requirements of the specifications and manufacturers guidelines.
    - The contractor will be required to pressure and leakage test the pipeline to greater than the maximum normal operating pressure anticipated as recommended by AWWA C600 to demonstrate that the pipeline was installed properly to meet the requirements of the specifications.
- Pipe breakage cause: Ground freeze/thaw cycle:

    - Provisions to mitigate risk:
        - The pipeline is designed to be approximately 6'-6" from the crown of pipe to grade, exceeding WDNR minimum requirements of 5'-0" from the crown of pipe to grade. The greater depth of cover will provide additional protection from the freeze/thaw cycle and subsequent heaving that could occur and damage the pipe. It will also reduce the potential for daylighting in the unlikely event of pipe breakage.
- Pipe breakage cause: Ductile iron pipe manufacturer defects
    - Provisions to mitigate risk:
        - Per the requirements of AWWA C151: Ductile-Iron Pipe, Centrifugally Cast, all ductile iron pipe goes through several quality control procedures, including hydrostatic tests, tensile tests, charpy impact tests, and visual inspection. In addition, each stick of ductile iron pipe is measured to ensure the inner diameter, outer diameter, thickness, and weight meet AWWA C151 standards. The standardized quality control procedures performed on ductile iron pipe mitigate the risk of fabricating and manufacturing pipe with any defects.
- Pipe breakage cause: Design Pressures that exceed operating limits
    - Provisions to mitigate risk:
        - The maximum pressure in the Return Flow Pipeline within the I-43 right-of-way is approximately 80 psi. The Return Flow Pipeline will be specified as Pressure Class 150 pipe, which equates to a 500 psi rated maximum pressure.

The Return Flow Pipeline will meet or exceed DIPRA and AWWA recommended standards for corrosion protection and will reduce the risk of a pipe breakage. No significant environmental impact is anticipated if a pipe break did occur in the I-43 right-of-way.

In summary, with the above provisions, it is anticipated that the likelihood of pipe breakage is minimal. In the unlikely event of a pipe breakage, the pressure transmitter will determine that a pressure drop has occurred and send a signal to turn off the pumps at the Return Flow Pumping Station. The water in the pipe along I-43 would drain into the soil and depressurize below grade. If flow were to daylight to the surface, it would flow through the existing drainage ditches as runoff and away from I-43 and would not impact I-43 and the traffic flow thereon.

3.4 Future Highway Expansion

Future interstate maintenance and expansion within the Interstate 43 right-of-way were reviewed as provided by WisDOT and Southeastern Wisconsin Regional Planning Commission (SEWRPC) as follows:

- WisDOT – Improvement Program Southeast Region 2019-2023:[2]
    - 2018: Bridge: New, Replace, Remove. Could be one or several of the following:
        - New bridge creating a new grade separation or structure
        - A bridge replacing an existing crossing, but not necessarily in the same place
        - A bridge replacing an existing crossing to increase system capacity
        - Bridge elimination

[2] Wisconsin Department of Transportation. November 2017. WisDOT – Improvement Program SE Region 2018 – 2023. Retrieved October XX, 2018, from https://wisconsindot.gov/Documents/projects/6yr-hwy-impr/proj-info/sermap.pdf

- SEWRPC Vision 2050:[3]
    - Arterial to be widened with additional traffic lanes

The Return Flow Pipeline would be compatible with Interstate 43 maintenance and expansion for the following reasons:

- The Program would coordinate with WisDOT regarding the 2018 bridge improvements so that the Return Flow Pipeline design accommodates for the improvements.
- The pipeline would not be affected by the expansion in the SEWRPC Vision 2050 given its proposed alignment 66-feet from the northern edge of pavement. An additional five to six westbound lanes would be required in order for the pipeline to be located beneath pavement. The potential for this magnitude of expansion was discussed during the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, PSC, WisDOT, and FHWA on October 23, 2018. WisDOT indicated this level of expansion is unlikely. In the unlikely event the road was to expand to a point where the Return Flow Pipeline would be located beneath pavement, the pipe bedding and DIP system would be sufficient to accommodate a HS-20 loaded per the American Association of State Highway Transportation Officials (AASHTO).
- If future highway expansion was to ever require relocation of the Return Flow Pipeline located within the Interstate 43 right-of-way, the pipeline would be abandoned in-place and a new segment constructed at WWU's cost. Construction of the new segment of Return Flow Pipeline would occur while the existing segment was in service. A shutdown would occur to accommodate the tie-in with the new Return Flow Pipeline segment and the abandonment of the existing segment. The relocation is not anticipated to be prohibitive under the provisions approved by the Compact Council, as the pipeline is not required to be continuously operated to return last year's water demand.

[3]Southeastern Wisconsin Regional Planning Commission. December 2016. Vision 2050: A Regional Land Use and Transportation System Plan for Southeastern Wisconsin. Retrieved October XX, 2018, from http://www.sewrpc.org/SEWRPCFiles/Vision2050/PlanSummaryDec2016.pdf

SECTION 4 Characterization of Route Alternatives

4.1 Definition of Route Alternatives

The portion of the Return Flow Pipeline proposed within the Interstate 43 right-of-way is located between Racine Avenue and Moorland Road. This Hardship Application summarizes the evaluation of route alternatives that was conducted between these two corridors. Figure 4-1 shows the route alternatives that were considered in this area, while Table 4-1 describes the route alternatives. The route alternatives were compared between a common starting point at the intersection of Racine Avenue and Coffee Road and a common ending point at the intersection of Moorland Road and College Avenue in New Berlin. The study area for these route alternatives has the extents of Moorland Road on the east, College Avenue on the south, Coffee Road on the north, and Racine Avenue on the west. The land use around the area is a mix of light industrial and commercial areas near Moorland Road, residential areas near Beres Road and Beloit Road, and agricultural areas. All routes considered are within New Berlin. East-west corridors, excluding Interstate 43, are comprised of two-lane, two-way roads.

Table 4-1 Route Alternative Descriptions

Route	Route Description
1	The route alternative proceeds east on Coffee Road, south on Calhoun Road, east onto an easement across from Beres Road, crosses Interstate 43, proceeds east and south within an easement, northeast on Small Road, southeast on Westridge Drive, and south on Moorland Road to the College Avenue intersection.
2	The route alternative proceeds south on Racine Avenue, north and east across multiple easements, and south on Calhoun Road. The remainder of the route alternative follows the same as described for Route Alternative 1.
3	The route alternative proceeds south on Racine Avenue, east on Observatory Road, south on Calhoun Road. The remainder of the route alternative follows the same as described for Route Alternative 1.
4	The route alternative proceeds south on Racine Avenue, east across multiple easements, northeast on National Avenue, southeast onto an easement, and south on Calhoun Road. The remainder of the route alternative follows the same as described for Route Alternative 1.
5	The route alternative proceeds south on Racine Avenue, east on Lawnsdale Road, and northeast on National Avenue. The remainder of the route alternative follows the same as described for Route Alternative 4.
6	The route alternative proceeds south on Racine Avenue, east on Lawnsdale Road, southwest on National Avenue, south across multiple easements, east on Beloit Road, and south on Calhoun Road. The remainder of the route alternative follows the same as described for Route Alternative 1.
7	The route alternative proceeds south on Racine Avenue, east onto an easement, northeast on National Avenue, and east on Beloit Road. The remainder of the route alternative follows the same as described for Route Alternative 6.
8	The route alternative proceeds south on Racine Avenue, east on multiple easements north of the Interstate 43 corridor, and crosses Interstate 43. The remainder of the route alternative follows the same as described for Route Alternative 1.
9	The route alternative proceeds south on Racine Avenue, east onto the Interstate 43 corridor, and crosses Interstate 43. The remainder of the route alternative follows the same as described for Route Alternative 1.
10A	The route alternative proceeds south on Racine Avenue and east on College Avenue to Moorland Road.
10B	The route alternative proceeds south on Racine Avenue, east on College Avenue, and northeast on Small Road to Westridge Drive. The remainder of the route alternative follows the same as described for Route Alternative 1.
11	The route alternative proceeds east on Coffee Road and south on Moorland Road to the College Avenue intersection.

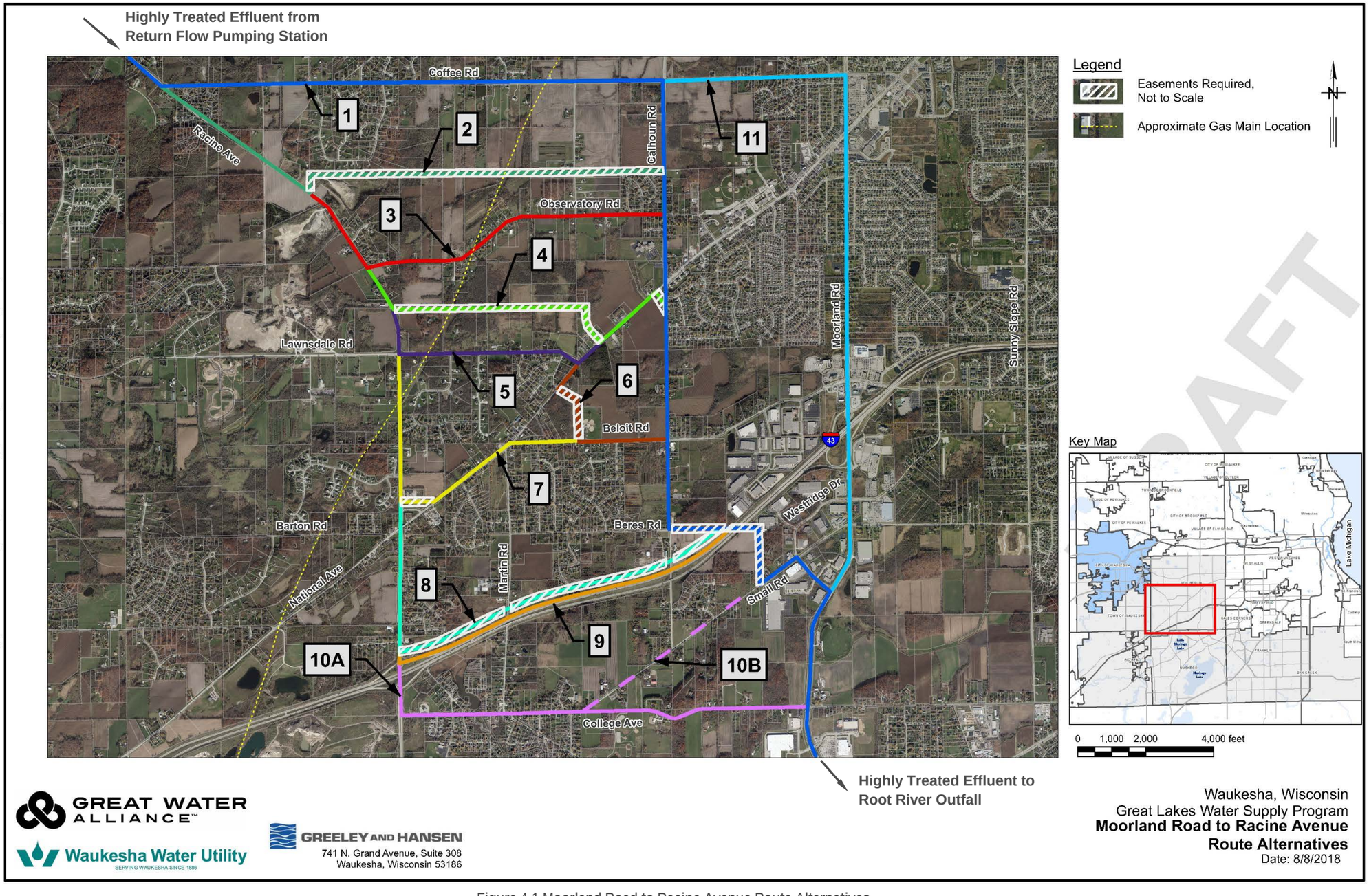


Figure 4-1 Moorland Road to Racine Avenue Route Alternatives

4.2 Non-Economic and Economic Evaluation Method

The route alternatives were evaluated based on non-economic and economic evaluation criteria. The following subsections describe the non-economic and economic evaluation criteria and methods used to quantify the criteria.

4.2.1 Pipeline Length

Longer pipeline lengths would require longer construction durations, or additional construction staff to complete construction in the same time frame. Longer pipeline length would increase the potential for latent defects (e.g., future leaks) and require additional pipeline appurtenances that must be maintained. Additional pipeline length would require more disruption to the public during construction and future required maintenance. Pipeline lengths of route alternatives were quantified with common starting and ending points across the route alternatives. Lengths were measured with Geographic Information System software utilizing the North American Datum of 1927 (NAD 27).

4.2.2 Maintenance of Traffic

Route alternatives are proposed to be installed within the existing right-of-way for the majority of their alignments. Therefore, construction of the pipeline would impact traffic and require maintenance of traffic. Maintenance of traffic was quantified in terms of additional travel distance from detours, additional travel time from detours, and Additional Total Road User Cost based on the below assumptions and sources.

- A production rate of 100-feet per day for constructing the pipeline.
- An average speed on a detour of 30-miles per hour.
- An average intersection signal cycle of 90-seconds.
- An average delay at an intersection of 30-seconds.
- All cars from the closed road would use the detour route.
- An Additional Total Road User Cost based on $0.545 per mile and $16 per hour.
- Detour routes would be directed to an even or higher roadway classification.
- Average daily traffic (ADT) obtained from WisDOT's interactive website.

4.2.3 Easements

The majority of the route alternatives are within right-of-way. However, route alternatives may exit the right-of-way and enter private property in some locations. This would require the purchase of easements within each parcel. Anticipated easements along each route alternative were summarized by the number of parcels and total acreage of required easements assuming easements are 50-feet wide and are permanent easements. The contractor may elect to acquire additional easements to most efficiently and effectively complete the work than those included in this Hardship Application and the contract documents for the selected route alternative.

4.2.4 Wetlands

A wetlands evaluation was performed to determine the quantities of wetlands that are anticipated within right-of-way and easements. Considering that horizontal alignments are under refinement during design, route alternatives with less acres of suspected wetlands within right-of-way and proposed easements have the potential to result in less wetland impacts and effort to defend in a practicable alternatives analysis as part of the Wetlands and Waterways

Individual Permits Application. Wetland acreages were quantified to include mapped wetlands within the right-of-way and proposed easements using mapped wetlands shown in the United States Fish and Wildlife Service National Wetlands Inventory.

4.2.5 Potential for Tree Removal

Existing trees flanking narrow right-of-way corridors or within easements would pose challenges for general site access and construction operations for large equipment. Heavy vegetation or trees may limit the areas in which construction equipment and materials may be staged. In areas where the pipeline alignment is within the drip line, the trees or vegetation may be impacted. The potential for tree impacts was qualitatively evaluated based on visual conditions observed in aerials and during field reconnaissance to evaluate route alternatives. Treed areas where trenchless construction via HDD is anticipated were considered as trees that would not be impacted.

4.2.6 Parks and Green Spaces

Portions of the route alternatives traverse public and/or private parks or green spaces that are used for recreational purposes. A pipeline alignment within a park and green space may increase the cost for restoration and future access. Traversing parks or green spaces may affect schedule depending on the type and schedule of public usage for recreational events. Route alternatives were evaluated based on acres of parks and green space reported by Waukesha County within 25-feet of either side of the route alternative alignments.

4.2.7 Stakeholder Challenges

Route alternatives were evaluated based on whether or not negative feedback was provided during the Open House Meetings regarding a particular route alternative.

Two Open House Meetings were held in New Berlin on June 29, 2017 and February 15, 2018 to acquire stakeholder feedback where the route alternatives are anticipated to be located. Stakeholders include residents, businesses, and others in the respective municipalities that the route alternatives travel through. Stakeholders expressed resistance to having the pipeline installed in several corridors and in close proximity to several properties. To address stakeholder concerns, segments of the pipeline were designated as trenchless construction via HDD to mitigate surface disruption in proximity to the properties that stakeholder were concerned about. The following stakeholder challenges were received during Open House Meetings:

- Road replacement along Coffee Road that was recently improved.
- Observatory and Lawnsdale Roads with construction operations occurring in close proximity to residents.
- Mr. Salentine and family own multiple properties in New Berlin along Calhoun Road and National Avenue, approximately between National Avenue and Beloit Road. The feedback on route alternatives in that area were negative. See Appendix C for Waukesha Freeman quotes from the February 15, 2018 Open House Meeting held in New Berlin.

In addition to the Open House Meetings in New Berlin, coordination meetings were held with Mayor Ament and New Berlin Public Works staff on July 18, 2017, August 30, 2017, February 22, 2018, June 27, 2018 and September 26, 2018. During these meetings, route alternatives were reviewed. The Program received feedback from New Berlin that the preferred route would not utilize Beloit Road due to recent reconstruction in 2017 and 2018. See Appendix B for letter from Mayor Ament stating New Berlin's preference to not utilize Beloit Road.

4.2.8 Class 4 Opinion of Probable Construction Costs

The American Association of Cost Engineers (AACE) has developed standards for cost estimating. The Program has determined to complete all OPCCs in accordance with the AACE's Recommended Practice No. 18R-97. According to AACE's Cost Estimate Classification Matrix for Process Industries shown in Table 4-2, a Class 4 estimate is used when the project is defined to a maturity level of up to 15% for an end use of a study or feasibility as defined under the 'End Usage' column and is, therefore, applicable during route studies when multiple routes are still be considered. A Class 4 OPCC has been developed for each route alternative to provide a means for evaluating route alternatives on an economic basis.

Table 4-2 AACE Cost Estimate Classification Matrix for Process Industries

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Key assumptions and sources used to develop the Class 4 OPCCs include the following:

- Unit cost information came from various sources, including pipe manufacturer quotes, RS Means, and bid tabs from Southeastern Wisconsin.
- The following pipeline unit costs were used that include bonds and insurance, mobilization / demobilization, and contractor overhead and profit. The unit costs shown have been rounded to the nearest $100 dollars:
  - Open-Cut Construction, Beyond Pavement: $400/LF
  - Open-Cut Construction, Beneath Pavement: $500/LF
  - Trenchless Construction, HDD: $1,000/LF
  - Trenchless Construction, Jack and Bore: $1,000-1,700/LF, depending on the local authority having jurisdiction
- Isolation valves were included every two-miles and at both ends of HDD, while air valves and blow-off assemblies were included every one-mile.
- Easement acquisition was accounted for at a cost of $25,200/acre based on average land value and geographic location for residential or agricultural land. Each easement also includes an administrative fee of $19,400/parcel. This takes into account the work that the real estate companies have to complete, title searches, appraisals, and recording fees.

- The Class 4 OPCC for Route Alternative 9 includes the present value of the WisDOT Utility Accommodation Policy fee for occupying approximately 2.1-miles of Interstate 43 right-of-way over 100-years. The net present value was calculated assuming a 3.00% inflation factor and an 8.00% discount rate.
- Costs were adjusted to June 2017 dollars at an Engineering News-Record Construction Cost Indices value of 10,942 and include maintenance of traffic (at 2.5%), bonds and insurance (at 3%), mobilization / demobilization (at 5%), contractor overhead and profit (at 15%), and contingency (at 20%).
- Corridors containing both the Water Supply and Return Flow Pipeline only include maintenance of traffic at 2.5% for one of the two pipelines to demonstrate savings that would be incurred by locating the pipelines in one corridor.

4.3 Non-Economic and Economic Characterization

The route alternatives were characterized based on the following non-economic and economic evaluation criteria as described in the following sections.

4.3.1 Route Alternative 1 – Coffee Road

Route Alternative 1 proceeds from the intersection of Racine Avenue and Coffee Road east along Coffee Road to Calhoun Road and then south along Calhoun Road.

4.3.1.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined as follows:

- Coffee Road: A portion of Route Alternative 1 follows Coffee Road. The Water Supply Pipeline will be located in Coffee Road between Swartz Road and Calhoun Road. Coffee Road is a two-way, two-lane road centered in a 100-foot right-of-way. Overhead electric lines abutting the south side of the road indicates the design would include parallel pipelines located on the north side of the right-of-way. The Water Supply Pipeline is being designed as far beyond the northern edge of pavement as is feasible, while mitigating impacts to trees and existing utilities. Potential horizontal alignments are shown in Appendix E that maintain the minimum horizontal separation required along Coffee Road.

  Simultaneous construction of the Water Supply and Return Flow Pipelines would require open-cut construction predominantly beneath pavement for the Return Flow Pipeline. As shown in Figure 4-2, Coffee Road will require full closure during construction along some segments. For the purposes of this Hardship Application, it is assumed Coffee Road will require road closure during construction. Figure 4-3 includes photo documentation collected during field reconnaissance on October 29, 2018 in proximity to the location where the section is shown in Figure 4-2.

- Calhoun Road: Open-cut construction beneath pavement would be used along Calhoun Road due to the limited right-of-way that is available beyond pavement due to overhead electric lines or trees. Trenchless construction via HDD would be used along some segments to mitigate stakeholder challenges described in Section 4.2.7.

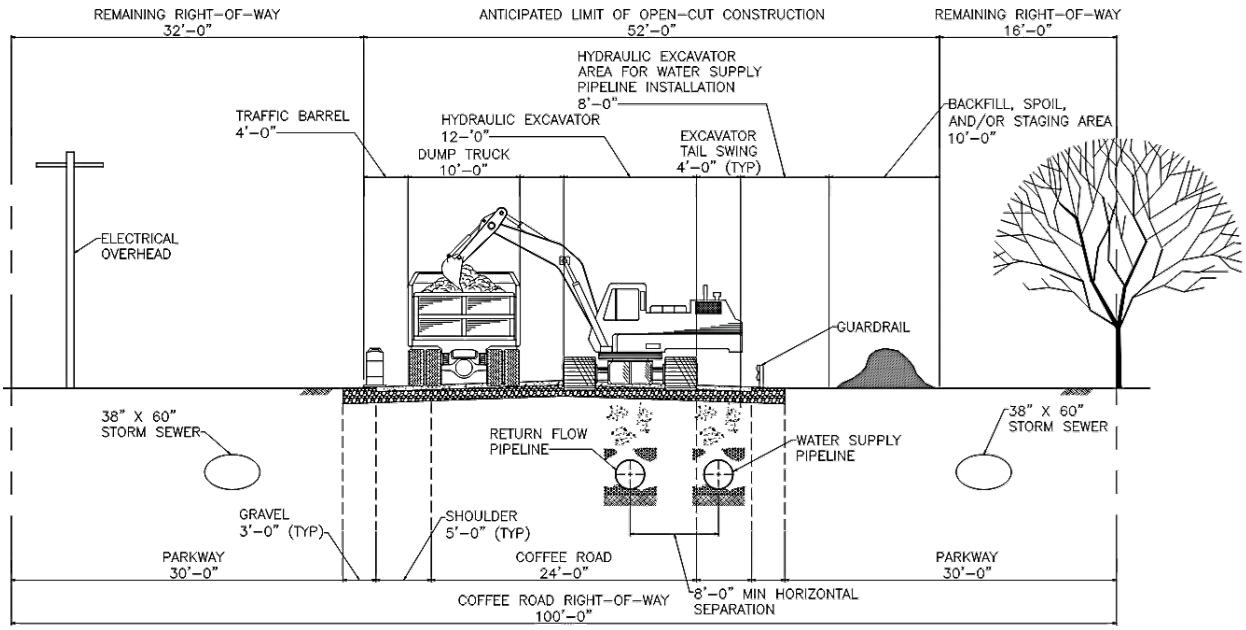


Figure 4-2 Anticipated Limits of Open-Cut Construction along Coffee Road at Station 5051+50



Figure 4-3 Photos of Coffee Road between Racine Avenue and Calhoun Road at Station 5051+50

- Parcel NBC 1286999001: This easement is used to accommodate the pipeline's Interstate 43 crossing. The construction method in this segment is anticipated to be open-cut construction beyond pavement.
- Interstate 43 Crossing: Trenchless construction via the jack and bore method would be the construction method used at the pipeline's Interstate 43 crossing as shown in Figure 4-4 and Figure 4-5. Any crossing of Interstate 43 would use a similar method.
- Parcel NBC 1286999002: This easement is used to accommodate the pipeline's Interstate 43 crossing. The construction method in this segment is anticipated to be open-cut construction beyond pavement.
- Small Road and Westridge Drive: It was determined that open-cut construction beneath and beyond pavement would be used along Small Road and Westridge Drive due to the presence of overhead electrical lines, surface indications of existing underground utilities located beyond pavement, and the limited remaining right-of-way available.
- Moorland Road: Available space within the right-of-way along Moorland Road permits the use of open-cut construction beyond pavement.

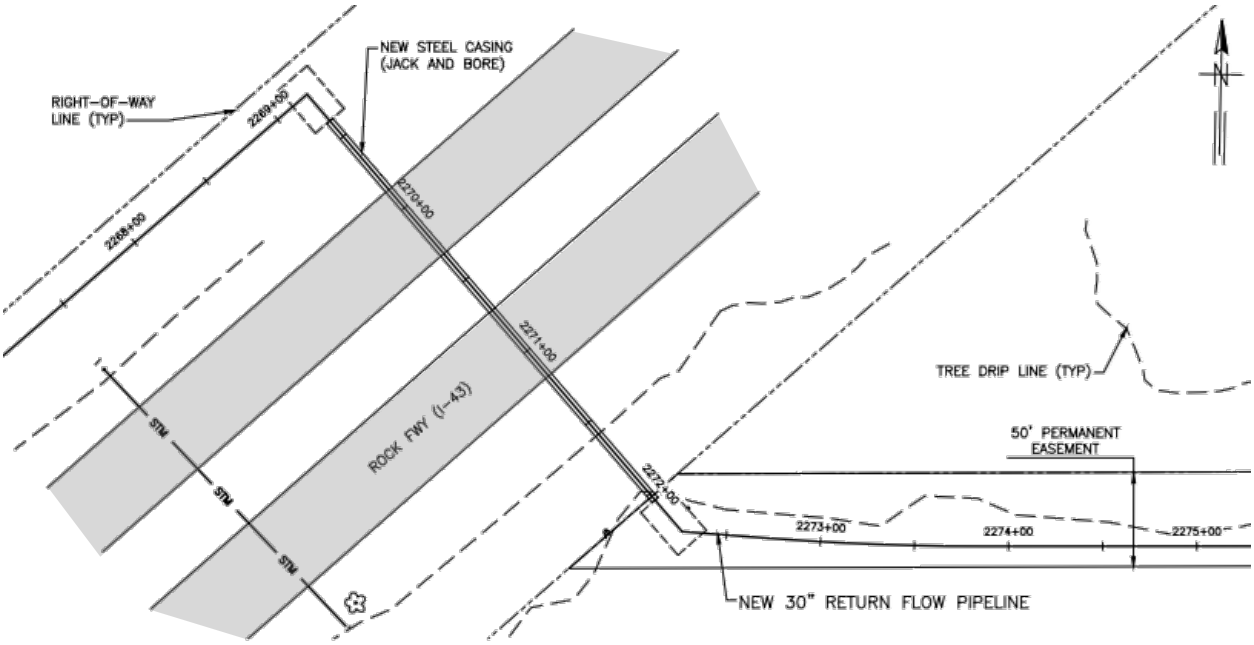
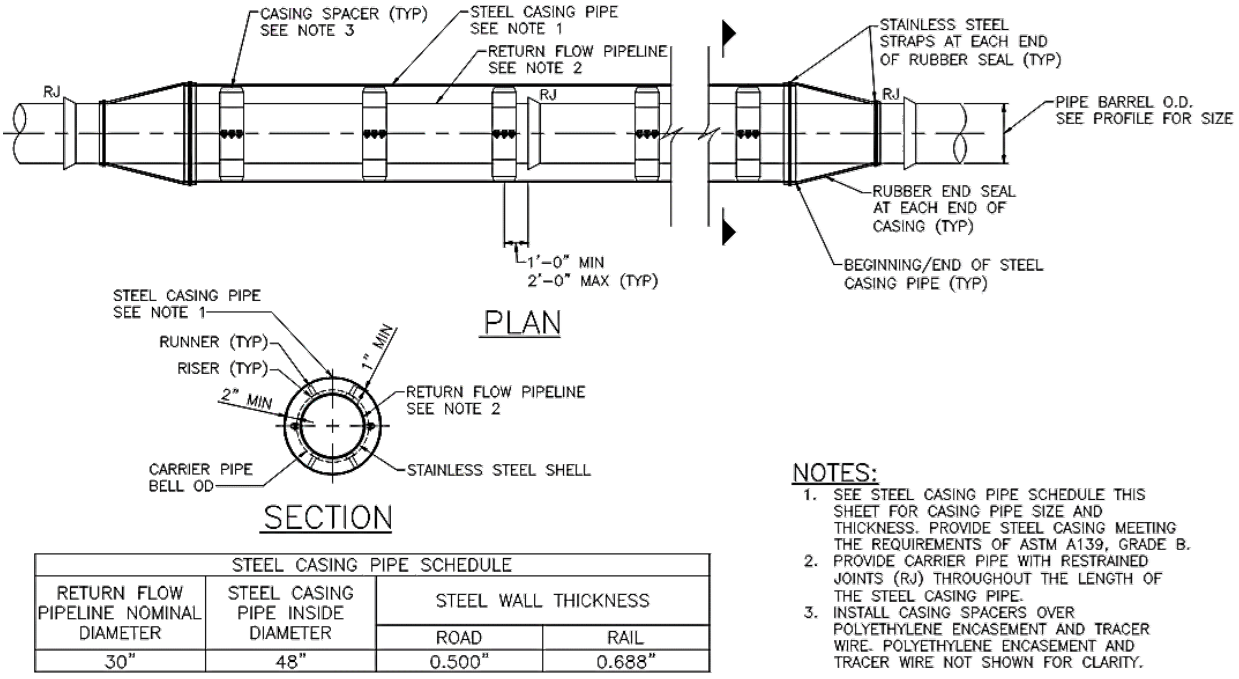


Figure 4-4 Plan for Interstate 43 Crossing, Trenchless Construction via Jack and Bore Method



STEEL CASING PIPE SCHEDULE			
RETURN FLOW PIPELINE NOMINAL DIAMETER	STEEL CASING PIPE INSIDE DIAMETER	STEEL WALL THICKNESS	
		ROAD	RAIL
30"	48"	0.500"	0.688"

NOTES:
1. SEE STEEL CASING PIPE SCHEDULE THIS SHEET FOR CASING PIPE SIZE AND THICKNESS. PROVIDE STEEL CASING MEETING THE REQUIREMENTS OF ASTM A139, GRADE B.
2. PROVIDE CARRIER PIPE WITH RESTRAINED JOINTS (RJ) THROUGHOUT THE LENGTH OF THE STEEL CASING PIPE.
3. INSTALL CASING SPACERS OVER POLYETHYLENE ENCASEMENT AND TRACER WIRE. POLYETHYLENE ENCASEMENT AND TRACER WIRE NOT SHOWN FOR CLARITY.

Figure 4-5 Steel Casing Detail for Interstate 43 Crossings, Trenchless Construction via Jack and Bore Method

Construction methods for this route alternative are summarized in Table 4-3.

Table 4-3 Route Alternative 1 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Coffee Road	Open-Cut, Beneath Pavement	Road Closure (Local Traffic Only)
Calhoun Road	Open-Cut, Beneath Pavement and HDD Past Select Parcels	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

Note that many corridors require trenchless construction to cross waterways or intersections. These smaller crossings are not described but are considered in the economic evaluation in this Hardship Application.

4.3.1.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-4.

Table 4-4 Route Alternative 1 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.3
Additional Travel Distance from Detours (millions of miles)	4.8
Additional Travel Time (thousands of hours)	180
Additional Total Road User Cost ($M)	5.6
No. of Easements	2
Acres of Easements (acres)	4.4
Wetlands (acres)	0.9
Agricultural Impacts (acres)	3.9
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	2.5
Stakeholder Challenges	Yes
Constructability Challenges	No
Class 4 OPCC ($M)	25.0

4.3.2 Route Alternative 2 – Multiple Easements (Racine Avenue to Calhoun Road)

Route Alternative 2 was developed as a route that would predominantly not utilize public right-of-way. The route alternative was developed to follow a section line to minimize the number of easements required.

4.3.2.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined as follows:

- Racine Avenue: Available space within the right-of-way permits the use of open-cut construction beyond pavement on some portions of Racine Avenue. An existing gas line, trees, and overhead electric lines restrict the space available beyond pavement and require the use of open-cut construction beneath pavement along some segments.
- Multiple Easements (Racine Avenue to Calhoun Road): The construction method in this segment is anticipated to be open-cut construction beyond pavement. The route alternative also passes through several treed areas. In order to eliminate the need to impact treed areas on private property, segments of the pipeline were designated as trenchless construction via HDD.

Construction methods south and east of Parcel NBC 1216995 and Calhoun Road are the same as described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-5.

Table 4-5 Route Alternative 2 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Multiple Easements (Racine Avenue to Calhoun Road)	Open-Cut, Beyond Pavement and HDD through Treed Areas	Not applicable
Calhoun Road	Open-Cut, Beneath Pavement and HDD Past Select Parcels	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.2.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-6.

Table 4-6 Route Alternative 2 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.1
Additional Travel Distance from Detours (millions of miles)	2.4
Additional Travel Time (thousands of hours)	140
Additional Total Road User Cost ($M)	3.0
No. of Easements	11
Acres of Easements (acres)	16.8
Wetlands (acres)	5.4
Agricultural Impacts (acres)	9.4
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	2.4
Stakeholder Challenges	N/A[1]
Constructability Challenges	No
Class 4 OPCC ($M)	26.1

Notes:
1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

4.3.3 Route Alternative 3 – Observatory Road

Route Alternative 3 proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue and east along Observatory Road.

4.3.3.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined as follows:

- Observatory Road: Observatory Road is a narrow corridor with overhead electric lines and trees in close proximity to the edge of pavement. Open-cut construction beneath pavement would be used along Observatory Road and would require the road to be closed during construction. For the purposes of this Hardship Application, it was determined that the construction method would be trenchless construction via HDD to minimize stakeholder challenges as described in Section 4.2.7. Available space within the 66-foot right-of-way was evaluated. Figure 4-6 includes photo documentation collected during field reconnaissance on August 14, 2018 that demonstrates right-of-way available beyond the 22-foot pavement width for locating pits, equipment, and materials without significant clearing of trees located in the right-of-way. As discussed in Section 2.1.2, trenchless construction via HDD has an anticipated limit of construction that is 22-feet wide. Thus, it is anticipated that trenchless construction via HDD would require Observatory Road to be closed.



Figure 4-6 Photos of Observatory Road between Racine Avenue and Calhoun Road

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2 and construction methods south and east of the intersection of Observatory and Calhoun Roads are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-7.

Table 4-7 Route Alternative 3 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Observatory Road	Trenchless, HDD	Road Closure (Local Traffic Only)
Calhoun Road	Open-Cut, Beneath Pavement and Trenchless, HDD Past Select Parcels	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.3.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-8.

Table 4-8 Route Alternative 3 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.1
Additional Travel Distance from Detours (millions of miles)	3.2
Additional Travel Time (thousands of hours)	140

Item	Values
Additional Total Road User Cost ($M)	3.9
No. of Easements	2
Acres of Easements (acres)	4.4
Wetlands (acres)	0.9
Agricultural Impacts (acres)	3.9
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	2.6
Stakeholder Challenges	Yes
Constructability Challenges	Yes
Class 4 OPCC ($M)	29.4

4.3.4 Route Alternative 4 – Multiple Easements (Racine Avenue to National Avenue)

Similar to Route Alternative 2, Route Alternative 4 was developed to predominantly not utilize right-of-way. The route alternative was developed to follow a section line to minimize the number of easements required.

4.3.4.1 Construction Methods

The corridors and easements along the route alternative were reviewed and construction methods were determined as follows:

- Multiple Easements (Racine Avenue to National Avenue): The construction method in this segment is anticipated to be open-cut construction beyond pavement. The route alternative passes through several treed areas. In order to eliminate the need to remove treed areas on private property, segments of the pipeline were designated as trenchless construction via HDD.
- National Avenue: It was determined open-cut construction beneath pavement would be used due to the limited right-of-way available beyond pavement and the presence of overhead electric lines. Segments of the corridor were designated as trenchless construction via HDD to mitigate stakeholder challenges as described in Section 4.2.7. See Appendix C for Waukesha Freeman quotes from the February 15, 2018 Open House Meeting held in New Berlin.
- Parcel NBC 1236996: This easement is used to avoid additional maintenance of traffic requirements at the intersection of National Avenue and Calhoun Road. The construction method would be trenchless construction to mitigate stakeholder challenges as described in Section 4.2.7.

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2 and construction methods south and east of the intersection of Parcel NBC 1236996 and Calhoun Road are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-9.

Table 4-9 Route Alternative 4 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Multiple Easements (Racine Avenue to National Avenue)	Open-Cut, Beyond Pavement and Trenchless, HDD through Treed Areas	Not applicable
National Avenue	Open-Cut, Beneath Pavement and Trenchless, HDD Past Select Parcel	Road Closures (Local Traffic Only)
Parcel NBC 1236996	Trenchless, HDD	Not applicable
Calhoun Road	Open-Cut, Beneath Pavement and Trenchless, HDD Past Select Parcels	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.4.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-10.

Table 4-10 Route Alternative 4 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	6.9
Additional Travel Distance from Detours (millions of miles)	4.6
Additional Travel Time (thousands of hours)	180
Additional Total Road User Cost ($M)	5.4
No. of Easements	10
Acres of Easements (acres)	11.5
Wetlands (acres)	4.8
Agricultural Impacts (acres)	6.1
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	2.0
Stakeholder Challenges	N/A[1]

Item	Values
Constructability Challenges	No
Class 4 OPCC ($M)	25.9

Notes:
1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

4.3.5 Route Alternative 5 – Lawnsdale Road

Route Alternative 5 proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue and east along Lawnsdale Road.

4.3.5.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined as follows:

- Lawnsdale Road: It was determined that open-cut construction beneath pavement would be used due to the limited right-of-way available beyond pavement, the presence of overhead electric lines and trees, and the indication of underground utilities at the surface, including a gas line. Open-cut construction would require road closure. For the purposes of this Hardship Application, it was determined the construction method would be trenchless construction via HDD to minimize impacts to residents as described in Section 4.2.7. Available space within the 100-foot right-of-way was evaluated. Figure 4-7 includes photo documentation collected during field reconnaissance on August 14, 2018 that demonstrates right-of-way available beyond the 22-foot pavement width for locating pits, equipment, and materials without significant clearing of trees within the right-of-way. As discussed in Section 2.1.2, trenchless construction via HDD has an anticipated limit of construction that is 22-feet wide. Thus, it is anticipated that trenchless construction via HDD would require Lawnsdale Road to be closed.



Figure 4-7 Photos of Lawnsdale Road between Racine and National Avenues

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2 and construction methods along National Avenue are consistent with the methods described for Route Alternative 4. Construction methods south and east of the intersection of Parcel NBC 1236996 and Calhoun Road are consistent

with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-11.

Table 4-11 Route Alternative 5 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Lawnsdale Road	Trenchless, HDD	Road Closures (Local Traffic Only)
National Avenue	Open-Cut, Beneath Pavement and Trenchless, HDD Past Select Parcel	Road Closures (Local Traffic Only)
Parcel NBC 1236996	Trenchless, HDD	Not applicable
Calhoun Road	Open-Cut, Beneath Pavement and Trenchless, HDD Past Select Parcels	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.5.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-12.

Table 4-12 Route Alternative 5 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	6.8
Additional Travel Distance from Detours (millions of miles)	5.3
Additional Travel Time (thousands of hours)	220
Additional Total Road User Cost ($M)	6.5
No. of Easements	3
Acres of Easements (acres)	5.1
Wetlands (acres)	1.3
Agricultural Impacts (acres)	3.9
Potential for Tree Removal (-)	Moderate
Parks / Green Space (acres)	1.7
Stakeholder Challenges	Yes

Item	Values
Constructability Challenges	Yes
Class 4 OPCC (4M)	27.7

4.3.6 Route Alternative 6 – Lawnsdale and Beloit Roads

Route Alternative 6 proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue and east along Lawnsdale Road. Rather than turning northeast on National Avenue, Route Alternative 6 heads southwest on National Avenue and utilizes an easement to go south to Beloit Road.

4.3.6.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined as follows:

- Parcel NBC 1262999001: The construction method in this segment is anticipated to be open-cut construction beyond pavement. The route alternative also passes through several treed areas. In order to eliminate the need to impact treed areas on private property, segments of the pipeline were designated as trenchless construction via HDD.
- Beloit Road: It was determined that open-cut construction beneath pavement would be used due to the limited right-of-way available beyond pavement and the presence of overhead electric lines and trees just beyond pavement on both sides of the road. Open-cut construction would require restoration of Beloit Road. This segment of Beloit Road was reconstructed in 2017 and opened in 2018 by New Berlin. Beloit Road is a Waukesha County Highway, known as County Highway I. Waukesha County has a moratorium of seven years post reconstruction before pavement can be cut or disturbed. For the purposes of this Hardship Application, it was determined that the construction method would be trenchless construction via HDD. Available space within the 66-foot right-of-way was evaluated. Figure 4-8 includes photo documentation collected during field reconnaissance on August 14 and 15, 2018 that demonstrates limited right-of-way available beyond the 22- to 30-foot pavement width for locating pits, equipment, and materials. As discussed in Section 2.1.2, trenchless construction via HDD has an anticipated limit of construction that is 22-feet wide at a minimum. Thus, it is anticipated that trenchless construction via HDD would require Beloit Road to be closed.



Figure 4-8 Photos of Beloit Road between National Avenue and Calhoun Road

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2 and construction methods along National Avenue are consistent with the methods described for Route Alternative 4. Construction methods south and east of the intersection of Beloit Road and Calhoun Road are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-13.

Table 4-13 Route Alternative 6 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Lawnsdale Road	Trenchless, HDD	Road Closure (Local Traffic Only)
National Avenue	Open-Cut, Beneath Pavement	Road Closures (Local Traffic Only)
Parcel NBC 1262999001	Open-Cut, Beyond Pavement and Trenchless, HDD through Treed Areas	Not applicable
Beloit Road	Trenchless, HDD	Road Closure (Local Traffic Only)
Calhoun Road	Open-Cut, Beneath Pavement	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.6.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-14.

Table 4-14 Route Alternative 6 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	6.5
Additional Travel Distance from Detours (millions of miles)	3.9
Additional Travel Time (thousands of hours)	170
Additional Total Road User Cost ($M)	4.8
No. of Easements	3
Acres of Easements (acres)	6.6
Wetlands (acres)	1.3
Agricultural Impacts (acres)	3.9
Potential for Tree Removal (-)	Low

Item	Values
Parks / Green Space (acres)	3.1
Stakeholder Challenges	Yes
Constructability Challenges	Yes
Class 4 OPCC ($M)	25.7

4.3.7 Route Alternative 7 – Beloit Road

Route Alternative 7 proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue, across an easement to National Avenue, northeast along National Avenue, and east along Beloit Road.

4.3.7.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined. Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2, construction methods along National Avenue are consistent with the methods described for Route Alternative 4, in the open-cut segment, and construction methods along Beloit Road are consistent with the methods described for Route Alternative 6. Construction methods south and east of the intersection of Beloit and Calhoun Roads are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-15.

Table 4-15 Route Alternative 7 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Parcel NBC 1268960	Open-Cut, Beyond Pavement	Not applicable
National Avenue	Open-Cut, Beneath Pavement	Road Closures (Local Traffic Only)
Beloit Road	Trenchless, HDD	Road Closure (Local Traffic Only)
Calhoun Road	Open-Cut, Beneath Pavement	Road Closure (Local Traffic Only)
Parcel NBC 1286999001	Open-Cut, Beyond Pavement	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.7.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-16.

Table 4-16 Route Alternative 7 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.0
Additional Travel Distance from Detours (millions of miles)	6.1
Additional Travel Time (thousands of hours)	250
Additional Total Road User Cost ($M)	7.4
No. of Easements	3
Acres of Easements (acres)	5.0
Wetlands (acres)	0.9
Agricultural Impacts (acres)	3.9
Potential for Tree Removal (-)	Moderate
Parks / Green Space (acres)	2.5
Stakeholder Challenges	Yes
Constructability Challenges	Yes
Class 4 OPCC ($M)	24.4

4.3.8 Route Alternative 8 – Multiple Easements (North of Interstate 43 Right-of-Way)

Route Alternative 8 proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue to the Interstate 43 right-of-way. From there, the route alternative heads east along multiple easements just beyond the Interstate 43 right-of-way between Racine Avenue to the Interstate 43 crossing.

4.3.8.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined.

- Multiple Easements (North of Interstate 43 Right-of-Way): The construction method in this segment is anticipated to be open-cut construction beyond pavement. The route alternative also passes through several treed areas. In order to eliminate the need to impact treed areas on private property, segments of the pipeline were designated as trenchless construction via HDD.

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2. Construction methods at the Interstate 43 crossing and extending south and east of the crossing are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-17.

Table 4-17 Route Alternative 8 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Multiple Easements (North of Interstate 43 Right-of-Way)	Open-Cut, Beyond Pavement and HDD through Treed Areas	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.8.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-18.

Table 4-18 Route Alternative 8 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.4
Additional Travel Distance from Detours (millions of miles)	3.2
Additional Travel Time (thousands of hours)	140
Additional Total Road User Cost ($M)	4.0
No. of Easements	13
Acres of Easements (acres)	13.9
Wetlands (acres)	1.2
Agricultural Impacts (acres)	6.4
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	1.8
Stakeholder Challenges	N/A[1]
Constructability Challenges	No
Class 4 OPCC ($M)	25.5

Notes:
1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

4.3.9 Route Alternative 9 – Interstate 43

Route Alternative 9 follows a similar route as Route Alternative 8. Unlike Route Alternative 8, Route Alternative 9 includes the pipeline alignment within the Interstate 43 right-of-way near the northern edge of the Interstate 43 right-

of-way line. For this route alternative, the pipeline would be designed with a horizontal alignment as close to the northern right-of-way boundary in the Interstate 43 right-of-way as possible.

4.3.9.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined.

- Interstate 43: The construction method in this segment is anticipated to be open-cut construction beyond pavement. There is one waterway within the Interstate 43 corridor where trenchless construction would be utilized to minimize impacts to the waterway per discussions with the WDNR.

Construction methods along Racine Avenue are consistent with the methods described for Route Alternative 2. Construction methods at the Interstate 43 crossing and extending south and east of the crossing are consistent with the methods described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-19.

Table 4-19 Route Alternative 9 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Interstate 43	Open-Cut, Beyond Pavement and HDD through waterway crossings	Not applicable
Interstate 43 Crossing	Trenchless, Jack and Bore	Not applicable
Parcel NBC 1286999002	Open-Cut, Beyond Pavement	Not applicable
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.9.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-20.

Table 4-20 Route Alternative 9 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.4
Additional Travel Distance from Detours (millions of miles)	3.2
Additional Travel Time (thousands of hours)	140
Additional Total Road User Cost ($M)	4.0
No. of Easements	1
Acres of Easements (acres)	2.4

Item	Values
Wetlands (acres)	0.9
Agricultural Impacts (acres)	2.0
Potential for Tree Removal (-)	Moderate
Parks / Green Space (acres)	0.0
Stakeholder Challenges	No
Constructability Challenges	No
Class 4 OPCC ($M)	22.7

4.3.10 Route Alternative 10A – College Avenue

Route Alternative 10A proceeds from the intersection of Racine Avenue and Coffee Road south along Racine Avenue to College Avenue, and then proceeds east along College Avenue to Moorland Road.

4.3.10.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined.

- College Avenue (West of Small Road): College Avenue west of Small Road is flanked with overhead electric lines and trees on both sides of the road. Surface features indicate the presence of underground utilities. Open-cut construction beneath pavement would be used along College Avenue west of Small Road.
- College Avenue (East of Small Road): College Avenue east of Small Road is a narrow corridor flanked with overhead electric lines on both sides of the road and an overhanging tree canopy. Open-cut construction beneath pavement would require full closure of this portion of College Avenue. Portions of the corridor are hilly with tight bends and in close proximity to residents. Production during construction through this corridor is anticipated to be slower than wider corridors where there is more room to operate construction equipment. For the purposes of this Hardship Application, it was determined the construction method would be trenchless construction via HDD. Figure 4-9 includes photo documentation collected during field reconnaissance on August 14, 2018 that demonstrates limited right-of-way available beyond the 22-foot pavement width for locating pits, equipment, and materials without significant clearing of trees within the right-of-way. As discussed in Section 2.1.2, trenchless construction via HDD has an anticipated limit of construction that is 22-feet wide. Thus, it is anticipated that trenchless construction via HDD would require College Avenue to be closed east of Small Road.



Figure 4-9 Photos of College Avenue between Small and Moorland Roads

Construction methods along Racine Avenue are consistent with the method described for Route Alternative 2, while the Interstate 43 crossing would require trenchless construction via the jack and bore method. Construction methods for this route alternative are summarized in Table 4-21.

Table 4-21 Route Alternative 10A Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue north of Interstate 43	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Interstate 43 Crossing at Racine Avenue	Trenchless, Jack and Bore	Not applicable
Racine Avenue south of Interstate 43	Open-Cut, Beneath and Beyond Pavement	Lane Closures
College Avenue West of Small Road	Open-Cut, Beneath Pavement	Lane Closures
College Avenue East of Small Road	Trenchless, HDD	Road Closure (Local Traffic Only)

4.3.10.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-22.

Table 4-22 Route Alternative 10A Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	6.4
Additional Travel Distance from Detours (millions of miles)	6.3
Additional Travel Time (thousands of hours)	260
Additional Total Road User Cost ($M)	7.6
No. of Easements	0
Acres of Easements (acres)	0.0
Wetlands (acres)	0.3
Agricultural Impacts (acres)	0.0

Item	Values
Potential for Tree Removal (-)	Low
Parks / Green Space (acres)	1.0
Stakeholder Challenges	N/A[1]
Constructability Challenges	Yes
Class 4 OPCC ($M)	25.0

Notes:
1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

4.3.11 Route Alternative 10B – College Avenue and Small Road

Route Alternative 10B follows a similar route as Route Alternative 10A west and north of the intersection of College Avenue and Small Road. Unlike Route Alternative 10A, Route Alternative 10B follows Small Road northeast from College Avenue.

4.3.11.1 Construction Methods

Construction methods along Racine Avenue are consistent with the method described for Route Alternative 2 and construction methods at the Interstate 43 crossing and along College Avenue west of Small Road are consistent with the method described for Route Alternative 10A. Construction methods east of the intersection of Small Road and College Avenue are consistent the method described for Route Alternative 1. Construction methods for this route alternative are summarized in Table 4-23.

Table 4-23 Route Alternative 10B Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Racine Avenue north of Interstate 43	Open-Cut, Beneath and Beyond Pavement	Lane Closures
Interstate 43 Crossing at Racine Avenue	Trenchless, Jack and Bore	Not applicable
Racine Avenue south of Interstate 43	Open-Cut, Beneath and Beyond Pavement	Lane Closures
College Avenue West of Small Road	Open-Cut, Beyond Pavement	Lane Closures
Small Road	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Westridge Drive	Open-Cut, Beneath and Beyond Pavement	Road Closure (Local Traffic Only)
Moorland Road	Open-Cut, Beyond Pavement	Lane Closures

4.3.11.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-24.

Table 4-24 Route Alternative 10B Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.5
Additional Travel Distance from Detours (millions of miles)	5.1
Additional Travel Time (thousands of hours)	220
Additional Total Road User Cost ($M)	6.2
No. of Easements	0
Acres of Easements (acres)	0.0
Wetlands (acres)	1.1
Agricultural Impacts (acres)	0.0
Potential for Tree Removal (-)	Moderate
Parks / Green Space (acres)	1.1
Stakeholder Challenges	N/A[1]
Constructability Challenges	No
Class 4 OPCC ($M)	24.0

Notes:
1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

4.3.12 Route Alternative 11 – Coffee and Moorland Roads

Route Alternative 11 is similar to Route Alternative 1, but follows Coffee Road further east to Moorland Road. At Moorland Road, the route alternative proceeds south to the intersection of Moorland Road and College Avenue.

4.3.12.1 Construction Methods

The corridors and proposed easements along the route alternative were reviewed and construction methods were determined.

- Moorland Road (North of Westridge Drive): Moorland Road north of Westridge Drive is a four-lane, two-way road with a median. As the road proceeds north, the adjacent land becomes progressively more urban. Construction may require closing two lanes of Moorland Road. The road is flanked with overhead electric lines and trees on one or both sides of the road. Surface features indicate the presence of underground utilities. For the purposes of this Hardship Application, it is anticipated open-cut construction beneath pavement would be utilized. Open-cut construction beyond pavement where the median exists would not be utilized as surface features for underground utilities indicate the potential for a storm sewer.

Construction methods along Coffee Road are consistent with the method of Route Alternative 1, while the Interstate 43 crossing at Moorland Road would require trenchless construction. Construction methods for this route alternative are summarized in Table 4-25.

Table 4-25 Route Alternative 11 Construction Methods

Right-of-Way / Easement	Construction Method	Maintenance of Traffic
Coffee Road	Open-Cut, Beneath Pavement	Road Closure (Local Traffic Only)
Moorland Road north of Interstate 43	Open-Cut, Beneath Pavement	Lane Closures
Interstate 43 Crossing at Moorland Road	Trenchless, Jack and Bore	Not applicable
Moorland Road south of Interstate 43	Open-Cut, Beyond Pavement	Lane Closures

4.3.12.2 Economic and Non-Economic Evaluation Criteria

Based on the route and the construction methods determined for the route alternative, the economic and non-economic evaluation criteria were quantified as summarized in Table 4-26.

Table 4-26 Route Alternative 11 Economic and Non-Economic Evaluation Criteria

Item	Values
Pipeline Length (miles)	7.4
Additional Travel Distance from Detours (millions of miles)	12.8
Additional Travel Time (thousands of hours)	480
Additional Total Road User Cost ($M)	14.6
No. of Easements	0
Acres of Easements (acres)	0.0
Wetlands (acres)	3.6
Agricultural Impacts (acres)	0.0
Potential for Tree Removal (-)	Moderate
Parks / Green Space (acres)	1.3
Stakeholder Challenges	Yes
Constructability Challenges	No
Class 4 OPCC ($M)	24.4

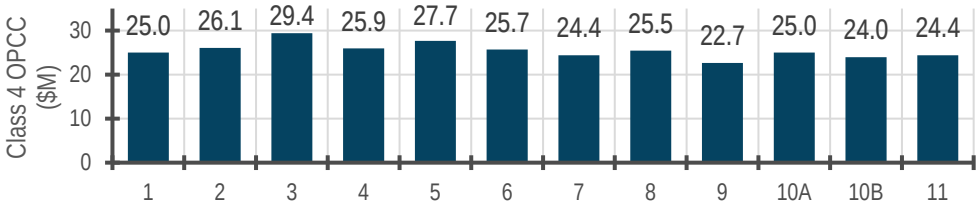
SECTION 5 Evaluation of Route Alernatives

5.1 Non-Economic and Economic Evaluation Matrix

The route alternatives were evaluated based on non-economic evaluation criteria shown in Table 5-1. Evaluation for each criteria was broken into the top third, middle third and bottom third. Red circles indicate that a route alternative is less preferable and green circles indicate a route alternative is more preferable. Orange circles indicate that a route alternative is at a neutral level.

Table 5-1 Non-Economic and Economic Evaluation

Criteria	Route Alternative 1	2	3	4	5	6	7	8	9	10A	10B	11
Pipeline Length	●	●	●	●	●	●	●	●	●	●	●	●
Pipeline Length (miles)	7.3	7.1	7.1	6.9	6.8	6.5	7.0	7.4	7.4	6.4	7.5	7.4
Maintenance of Traffic	●	●	●	●	●	●	●	●	●	●	●	●
Additional Travel Distance (mi, M)	4.8	2.4	3.2	4.6	5.3	3.9	6.1	3.2	3.2	6.3	5.1	12.8
Additional Travel Hours (hours, K)	180	140	140	180	220	170	250	140	140	260	220	480
Additional Total Road Use Cost ($M)	5.6	3.0	3.9	5.4	6.5	4.8	7.4	4.0	4.0	7.6	6.2	14.6
Easements	●	●	●	●	●	●	●	●	●	●	●	●
No. of Easements	2	11	2	10	3	3	3	13	1	0	0	0
Acres of Easements (acres)	4.4	16.8	4.4	11.5	5.1	6.6	5.0	13.9	2.4	0.0	0.0	0.0
Wetlands	●	●	●	●	●	●	●	●	●	●	●	●
Wetland Impacts (acres)	0.9	5.4	0.9	4.8	1.3	1.3	0.9	1.2	0.9	0.3	1.1	3.6
Agricultural Resources	●	●	●	●	●	●	●	●	●	●	●	●
Agricultural Impacts (acres)	3.9	9.4	3.9	6.1	3.9	3.9	3.9	6.4	2.0	0.0	0.0	0.0
Potential for Tree Removal (Moderate: ●, Low: ●)	●	●	●	●	●	●	●	●	●	●	●	●
Parks / Green Spaces	●	●	●	●	●	●	●	●	●	●	●	●
Parks / Green Spaces (acres)	2.5	2.4	2.6	2.0	1.7	3.1	2.5	1.8	0.0	1.0	1.1	1.3
Stakeholder Challenges (Yes: ●, No: ●)	●	N/A[1]	●	N/A[1]	●	●	●	N/A[1]	●	N/A[1]	N/A[1]	●
Constructability Challenges (Yes: ●, No: ●)	●	●	●	●	●	●	●	●	●	●	●	●
Class 4 OPCC	●	●	●	●	●	●	●	●	●	●	●	●
Class 4 OPCC ($M)	25.0	26.1	29.4	25.9	27.7	25.7	24.4	25.5	22.7	25.0	24.0	24.4



Notes:

1. Route alternatives or segments of route alternatives were not presented during Open House Meetings.

Based on the characterization of route alternatives, the advantages and disadvantages of each route alternative is summarized in the following subsections. Criteria that scored orange or red for a given alternative were taken as disadvantages, while criteria that scored green for a given route alternatives were taken as advantages. The advantages and disadvantages of the route alternatives were reviewed and route alternatives were eliminated or retained for further consideration.

5.2 Route Alternative 1 – Coffee Road

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-2.

Table 5-2 Advantages and Disadvantages of Route Alternative 1

Advantages	Disadvantages
• Easements: The route alternative is tied for the third fewest easements. • Wetlands: The route alternative is tied for the second fewest wetlands within the anticipated right-of-way and proposed easements. • Potential for Tree Removal: The route alternative has a lower anticipated potential to impact trees. • Constructability Challenges: The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative has the fifth longest pipeline length. • Maintenance of Traffic: The route alternative has the sixth highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Agricultural Resources: The route alternative is tied for the fourth highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative is tied for the third highest anticipated impact to parks and green spaces. • Stakeholder Challenges: Coffee Road was recently reconstructed and stakeholders expressed concern the Program would impact new pavement. The Water Supply Pipeline will be located within the Coffee Road corridor. The Water Supply Pipeline alignment would cause the Return Flow Pipeline to be located beneath pavement. • Class 4 OPCC: The route alternative is tied for the seventh highest Class 4 OPCC. • Other Considerations: The route alternative traverses Calhoun Road, which is a narrow corridor flanked with electrical utilities that passes Ronald Reagan Elementary School. The narrow corridor compounded by the additional traffic attributed to the elementary school could impede construction and cause additional stakeholder challenges.

Route Alternative 1 would follow Coffee Road east from Racine Avenue. Coffee Road was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would require road closure of Coffee and Calhoun Roads, which would result in an estimated Additional Total Road User Cost of over $5.6 million due to detours, a factor of $1.6 to $2.6 million more than the route alternatives with the lowest anticipated maintenance of traffic impacts. The additional maintenance of traffic impacts along Coffee Road are attributed to constructing a second pipeline within the corridor. The route alternative also passes New Berlin's Ronald Reagan Elementary School located along Calhoun Road. Impacts to traffic in that area would be unavoidable. Approximately 40% of the Program's pipeline length is proposed within New Berlin. Although New Berlin will be receiving no benefit from the Program, New Berlin will be the community most affected by construction. New Berlin and its residents would bear the majority of the additional anticipated traffic impacts.

- Stakeholder Challenges: Stakeholders have expressed concerned for pavement replacement on recently rebuilt roads as discussed in Section 4.2.7. The additional pavement replacement required along Coffee Road is attributed to constructing a second pipeline within the corridor. New Berlin has expressed concern over reconstructing recently rebuilt roads in their community, including Coffee Road. Per New Berlin City Ordinance 275-15, the planning commission has the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin as discussed and confirmed during the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, PSC, WisDOT, and FHWA on October 23, 2018. In addition, WWU desires to maintain good relationships with their neighboring communities.
- Class 4 OPCC: On an economic basis, Route Alternative 1 has a higher Class 4 OPCC than the least costly alternative by $2.3M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.3 Route Alternative 2 – Multiple Easements (Racine Avenue to Calhoun Road)

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-3.

Table 5-3 Advantages and Disadvantages of Route Alternative 2

Advantages	Disadvantages
• Potential for Tree Removal: The route alternative has a lower potential to impact trees as HDD would be used to avoid some tree impacts. • Maintenance of Traffic: The route alternative has the lowest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. The low anticipated maintenance of traffic impact is principally attributed to its alignment beyond public right-of-way. • Constructability Challenges: The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative is tied for the sixth longest pipeline length. • Easements: The route alternative has the second highest number of easements and highest easement acreage. • Agricultural Resources: The route alternative has the highest anticipated impact to agricultural resources. • Wetlands: The route alternative has the highest anticipated potential to impact wetlands within the anticipated right-of-way and proposed easements. • Parks / Green Spaces: The route alternative has the fifth highest potential impact to parks and green spaces. • Class 4 OPCC: The route alternative has the third highest Class 4 OPCC.

Route Alternative 2 was developed as a route that has a segment that would not utilize public right-of-way and follow section lines in order to minimize the number of easements required. Route Alternative 2 was eliminated for the following key disadvantages.

- Easements: This route alternative requires a total of 11 easements, which is the second highest number of easements required of the route alternatives evaluated, and the highest acreage of easements of the route alternatives evaluated. Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way. Waukesha ratepayers would also incur additional costs to construct the permanent access roads required for pipeline maintenance purposes. There are added risks to the Program costs and schedule in cases where the property owner opposes the purchase of an easement as discussed during the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, PSC, WisDOT, and FHWA on October 23, 2018. Section 32.05 of the Wisconsin Administrative Code allows for WWU to condemn property for the pipeline if WWU can defend the public necessity of the Program. The process to use eminent domain can take six- to 14-months and, in addition to that, per Section 32.05(9)(a), the owners have the ability to appeal the easement offer for up to two-years.

While WWU may own the easement based on eminent domain, the costs for the Program have the potential to increase. If there are multiple owners, they can organize themselves into class action lawsuits that can take time to resolve and also increase the potential costs to WWU due to legal fees. With the potential for additional costs and negative public perception, it has been the goal of the Program to limit the number of easements.

- Agricultural Resources: This route alternative requires eight easements through farmland. New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to the permanent access roads and potential pipeline appurtenances required for pipeline maintenance that would reduce harvestable area.
- Class 4 OPCC: On an economic basis, Route Alternative 2 has a higher Class 4 OPCC than the least costly alternative by $3.4M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.4 Route Alternative 3 – Observatory Road

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-4.

Table 5-4 Advantages and Disadvantages of Route Alternative 3

Advantages	Disadvantages
• Maintenance of Traffic: The route alternative is anticipated to have the second lowest impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Easements: The route alternative is tied for the fifth fewest easements. • Wetlands: The route alternative is tied for the second fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Potential for Tree Removal: The route alternative has a lower potential to impact trees as HDD would be used in lieu of open-cut construction along some segments.	• Pipeline Length: The route alternative is tied for the sixth longest pipeline length. • Agricultural Resources: The route alternative is tied for the fourth highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the second highest anticipated impact to parks and green spaces. • Stakeholder Challenges: Stakeholders expressed concern during Open House Meetings that construction operations would occur in close proximity to residents given the narrow nature of the corridor. • Constructability Challenges: The route alternative has potential constructability challenges given the narrow corridor available between overhead electric and a flanking tree canopy for staging and operating construction equipment. • Class 4 OPCC: The route alternative has the highest Class 4 OPCC.

Route Alternative 3 would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue and east along Observatory Road. Observatory Road was eliminated for the following key disadvantages.

- Stakeholder Challenges: Stakeholders were concerned about construction occurring in close proximity to their properties given the narrow nature of the right-of-way available. Trenchless construction would be used in lieu of open-cut construction to mitigate their concerns as part of this Hardship Application; however, this construction method increases the Class 4 OPCC of the route alternative. The route alternative also passes New Berlin's Ronald Reagan Elementary School located along Calhoun Road. Impacts to traffic in that area would be unavoidable, and additional stakeholder concerns are anticipated due to impacts to traffic in that area. New Berlin and its residents would bear the brunt of these impacts and yet receive no benefit from the Program. WWU desires to maintain good relationships with their neighboring communities.

- Class 4 OPCC: On an economic basis, Route Alternative 3 has a higher Class 4 OPCC than the least costly alternative by $6.7M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.5 Route Alternative 4 – Multiple Easements (Racine Avenue to National Avenue)

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-5.

Table 5-5 Advantages and Disadvantages of Route Alternative 4

Advantages	Disadvantages
• Potential for Tree Removal: The route alternative has a lower anticipated potential to impact trees as HDD would be used to mitigate impact to treed segments. • Constructability Challenges: The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative has the ninth longest pipeline length. • Easements: The route alternative has the third highest number of easements. • Maintenance of Traffic: The route alternative has the seventh highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Wetlands: The route alternative has the second highest estimated wetlands within the anticipated right-of-way and proposed easements. • Agricultural Resources: The route alternative has the third highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the sixth highest anticipated impact to parks and green spaces. • Class 4 OPCC: The route alternative has the fourth highest Class 4 OPCC.

Route Alternative 4 was developed as a route that would predominantly not utilize public right-of-way by following section lines in order to minimize the number of easements required. Route Alternative 4 was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $5.4M due to detours, approximately $1.4M to $2.4M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Easements: This route alternative requires a total of 10 easements, which is the third highest easement requirements of the route alternatives evaluated. With the potential for additional costs and negative public perception, it has been the goal of the Program to limit the number of easements.
- Agricultural Resources: This route alternative requires four easements through farmland. New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to the permanent access roads and potential pipeline appurtenances required for pipeline maintenance that would reduce harvestable area.
- Class 4 OPCC: On an economic basis, Route Alternative 4 has a higher Class 4 OPCC than the least costly alternative by $3.2M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.6 Route Alternative 5 – Lawnsdale Road

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-6.

Table 5-6 Advantages and Disadvantages of Route Alternative 5

Advantages	Disadvantages
• Easements: The route alternative is tied for the seventh fewest easements. • Wetlands: The route alternative is tied for the eighth fewest estimated wetlands within the anticipated right-of-way and proposed easements.	• Pipeline Length: The route alternative has the ninth longest pipeline length. • Maintenance of Traffic: The route alternative has the fourth highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Agricultural Resources: The route alternative is tied for the fourth highest anticipated impact to agricultural resources. • Potential for Tree Removal: The route alternative has a moderate potential to impact trees due to their close proximity to the road along Lawnsdale Road. • Parks / Green Spaces: The route alternative has the eighth highest anticipated impact to parks and green spaces. • Stakeholder Challenges: Stakeholders expressed concern during Open House Meetings that construction operations would occur in close proximity to residents given the narrow nature of the corridor. • Constructability Challenges: The route alternative has potential constructability challenges given the narrow corridor available between overhead electric and a flanking tree canopy for staging and operating construction equipment. • Class 4 OPCC: The route alternative has the second highest Class 4 OPCC.

Route Alternative 5 would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue, east along Lawnsdale Road, and northeast along National Avenue. Lawnsdale Road was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $6.5 million due to detours, approximately $2.5M to $3.5M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Stakeholder Challenges: Stakeholders were concerned about construction occurring in close proximity to their properties given the narrow nature of the right-of-way available. WWU desires to maintain good relationships with their neighboring communities. Trenchless construction would be used in lieu of open-cut construction to mitigate their concerns as part of this Hardship Application; however, this construction method increases the Class 4 OPCC of the route alternative. New Berlin and its residents would bear the brunt of these impacts and yet receive no benefit from the Program.
- Class 4 OPCC: On an economic basis, Route Alternative 5 has a higher Class 4 OPCC than the least costly alternative by $5.0M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.7 Route Alternative 6 – Lawnsdale and Beloit Roads

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-7.

Table 5-7 Advantages and Disadvantages of Route Alternative 6

Advantages	Disadvantages
• Pipeline Length: The route alternative has the second shortest pipeline length. • Wetlands: The route alternative is tied for the eighth fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Potential for Tree Removal: The route alternative has a lower potential to impact trees as HDD would be used in lieu of open-cut construction along some segments.	• Easements: The route alternative is tied for the fourth highest number of easements. • Maintenance of Traffic: The route alternative has the eighth highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Agricultural Resources: The route alternative is tied for the fourth highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the highest anticipated impact to parks and green spaces. • Stakeholder Challenges: Stakeholders expressed concern during Open House Meetings that construction operations would occur in close proximity to residents given the narrow nature of the corridor. • Constructability Challenges: The route alternative has potential constructability challenges given the narrow corridor available between overhead electric and a flanking tree canopy for staging and operating construction equipment. Beloit Road was recently reconstructed and stakeholders expressed concern the Program would impact new pavement. HDD is proposed to mitigate damage to new pavement. • Class 4 OPCC: The route alternative has the fifth highest Class 4 OPCC.

Route Alternative 6 would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue, east along Lawndale Road, southwest along National Avenue, south through an easement, and east along Beloit Road. Route Alternative 6 was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $4.8M due to detours, approximately $0.8M to $1.8M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Stakeholder Challenges: WWU desires to maintain good relationships with their neighboring communities. Trenchless construction would be used in lieu of open-cut construction to mitigate concerns expressed by stakeholders as described in Section 4.2.7 and to mitigate pavement replacement along Beloit Road since it was reconstructed in 2017. However, trenchless construction increases the Class 4 OPCC of the route alternative.
- Class 4 OPCC: On an economic basis, Route Alternative 6 has a higher Class 4 OPCC than the least costly alternative by $3.0M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.8 Route Alternative 7 – Beloit Road

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-8.

Table 5-8 Advantages and Disadvantages of Route Alternative 7

Advantages	Disadvantages
• Easements: The route alternative is tied for the seventh fewest easements. • Wetlands: The route alternative is tied for the second fewest estimated wetlands within the anticipated right-of-way and proposed easements.	• Pipeline Length: The route alternative has the fifth shortest pipeline length. • Maintenance of Traffic: The route alternative has the third highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Agricultural Resources: The route alternative is tied for the fourth highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative is tied for the third highest anticipated impact to parks and green spaces. • Potential for Tree Removal: The route alternative has a moderate potential to impact more trees due to their close proximity to the edge of pavement along Beloit Road. • Stakeholder Challenges: Beloit Road was recently reconstructed and stakeholders expressed concern the Program would impact new pavement. HDD is proposed to mitigate damage to new pavement. • Constructability Challenges: The route alternative has potential constructability challenges given the narrow corridor available between overhead electric and a flanking tree canopy for staging and operating construction equipment. • Class 4 OPCC: The route alternative has the third lowest Class 4 OPCC, approximately $1.7M more than the least costly route alternative.

Route Alternative 7 would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue, northeast along National Avenue, and east along Beloit Road. Beloit Road was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $7.4M due to detours, a factor of $3.4M to $4.4M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Stakeholder Challenges: WWU desires to maintain good relationships with their neighboring communities. Beloit Road was reconstructed in 2017 and 2018 and New Berlin officials, including the Mayor, expressed concern the Program would impact new pavement. Trenchless construction would be used instead of open-cut construction to mitigate impacts to new pavement on Beloit Road; however, this construction method increases the Class 4 OPCC of the route alternative.
- Class 4 OPCC: On an economic basis, Route Alternative 7 has a higher Class 4 OPCC than the least costly alternative by $1.7M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.9 Route Alternative 8 – Multiple Easements (North of Interstate 43 Right-of-Way)

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-9.

Table 5-9 Advantages and Disadvantages of Route Alternative 8

Advantages	Disadvantages
• Wetlands: The route alternative has the seventh fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Potential for Tree Removal: The route alternative has a lower potential to impact trees as HDD would be used to mitigate tree damage along some segments. • Maintenance of Traffic: The route alternative is tied for the third lowest impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Constructability Challenges: The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative is tied for the second longest pipeline length. • Easements: The route alternative has the most easements. • Agricultural Resources: The route alternative has the second highest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the seventh highest anticipated impact to parks and green spaces. • Class 4 OPCC: The route alternative has the sixth highest Class 4 OPCC.

Route Alternative 8 would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue to the Interstate 43 right-of-way. From there, the route alternative would head east along multiple easements just beyond the Interstate 43 right-of-way between Racine Avenue to the Interstate 43 crossing. From the evaluation, the following key disadvantages were noted:

- Easements: This route alternative requires a total of 13 easements, which is the highest easement requirements of the route alternatives evaluated. With the potential for additional costs and negative public perception, it has been the goal of the Program to limit the number of easements.
- Agricultural Resources: This route alternative requires four easements through farmland. New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to the permanent access roads and potential pipeline appurtenances required for pipeline maintenance that would reduce harvestable area.
- Class 4 OPCC: On an economic basis, Route Alternative 8 has a higher Class 4 OPCC than the least costly alternative by $2.8M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.10 Route Alternative 9 – Interstate 43

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-10.

Table 5-10 Advantages and Disadvantages of Route Alternative 9

Advantages	Disadvantages
• Easements: The route alternative has the fourth fewest easements. • Wetlands: The route alternative is tied for the second fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Maintenance of Traffic: The route alternative is tied for the third lowest impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Agricultural Resources: The route alternative has the fourth fewest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the fewest anticipated impact to parks and green spaces. • Stakeholder Challenges: The route alignment is the only route alternative presented during Open House Meetings where no stakeholder challenges were noted. • Constructability Challenges: The route alternative has less anticipated constructability challenges. • Class 4 OPCC: The route alternative has the lowest Class 4 OPCC than any other route alternative evaluated.	• Pipeline Length: The route alternative is tied for the second longest pipeline length. • Potential for Tree Removal: The route alternative has a moderate potential to impact more trees due to their close proximity to the right-of-way line along Interstate 43.

Route Alternative 9 would follow a similar route as Route Alternative 8. Unlike Route Alternative 8, Route Alternative 9 includes a pipeline alignment within the Interstate 43 right-of-way near the northern edge of the Interstate 43 right-of-way line.

From the evaluation, two disadvantages were noted – pipeline length and moderate potential for tree removal. The disadvantages were not used as key disadvantages contributing to the rationale for eliminating any other route alternative, and are not sufficient to warrant elimination of this route alternative.

5.11 Route Alternative 10A – College Avenue

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-11.

Table 5-11 Advantages and Disadvantages of Route Alternative 10A

Advantages	Disadvantages
• Pipeline Length: The route alternative has the shortest pipeline length. • Easements: The route alternative is tied for the fewest easements. • Wetlands: The route alternative has the fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Potential for Tree Removal: The route alternative a lower potential to impact trees as HDD would be used in lieu of open-cut construction along some segments. • Agricultural Resources: The route alternative is tied for the fewest anticipated impact to agricultural resources. • Parks / Green Spaces: The route alternative has the second fewest anticipated impact to parks and green spaces.	• Maintenance of Traffic: The route alternative has the second highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Class 4 OPCC: The route alternative has the seventh highest Class 4 OPCC. • Constructability Challenges: The route alternative has potential constructability challenges given the narrow corridor available between overhead electric and an overhanging tree canopy for staging and operating construction equipment and the tight, winding bends the corridor exhibits.

Route Alternative 10A would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue and east along College Avenue. College Avenue was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $7.6M due to detours, approximately $3.6M to $4.6M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. WWU desires to maintain good relationships with their neighboring communities. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Constructability Challenges: The route alternative corridor is narrow and winding with overhead electric and overhanging tree canopy which would impede construction.
- Class 4 OPCC: On an economic basis, Route Alternative 10A has a higher Class 4 OPCC than the least costly alternative by $2.3M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.12 Route Alternative 10B – College Avenue and Small Road

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-12.

Table 5-12 Advantages and Disadvantages of Route Alternative 10B

Advantages	Disadvantages
• Easements: The route alternative is tied for the fewest easements. • Wetlands: The route alternative has the sixth fewest estimated wetlands within the anticipated right-of-way and proposed easements. • Agricultural Resources: The route alternative is tied for the fewest anticipated impact to agricultural resources. • Constructability Challenges: The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative has the longest pipeline length. • Maintenance of Traffic: The route alternative has the fifth highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Parks / Green Spaces: The route alternative has the tenth highest anticipated impact to parks and green spaces. • Potential for Tree Removal: The route alternative has a moderate potential to impact more trees due to their close proximity to the edge of pavement along Small Road. • Class 4 OPCC: The route alternative has the second lowest Class 4 OPCC, approximately $1.3M more than the least costly route alternative.

Route Alternative 10B would proceed from the intersection of Racine Avenue and Coffee Road south along Racine Avenue, east along College Avenue, and northeast along Small Road where it follows the rest of Route Alternative 1. College Avenue and Small Road were eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated the route alternative would result in an estimated Additional Total Road User Cost of over $6.2M due to detours, approximately $2.2M to $3.2M more than the route alternatives with the lowest anticipated maintenance of traffic impacts. WWU desires to maintain good relationships with their neighboring communities. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Class 4 OPCC: On an economic basis, Route Alternative 10B has a higher Class 4 OPCC than the least costly alternative by $1.3M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

5.13 Route Alternative 11 – Coffee and Moorland Roads

The non-economic and economic evaluation criteria were reviewed and the advantages and disadvantages of the route alternative are summarized in Table 5-13.

Table 5-13 Advantages and Disadvantages of Route Alternative 11

Advantages	Disadvantages
• Easements: The route alternative is tied for the fewest easements. • Agricultural Resources: The route alternative is tied for the fewest anticipated impact to agricultural resources. • Constructability Challenges The route alternative has less anticipated constructability challenges.	• Pipeline Length: The route alternative is tied for the second longest pipeline length. • Maintenance of Traffic: The route alternative has the highest anticipated impact to maintenance of traffic in terms of additional travel distance and time due to detours and additional total user cost. • Wetlands: The route alternative has the third most estimated wetlands within the anticipated right-of-way and proposed easements. • Stakeholder Challenges: Coffee Road was recently reconstructed and stakeholders expressed concern the Program would impact new pavement. The Water Supply Pipeline will be located within the Coffee Road corridor. The Water Supply Pipeline alignment would cause the Return Flow Pipeline to be located beneath pavement. • Potential for Tree Removal: The route alternative has a moderate potential to impact more trees due to their close proximity to the edge of pavement along Moorland Road. • Parks / Green Spaces: The route alternative has the ninth highest anticipated impact to parks and green spaces. • Class 4 OPCC: The route alternative has the third lowest Class 4 OPCC, approximately $1.7M more than the least costly route alternative.

Route Alternative 11 would follow Coffee Road east from Racine Avenue and south on Moorland Road. Coffee and Moorland Roads was eliminated for the following key disadvantages.

- Maintenance of Traffic: It is anticipated that the route alternative would result in the highest estimated Additional Total Road User Cost of over $14.6M due to detours, approximately a factor of ten times more than the route alternatives with the lowest anticipated maintenance of traffic impacts. New Berlin and its residents, who receive no benefit from the Program, would bear the majority of the anticipated traffic impacts.
- Stakeholder Challenges: WWU desires to maintain good relationships with their neighboring communities. Stakeholders have expressed concerned for pavement replacement on recently rebuilt roads as discussed in Section 5.2.
- Class 4 OPCC: On an economic basis, Route Alternative 11 has a higher Class 4 OPCC than the least costly alternative by $1.7M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.

SECTION 6 Evaluation of Primary and Secondary Preferred Route Alternatives

6.1 Primary Preferred Route

The primary preferred route based on economic and non-economic evaluation criteria is Route Alternative 9. As described in Section 5, two disadvantages were noted for Route Alternative 9, pipeline length and moderate potential for tree removal. The disadvantages were not used as key disadvantages for eliminating any other route alternative, and are not sufficient to warrant elimination of this route alternative. Other route alternatives require construction in narrower corridors flanked by overhead electric lines, in close proximity to trees and passing numerous residential properties with stakeholder challenges. Trenchless construction was used to mitigate many of the challenges. However, using the trenchless construction increases the Class 4 OPCCs of the route alternatives.

Route Alternative 9 requires one easement, fewer easements than Route Alternatives 1-8. More easements increase the coordination with the property owners and increase the likelihood WWU will be required to exercise eminent domain. Coordination with property owners and utilization of the eminent domain process is a hardship for WWU for the following reasons:

- Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way.
- Waukesha ratepayers will incur additional costs to construct permanent access roads for pipeline maintenance purposes. Additionally, New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to a reduced harvestable area.
- There is a negative public perception associated with exercising eminent domain in New Berlin, a neighboring community whose citizenry will not benefit from the Program. WWU is endeavoring to maintain good relationships with the neighboring communities who are being negatively impacted during the construction of the infrastructure to serve the community of Waukesha.
- New Berlin, who is not receiving a direct benefit from the Program, has expressed concern over reconstructing recently rebuilt roads in their community. Refer to Appendix B for a letter from the Mayor of New Berlin expressing concern regarding the impact to the residents of New Berlin. In addition to WWU's desire to maintain good relationships with their neighboring communities, per New Berlin City Ordinance 275-15, the planning commission has the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin.

Route Alternative 9 lowers potential impacts to parks and open spaces, and reduces potential impacts to wetlands relative to many other alternatives. The wetlands along Route Alternative 9 have been field-delineated and documentation has been prepared for the Wetlands and Waterways Individual Permits Application in order to maintain the schedule stipulated by the July 2017 Amended Stipulation and Order for Amended Judgement, refer to Appendix G. Survey has been completed and horizontal and vertical alignments are being designed in preparation for a 60% design submittal. Any other route alternative will require additional effort to accomplish these items. Route changes will delay design and submittal of the Wetlands and Waterways Individual Permits Application. The delay of these items could delay construction, which could jeopardize the Program's ability to meet milestone dates specified in the July 2017 Amended Stipulation and Order for Amended Judgement. Per the July 2017 Amended Stipulation and Order for Amended Judgment, WWU shall "Initiate Phase II [interim radium treatment] no later than June 1, 2022 if, as of May 1, 2022, the Defendant's Great Lakes water diversion project manager and construction manager

(PM/CM) cannot certify that all of the Great Lakes water diversion project construction is under contract and is 50% complete…". Construction of interim radium treatment would increase the financial burden on Waukesha ratepayers

The public did not voice any concern about the Interstate 43 right-of-way during any Open House Meeting held within New Berlin or at other communities. The public did express concerns about every other route alternative presented in Open House Meetings in existing east-west right-of-way described in this Hardship Application due to traffic and construction impacts.

On an economic basis, Route Alternative 9 is the least costly route alternative, which is between $1.3M and $6.7M less expensive than the other route alternatives. Utilizing any other alternative would be incurred at an additional cost to Waukesha ratepayers. Use of the Interstate 43 right-of-way is anticipated to produce less maintenance of traffic impacts than any other route alternative other than Route Alternative 2. The other route alternatives would result in Additional Total Road User Cost due to detours to local traffic in New Berlin, a neighboring community that will not benefit from the pipeline.

There are several design elements of the pipeline that reduce risk of impairing the free and safe flow of traffic on Interstate 43. These include the following (refer to Section 3 for details).

- The purpose of the pipeline is to return highly treated effluent equal to Waukesha's average day demand from the previous year on an annual basis. The Return Flow Pipeline is not required to provide continuous, uninterrupted service. In the event the pipeline needs to be maintained, the pipeline would be shut down and repaired in coordination with WisDOT for staging and planning.
- The Return Flow Pipeline is not anticipated to require regular access for maintenance and operations. Design provisions are being implemented to reduce the likelihood of pipe failure.
- The Return Flow Pipeline would be aligned adjacent to the right-of-way line so that future highway improvements should minimize the potential for impacts.
- The normal operating pressure for the Return Flow Pipeline is anticipated to be approximately 80 psi or less, lower than other high-pressure transmission pipelines nearby such as natural gas.
- The pipeline is not anticipated to have cathodic protection via induced current and, therefore, stray electrical currents that would be present from infrastructure, such as high-pressure gas mains, are not anticipated.

The benefits of Route Alternative 9 would be realized in design and construction through improved scheduling, cost-effectiveness, as well as increased overall public acceptance of the Program via lower maintenance of traffic impacts. Route Alternative 9 is the recommended route alternative and is in the public's best interest.

Panels 19 through 22 in Appendix A show the preliminary horizontal alignment of the Return Flow Pipeline within the Interstate 43 right-of-way. The panels in Appendix A show the proposed location of the pipeline within the interstate right-of-way with respect to the existing interstate, the traveled way, and right-of-way lines. The alignment and trenchless lengths shown are preliminary and would be refined during design based on survey information. As shown, the preliminary horizontal alignment is beyond the edge of pavement and would be designed as close to the northern right-of-way boundary as possible within the Interstate 43 right-of-way. Contract documents would be developed to maintain a horizontal alignment such that construction activities would not impair the highway or interfere with the free and safe flow of traffic.

6.2 Secondary Preferred Route

The secondary preferred route was selected by identifying a route alternative that satisfies WWU's priority of protecting WWU ratepayers by completing the Program in a cost-effective manner and minimizing impacts to communities and the environment.

Approximately 40% of the Program's pipeline length is proposed within New Berlin. Although New Berlin will be receiving no benefit from the Program, New Berlin will be the community most affected by construction and would bear the majority of the additional anticipated traffic impacts. Per New Berlin City Ordinance 275-15, the planning commission has the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin, as discussed and confirmed during the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, PSC, WisDOT, and FHWA on October 23, 2018. In addition, WWU desires to maintain good relationships with their neighboring communities. For these reasons, a secondary preferred route alternative would mitigate impacts to Waukesha's neighbor, New Berlin, to both support completion of the Program by mitigating denial of permits required to construct the Program and by continuing to support its neighboring relationships.

WWU has selected their secondary preferred route as Route Alternative 8 due to fewer stakeholder challenges and less maintenance of traffic impacts in New Berlin.

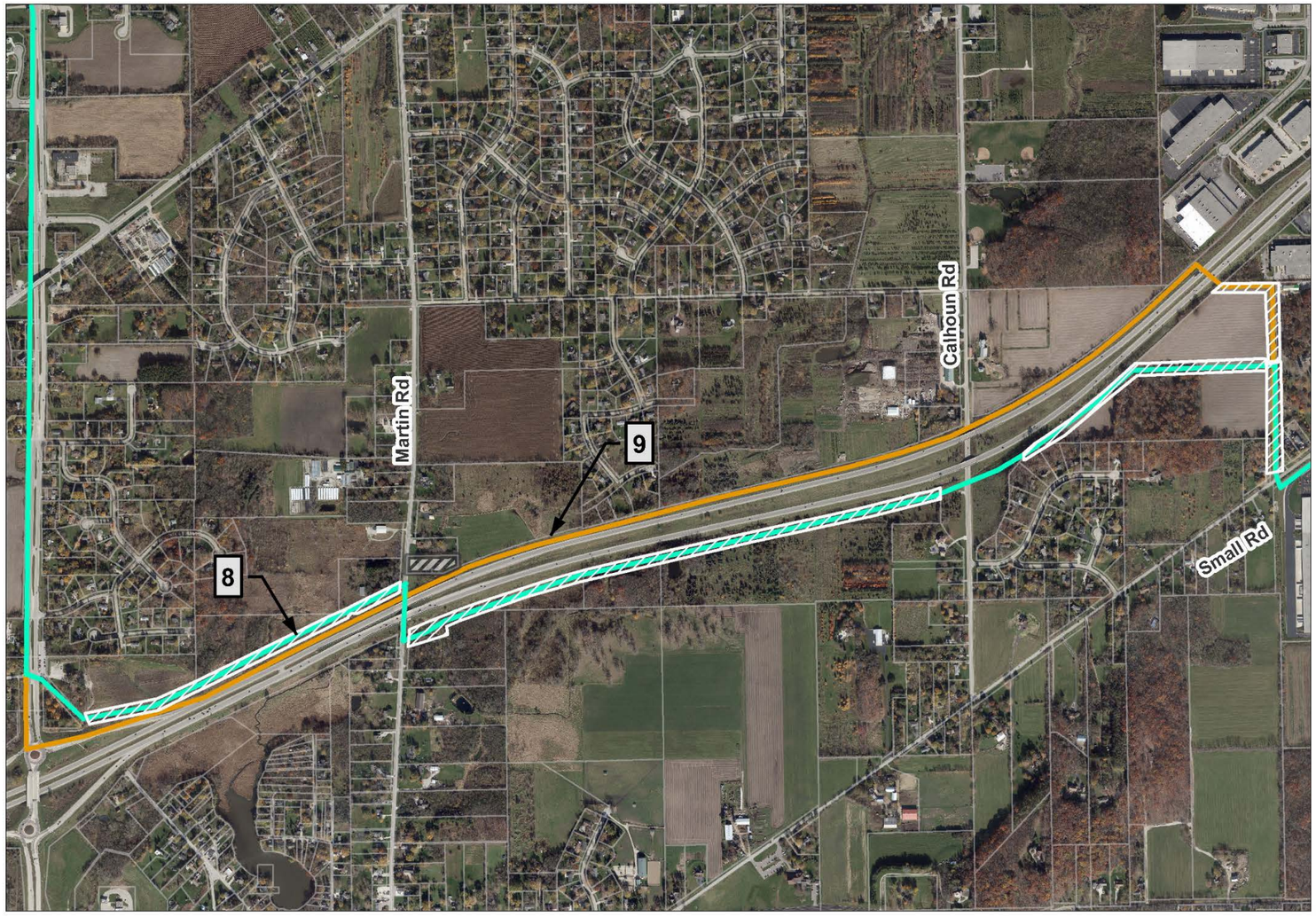
6.3 Route Refinements

The primary and secondary preferred route alternatives were further refined and compared in order to provide Class 3 OPCCs and initiate steps necessary to complete the National Environmental Policy Act (NEPA) documentation required. The refinement and evaluation were completed within the Interstate 43 right-of-way between common starting an ending points as shown in Figure 6-1.

The primary preferred route alternative, Route Alternative 9, is being designed in advance of approval of the Hardship Application to strive to meet the schedule stipulated in the July 2017 Amended Stipulation and Order for Amended Judgement. Costs were developed as described in Section 4.2.8 within the extents of the Interstate 43 right-of-way. The easement costs were also further refined as follows based on the type of easement acquisition required:

- Land Value: $10,000/agricultural acre
- Land Value: $60,000/residential acre
- Administrative Fee: $19,400/parcel

Route Alternative 8 was further evaluated in October 2018 based on field reconnaissance and aerial photo documentation. Route Alternative 8 was refined to be south of Interstate 43 east of Martin Road. The pipeline alignment shift is due to a residential building abutting the northern Interstate 43 right-of-way line east of Martin Road. The Interstate 43 crossing would occur on Martin Road to avoid trenchless construction that would otherwise be required to longitudinally cross a surface water located parallel to and south of the Interstate 43 right-of-way just west of Martin Road. The alignment would then proceed beyond the northern Interstate 43 right-of-way line through easements to Racine Court, where it would then turn northwest and proceed to Racine Avenue. Class 3 OPCCs were prepared for this alternative based on the refined alignment and as described in Section 4.2.8.



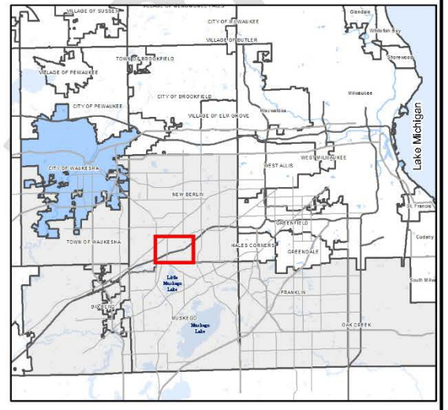
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Easements Required, Not to Scale

Property Avoidance

N

Key Map



0 375 750 1,500 feet

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Great Lakes Water Supply Program
Moorland Road to Racine Avenue
Primary and Secondary Preferred Route Alternatives
Date: 11/6/2018

Plotted: 11/6/2018
Document Path: G:\15310-Waukesha Great Lakes Water Supply PM-CM\24 GIS\24.05_Working_MXDs\Working_Milwaukee_New\I-43 Hardship\I-43_Hardship Subalternates_10242018.mxd

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Figure 6-1 Moorland Road to Racine Avenue Primary and Secondary Preferred Route Alternatives

The Class 3 OPCCs for the refined Route Alternatives 8 and 9 are summarized in Table 6-1.

Table 6-1 Class 3 OPCCs for Refined Route Alternatives

Criteria	Route Alternative	
	8	9
Class 4 OPCC ($M)	9.8	8.0

6.4 Route Recommendation

The primary and secondary preferred route alternatives were further reviewed after the refinement. Route Alternative 8 was eliminated for the following key disadvantages.

- Easements: This route alternative requires a total of 10 easements, which is the third highest easement requirements of the route alternatives evaluated. With the potential for additional costs and negative public perception, it has been the goal of the Program to limit the number of easements.
- Agricultural Resources: This route alternative requires eight easements through farmland. New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to the permanent access roads and potential pipeline appurtenances required for pipeline maintenance that would reduce harvestable area.
- Class 4 OPCC: On an economic basis, Route Alternative 8 has a higher Class 3 OPCC than Route Alternative 9, by $1.8M. The route alternative would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.
- Schedule: Wetlands within anticipated construction limits have been field-delineated and temporary wetland impacts have been quantified along the Return Flow Pipeline. This includes wetlands within the Interstate 43 right-of-way beyond the northern edge of pavement. This work was expedited ahead of the approval of the Hardship Application in order to strive to meet the schedule stipulated in the July 2017 Amended Stipulation and Order for Amended Judgement. If the Return Flow Pipeline route was changed from using the Interstate 43 right-of-way, additional time and effort would be required to reorganize and resubmit the Wetland and Waterways Individual Impact Permit Application which would restart the review process timeline for WDNR. This would negatively impact the overall Program schedule. The Program had requested a decision by November 30, 2018 as discussed at the Waukesha Water Utility I-43 Hardship Application Meeting with the members of the Program, WDNR, PSC, WisDOT, and FHWA held on October 23, 2018. The Program team received approval from FHWA and WisDOT in April 2019.

Due to reasons described in this section, Route Alternative 9 is the selected route alternative. The Program has submitted additional documentation to meet NEPA requirements under a separate cover.

SECTION 7 Liability, Responsibility, and Compliance

7.1 Liability and Responsibilities

The extent of the WWU's liability and responsibilities associated with potential future adjustment of the Return Flow Pipeline installed within the Interstate 43 right-of-way to accommodate required highway improvements include the following.

- The Return Flow Pipeline will be placed adjacent to the right-of-way line so that future highway improvements should not cause an impact to the pipeline and the pipeline should not impact future highway improvements.
- Following completion of construction, markers will be laid every 1,000-feet and at critical locations such as road, culvert, and utility crossings to notify anyone near the pipeline as to its approximate location.
- The Return Flow Pipeline is not required to provide continuous, uninterrupted service. In the event the pipeline needs to be serviced, the pipeline will be shut down and repaired in coordination with WisDOT for staging and planning.

The following indemnification language would be included in the contract documents to meet WisDOT requirements.

- WWU shall save and hold the State, its officers, employees, agents, all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, and the Federal Highway Administration harmless, as allowed by Wisconsin law, from actions of any nature whatsoever (including any by WWU itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by WWU, or the construction or maintenance of facilities by WWU, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, (1) while WWU is performing its work, or (2) while any of WWU's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of WWU remains on the State's property or right-of-way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way; including without limiting the generality of the foregoing, all liability, damages, loss expense, claims, demands and actions on account of personal injury, death or property loss to the State, its officers, employees, agents, contractors, subcontractors or frequenters; to WWU, its employees, agents, contractors, subcontractors, or frequenters; or to any other persons, whether based upon, or claimed to be based upon, statutory (including, without limiting the generality of the foregoing, worker's compensation), contractual, tort, or whether or not caused or claimed to have been caused by active or inactive negligence or other breach of duty by the State, its officers, employees, agents, contractors, subcontractors or frequenters; WWU, its employees, agents, contractors, subcontractors or frequenters; or any other person.
- Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of WWU pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way in the past or present, or that are located on any highway or State property or right-of-way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. WWU shall at its own expense investigate all such claims and demands, attend to their settlement or other

disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.

- Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of WWU that remains on the State's property or right-of-way pursuant to this permit shall not release WWU from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of WWU that remains on the State's property or right-of-way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.

7.2 Compliance with WisDOT Requirements

If, in the future, any case of noncompliance with WisDOT requirements is detected, the following actions will be taken by WWU.

- Within the timeframe identified by WisDOT, a mitigation plan will be developed to correct the non-compliance item(s) and submitted to WisDOT for review and approval.

Upon approval by WisDOT, the Program will implement the mitigation plan within the timeframe as agreed to with WisDOT.

SECTION 8 Conclusion

The purpose of this Hardship Application is to receive an exception to 23 CFR 1.23 (c) to use the right-of-way of Interstate 43 between Racine Avenue and approximately 1,800-feet east of Calhoun Road for the Return Flow Pipeline. This Hardship Application summarizes the route alternatives considered for the pipeline near the Interstate 43 corridor and examines their impacts. It demonstrates the drawbacks of those alternatives in comparison to the Interstate 43 right-of-way. This Hardship Application provides information on how using the Interstate 43 right-of-way is in the public interest and how it would not impair the highway or the free and safe flow of traffic. A total of 12 route alternatives were identified. The route alternatives were evaluated based on the following economic and non-economic evaluation criteria:

- Pipeline Length
- Maintenance of Traffic
- Easements
- Wetlands
- Agricultural Resources
- Potential for Tree Removal
- Parks / Green Spaces
- Stakeholder Challenges
- Constructability Challenges
- Class 4 OPCC

The route alternatives were evaluated with common starting and ending points. Conclusions are summarized as follows:

- Of the route alternatives presented in Open House Meetings, Route Alternative 9 is the only route the public did not voice concern over.
- Route Alternative 9, which utilizes the Interstate 43 right-of-way, has lower Class 3 and 4 Opinion of Probable Construction Costs (OPCCs) than the other route alternatives evaluated. The OPCC for Route Alternative 9 is approximately $1.3M and $6.7M less than the other route alternatives. The other route alternatives evaluated would increase the cost of construction of the Program that would be incurred by the Waukesha ratepayers.
- Route Alternative 9 has a lower or equal anticipated Additional Total Road User Cost due to fewer detours than any other route alternative except Route Alternative 2, which departs public right-of-way and requires the acquisition of 11 easements. Route Alternative 9's anticipated Additional Total Road User Cost is less than these other route alternatives by up to $10.6M. These other route alternatives would result in a greater Additional Total Road User Cost due to detours to local traffic in New Berlin, a neighboring community that will not benefit from the Program.
- Route Alternative 9 requires one easement in the area evaluated as part of this Hardship Application, which is fewer easements than Route Alternatives 1-8. More easements increase the coordination with the property owners and increase the likelihood WWU will be required to exercise eminent domain. Coordination with property owners and utilization of the eminent domain process is a hardship for WWU for the following reasons:
  - Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way.
  - Waukesha ratepayers will incur additional costs to construct permanent access roads for pipeline maintenance purposes. Additionally, New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to a reduced harvestable area.
  - There is a negative public perception associated with exercising eminent domain in New Berlin, a neighboring community whose residents will not benefit from the Program. WWU is endeavoring to

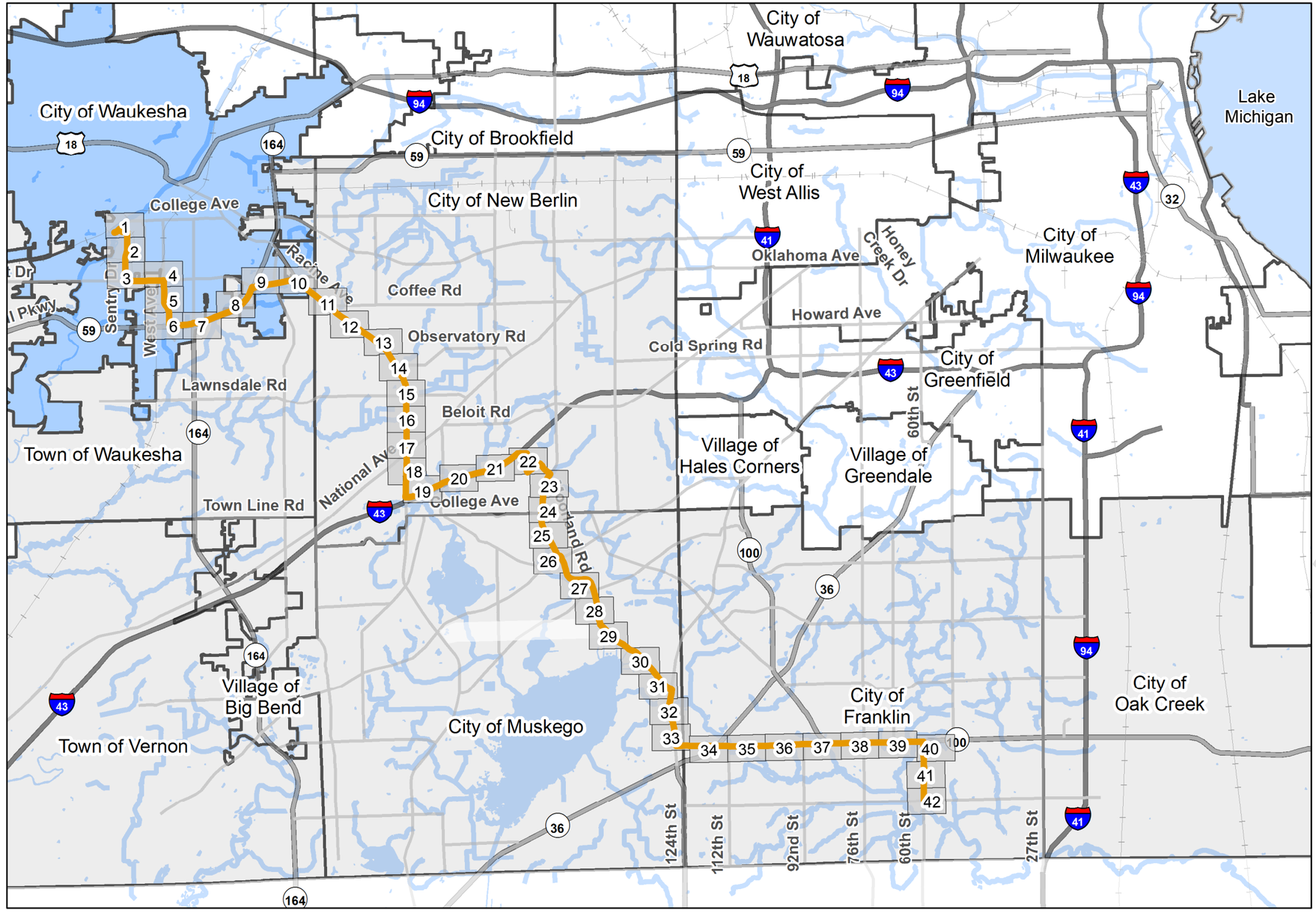
maintain good relationships with the neighboring communities who are being impacted during the construction of the infrastructure to serve the community of Waukesha.

- New Berlin has expressed concern over reconstructing recently rebuilt roads in their community. Refer to Appendix B for a letter from the Mayor of New Berlin expressing concern regarding the impact to the residents of New Berlin. In addition to WWU's desire to maintain good relationships with their neighboring communities, New Berlin City Ordinance 275-15 gives the planning commission the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin, which has the potential to delay the Program.

- If approval is granted by WisDOT, the Return Flow Pipeline would be located along the northern right-of-way line. In the unlikely event of a failure of the Return Flow Pipeline, there will be minimal risk to the traffic along Interstate 43.
- The wetlands along Route Alternative 9 have been field-delineated and documentation has been prepared for the Wetlands and Waterways Individual Permits Application. Route changes would delay design and submittal of the Wetlands and Waterways Individual Permits Application. Wetland delineation has seasonal constraints; the growing seasons in 2017 and 2018 began in April and ended in late October of each year. Wetland delineation and survey had proceeded in advance of approval of this Hardship Application in order to maintain the schedule stipulated in the July 2017 Amended Stipulation and Order for Amended Judgment, refer to Appendix G and accommodate the seasonal restriction. Per that court order, if the new water supply project is not under contract and certified to be 50% complete by May 1, 2022, WWU must initiate construction of interim radium treatment. Further delays on approval or denial of this Hardship Application will progressively put the Program at risk for not meeting the schedule. Construction of interim radium treatment caused by further delays would increase the financial burden on Waukesha ratepayers for the interim treatment but not eliminate the need for the new water supply project.

The Return Flow Pipeline route alternatives evaluated that do not utilize the Interstate 43 corridor would create a hardship for WWU, Waukesha, Waukesha ratepayers, and the residents of New Berlin. Waukesha ratepayers will already incur rate increases on the order of three times current rates due to the water supply transition to Lake Michigan water. Route alternatives other than Route Alternative 9, which uses the Interstate 43 corridor, would cause additional costs to be incurred to Waukesha ratepayers. Furthermore, locating the Return Flow Pipeline in the Interstate 43 corridor would minimize impacts to the residents of New Berlin. The documentation herein supports the conclusion for an exception to 23 CFR 1.23 (c) to locate the Return Flow Pipeline in a portion of the Interstate 43 right-of-way.

Appendix A – Return Flow Pipeline Preliminary Horizontal Alignment



Legend

- Return Flow Pipeline
- # — Panels, see attachments
- Municipality within Oak Creek Route Study Area

Significant Features

- Interstates
- State Highways
- Local Roads
- Railroads
- Surface Waters

N

1" = 10,000'

0 5,000 10,000 20,000 feet

DRAFT

Plotted: 4/20/2018
Document Path: \\GH-DATA01\client02\15310-Waukesha Great Lakes Water Supply PM-CM\24 GIS\24.05 Working_MXDs\Working_Milwaukee_NewI-43 HardshipKey_Map_04102018.mxd

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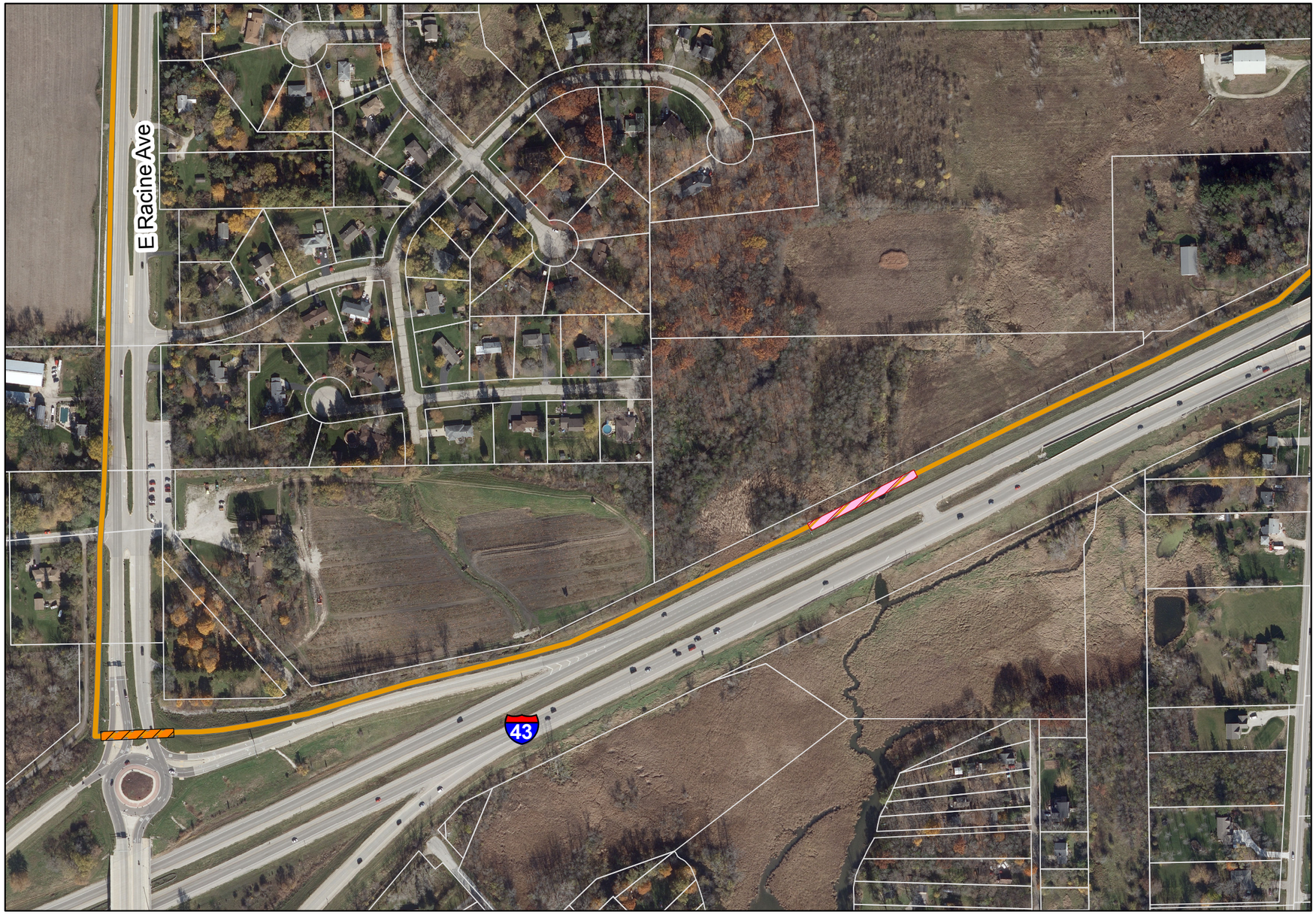
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Waukesha, Wisconsin
Great Lakes Water Supply Program

Return Flow Pipeline Key Map

Date: 4/20/2018

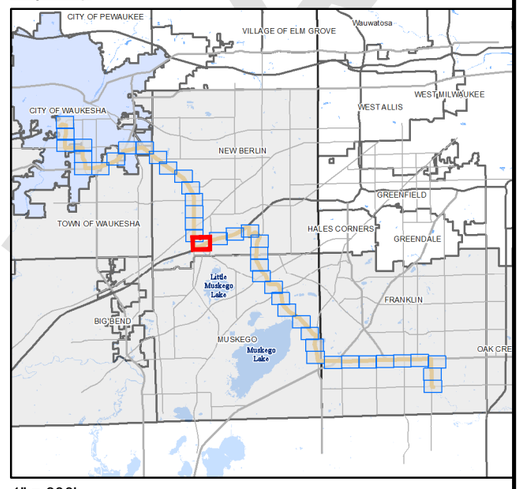


Legend

- Return Flow Pipeline
- Casing (Jack and Bore Method)
- Horizontal Directional Drilling (HDD)
- Easement Required (50 ft wide)

N

Key Map



1" = 300'

0 150 300 600 feet

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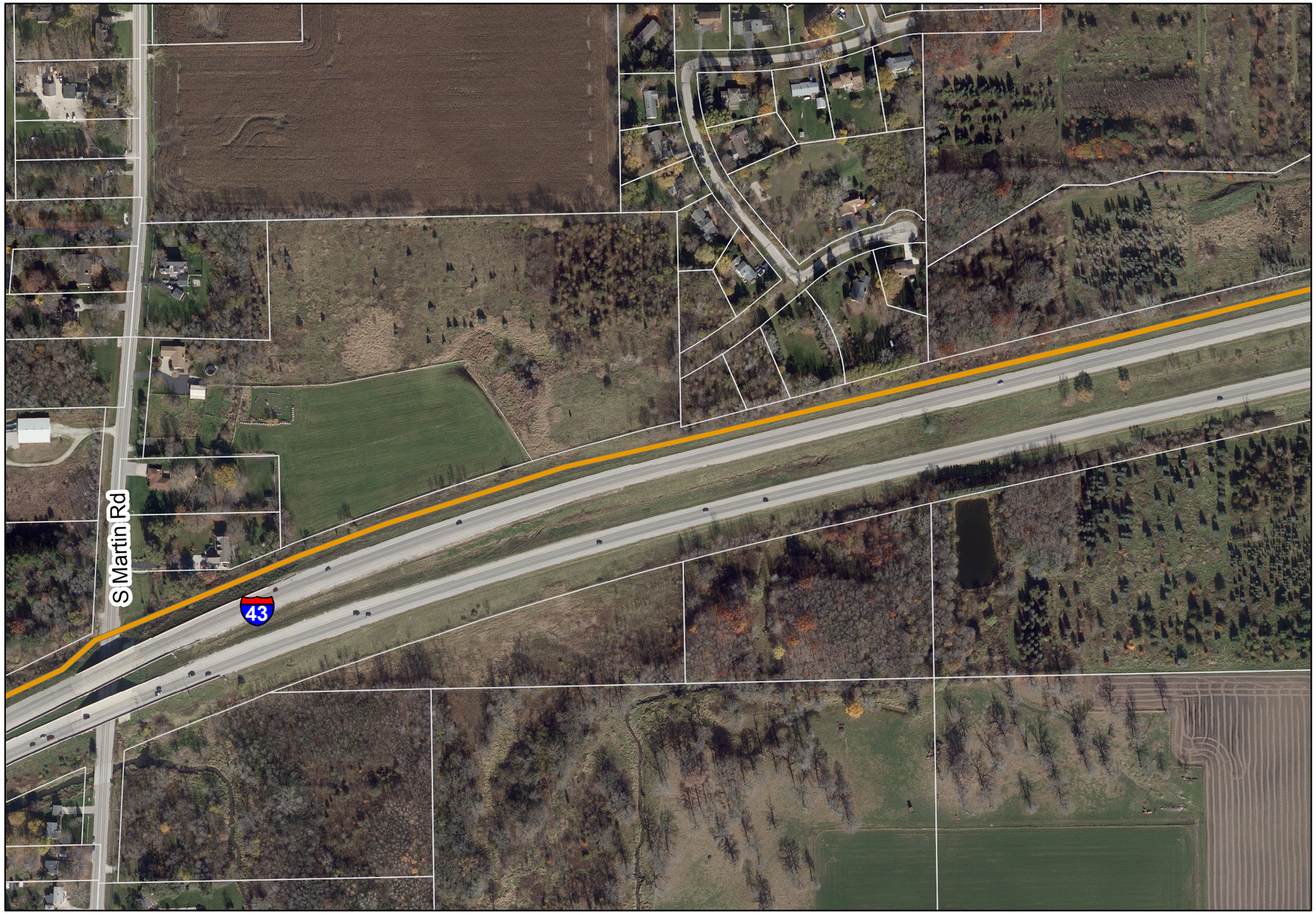
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Return Flow Pipeline - Panel 19 of 42

Date: 4/30/2018

Plotted: 4/30/2018
Document Path: \\GH-DATA01\client02\15310-Waukesha Great Lakes Water Supply PM-CM\24 GIS\24.05_Working_MXDs\Working_Milwaukee_New\I-43 Hardship\I-43 Hardship Panels_04102018_Use.mxd

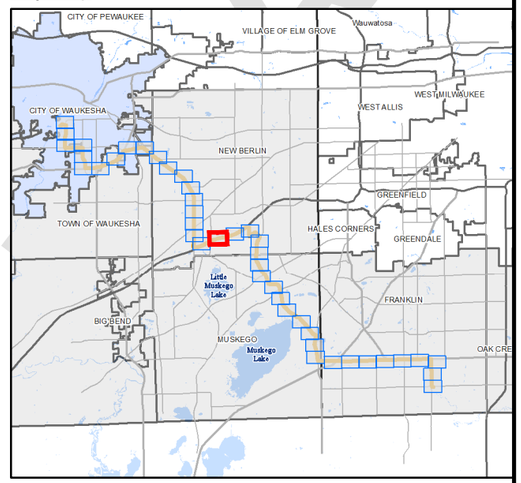


Legend

- Return Flow Pipeline
- Casing (Jack and Bore Method)
- Horizontal Directional Drilling (HDD)
- Easement Required (50 ft wide)

N

Key Map



1" = 300'

0 150 300 600 feet

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Return Flow Pipeline - Panel 20 of 42

Date: 4/30/2018

Plotted: 4/30/2018
Document Path: \\GH-DATA01\client02\15310-Waukesha Great Lakes Water Supply PM-CM\24 GIS\24.05_Working_MXDs\Working_Milwaukee_New\I-43 Hardship\I-43 Hardship Panels_04102018_Use.mxd



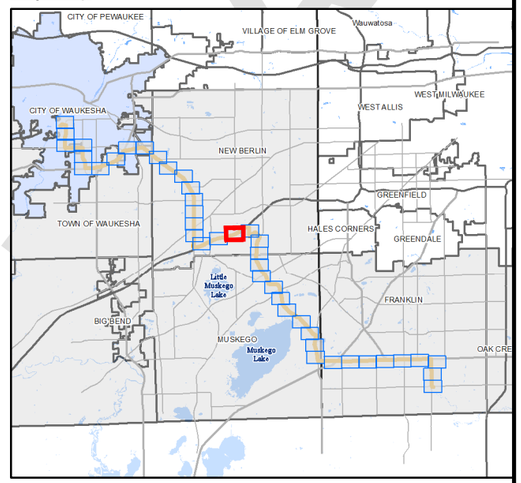
Legend

- Return Flow Pipeline
- Casing (Jack and Bore Method)
- Horizontal Directional Drilling (HDD)
- Easement Required (50 ft wide)

N

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Key Map



1" = 300'

0 150 300 600 feet

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Date: 4/30/2018

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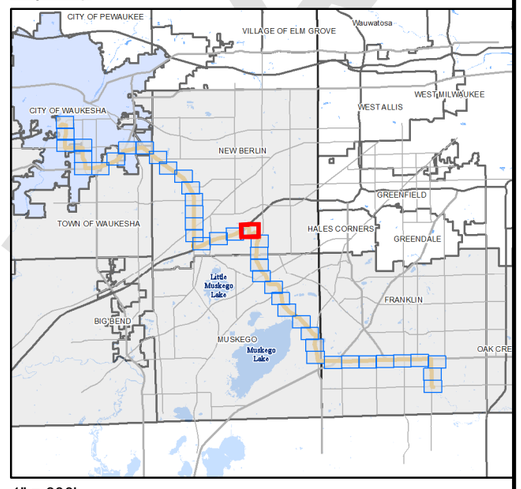


Legend

- Return Flow Pipeline
- Casing (Jack and Bore Method)
- Horizontal Directional Drilling (HDD)
- Easement Required (50 ft wide)

N

Key Map



1" = 300'

0 150 300 600 feet

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Return Flow Pipeline - Panel 22 of 42

Date: 4/30/2018

Plotted: 4/30/2018
Document Path: \\GH-DATA01\client02\15310-Waukesha Great Lakes Water Supply PM-CM\24 GIS\24.05_Working_MXDs\Working_Milwaukee_New\I-43 Hardship\I-43 Hardship Panels_04102018_Use.mxd

Appendix B – Letter from New Berlin Mayor Ament

City of New Berlin
city living with a touch of country

Mayor David A. Ament

3805 South Casper Drive • New Berlin, Wisconsin 53151-0921 • (262) 786-8610 • Fax (262) 786-6121 • www.newberlin.org

August 23, 2018

Robert Fasick
State Right-of-Way Permits Engineer
Bureau of Highway Maintenance
4822 Madison Yards Way, 5th Floor South
Madison, WI 53705

Dear Mr. Fasick

The City of New Berlin has been collaborating with the City of Waukesha and the Waukesha Water Utility to minimize the impacts in transitioning the City of Waukesha's water supply to Lake Michigan water. The City of New Berlin has hosted two open houses to solicit feedback on the proposed routes from New Berlin residents. City of New Berlin officials and representatives of the Waukesha Water Utility's Great Water Alliance have also met multiple times to work in conjunction on the design of the Program to minimize impacts to the residents of New Berlin.

The City of New Berlin supports the Waukesha Water Utility's request for an exception from the Wisconsin Department of Transportation (WisDOT) to utilize the Interstate 43 right-of-way between Racine Avenue and approximately 1,800-feet east of Calhoun Road for the installation of a pipeline. Locating the pipeline within the Interstate 43 right-of-way would minimize construction impacts to the residents of New Berlin and would limit construction within New Berlin roads that have been recently reconstructed.

If the Waukesha Water Utility is not granted the exception for Interstate 43 right-of-way, the pipeline will have to be constructed through the roads and right-of-ways of the City of New Berlin. Several of the route alternatives utilize Beloit Road and College Avenue, both of which are classified as primary arterial roads that are an important part of New Berlin's infrastructure. Beloit Road was recently reconstructed in 2017 and opened in 2018. Construction utilizing either Beloit Road or College Avenue would require road closures for open cut or trenchless installation and would have negative impacts on the residents of New Berlin, visitors and employees of New Berlin's Business Parks.

I hope WisDOT considers the effect on the residents and businesses of New Berlin in reviewing the Waukesha Water Utility's request for an exception to use right-of-way in the Hardship Application.

Sincerely,

Mr. David Ament
Mayor, City of New Berlin

Appendix C – Waukesha Freeman Articles

FRIDAY
June 30, 2017
75¢
gmtoday.com



4th of July festivities in Waukesha County ► 2A



Personality on a plate

Old-time bar gets new life in Big Bend ► 3A

The FREEMAN

Waukesha County's Daily Newspaper

Bands, musicians return for tuneful Throwback Thursday



Ashley Haynes/Freeman Staff

A large parade makes its way through the Summerfest grounds as onlookers gathered to watch. Everything from a marching band to stilt walkers provided a spectacle.

By Ashley Haynes
Freeman Staff

MILWAUKEE — This Thursday was Throwback Thursday at the annual Summerfest music festival. In honor of the event's 50th anniversary, bands and musicians who have performed within the last few decades returned to Henry Maier Festival Park. Throwback Thursday is a celebration of five decades of music that have brought the community together.

Summerfest is well-known for being a national and even local gathering. Artists like pianist David Gogi have traveled hundreds of miles for the chance to perform.

"The thing is, for summer, I have a long holiday for three or four months, so I just check out some festivals," said Gogi.

Gogi is a 27-year-old PhD student in physics at the University of Texas – Austin. He plays the piano as a hobby and to make some extra cash. This year was his second performing at Summerfest. He travels to festivals all over the country and says Summerfest is one of his favorites.

"Well, it was probably the best festival that I've been to," said Gogi. "The attendance is crazy, I heard it's more than a million people, and last year I saw one of my favorite artists here."

See **SUMMERFEST**, PAGE 8A

Ex-Falls teacher gets 2 years for sex with student

Judge: Novak's actions cast 'dark cloud' over school community

By Brian Huber
Freeman Staff



Novak

WAUKESHA — A former teacher at Menomonee Falls High School who had sex with a student in her classroom repeatedly was sentenced Thursday to serve two years in prison for conduct a judge said cast a "dark cloud" over the entire school community even if she did not initiate it.

April Novak, 32, was convicted of three counts of sexual assault of a student by a school staff member in a plea agreement that saw nine other counts dismissed. She was ordered to serve two years in prison and three years on supervision for each count concurrently, during which she must have no contact with the male victim, the school or anyone under 18 except her own children, Waukesha County Circuit Court Judge Ralph Ramirez ordered. Novak also must register as a sex offender.

Novak resigned her position with the school in December 2015, shortly before charges were filed against her. Menomonee Falls police were contacted after an internal investigation conducted by the school, which began after another teacher thought he saw Novak and the student kissing in her classroom.

The detectives spoke with the student, who said he and Novak had "less than 12 times" engaged in sexual intercourse on her classroom couch. He said they also performed oral sex on each other multiple times, and all of the sexual contact occurred in Novak's classroom.

Deputy District Attorney Ted Szczupakiewicz asked for a prison term, saying Novak violated the trust the student, his family, the school and the entire community placed in her to nurture children. He said all have a right to expect teachers can be trusted with children, and "the line here can't be any clearer."

See **NOVAK**, PAGE 8A

Police describe Simek murder suspect

Believe killing of Oconomowoc woman was random

MILWAUKEE — Milwaukee Police held a press conference Thursday requesting the public's assistance in tracking the man who killed a 53-year-old Oconomowoc woman in a Jan. 31 robbery.

Karen Simek was heading to her employer, Garden Fresh Foods of Milwaukee, when she was robbed and shot around 5:40 a.m. that day in the 700 block of South 12th St.

The murder was believed to be random with the motive being the bag which was taken from Simek, Milwaukee Police Sergeant and Public Information Officer Timothy Gauerke told The Freeman on Thursday.



Submitted photo

A still shot from a store surveillance video shows the man Milwaukee Police believe murdered Oconomowoc resident Karen Simek on Jan. 31.

See **SIMEK**, PAGE 8A

WAUKESHA GREAT LAKES DIVERSION

New Berlin residents worried about pipeline's impact on private properties

By Hannah Weikel
Freeman Staff

NEW BERLIN — At the final public Waukesha water pipeline meeting on Thursday night, New Berlin residents aired concerns about proposed routes and made it clear construction isn't welcome in their backyards.

The route is still undetermined, but the narrowed options show three different routes through New Berlin, and they could run through several private properties. The people whose properties are being considered as part of this project were contacted by their local mayor more than two weeks ago and invited to learn more at the sessions this week, said Dan Duchniak, general manager for Waukesha's Water Utility.

Most at the New Berlin Public Library on Thursday came to figure out how the proposed routes would affect their property and roadways. None said they wanted the pipeline near their home.

Jim and Mary Ann Gueme said they read about the public meeting in the local paper and wanted to know how close the pipeline would come to their property.

The couple recently spent a few thousand dollars on landscaping their yard, and worried that construction could ruin the flowerbeds.

"We just want to enjoy our yard before we die," Mary Ann joked.

The Guemes said the renderings of three route options on display took all their concerns away; the pipeline would not be built near their home.

See **WATER**, PAGE 8A

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Opinion.....6A
Sports.....1B
Weather.....8A

Volume 159, No. 68

Fun Things To Do This Weekend

Pop-Up Beer Garden, 4 p.m. to 9 p.m. today, Minooka Park, corner of Racine Avenue and Sunset Drive, Waukesha. Beer by Raised Grain Brewing.

Big Band 4th, 6:30 p.m. today, Sharon Lynne Wilson Center for the Arts, 19805 W. Capitol Drive, Brookfield. Part of the Wilson Center's Starry Nights Series. Performed by Wisconsin Philharmonic. Free.

Eble Public Skate, noon to 2 p.m. today, Saturday and Sunday, Eble Park Ice Arena, 19400 W. Bluemound Road, Brookfield. Adults $6.50, juniors (under 18) $5. Skate rental $2.50, skate sharpening $5.

Waukesha's Friday Night Live, 6:30 p.m. to 9 p.m. today, downtown Waukesha.

Delafield Contra Dance IndepenDance Weekend, today through Sunday, Prairie Hill Waldorf School, N14-W29143 Silvernail Road, Town of Delafield. Two bands and two callers starting this evening at 8 p.m. More info at www.delafield-contra.com

"The Comedy of Errors," 5 p.m. to 9 p.m. today, SummerStage at Lapham Peak, W329-N846 Highway C, Town of Delafield. www.summer-stage.org

Waukesha Farmers Market, 8 a.m. to noon Saturday, corner of Madison Street and East St. Paul Avenue. www.waukeshafarmersmarket.com

Hartland 125th Anniversary Celebration, events throughout Saturday, Hartland. 8:30 a.m. 5K Family Run/Walk; bounce houses 9 a.m. to 1 p.m.; arts and crafts vendors 9 a.m. to 2 p.m.; family friendly obstacle course 10 a.m. to noon; pie baking contest; old fashioned games noon to 2:00 p.m.; and more. www.village-ofhartland.com

Family Fest, 6 p.m. to 9 p.m. Tuesday, Mitchell Park, Brookfield. Family-oriented games and activities, huge bouncing inflatables, free face painting, stilt walkers, a variety of food, and entertainment.

WEATHER

Tomorrow: Partly sunny
High 76
Low 58

See complete forecast on 8A

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FIVE-DAY FORECAST

TONIGHT
Chance of thunderstorms
61

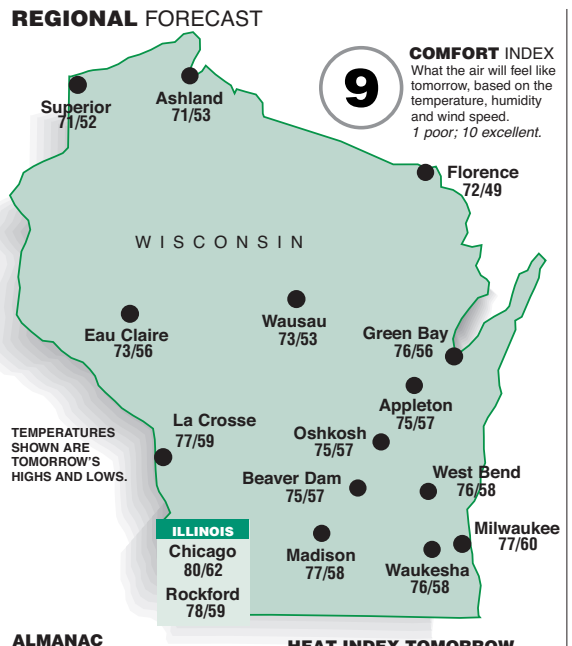
TOMORROW
Partly sunny
76/58

SUNDAY
Chance of thunderstorms
78/61

MONDAY
Chance of thunderstorms
75/60

TUESDAY
Partly sunny
75/61

REGIONAL FORECAST



TEMPERATURES SHOWN ARE TOMORROW'S HIGHS AND LOWS.

COMFORT INDEX
9
What the air will feel like tomorrow, based on the temperature, humidity and wind speed.
1 poor; 10 excellent.

ALMANAC
Statistics for yesterday

High/Low, Waukesha	77/64
High/Low	81/66
Normal High / Low	79/62
Last year's high for date	75
Last year's low for date	53
Precipitation, Waukesha	1.03"
Precipitation	0.19"
Precip. month to date	5.21"
Normal month to date	3.77"
Precip. year to date	22.00"
Normal year to date	16.41"

* Precipitation source, Gen. Mitchell International, Milwaukee. Precipitation is the liquid equivalent of snow, ice and rain.

Jun. 30 First Q	Jul. 9 Full	Jul. 16 Last Q	Jul. 23 New

Sunset today 8:35 p.m.
Sunrise tomorrow 5:18 a.m.

HEAT INDEX TOMORROW
A composite of the effects of temperature and humidity on the human body.

8 a.m.	63
Noon	70
4 p.m.	76
8 p.m.	74

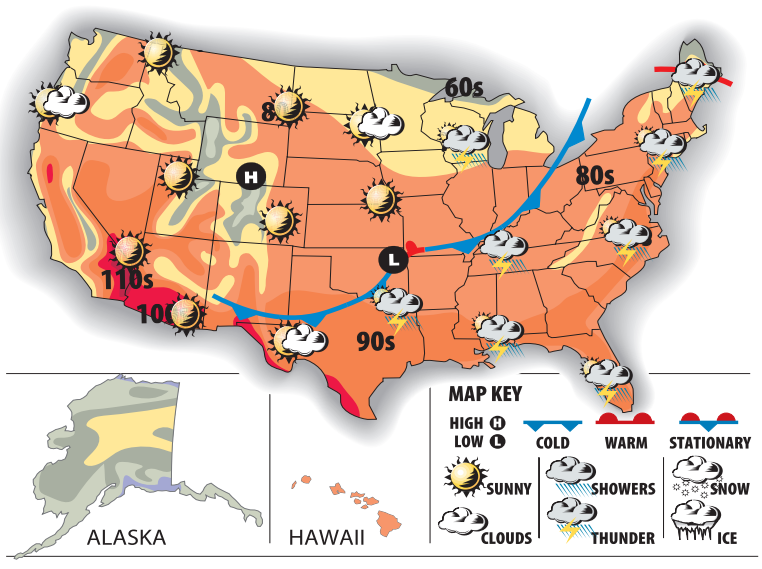
COOLING DEGREE
An index of energy consumption indicating how many degrees the day's mean temperature was above 65 degrees.

Yesterday	4
Month to date	
Year to date	
Normal season to date	

Moonrise tomorrow 12:40 p.m.
Moonset tomorrow 12:59 a.m.

NATIONAL FORECAST

Saturday, Jul. 01, 2017



SOUTHEASTERN WISCONSIN

Tonight: Mostly cloudy with a 40 percent chance of light showers and thunderstorms. Lows in the lower 60s.
Saturday: Partly sunny with a 20 percent chance of light showers and thunderstorms. Highs in the mid-70s.

MARINE FORECAST

Lake Michigan near shore forecast:
Tonight: Southwest wind 5 to 10 knots, veering west after midnight. Chance of showers and thunderstorms.

Lake Michigan water temperature is 53 degrees.

ULTRAVIOLET INDEX FORECAST

The UVI forecast for Saturday is **8**

UV scale and warnings on possible skin damage: 0-2 low risk, 3-5 moderate risk,6-7 high risk, 8-10 very high risk, 11-over extreme risk.

All maps, forecasts and data provided by
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TRAVEL ADVISORY FOR TOMORROW

ATLANTA High: 88 Low: 71	CHICAGO High: 80 Low: 62	DALLAS High: 91 Low: 77
DENVER High: 85 Low: 58	LOS ANGELES High: 71 Low: 62	MIAMI High: 89 Low: 80
MINNEAPOLIS High: 75 Low: 60	NEW YORK High: 86 Low: 73	PHOENIX High: 110 Low: 83
SEATTLE High: 75 Low: 57	ST. LOUIS High: 86 Low: 67	WASHINGTON High: 90 Low: 74


Waukesha County to the Main Gate
Kids 12 & Under Only $5 before 3 PM
$10 Round Trip from various Waukesha County Park & Rides. That's only $5 each way (round trip ticket required)!
WisconsinCoach.com For Park & Ride Locations

Summerfest

From Page 1A

Gogi names Paul McCartney, Def Leppard and Blink-182 as some of the favorite bands he has seen at Summerfest. This year, he was able to attend the Red Hot Chili Peppers concert.

"Everything is organized great and I'm having a great time myself," said Gogi. "For me, it's a bunch of memories that I'll be thinking of for the rest of the year."

He continues performing in the hope that he might someday catch a break and someone will recognize his musical talents.

While Gogi represents a new generation of Summerfest attendees who are making fresh memories, older couples like Debbie and Gary White represent the old-school generation that has been coming for decades. Debbie White has attended the festival for 40 years.

"When I started coming down here, there was only like the one big-name stage, and I remember seeing all this music for free," said Debbie White.

Both Debbie and Gary White are Milwaukee natives. They actually met each other at Summerfest back in September of 2000. They describe Summerfest as the place to be and hang out with your friends back in the day. Now, they come to relive their memories and have a beer by the lake.

"My friends and I came down here almost every single day when I was in high school, in the late 70s," said Debbie White. "I remember there being just a long dirt road, and none of these little stages were here."

She said she does recognize some of the bands that returned to Summerfest this year for Throwback Thursday. She remembers Foghat and Toto, as well as the band Fishbone. She said just being at Summerfest makes the beginning of summer real for her and she looks forward to returning for many more years to come.

Email: ahaynes@conleynet.com



Ashley Haynes/Freeman Staff

Artist Nora Collins performs at the Tiki Hut near the lake, providing a mellow vibe for listeners.



There were artists performing every genre of music at small stages all over the Summerfest grounds on Thursday.



Groups representing all kinds of causes marched during the Summerfest parade. The Beevangelists are on a mission to save the bee population.

Summerfest highlights Saturday, July 1

Admission special: Goodwill Day — noon to 3 p.m.: First 1,500 patrons receive 1 free general admission ticket valid for the day when presenting an original specially marked receipt showing a minimum purchase of $10 at a Goodwill Store between June 1 and July 1.

Amphitheater Headliner
Zach Brown Band

Miller Lite Oasis
5 p.m. The Naked and the Famous
10:15 p.m. Bleachers

BMO Harris Pavilion
8 p.m. The Terry Sims Band
9:45 p.m. Maze featuring Frankie Beverly

Harley-Davidson Roadhouse
8 p.m. Greta Van Fleet
10 p.m. Shinedown

Briggs & Stratton Big Backyard
4 p.m. Tonic
6 p.m. Alter Ego
10 p.m. Collective Soul

U.S. Cellular Stage
8 p.m. Hey Violet
10 p.m. Bebe Rexha

Uline Warehouse
5 p.m. John Waite
10 p.m. Blues Traveler

Johnson Controls World Sound Stage
8 p.m. Dead Horses
10 p.m. Horseshoes & Hand Grenades

JoJo's Martini Lounge
8 p.m. Spoiled Rotten

Water

From Page 1A

Their one complaint was the minimal amount of advertisements calling residents to last night's meeting. They said once construction begins on the pipeline, many New Berlin residents will likely be upset and not know there was ample opportunity to give feedback.

Duchniak said he has stressed to residents that the three sections of pipeline — through Muskego, New Berlin and Franklin — aren't set in stone yet. He said if someone living in the 13 or 14 homes that could be impacted by the pipeline has a big problem with it running through their property, Waukesha will do its best to work around them.

But some in attendance considered any selection from the three route options through New Berlin to be picking the "lesser of three evils."

A group of four neighbors, none of whom wanted to be named, said they live in farmhouses west of Calhoun Road, and were invited to the meeting by their mayor because one of the route options would run through their properties and near existing structures, which one man described as historic barns and farm buildings that have been on the property since his family settled there in the late 1800s.

The group said they felt their concerns weren't met with much sympathy at the meeting, and said they'd prefer the construction to stay on the road right-of-way, which only skims a corner of their collective properties.

A road right-of-way is an easement that is reserved or granted over a piece of property for transportation purposes, be it a trail, highway or pipeline.

They told Duchniak they'd like Waukesha to pick a route option as soon as possible, to eliminate their guessing.

Email: hweikel@conleynet.com



Hannah Weikel/Freeman Staff

Waukesha Water Utility General Manager Dan Duchniak talks with a group of New Berlin residents whose properties could be seeing pipeline construction.

Simek

From Page 1A

The department is describing the suspect as a black male with a light complexion, 20-27 years old, 5'6" to 5'7," between 140 and 150 pounds, with a short Afro-style haircut.

Surveillance video of the man from area businesses leads police to believe he either lives in or frequents the area of Cesar Chavez Drive to 27th and Pierce St. to Greenfield Avenue.

Gauerke said some witnesses have told the department they saw the man walking in the area.

The department is also still seeking Simek's bag. It is described as a gray or tan women's canvas travel or tote bag made by Duluth Trading Company. The bag has a front zipper pocket and a zipper closure main compartment. It is approximately 13 inches wide and 15 inches tall.

The department is asking anyone with information to call 414-935-7360.

Simek's husband, Kevin Sasse, previously told The Freeman that he and his wife had moved to Oconomowoc in 2003. Both grew up in Waukesha County.

— Freeman Staff

Novak

From Page 1A

"Miss Novak certainly threw away a great deal by having a sexual relationship with a young boy at Menomonee Falls High School. Her marriage, her relationship with her children, none of those was enough to get her to pause and say, 'I can't do this,'" he said.

Defense attorney Michael Hart argued that prison was not necessary to meet the demands of justice, saying "she wasn't of sound mind. She wasn't properly thinking of her young children or the repercussions of her inappropriate behavior."

He added the victim, a boy over 6 feet tall and near 17 years old, pursued Novak, who resisted at first.

But, he said, Novak, in a troubled marriage that has since ended, was not getting the love and support at home she felt she needed, and "fell into a relationship that cannot be condoned by a civilized society."

Dr. Jeffrey Taxman, a psychiatrist working with Novak since she was charged, described the difference in her from then to now as like two different people.

She suffered from panic attacks since childhood, had an inferiority complex and a strong fear of failure and rejection. Her first marriage ended in divorce, as has her second, which bore her two children, one with special needs, he said.

By 2015, she'd become more depressed and withdrawn, and began receiving positive attention from the student, with her saying that attention, not the sex, made her attracted to him. Without treatment she "fell apart," Taxman said, but with treatment has behaved appropriately, finding work and also a new age-appropriate relationship. He said Novak is not a predator, has shown no interest in physical closeness with children and has behaved such that her likelihood of reoffending is minimal to zero.

Novak apologized for her actions and thanked her family and friends for unconditional love and support.

"I was the teacher, the adult. I made a gross lapse in judgment. As a mother of two young boys I am repulsed by my conduct," she said. "I am sorry. I disappointed and failed you all and I regret it."

Larger impact

Ramirez said the crime had an impact on the larger community, painting teaches with a broad brush. "This is a dark cloud on a lot of people. It's not just you and the student, it affected lots of people ... in a very negative way."

He also, at the state's request, dismissed and considered for sentencing a recent bail jumping charge stemming from an incident this month where Novak went to her ex-husband's home and angrily confronted him and his new girlfriend in the presence of her children, breaking a screen door. She's paid the restitution for that, and as part of her sentence was ordered to have no contact with the girlfriend and contact with her ex-husband regarding their children at his discretion, following an order in a family court case.

Ramirez said he understands Novak lost nearly everything due to what was essentially consensual conduct that also was inappropriate sexually, emotionally, legally and morally. But to put her on probation only would send the wrong message to the community and unduly underestimate the seriousness of the offense, he said.

Afterward, Bonnie Boatwright, who said she was the victim's grandmother, said the victim and his family have left the state. She said she felt Novak deserved some prison time, but didn't want to see her locked up for years. "She needed some time," Boatwright said. "It's unfortunate. I feel for her children but my grandson has got to live with it, too."

Email: bhuber@conleynet.com

FRIDAY
February 16, 2018
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NEWS2USE

Study: Skipping breakfast not good idea in long run ► 8B



How to know when to seek medical help for flu ► 8B

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THEY'RE OUT!

City administrator ends discussions with Big Top Baseball; cites lack of support from public, council



Rendering provided by Big Top Baseball

Big Top Baseball's proposal to bring a Northwoods League team to Frame Park included plans for a 2,500-seat stadium. City Administrator Kevin Lahner has decided not to continue with the project.

By Cara Spoto
cspoto@conleynet.com
262-513-3562

WAUKESHA — Waukesha City Administrator Kevin Lahner has called it quits on a proposal to build bring amateur baseball to Frame Park.

In statement issued Thursday night, Lahner stated that the proposed partnership with Northwoods League developer Big Top Baseball would not be moving forward.

In the statement, Lahner says the administration appreciated the "input and effort from all the individuals who provided their opinions" and would still be pursuing redevelopment efforts in the Whiterock Avenue/East Main Street corridor.

Speaking to The Freeman, Lahner said a lack of public and aldermanic support for the $4.5 million project prompted the move.

"I think, at the end of the day, there just wasn't enough support for it, from the public and ultimately from the council," said Lahner, adding that the decision to cease moving forward with the project was largely his.

That's something Mayor Shawn Reilly confirmed.

"If Kevin wanted to keep pursuing it I wouldn't have stopped him," said Reilly, adding that he also didn't feel comfortable moving forward with the project given the level of opposition.

"I guess I was surprised that there was so much opposition to it, even with the use of Frame Park," Reilly said.

SOUND OFF

What do you think?

Phone: 262-513-2641
Email: soundoff@conleynet.com

Reaction

Oddly enough, opponents and proponents of the project both said they were disappointed by the news.

Scott Anfinson, a member of the Friends of Frame Park, said he was sad Big Top and the city couldn't find a way to develop a stadium elsewhere in Waukesha, while Common Council President Aaron Perry, an early backer of the proposal, said he was disappointed there wasn't a vote on the project.

"It is not the fault of the administration or Big Top Baseball. I understand their position and their needs," said Perry.

But he bemoaned the negativity put forward by some people opposed to the project.

"Based on what I have seen on social media, there has been a small handful of them who have not shown the best version of themselves," he said. "They are going to look at this as a win, and I really hope it doesn't set a precedent."

In a press release issued Thursday evening, Big Top Baseball's president Vern Stenman and its chief operating officer Conor Caloia thanked the city and Common Council for discussing the company's proposal.

"Historically, our franchises and venues have united communities. Unfortunately, this idea was more divisive than we like to see," the pair said in the joint statement. "We want to be in communities where the residents and elected officials share our vision."

Alderman Vance Skinner, who expressed serious reservations about the city and Big Top's plan, nevertheless was hopeful on Thursday that a baseball team "or something like it" will someday make Waukesha its home.

"I still hold out hope that it's possible. Maybe there is another partner that is willing to look at Waukesha and maybe put up some more of their own dollars," Skinner said.

Vocal opposition

News first broke that Big Top was considering Waukesha for its latest baseball franchise this past summer, but administration officials didn't present an official proposal for the $4.5 million project until December.

Within days a vocal group of citizens calling themselves the Friends of Frame Park raised opposition to the plan, which called for constructing a 2,500-seat outdoor stadium at Frame Park.

The group partnered with Karen Frame McDonald — the great granddaughter of Andrew and Emma Frame — and filed a lawsuit arguing that deed restrictions on the land donated to the city by the Frames prevent it from being leased to a private entity.

The group also pointed to federal land use restrictions that they say prevent the city from leasing part of the park to a private entity.

On Thursday Lahner called the land use concerns "non-issues."

"We may still move those lawsuits forward to get a judge's ruling," he said. "We are extremely confident about our legal position on those matters."

Financing concerns

But land use wasn't the only sticking point for opponents and others reticent about the plan.

The proposed financing for the project, which called for the city to shoulder $4 million of the $4.5 million capital investment, raised concerns among some aldermen.

Although the plan called for Big Top to put up $500,000 of the construction costs and pay the city $175,000 annually as part of a 20-year lease, many aldermen had qualms about the city's plans to use a tax increment finance district to pay back the debt.

News of Waukesha pulling away from the deal comes two days after the city pulled the consideration of a new financing plan for the project from a committee meeting agenda.

Lahner said Thursday that the administration had been working on a financing plan for the project that didn't include the use of TIF funds when he made the decision to put on the brakes.

"We were very, very confident that it would work," he said.

WAUKESHA WATER PLAN

New Berlin farm spared after pipeline shifts routes

Residents, local leaders express concerns about all three options through city

By Hannah Weikel
hweikel@conleynet.com
262-513-2651

NEW BERLIN — Al Salentine says he couldn't stand the thought of his New Berlin farm — in the family since the 1850s — getting dug up for a water pipeline, so he started making calls.

Salentine's family farm sits on approximately 82 acres of land, shaped into a triangle by National Avenue, Calhoun Road and Beloit Road — all near where the Waukesha Water Utility plans to lay a pipeline that would carry Lake Michigan water from Milwaukee to Waukesha. In an earlier route plan, the utility had considered running the pipeline through Salentine's farm, but he put up a fight and they have since decided the route would "skirt" around the land, he said.

Still, the area around Salentine's farm may see none of the pipeline construction. Three routes are still being considered and a decision won't be reached until later this year, utility officials say. Alternative routes have the pipeline running down Coffee Road or Observatory Road to eventually meet up with Racine Avenue and into Minooka Park, where a water reservoir and pumping station will be built.

At a public information meeting in New Berlin Thursday night, every resident and city official in attendance opposed a different route. Some said the pipeline should avoid Coffee Road and Beloit Road, which were just repaved in the last year or two. Others said National Avenue sees heavy traffic and any construction closures would muck up commutes to and from the city.

But ultimately, the water pipeline isn't being built to help New Berlin, said District 2 Ald. Chuck Garrigues. It's necessary for Waukesha and one of the routes will be picked eventually. Information meetings, like Thursday's in New Berlin, allow the utility to gather feedback on the route options, but a decision will have to be made and there will be some who are unhappy about it, he said.

Garrigues came to Thursday's meeting at New Berlin City Hall with Ald. John Hopkins, Ald. Keith Heun and Council President Kenneth Harenda. They pointed out a railroad route that cuts through New Berlin and takes a straight line to Waukesha.

"We are questioning why they aren't using that railroad," Heun said, adding that it looked as short as the three routes that use county and city roads.

Dan Duchniak, Waukesha Water Utility general manager, said the railroad isn't totally abandoned and the pipeline "can't run parallel to a railroad."

Still, he agreed to look into it and said he appreciates the feedback.

Harenda said even though the railroad has pulled tracks at road crossings in some places, it has the right to start using it at any time.

Waukesha's return pipeline — carrying the city's treated wastewater to the Root River in Franklin — will also go through New Berlin, but that route has already been selected, Duchniak said. A team of researchers and engineers are running tests on the land along the return flow route, and any environmental or other issues could trigger some minor changes in that path, he said.

More public meetings will be held as plans progress, but none have been scheduled yet.



Wings start playoffs with win over Stoughton ► 1B



Arrowhead, Mukwonago, KM boys all win to stay on top of packed Classic 8 standings ► 1B

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Volume 159, No. 230

Fun Things To Do This Weekend

St. Paul Fish Fry, 4:30 p.m. to 7:30 p.m. today, St. Paul Parish, S38-W31602 Wern Way, Genesee Depot. All-you-can-eat dinner includes fried fish, baked fish, French fries, baked potatoes, coleslaw, bread, grilled cheese, apple sauce, coffee, and relish tray, as well as one milk and one dessert. Beer, soda, extra milk available for purchase. $12 for adults, $6 for children (ages 5-11). https://stpaulgenesee.net/fish-fry

"The Complete Works of William Shakespeare (Abridged)," 7:30 p.m. today, 2 p.m. and 7:30 p.m. Saturday, 2 p.m. Sunday, Waukesha Civic Theatre, 264 W. Main St., Waukesha. 262-547-0708, www.waukeshacivictheatre.org

Prairieville Desperados, 1 p.m. Saturday, Wern Valley Sportsmen Club, S36-W29657 Wern Way, Town of Waukesha. Give Cowboy Fast Draw shooting a try. Everything supplied. In a heated building.

Dragons Love Tacos storytime, 10 a.m. Saturday, Books & Company, 1039 Summit Ave., Oconomowoc. Special dragon storytime. www.booksco.com

Chinese Lion Dance Show, 2 p.m. to 3 p.m. Saturday, Golden Gate Restaurant, 1427 E. Racine Ave., Waukesha. Firecrackers, music and distribution of envelopes with "Lucky Money." Free.

64th annual Pancake Festival, 7:30 a.m. to 1:30 p.m. Saturday, Waukesha County Expo Center, 1000 Northview Road, Waukesha. Held by Waukesha Rotary clubs. Tickets $5 in advance from Rotarians and at Waukesha State Bank in downtown Waukesha or $8 at the door. Children 5 and younger eat free. Gluten-free pancakes available.

Spring Treasures Craft and Art Show, 10 a.m. to 4 p.m. Saturday and Sunday, Waukesha County Expo Center Forum, 1000 Northview Road, Waukesha. Admission: $3, children 15 and under free. $1 off admission coupon from website, www.craftproductionsinc.com.

SummerStage Winter Music Series, 4 p.m. to 6 p.m. Sunday, Delafield History Center at Hawks Inn, 426 Wells St., Delafield. Chris Hanson Band with Robin Pluer. $15 tickets, $13 seniors. Order tickets online at www.SummerStageofDelafield.org, call at 262-337-1560.

WEATHER

Tomorrow: Chance of snow
High 31
Low 17

See complete forecast on 8A

7 97883 00027 1

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Appendix D – Bid Tabs

Ruekert • Mielke
Your Infrastructure Ally

W233 N2080 Ridgeview Parkway • Waukesha, WI 53188-1020 • Tel. (262) 542-5733

May 25, 2018

Mr. Keith E. Haas, P. E.
General Manager
City Hall Annex
Racine Water and Wastewater Utilities
800 Center Street, Room 227
Racine, WI 53403

RE: Braun Road Transmission Main

Dear Mr. Haas:

Bids for the above project were opened on May 24, 2018 at 3:00 p.m. at Racine Water Utility at 800 Center Street, City Hall Annex, Room 227, Racine, WI 53403 as follows:

	Bidder	Base Bid
1.	Fischer Excavating. Inc.	$7,361,460.00
2.	Super Excavators, Inc.	$8,054,520.00
3.	Rachel Contracting	$8,357,113.00
4.	Globe Contractors, Inc.	$8,809,165.00
5.	American Sewer Services	$9,446,333.00
6.	Dorner, Inc.	$10,248,871.00
7.	PTS Contractors, Inc.	$10,315,347.00
8.	M.J. Construction, Inc.	$12,368,805.00

We reviewed the documentation submitted by the apparent low bidder and found that:

1. The Bid Form has been appropriately completed.
2. We have no objections to the low bidder.
3. The bidder has little experience laying pipe greater than 20-inches in diameter, but is prequalified to bid. He also has experience laying 20-inch and smaller pipe.

On these bases, we recommend that Fischer Excavating, Inc. be awarded the Braun Road Transmission Main contract plus Mandatory Alternate items as ordered by the Engineer during construction in the total contract amount of $7,361,460, contingent on the following;

1. DNR approval of the project.
2. Appropriate permits from the Wisconsin Department of Transportation.
3. A financing commitment from the Village of Mount Pleasant to fund the project on behalf of the Racine Water Utility.
4. Final water demands to ensure that the transmission main is sized appropriately.

This total contract amount is based on the bid unit prices and estimated quantities. Actual quantities, and therefore the final contract price, may vary. On all construction projects, and especially complex ones like this, unpredictable factors may increase the final contract amount. For this reason we recommend that the Utility include a 10 percent contingency when preparing the financial plan for this work.

Our review did not include an evaluation of bidder's current financial condition nor of their permanent safety program.

Should you decide to accept our recommendation, we have prepared the enclosed Notice of Award for your use. We recommend that you not award this project until all of the above listed items have been resolved. After these items have been resolved and Utility Commission approval has been received, please have the appropriate official sign where indicated and forward all three signed copies of the Notice of Award to our office. We will then fill in the date at the top of page one and forward it, with contracts for execution, to the Contractor. One fully completed Notice of Award will be returned to you for your records.

Bids remain subject to acceptance until September 1, 2018, unless Bidder agrees to an extension. Please advise us of your award decision, or call if there are any questions.

Very truly yours,

RUEKERT & MIELKE, INC.



Kenneth R. Ward, P.E. (WI)
Vice President/Office Manager
kward@ruekert-mielke.com

KRW:sjs
Encl: Notice of Award
Bid Tabulation

cc: Michael L. Gitter, P.E., Racine Water and Wastewater Utilities
Nancy Sanders, Racine Water and Wastewater Utilities
Kurt A. Peot, P.E., Ruekert & Mielke, Inc.
Sean M. Sullivan, P.E., Ruekert & Mielke, Inc.
File

NOTICE OF AWARD

Date of Issuance: __

Contract:	Braun Road Transmission Main	Owner:	Racine Water and Wastewater Utilities
Bidder:	Fischer Excavating, Inc.	Owner's Contract No.:	W-18-6
Address:	1567 N. Heine Road	Engineer:	Ruekert & Mielke, Inc.
	Freeport, IL 61032	Engineer's Project No.:	8022-10021.200

TO BIDDER:

You are notified that your Bid dated May 24, 2018, for the above Contract has been accepted by Owner and you are the Successful Bidder and are awarded a Contract for:

Braun Road Transmission Main Base Bid

The Contract Price of your Contract is: $ 7,361,460.00

Three (3) copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award or have been transmitted or made available to Bidder electronically.

Four (4) sets of the Drawings will be delivered separately, or otherwise made available to Bidder electronically.

Bidder must comply with the following conditions precedent within 15 days of the date of issuance of this Notice of Award:

1. Deliver to Engineer one (1) fully executed counterparts of the Contract Documents.

2. Deliver with the executed Agreement the Bid security as specified in the Instructions to Bidders (Article 21), General Conditions (Paragraph 6.01), and Supplementary Conditions (Paragraph SC-6.01).

3. Deliver with the executed Agreement certificates and other evidence of insurance as specified in the General Conditions (Article 6) and the Supplementary Conditions modifying Article 6 of the General Conditions.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Engineer will return to you one fully executed counterpart of the Agreement.

Owner: RACINE WATER AND WASTEWATER UTILITIES

By: _____
Authorized Signature

Title: _____

Date: _____

Copy: Engineer

Ruekert · Mielke
W233 N2080 Ridgeview Parkway
Waukesha, WI 53188-1020

COST COMPARISON OF BIDDERS

OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				FISCHER EXCAVATING, INC.		SUPER EXCAVATORS, INC.		RACHEL CONTRACTING, INC.		GLOBE CONTRACTORS, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
1	Mobilization	L.S.	1	$350,000.00	$350,000.00	$180,000.00	$180,000.00	$1,900,000.00	$1,900,000.00	$25,000.00	$25,000.00
2	Traffic control	L.S.	1	$8,800.00	$8,800.00	$10,000.00	$10,000.00	$50,000.00	$50,000.00	$53,000.00	$53,000.00
3	Silt fence	L.F.	13,000	$2.00	$26,000.00	$1.50	$19,500.00	$2.00	$26,000.00	$2.00	$26,000.00
4	Ditch check	L.F.	720	$10.00	$7,200.00	$5.00	$3,600.00	$9.00	$6,480.00	$9.00	$6,480.00
5	Tracking pad	S.F.	2,750	$2.00	$5,500.00	$4.00	$11,000.00	$2.50	$6,875.00	$2.00	$5,500.00
6	Inlet sediment guards	EA.	8	$150.00	$1,200.00	$50.00	$400.00	$100.00	$800.00	$100.00	$800.00
7	Temporary seed and mulch	S.Y.	25,500	$0.50	$12,750.00	$1.00	$25,500.00	$0.44	$11,220.00	$0.50	$12,750.00
8	Full depth saw cutting	L.F.	3,700	$2.00	$7,400.00	$2.00	$7,400.00	$2.15	$7,955.00	$2.00	$7,400.00
9	Tree removal	INCH DIA.	1,460	$20.00	$29,200.00	$20.00	$29,200.00	$22.00	$32,120.00	$20.00	$29,200.00 *
10	Trench bridging	L.F.	48	$475.00	$22,800.00	$70.00	$3,360.00	$650.00	$31,200.00	$50.00	$2,400.00
11	6-inch Water main in slurry backfill	L.F.	10	$155.00	$1,550.00	$230.00	$2,300.00	$165.00	$1,650.00	$278.00	$2,780.00
12	6-inch Water main in granular backfill	L.F.	490	$82.00	$40,180.00	$175.00	$85,750.00	$130.00	$63,700.00	$176.00	$86,240.00
13	12-inch Water main in granular backfill	L.F.	120	$85.00	$10,200.00	$190.00	$22,800.00	$165.00	$19,800.00	$210.00	$25,200.00
14	16-inch Water main in 30-inch casing pipe bored	L.F.	383	$510.00	$195,330.00	$550.00	$210,650.00	$420.00	$160,860.00	$480.00	$183,840.00
15	16-inch Water main directional drill	L.F.	90	$305.00	$27,450.00	$660.00	$59,400.00	$245.00	$22,050.00	$746.00	$67,140.00
16	16-inch Water main in granular backfill	L.F.	100	$110.00	$11,000.00	$135.00	$13,500.00	$195.00	$19,500.00	$188.00	$18,800.00
17	16-inch Water main in spoil backfill	L.F.	4,150	$84.00	$348,600.00	$110.00	$456,500.00	$110.00	$456,500.00	$113.00	$468,950.00
18	20-inch Water main in slurry backfill	L.F.	185	$360.00	$66,600.00	$400.00	$74,000.00	$360.00	$66,600.00	$507.00	$93,795.00
19	24-inch Water main directionally drill	L.F.	387	$380.00	$147,060.00	$475.00	$183,825.00	$410.00	$158,670.00	$485.00	$187,695.00
20	24-inch Water main in slurry backfill	L.F.	2,400	$280.00	$672,000.00	$300.00	$720,000.00	$310.00	$744,000.00	$429.00	$1,029,600.00
21	24-inch Water main in granular backfill	L.F.	3,200	$185.00	$592,000.00	$205.00	$656,000.00	$210.00	$672,000.00	$260.00	$832,000.00
22	24-inch Water main in spoil backfill	L.F.	6,200	$120.00	$744,000.00	$135.00	$837,000.00	$97.00	$601,400.00	$158.00	$979,600.00
23	36-inch Water main in 48-inch casing pipe bored	L.F.	265	$1,026.00	$271,890.00	$1,200.00	$318,000.00	$850.00	$225,250.00	$1,000.00	$265,000.00
24	36-inch Water main in granular backfill	L.F.	6,047	$363.00	$2,195,061.00	$400.00	$2,418,800.00	$290.00	$1,753,630.00	$445.00	$2,690,915.00
25	36-inch Water main in spoil backfill	L.F.	2,400	$280.00	$672,000.00	$270.00	$648,000.00	$190.00	$456,000.00	$325.00	$780,000.00
26	Hydrant assembly including anchor tee	EA.	24	$8,500.00	$204,000.00	$8,000.00	$192,000.00	$4,000.00	$96,000.00	$3,500.00	$84,000.00
27	Hydrant valves	EA.	24	$1,250.00	$30,000.00	$1,000.00	$24,000.00	$1,800.00	$43,200.00	$1,200.00	$28,800.00
28	6-inch Gate valves	EA.	0	$1,250.00	$0.00	$1,000.00	$0.00	$2,000.00	$0.00	$1,200.00	$0.00
29	12-inch Butterfly valves	EA.	3	$2,200.00	$6,600.00	$1,450.00	$4,350.00	$3,500.00	$10,500.00	$2,300.00	$6,900.00
30	16-inch Butterfly valves	EA.	7	$3,170.00	$22,190.00	$3,000.00	$21,000.00	$4,500.00	$31,500.00	$3,500.00	$24,500.00
31	20-inch Butterfly valves	EA.	1	$4,220.00	$4,220.00	$4,000.00	$4,000.00	$7,500.00	$7,500.00	$4,700.00	$4,700.00

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Ruekert · Mielke
W233 N2080 Ridgeview Parkway
Waukesha, WI 53188-1020

COST COMPARISON OF BIDDERS

OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				FISCHER EXCAVATING, INC.		SUPER EXCAVATORS, INC.		RACHEL CONTRACTING, INC.		GLOBE CONTRACTORS, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
32	24-inch Butterfly valves	EA.	7	$7,330.00	$51,310.00	$7,000.00	$49,000.00	$10,000.00	$70,000.00	$7,800.00	$54,600.00
33	36-inch Butterfly valves	EA.	4	$14,000.00	$56,000.00	$14,000.00	$56,000.00	$18,000.00	$72,000.00	$15,000.00	$60,000.00
34	Remove and replace concrete curb and gutter	L.F.	50	$70.00	$3,500.00	$35.00	$1,750.00	$90.00	$4,500.00	$60.00	$3,000.00
35	Asphaltic concrete binder course	Ton	340	$167.00	$56,780.00	$160.00	$54,400.00	$160.00	$54,400.00	$147.00	$49,980.00
36	Asphaltic concrete surface course	Ton	210	$124.00	$26,040.00	$185.00	$38,850.00	$135.00	$28,350.00	$124.00	$26,040.00
37	4-inch White pavement marking	L.F.	930	$1.00	$930.00	$1.00	$930.00	$1.10	$1,023.00	$1.00	$930.00
38	4-inch Yellow pavement marking	L.F.	1,800	$1.00	$1,800.00	$1.00	$1,800.00	$0.80	$1,440.00	$1.00	$1,800.00
39	Crushed aggregate driveway replacement	S.F.	3,350	$2.00	$6,700.00	$3.00	$10,050.00	$5.00	$16,750.00	$3.00	$10,050.00
40	3-inch Asphalt driveway replacement	S.F.	2,500	$6.00	$15,000.00	$16.00	$40,000.00	$5.00	$12,500.00	$5.00	$12,500.00
41	5-inch Concrete driveway replacement	S.F.	900	$13.00	$11,700.00	$8.00	$7,200.00	$12.00	$10,800.00	$8.00	$7,200.00
42	Crushed aggregate shoulders	L.F.	6,100	$6.00	$36,600.00	$11.00	$67,100.00	$8.00	$48,800.00	$15.00	$91,500.00
43	Topsoil, seed, fertilizer and mulch	S.Y.	14,170	$4.00	$56,680.00	$8.00	$113,360.00	$1.20	$17,004.00	$6.00	$85,020.00
44	12-inch CMCP	L.F.	180	$55.00	$9,900.00	$45.00	$8,100.00	$33.00	$5,940.00	$70.00	$12,600.00
45	12-inch Medal end sections	EA.	14	$280.00	$3,920.00	$60.00	$840.00	$60.00	$840.00	$150.00	$2,100.00
46	15-inch CMCP	L.F.	93	$41.00	$3,813.00	$50.00	$4,650.00	$36.00	$3,348.00	$80.00	$7,440.00
47	15-inch Medal end sections	EA.	6	$272.00	$1,632.00	$75.00	$450.00	$80.00	$480.00	$200.00	$1,200.00
48	Temporary precast concrete barrier	L.F.	500	$50.00	$25,000.00	$35.00	$17,500.00	$30.00	$15,000.00	$50.00	$25,000.00
49	Detector wire and locator box for water main	EA.	24	$126.00	$3,024.00	$80.00	$1,920.00	$300.00	$7,200.00	$150.00	$3,600.00
50	15 lb. Magnesium anodes	EA.	73	$90.00	$6,570.00	$90.00	$6,570.00	$83.00	$6,059.00	$140.00	$10,220.00
51	32 lb. Magnesium anodes	EA.	87	$150.00	$13,050.00	$145.00	$12,615.00	$137.00	$11,919.00	$200.00	$17,400.00
52	Valve vault MH	EA.	1	$3,050.00	$3,050.00	$26,000.00	$26,000.00	$45,000.00	$45,000.00	$35,000.00	$35,000.00
53	Hydrant removal	EA.	1	$770.00	$770.00	$600.00	$600.00	$500.00	$500.00	$1,000.00	$1,000.00
54	2-inch Air release valves	EA.	7	$2,800.00	$19,600.00	$1,000.00	$7,000.00	$1,600.00	$11,200.00	$1,400.00	$9,800.00
55	36-inch Casing pipe installed in open cut	L.F.	120	$188.00	$22,560.00	$600.00	$72,000.00	$380.00	$45,600.00	$500.00	$60,000.00
56	Asphaltic concrete trench patch	S.Y.	400	$90.00	$36,000.00	$90.00	$36,000.00	$90.00	$36,000.00	$83.00	$33,200.00
57	SOO Line Railroad Company d/b/a/ Canadian Pacific Flagmen (Allowance)	L.S.	1	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00
58	Union Pacific Flagmen	L.S.	1	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00
59	Timber Mats	S.F.	4,000	$10.00	$40,000.00	$10.00	$40,000.00	$7.50	$30,000.00	$10.00	$40,000.00
60	Inlet reconstruction	EA.	1	$1,750.00	$1,750.00	$3,000.00	$3,000.00	$2,500.00	$2,500.00	$4,000.00	$4,000.00
61	Water main offset (Allowance)	L.S.	1	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00
TOTAL OF ALL ESTIMATED PRICES (ITEMS 1 - 61)					**$7,361,460.00**		**$8,034,520.00 ***		**$8,357,113.00**		**$8,809,165.00**

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W233 N2080 Ridgeview Parkway
Waukesha, WI 53188-1020

COST COMPARISON OF BIDDERS

OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				FISCHER EXCAVATING, INC.		SUPER EXCAVATORS, INC.		RACHEL CONTRACTING, INC.		GLOBE CONTRACTORS, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
MANDATORY ALTERNATE BID ITEMS											
MA-1	24-inch water main in slurry backfill	L.F.	400	$285.00	$114,000.00	$295.00	$118,000.00	$310.00	$124,000.00	$429.00	$171,600.00
MA-2	24-inch water main in granular backfill	L.F.	120	$200.00	$24,000.00	$200.00	$24,000.00	$210.00	$25,200.00	$260.00	$31,200.00
MA-3	24-inch water main in spoil backfill	L.F.	650	$120.00	$78,000.00	$130.00	$84,500.00	$150.00	$97,500.00	$158.00	$102,700.00
MA-4	6-inch water main in granular backfill	L.F.	10	$82.00	$820.00	$170.00	$1,700.00	$130.00	$1,300.00	$176.00	$1,760.00
MA-5	Hydrant assembly including anchor tee	EA.	1	$8,600.00	$8,600.00	$8,000.00	$8,000.00	$4,000.00	$4,000.00	$3,500.00	$3,500.00
MA-6	Hydrant valves	EA.	1	$1,250.00	$1,250.00	$1,000.00	$1,000.00	$1,800.00	$1,800.00	$1,300.00	$1,300.00
MA-7	Crushed aggregate driveway replacement	S.F.	60	$8.00	$480.00	$3.00	$180.00	$5.00	$300.00	$3.00	$180.00

* Erron Super Excavaor's Total of All Estimated Bid Prices: Super Excavator's Total shows $8,054,520; actual Total is $8,034,520.
* Error on Globe Contractor's Bid Item No. 9; Contactor's Total shows $$2,780.00; actual Total is $29,200.00/

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COST COMPARISON OF BIDDERS

OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				AMERICAN SEWER SERVICES		DORNER, INC.		PTS CONTRACTORS, INC.		M.J. CONSTRUCTION, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
1	Mobilization	L.S.	1	$50,000.00	$50,000.00	$171,739.00	$171,739.00	$135,000.00	$135,000.00	$100,000.00	$100,000.00
2	Traffic control	L.S.	1	$10,000.00	$10,000.00	$40,000.00	$40,000.00	$45,000.00	$45,000.00	$100,000.00	$100,000.00
3	Silt fence	L.F.	13,000	$2.00	$26,000.00	$2.10	$27,300.00	$2.10	$27,300.00	$2.00	$26,000.00
4	Ditch check	L.F.	720	$5.00	$3,600.00	$9.00	$6,480.00	$10.60	$7,632.00	$7.00	$5,040.00
5	Tracking pad	S.F.	2,750	$12.00	$33,000.00	$5.00	$13,750.00	$5.20	$14,300.00	$5.00	$13,750.00
6	Inlet sediment guards	EA.	8	$75.00	$600.00	$74.00	$592.00	$106.00	$848.00	$75.00	$600.00
7	Temporary seed and mulch	S.Y.	25,500	$6.00	$153,000.00	$1.00	$25,500.00	$0.40	$10,200.00	$1.00	$25,500.00
8	Full depth saw cutting	L.F.	3,700	$3.00	$11,100.00	$2.20	$8,140.00	$2.10	$7,770.00	$2.00	$7,400.00
9	Tree removal	INCH DIA.	1,460	$23.00	$33,580.00	$25.00	$36,500.00	$46.00	$67,160.00	$75.00	$109,500.00
10	Trench bridging	L.F.	48	$145.00	$6,960.00	$100.00	$4,800.00	$156.00	$7,488.00	$25.00	$1,200.00
11	6-inch Water main in slurry backfill	L.F.	10	$190.00	$1,900.00	$542.00	$5,420.00	$615.00	$6,150.00	$615.00	$6,150.00
12	6-inch Water main in granular backfill	L.F.	490	$125.00	$61,250.00	$256.00	$125,440.00	$243.00	$119,070.00	$78.00	$38,220.00
13	12-inch Water main in granular backfill	L.F.	120	$220.00	$26,400.00	$424.00	$50,880.00	$272.00	$32,640.00	$240.00	$28,800.00
14	16-inch Water main in 30-inch casing pipe bored	L.F.	383	$660.00	$252,780.00	$603.00	$230,949.00	$464.00	$177,712.00	$725.00	$277,675.00
15	16-inch Water main directional drill	L.F.	90	$835.00	$75,150.00	$362.00	$32,580.00	$325.00	$29,250.00	$725.00	$65,250.00
16	16-inch Water main in granular backfill	L.F.	100	$180.00	$18,000.00	$250.00	$25,000.00	$230.00	$23,000.00	$200.00	$20,000.00
17	16-inch Water main in spoil backfill	L.F.	4,150	$110.00	$456,500.00	$115.00	$477,250.00	$138.00	$572,700.00	$172.00	$713,800.00
18	20-inch Water main in slurry backfill	L.F.	185	$370.00	$68,450.00	$789.00	$145,965.00	$525.00	$97,125.00	$450.00	$83,250.00
19	24-inch Water main directionally drill	L.F.	387	$530.00	$205,110.00	$521.00	$201,627.00	$545.00	$210,915.00	$610.00	$236,070.00
20	24-inch Water main in slurry backfill	L.F.	2,400	$285.00	$684,000.00	$504.00	$1,209,600.00	$450.00	$1,080,000.00	$565.00	$1,356,000.00
21	24-inch Water main in granular backfill	L.F.	3,200	$230.00	$736,000.00	$325.00	$1,040,000.00	$350.00	$1,120,000.00	$382.00	$1,222,400.00
22	24-inch Water main in spoil backfill	L.F.	6,200	$160.00	$992,000.00	$179.00	$1,109,800.00	$188.00	$1,165,600.00	$260.00	$1,612,000.00
23	36-inch Water main in 48-inch casing pipe bored	L.F.	265	$1,650.00	$437,250.00	$1,364.00	$361,460.00	$1,395.00	$369,675.00	$1,850.00	$490,250.00
24	36-inch Water main in granular backfill	L.F.	6,047	$530.00	$3,204,910.00	$459.00	$2,775,573.00	$500.00	$3,023,500.00	$570.00	$3,446,790.00
25	36-inch Water main in spoil backfill	L.F.	2,400	$340.00	$816,000.00	$320.00	$768,000.00	$391.00	$938,400.00	$510.00	$1,224,000.00
26	Hydrant assembly including anchor tee	EA.	24	$9,500.00	$228,000.00	$11,100.00	$266,400.00	$3,600.00	$86,400.00	$5,000.00	$120,000.00
27	Hydrant valves	EA.	24	$1,100.00	$26,400.00	$1,500.00	$36,000.00	$1,062.00	$25,488.00	$1,000.00	$24,000.00
28	6-inch Gate valves	EA.	0	$0.00	$0.00	$1,500.00	$0.00	$0.00	$0.00	$1,000.00	$0.00
29	12-inch Butterfly valves	EA.	3	$2,000.00	$6,000.00	$2,500.00	$7,500.00	$2,850.00	$8,550.00	$2,000.00	$6,000.00
30	16-inch Butterfly valves	EA.	7	$3,800.00	$26,600.00	$3,800.00	$26,600.00	$4,155.00	$29,085.00	$3,000.00	$21,000.00

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OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				AMERICAN SEWER SERVICES		DORNER, INC.		PTS CONTRACTORS, INC.		M.J. CONSTRUCTION, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
31	20-inch Butterfly valves	EA.	1	$5,500.00	$5,500.00	$5,000.00	$5,000.00	$6,260.00	$6,260.00	$4,200.00	$4,200.00
32	24-inch Butterfly valves	EA.	7	$7,700.00	$53,900.00	$8,000.00	$56,000.00	$9,270.00	$64,890.00	$8,500.00	$59,500.00
33	36-inch Butterfly valves	EA.	4	$15,000.00	$60,000.00	$16,500.00	$66,000.00	$16,000.00	$64,000.00	$28,000.00	$112,000.00
34	Remove and replace concrete curb and gutter	L.F.	50	$75.00	$3,750.00	$100.00	$5,000.00	$121.00	$6,050.00	$75.00	$3,750.00
35	Asphaltic concrete binder course	Ton	340	$168.00	$57,120.00	$166.00	$56,440.00	$154.00	$52,360.00	$150.00	$51,000.00
36	Asphaltic concrete surface course	Ton	210	$140.00	$29,400.00	$141.00	$29,610.00	$131.00	$27,510.00	$130.00	$27,300.00
37	4-inch White pavement marking	L.F.	930	$1.10	$1,023.00	$2.30	$2,139.00	$1.00	$930.00	$1.00	$930.00
38	4-inch Yellow pavement marking	L.F.	1,800	$1.00	$1,800.00	$2.30	$4,140.00	$1.00	$1,800.00	$1.00	$1,800.00
39	Crushed aggregate driveway replacement	S.F.	3,350	$5.00	$16,750.00	$5.00	$16,750.00	$3.60	$12,060.00	$5.00	$16,750.00
40	3-inch Asphalt driveway replacement	S.F.	2,500	$5.00	$12,500.00	$8.00	$20,000.00	$4.60	$11,500.00	$8.00	$20,000.00
41	5-inch Concrete driveway replacement	S.F.	900	$10.00	$9,000.00	$25.00	$22,500.00	$8.90	$8,010.00	$15.00	$13,500.00
42	Crushed aggregate shoulders	L.F.	6,100	$1.50	$9,150.00	$33.00	$201,300.00	$21.00	$128,100.00	$25.00	$152,500.00
43	Topsoil, seed, fertilizer and mulch	S.Y.	14,170	$13.50	$191,295.00	$7.00	$99,190.00	$5.30	$75,101.00	$5.00	$70,850.00
44	12-inch CMCP	L.F.	180	$50.00	$9,000.00	$67.00	$12,060.00	$67.00	$12,060.00	$50.00	$9,000.00
45	12-inch Medal end sections	EA.	14	$105.00	$1,470.00	$135.00	$1,890.00	$285.00	$3,990.00	$150.00	$2,100.00
46	15-inch CMCP	L.F.	93	$65.00	$6,045.00	$74.00	$6,882.00	$100.00	$9,300.00	$60.00	$5,580.00
47	15-inch Medal end sections	EA.	6	$150.00	$900.00	$210.00	$1,260.00	$300.00	$1,800.00	$175.00	$1,050.00
48	Temporary precast concrete barrier	L.F.	500	$75.00	$37,500.00	$50.00	$25,000.00	$31.00	$15,500.00	$65.00	$32,500.00
49	Detector wire and locator box for water main	EA.	24	$60.00	$1,440.00	$1,500.00	$36,000.00	$222.00	$5,328.00	$125.00	$3,000.00
50	15 lb. Magnesium anodes	EA.	73	$110.00	$8,030.00	$88.00	$6,424.00	$310.00	$22,630.00	$100.00	$7,300.00
51	32 lb. Magnesium anodes	EA.	87	$160.00	$13,920.00	$143.00	$12,441.00	$360.00	$31,320.00	$150.00	$13,050.00
52	Valve vault MH	EA.	1	$15,500.00	$15,500.00	$35,000.00	$35,000.00	$21,000.00	$21,000.00	$45,000.00	$45,000.00
53	Hydrant removal	EA.	1	$750.00	$750.00	$1,600.00	$1,600.00	$1,170.00	$1,170.00	$2,500.00	$2,500.00
54	2-inch Air release valves	EA.	7	$1,600.00	$11,200.00	$3,000.00	$21,000.00	$1,700.00	$11,900.00	$2,500.00	$17,500.00
55	36-inch Casing pipe installed in open cut	L.F.	120	$450.00	$54,000.00	$500.00	$60,000.00	$731.00	$87,720.00	$600.00	$72,000.00
56	Asphaltic concrete trench patch	S.Y.	400	$95.00	$38,000.00	$136.00	$54,400.00	$64.00	$25,600.00	$100.00	$40,000.00
57	SOO Line Railroad Company d/b/a/ Canadian Pacific Flagmen (Allowance)	L.S.	1	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00
58	Union Pacific Flagmen	L.S.	1	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00	$7,500.00
59	Timber Mats	S.F.	4,000	$7.00	$28,000.00	$10.00	$40,000.00	$13.00	$52,000.00	$20.00	$80,000.00

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Ruekert • Mielke
W233 N2080 Ridgeview Parkway
Waukesha, WI 53188-1020

COST COMPARISON OF BIDDERS

OWNER: Racine Water & Wastewater Utilities
PROJECT: Braun Road Transmission Main
BID OPENING DATE: May 24, 2018 3:00 P.M.

BASE BID				AMERICAN SEWER SERVICES		DORNER, INC.		PTS CONTRACTORS, INC.		M.J. CONSTRUCTION, INC.	
ITEM #	ITEM DESCRIPTION	UNIT	QTY.	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL	UNIT $	TOTAL
60	Inlet reconstruction	EA.	1	$3,850.00	$3,850.00	$5,000.00	$5,000.00	$2,500.00	$2,500.00	$8,500.00	$8,500.00
61	Water main offset (Allowance)	L.S.	1	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00
TOTAL OF ALL ESTIMATED PRICES (ITEMS 1 - 61)					**$9,446,333.00**		**$10,248,871.00**		**$10,315,347.00**		**$12,368,805.00**
MANDATORY ALTERNATE BID ITEMS											
MA-1	24-inch water main in slurry backfill	L.F.	400	$285.00	$114,000.00	$504.00	$201,600.00	$450.00	$180,000.00		$0.00
MA-2	24-inch water main in granular backfill	L.F.	120	$230.00	$27,600.00	$325.00	$39,000.00	$350.00	$42,000.00		$0.00
MA-3	24-inch water main in spoil backfill	L.F.	650	$160.00	$104,000.00	$179.00	$116,350.00	$250.00	$162,500.00		$0.00
MA-4	6-inch water main in granular backfill	L.F.	10	$125.00	$1,250.00	$256.00	$2,560.00	$450.00	$4,500.00		$0.00
MA-5	Hydrant assembly including anchor tee	EA.	1	$9,500.00	$9,500.00	$11,100.00	$11,100.00	$3,700.00	$3,700.00		$0.00
MA-6	Hydrant valves	EA.	1	$1,100.00	$1,100.00	$1,500.00	$1,500.00	$1,050.00	$1,050.00		$0.00
MA-7	Crushed aggregate driveway replacement	S.F.	60	$10.00	$600.00	$5.00	$300.00	$3.00	$180.00		$0.00

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Bid Tabulation

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR				Merryman Excavation, Inc. 1501 Lamb Road Woodstock, IL 60098		Globe Contractors, Inc. N50 W23076 Betker Road Pewaukee, WI 53072		Reesman's Exc. & Grdg., Inc. 28815 Bushnell Road Burlington, WI 53105		PTS Contractors, Inc. 4075 Eaton Road Green Bay, WI 54311		Advance Construction, Inc. 2141 Woodale Avenue Green Bay, WI 54313	
BID SECURITY				5% BB	X	5% BB	X	5% BB	X	5% BB	X	5% BB	X
ADDENDA NOs. 1 & 2				XX		XX		XX		XX		XX	
No.	**Item**	**Unit**	**Qty**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**
Section 1 - CTH Q / 108th Street 20" Water Main:													
1	20" Water Main (Open Cut with Excavated Material Backfill)	LF	5,324	$130.50	$694,782.00	$139.00	$740,036.00	$150.50	$801,262.00	$165.00	$878,460.00	$174.00	$926,376.00
2	20" Water Main (Open Cut with Granular Material Backfill)	LF	849	$213.50	$181,261.50	$196.00	$166,404.00	$227.00	$192,723.00	$167.00	$141,783.00	$216.00	$183,384.00
3	20" Water Main (Open Cut with Slurry Material Backfill)	LF	15	$353.00	$5,295.00	$460.00	$6,900.00	$1,400.00	$21,000.00	$390.00	$5,850.00	$392.00	$5,880.00
4	20" Water Main (Directional Drill)	LF	361	$411.00	$148,371.00	$453.00	$163,533.00	$382.00	$137,902.00	$321.00	$115,881.00	$306.00	$110,466.00
5	20" Water Main (with Casing Pipe Under Interstate)	LF	327	$676.50	$221,215.50	$559.00	$182,793.00	$632.00	$206,664.00	$633.00	$206,991.00	$464.00	$151,728.00
6	16" Water Main (Open Cut with Excavated Material Backfill)	LF	120	$147.50	$17,700.00	$139.00	$16,680.00	$197.00	$23,640.00	$146.00	$17,520.00	$184.00	$22,080.00
7	16" Water Main (Open Cut with Granular Material Backfill)	LF	50	$189.00	$9,450.00	$276.00	$13,800.00	$240.00	$12,000.00	$270.00	$13,500.00	$220.00	$11,000.00
8	12" Water Main (Open Cut with Excavated Material Backfill)	LF	26	$147.00	$3,822.00	$385.00	$10,010.00	$173.00	$4,498.00	$220.00	$5,720.00	$362.00	$9,412.00
9	6" Hydrant Leads	LF	165	$69.30	$11,434.50	$143.00	$23,595.00	$71.00	$11,715.00	$198.00	$32,670.00	$125.00	$20,625.00
10	20" Butterfly Valve and Box	EA	13	$6,430.00	$83,590.00	$5,300.00	$68,900.00	$5,436.00	$70,668.00	$4,855.00	$63,115.00	$4,800.00	$62,400.00
11	16" Butterfly Valve and Box	EA	2	$4,927.00	$9,854.00	$3,700.00	$7,400.00	$4,050.00	$8,100.00	$3,475.00	$6,950.00	$3,600.00	$7,200.00
12	12" Butterfly Valve and Box	EA	2	$9,184.00	$18,368.00	$2,700.00	$5,400.00	$5,600.00	$11,200.00	$3,400.00	$6,800.00	$2,600.00	$5,200.00
13	6" Gate Valve and Box	EA	11	$1,757.00	$19,327.00	$1,400.00	$15,400.00	$1,500.00	$16,500.00	$1,200.00	$13,200.00	$1,245.00	$13,695.00
14	Hydrants	EA	11	$4,712.00	$51,832.00	$4,300.00	$47,300.00	$7,485.00	$82,335.00	$4,328.00	$47,608.00	$4,700.00	$51,700.00
15	Automatic Flushing Device	EA	1	$7,014.00	$7,014.00	$11,000.00	$11,000.00	$6,450.00	$6,450.00	$8,800.00	$8,800.00	$6,850.00	$6,850.00
16	Pavement Restoration/Marking for Radisson Hotel Parking Lot	LS	1	$131,745.00	$131,745.00	$71,000.00	$71,000.00	$67,920.00	$67,920.00	$73,450.00	$73,450.00	$87,500.00	$87,500.00
16.1	Survey Project	LS	1	$17,585.00	$17,585.00	$38,000.00	$38,000.00	$20,400.00	$20,400.00	$16,035.00	$16,035.00	$35,000.00	$35,000.00
Subtotal - Section 1, Items 1 thru 16.1, Inclusive…				**Subtotal**	**$1,632,646.50**	**Subtotal**	**$1,588,151.00**	**Subtotal**	**$1,694,977.00**	**Subtotal**	**$1,654,333.00**	**Subtotal**	**$1,710,496.00**

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Bid Tabulation

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR				Merryman Excavation, Inc. 1501 Lamb Road Woodstock, IL 60098		Globe Contractors, Inc. N50 W23076 Betker Road Pewaukee, WI 53072		Reesman's Exc. & Grdg., Inc. 28815 Bushnell Road Burlington, WI 53105		PTS Contractors, Inc. 4075 Eaton Road Green Bay, WI 54311		Advance Construction, Inc. 2141 Woodale Avenue Green Bay, WI 54313	
BID SECURITY				5% BB	X	5% BB	X	5% BB	X	5% BB	X	5% BB	X
ADDENDA NOs. 1 & 2				XX		XX		XX		XX		XX	
No.	**Item**	**Unit**	**Qty**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**
Section 2 - East Frontage Road 16" Water Main:													
17	16" Water Main (Open Cut with Excavated Material Backfill)	LF	100	$89.60	$8,960.00	$105.00	$10,500.00	$116.00	$11,600.00	$114.00	$11,400.00	$160.00	$16,000.00
18	16" Water Main (Open Cut with Granular Material Backfill)	LF	2,129	$143.50	$305,511.50	$161.00	$342,769.00	$157.00	$334,253.00	$226.00	$481,154.00	$234.00	$498,186.00
19	16" Water Main (Open Cut with Slurry Material Backfill)	LF	1,149	$221.50	$254,503.50	$245.00	$281,505.00	$162.00	$186,138.00	$201.00	$230,949.00	$306.00	$351,594.00
20	16" Water Main (Directional Drill)	LF	310	$182.50	$56,575.00	$260.00	$80,600.00	$263.00	$81,530.00	$224.00	$69,440.00	$221.00	$68,510.00
21	6" Hydrant Leads	LF	72	$75.70	$5,450.40	$153.00	$11,016.00	$71.00	$5,112.00	$179.00	$12,888.00	$139.00	$10,008.00
22	16" Butterfly Valve and Box	EA	6	$4,434.00	$26,604.00	$3,700.00	$22,200.00	$4,020.00	$24,120.00	$3,450.00	$20,700.00	$3,025.00	$18,150.00
23	6" Gate Valve and Box	EA	8	$2,184.00	$17,472.00	$1,400.00	$11,200.00	$1,500.00	$12,000.00	$1,675.00	$13,400.00	$1,245.00	$9,960.00
24	Hydrants	EA	8	$4,427.00	$35,416.00	$4,300.00	$34,400.00	$7,230.00	$57,840.00	$4,285.00	$34,280.00	$4,700.00	$37,600.00
24.1	Survey Project	LS	1	$11,725.00	$11,725.00	$24,000.00	$24,000.00	$10,600.00	$10,600.00	$16,035.00	$16,035.00	$15,000.00	$15,000.00
Subtotal - Section 2, Items 17 thru 24.1, Inclusive…				**Subtotal**	**$722,217.40**	**Subtotal**	**$818,190.00**	**Subtotal**	**$723,193.00**	**Subtotal**	**$890,246.00**	**Subtotal**	**$1,025,008.00**
TOTAL - (BASE BID) - SECTIONS 1 thru 2; ITEMS 1 THRU 24.1 (INCLUDING 16.1), INCLUSIVE…				**Total**	**$2,354,863.90**	**Total**	**$2,406,341.00**	**Total**	**$2,418,170.00**	**Total**	**$2,544,579.00**	**Total**	**$2,735,504.00**
Alternate Bid:													
Section 2 - East Frontage Road 16" Water Main - Directional Drill All Water Main:													
No.	**Item**	**Unit**	**Qty**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**	**Price**	**Total**
17A.	16" Water Main (Directional Drill)	LF	3,378	$210.50	$711,069.00	$224.00	$756,672.00	$227.00	$766,806.00	$209.00	$706,002.00	$176.00	$594,528.00
Subtotal - Alternate Bid - Section 2 - Items 17A and 20 thru 24.1, Inclusive (*Does Not Include Items 17 through 19 From Base Bid*)…				***Alternate - Subtotal**	**$864,311.40**	**Alternate - Subtotal**	**$940,088.00**	**Alternate - Subtotal**	**$958,008.00**	***Alternate - Subtotal**	**$872,745.00**	**Alternate - Subtotal**	**$753,756.00**

*Math Error in Alt. Subtotal.

*Math Error in Alt. Subtotal.

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Bid Tabulation

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR				Super Excavators, Inc. N59 W14601 Bobolink Avenue Menomonee Falls, WI 53051		A W Oakes & Son, Inc. 2000 Oakes Road Racine, WI 53406							
BID SECURITY				5% BB	X	5% BB	X	5% BB		5% BB		5% BB	
ADDENDA NOs. 1 & 2				XX		XX							
No.	Item	Unit	Qty	Price	Total	Price	Total	Price	Total	Price	Total	Price	Total
Section 1 - CTH Q / 108th Street 20" Water Main:													
1	20" Water Main (Open Cut with Excavated Material Backfill)	LF	5,324	$195.00	$1,038,180.00	$178.00	$947,672.00						
2	20" Water Main (Open Cut with Granular Material Backfill)	LF	849	$220.00	$186,780.00	$379.00	$321,771.00						
3	20" Water Main (Open Cut with Slurry Material Backfill)	LF	15	$520.00	$7,800.00	$1,225.00	$18,375.00						
4	20" Water Main (Directional Drill)	LF	361	$500.00	$180,500.00	$455.00	$164,255.00						
5	20" Water Main (with Casing Pipe Under Interstate)	LF	327	$790.00	$258,330.00	$842.00	$275,334.00						
6	16" Water Main (Open Cut with Excavated Material Backfill)	LF	120	$210.00	$25,200.00	$550.00	$66,000.00						
7	16" Water Main (Open Cut with Granular Material Backfill)	LF	50	$215.00	$10,750.00	$300.00	$15,000.00						
8	12" Water Main (Open Cut with Excavated Material Backfill)	LF	26	$920.00	$23,920.00	$400.00	$10,400.00						
9	6" Hydrant Leads	LF	165	$190.00	$31,350.00	$150.00	$24,750.00						
10	20" Butterfly Valve and Box	EA	13	$5,000.00	$65,000.00	$7,200.00	$93,600.00						
11	16" Butterfly Valve and Box	EA	2	$4,000.00	$8,000.00	$5,700.00	$11,400.00						
12	12" Butterfly Valve and Box	EA	2	$3,000.00	$6,000.00	$4,900.00	$9,800.00						
13	6" Gate Valve and Box	EA	11	$1,400.00	$15,400.00	$2,000.00	$22,000.00						
14	Hydrants	EA	11	$6,000.00	$66,000.00	$6,375.00	$70,125.00						
15	Automatic Flushing Device	EA	1	$6,000.00	$6,000.00	$16,350.00	$16,350.00						
16	Pavement Restoration/Marking for Radisson Hotel Parking Lot	LS	1	$75,000.00	$75,000.00	$205,000.00	$205,000.00						
16.1	Survey Project	LS	1	$15,000.00	$15,000.00	$25,000.00	$25,000.00						
Subtotal - Section 1, Items 1 thru 16.1, Inclusive…				**Subtotal**	**$2,019,210.00**	**Subtotal**	**$2,296,832.00**	**Subtotal**		**Subtotal**		**Subtotal**	

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Bid Tabulation

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR				Super Excavators, Inc. N59 W14601 Bobolink Avenue Menomonee Falls, WI 53051		A W Oakes & Son, Inc. 2000 Oakes Road Racine, WI 53406							
BID SECURITY				5% BB	X	5% BB	X	5% BB		5% BB		5% BB	
ADDENDA NOs. 1 & 2				XX		XX							
No.	Item	Unit	Qty	Price	Total	Price	Total	Price	Total	Price	Total	Price	Total
Section 2 - East Frontage Road 16" Water Main:													
17	16" Water Main (Open Cut with Excavated Material Backfill)	LF	100	$155.00	$15,500.00	$165.00	$16,500.00						
18	16" Water Main (Open Cut with Granular Material Backfill)	LF	2,129	$210.00	$447,090.00	$190.00	$404,510.00						
19	16" Water Main (Open Cut with Slurry Material Backfill)	LF	1,149	$300.00	$344,700.00	$275.00	$315,975.00						
20	16" Water Main (Directional Drill)	LF	310	$310.00	$96,100.00	$280.00	$86,800.00						
21	6" Hydrant Leads	LF	72	$185.00	$13,320.00	$150.00	$10,800.00						
22	16" Butterfly Valve and Box	EA	6	$4,000.00	$24,000.00	$4,900.00	$29,400.00						
23	6" Gate Valve and Box	EA	8	$1,400.00	$11,200.00	$2,000.00	$16,000.00						
24	Hydrants	EA	8	$6,000.00	$48,000.00	$6,375.00	$51,000.00						
24.1	Survey Project	LS	1	$15,000.00	$15,000.00	$15,000.00	$15,000.00						
Subtotal - Section 2, Items 17 thru 24.1, Inclusive…				**Subtotal**	**$1,014,910.00**	**Subtotal**	**$945,985.00**	**Subtotal**		**Subtotal**		**Subtotal**	
TOTAL - (BASE BID) - SECTIONS 1 thru 2; ITEMS 1 THRU 24.1 (INCLUDING 16.1), INCLUSIVE…				**Total**	**$3,034,120.00**	**Total**	**$3,242,817.00**	**Total**		**Total**		**Total**	
Alternate Bid:													
Section 2 - East Frontage Road 16" Water Main - Directional Drill All Water Main:													
No.	Item	Unit	Qty	Price	Total	Price	Total	Price	Total	Price	Total	Price	Total
17A.	16" Water Main (Directional Drill)	LF	3,378	$258.00	$871,524.00	$215.00	$726,270.00						
Subtotal - Alternate Bid - Section 2 - Items 17A and 20 thru 24.1, Inclusive (*Does Not Include Items 17 through 19 From Base Bid*)…				**Alternate - Subtotal**	**$1,079,144.00**	**Alternate - Subtotal**	**$935,270.00**	**Alternate - Subtotal**		**Alternate - Subtotal**		**Alternate - Subtotal**	

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Bid Tabulation - Schedule of Supplemental Unit Prices

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR			Merryman Excavation, Inc. 1501 Lamb Road Woodstock, IL 60098	Globe Contractors, Inc. N50 W23076 Betker Road Pewaukee, WI 53072	Reesman's Exc. & Grdg., Inc. 28815 Bushnell Road Burlington, WI 53105	PTS Contractors, Inc. 4075 Eaton Road Green Bay, WI 54311	Advance Construction, Inc. 2141 Woodale Avenue Green Bay, WI 54313
No.	**Item**	**Unit**	**Price**	**Price**	**Price**	**Price**	**Price**
Utility Construction - General:							
1	Rock excavation.	CY	$75.00	$300.00	$350.00	$250.00	$300.00
2	Close sheathing and bracing, ordered left in place.	1,000 BF	$1,000.00	$5,000.00	$5,000.00	$10,000.00	$3,000.00
3	Spot sheathing and bracing, ordered left in place.	1,000 BF	$1,000.00	$5,000.00	$5,500.00	$10,000.00	$3,500.00
4	No. 3 crushed stone, 2 inch size, for unstable trench bottom, including excavation of unsuitable material.	CY	$75.00	$50.00	$50.00	$35.00	$40.00
5	Granular backfill, to support underground structures.	CY	$55.00	$30.00	$42.00	$34.00	$50.00
6	Reinforced concrete beam, to support underground structures.	LF	$600.00	$400.00	$500.00	$300.00	$85.00
7	Insulation.	LF	$12.00	$10.00	$50.00	$15.00	$10.00
Water Main Construction:							
8	Hydrant barrel extension:						
	a) 6 inch extension	EA	$700.00	$450.00	$575.00	$400.00	$750.00
	b) 12 inch extension	EA	$825.00	$500.00	$690.00	$500.00	$850.00
	c) 18 inch extension	EA	$1,000.00	$550.00	$810.00	$600.00	$950.00
	d) 24 inch extension	EA	$1,100.00	$600.00	$965.00	$700.00	$1,100.00

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Bid Tabulation - Schedule of Supplemental Unit Prices

Project Name: Prairie Wood & Premium Outlet Wtm
Owner: Village of Pleasant Prairie
Kenosha County, Wisconsin

Bid Date: March 5, 2015
Time: 2:00 p.m.
Project No. W130071.05

CONTRACTOR			Super Excavators, Inc. N59 W14601 Bobolink Avenue Menomonee Falls, WI 53051	A W Oakes & Son, Inc. 2000 Oakes Road Racine, WI 53406			
No.	**Item**	**Unit**	**Price**	**Price**	**Price**	**Price**	**Price**
Utility Construction - General:							
1	Rock excavation.	CY	$350.00	$500.00			
2	Close sheathing and bracing, ordered left in place.	1,000 BF	$5,000.00	$1,000.00			
3	Spot sheathing and bracing, ordered left in place.	1,000 BF	$4,500.00	$5,000.00			
4	No. 3 crushed stone, 2 inch size, for unstable trench bottom, including excavation of unsuitable material.	CY	$60.00	$75.00			
5	Granular backfill, to support underground structures.	CY	$45.00	$50.00			
6	Reinforced concrete beam, to support underground structures.	LF	$250.00	$750.00			
7	Insulation.	LF	$15.00	$25.00			
Water Main Construction:							
8	Hydrant barrel extension:						
	a) 6 inch extension	EA	$750.00	$600.00			
	b) 12 inch extension	EA	$850.00	$800.00			
	c) 18 inch extension	EA	$950.00	$1,100.00			
	d) 24 inch extension	EA	$1,050.00	$1,500.00			

CITY OF WAUKESHA
BOARD OF PUBLIC WORK
E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
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Bids Received: Friday, February 26, 2016 at 11:00 a.m.

Bidders:	Total Contract Price	Item No. 1 – 1 Traffic Control Lump Sum	Item No. 2 – 1 E. Moreland Blvd. Detour Lump Sum
Advance Construction Inc. 2141 Woodale Ave., Green Bay 54313	$4,907,507.57	$105,000.00	$5,600.00
Zignego, Inc. W226 N2940 Duplainville Rd., Waukesha 53186	$5,352,741.52	161,400.00	15,600.00
MJ Construction, Inc. 8617 W. Kaul Ave., Milwaukee 53225	$6,038,660.00	65,000.00	6,000.00
American Sewer Services, Inc. N2768 County Road P, Rubicon 53078	$6,538,928.64	50,000.00	6,000.00
Super Excavators, Inc. N59 W14601 Bobolink Ave., Meno. Falls, 53051	$7,520,081.00	70,000.00	10,000.00
D.F. Tomasini Contractors, Inc. N70 W25176 Indian Grass Ln., Sussex 53089	$7,968,175.50	44,500.00	5,000.00

	Item No. 3 – 300 Lin. Ft. of Fence Safety (WisDOT 616.0700.S.)		Item No. 4 – 2,100 Lin. Ft. of Sawcutting at Pavement Limits		Item No. 5 – 195 of Clearing and Grubbing	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$3.00	$900.00	$2.50	$5,250.00	$45.00	$8,775.00
Zignego, Inc.	$3.00	900.00	2.00	4,200.00	72.85	14,205.75
MJ Construction, Inc.	$2.50	750.00	2.00	4,200.00	75.00	14,625.00
American Sewer Services, Inc.	$5.00	1,500.00	2.00	4,200.00	60.00	11,700.00
Super Excavators, Inc.	$10.00	3,000.00	2.00	4,200.00	50.00	9,750.00
D.F. Tomasini Contractors, Inc.	$2.00	600.00	2.40	5,040.00	55.00	10,725.00

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	Item No. 6 – 9,440 Lin. Ft. of Concrete Curb and Gutter Removal		Item No. 7 – 27,260 Sq. Yds. of Pavement Removal		Item No. 8 – 25,210 Sq. Ft. of Sidewalk and Drive Approach Removal	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.00	$18,880.00	$2.00	$54,520.00	$1.00	$25,210.00
Zignego, Inc.	$2.00	18,880.00	2.00	54,520.00	1.00	25,210.00
MJ Construction, Inc.	$4.00	37,760.00	5.00	136,300.00	2.00	50,420.00
American Sewer Services, Inc.	$5.30	50,032.00	6.57	179,098.20	0.37	9,327.70
Super Excavators, Inc.	$5.00	47,200.00	5.00	136,300.00	1.00	25,210.00
D.F. Tomasini Contractors, Inc.	$2.40	22,656.00	12.50	340,750.00	1.60	40,336.00

	Item No. 9 – 14,170 Tons of 1¼-Inch Dense Aggregate		Item No. 10 – 600 Tons of 1¼-Inch Crushed Stone Backfill		Item No. 11 – 1,200 Tons of 3-Inch Crushed Stone Backfill	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$13.00	$184,210.00	$25.00	$15,000.00	$25.00	$30,000.00
Zignego, Inc.	$14.00	198,380.00	40.00	24,000.00	40.00	48,000.00
MJ Construction, Inc.	$10.00	141,700.00	12.00	7,200.00	11.00	13,200.00
American Sewer Services, Inc.	$13.85	196,254.50	28.00	16,800.00	18.00	21,600.00
Super Excavators, Inc.	$13.00	184,210.00	13.00	7,800.00	11.00	13,200.00
D.F. Tomasini Contractors, Inc.	$16.50	233,805.00	26.00	15,600.00	27.00	32,400.00

	Item No. 12 – 2,386 Sq. Yds. of Geotextile Fabric, Type SAS		Item No. 13 – 4,240 Lin. Ft. of Shaping and Grading of Roadway Base		Item No. 14 – 10,205 Lin. Ft. of 30-Inch Combination Concrete Curb and Gutter	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.25	$5,368.50	$25.00	$106,000.00	$12.50	$127,562.50
Zignego, Inc.	$3.00	7,158.00	25.00	106,000.00	19.54	199,405.70
MJ Construction, Inc.	$1.00	2,386.00	14.00	59,360.00	15.00	153,075.00
American Sewer Services, Inc.	$1.50	3,579.00	7.11	30,146.40	15.70	160,218.50
Super Excavators, Inc.	$2.00	4,772.00	40.00	169,600.00	25.00	255,125.00
D.F. Tomasini Contractors, Inc.	$3.00	7,158.00	5.00	21,200.00	12.50	127,562.50

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Bidders:	Item No. 15 – 53 Lin. Ft. of Concrete Curb and Gutter Type 30G (WisDOT 601.0413)		Item No. 16 – 23,570 Sq. Yds. of 9-Inch Concrete Pavement, Doweled		Item No. 17 – 333 Sq. Yds. of 8-Inch Concrete Pavement, Doweled	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$50.00	$2,650.00	$35.00	$824,950.00	$35.00	$11,655.00
Zignego, Inc.	$50.00	2,650.00	43.00	1,013,510.00	43.00	14,319.00
MJ Construction, Inc.	$19.50	1,033.50	38.00	859,660.00	42.50	14,152.50
American Sewer Services, Inc.	$24.00	1,272.00	37.50	883,875.00	37.50	12,487.50
Super Excavators, Inc.	$30.00	1,590.00	38.00	895,660.00	25.00	8,325.00
D.F. Tomasini Contractors, Inc.	$50.00	2,650.00	35.00	824,950.00	35.00	11,655.00

Bidders:	Item No. 18 – 49 Tons of HMA Pavement Type E-3, 19.0 mm PG 64-28		Item No. 19 – 49 Tons of HMA Pavement Type E-3, 12.5 mm PG 64-28		Item No. 20 – 39 Tons of HMA Pavement Type E-3, 9.5 mm PG 64-28	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$115.00	$5,635.00	$120.00	$5,880.00	$145.00	$5,655.00
Zignego, Inc.	$115.00	5,635.00	120.00	5,880.00	145.00	5,655.00
MJ Construction, Inc.	$118.00	5,782.00	122.50	6,002.50	148.00	5,772.00
American Sewer Services, Inc.	$120.00	5,880.00	126.00	6,174.00	152.00	5,928.00
Super Excavators, Inc.	$140.00	6,860.00	150.00	7,350.00	200.00	7,800.00
D.F. Tomasini Contractors, Inc.	$115.00	5,635.00	120.00	5,880.00	145.00	5,655.00

Bidders:	Item No. 21 – 3,597 Sq. Ft. of 4-Inch HMA Pavement for Driveways		Item No. 22 – 4,410 Sq. Ft. of HMA Butt Joint		Item No. 23 – 104 Lin. Ft. of Concrete Curb - Pedestrian	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5.20	$18,704.40	5.40	$23,814.00	$50.00	$5,200.00
Zignego, Inc.	$5.20	18,704.40	5.40	23,814.00	40.00	4,160.00
MJ Construction, Inc.	$5.50	19,783.50	5.50	24,255.00	22.50	2,340.00
American Sewer Services, Inc.	$5.46	19,639.62	5.67	25,004.70	42.00	4,368.00
Super Excavators, Inc.	$5.00	17,985.00	5.00	22,050.00	50.00	5,200.00
D.F. Tomasini Contractors, Inc.	$5.20	18,704.40	5.40	23,814.00	50.00	5,200.00

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E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
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Bidders:	Item No. 24 – 514 Sq. Ft. of Remove, Salvage and Re-install Brick Pavers at Frame Park, SPV.0165.01		Item No. 25 – 6,186 Sq. Ft. of Stamped Colored Concrete Sidewalk 4-Inch, SPV.0165.02		Item No. 26 – 17,840 Sq. Ft. of New 4-Inch Concrete Sidewalk and Curb Ramps	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$38.00	$19,532.00	$9.00	$55,674.00	$4.40	$78,496.00
Zignego, Inc.	$30.00	15,420.00	15.00	92,790.00	5.00	89,200.00
MJ Construction, Inc.	$9.50	4,883.00	8.00	49,488.00	4.50	80,280.00
American Sewer Services, Inc.	$20.00	10,280.00	13.50	83,511.00	4.30	76,712.00
Super Excavators, Inc.	$35.00	17,990.00	10.00	61,860.00	5.00	89,200.00
D.F. Tomasini Contractors, Inc.	$22.50	11,565.00	11.00	68,046.00	6.00	107,040.00

Bidders:	Item No. 27 – 4,523 Sq. Ft. of New 6-Inch Concrete Sidewalk and Drive Approach		Item No. 28 – 4,749 Sq. Ft. of New 7-Inch Concrete Sidewalk and Drive Approach		Item No. 29 – 360 Sq. Ft. of Concrete Slope Nose	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4.40	$19,901.20	$4.70	$22,320.30	$10.00	$3,600.00
Zignego, Inc.	$7.50	33,922.50	7.50	35,617.50	12.00	4,320.00
MJ Construction, Inc.	$5.00	22,615.00	5.50	26,119.50	7.50	2,700.00
American Sewer Services, Inc.	$4.60	20,805.80	4.88	23,175.12	10.50	3,780.00
Super Excavators, Inc.	$6.00	27,138.00	7.00	33,243.00	10.00	3,600.00
D.F. Tomasini Contractors, Inc.	$6.00	27,138.00	6.25	29,681.25	10.00	3,600.00

Bidders:	Item No. 30 – 384 Sq. Ft. of Detectable Warning Field		Item No. 31 – 75 Extra Bags of Cement for High-Early-Strength Concrete		Item No. 32 – 8,466 Lin. Ft. of Pavement Marking Epoxy 4-Inch	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$45.00	$17,280.00	$10.00	$750.00	$1.55	$13,122.30
Zignego, Inc.	$40.00	15,360.00	12.00	900.00	1.55	13,122.30
MJ Construction, Inc.	$30.50	11,712.00	9.00	675.00	2.00	16,932.00
American Sewer Services, Inc.	$35.00	13,440.00	21.00	1,575.00	1.63	13,799.58
Super Excavators, Inc.	$35.00	13,440.00	10.00	750.00	1.00	8,466.00
D.F. Tomasini Contractors, Inc.	$45.00	17,280.00	10.00	750.00	1.55	13,122.30

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Bidders:	Item No. 33 – 902 Lin. Ft. of Pavement Marking Epoxy 8-Inch		Item No. 34 – 30 Lin. Ft. of Pavement Marking Diagonal Epoxy 12-Inch		Item No. 35 – 262 Lin. Ft. of Pavement Marking Stop Line Epoxy 18-Inch	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.05	$1,849.10	$8.75	$262.50	$10.00	$2,620.00
Zignego, Inc.	$2.05	1,849.10	8.75	262.50	10.00	2,620.00
MJ Construction, Inc.	$2.50	2,255.00	9.00	270.00	10.50	2,751.00
American Sewer Services, Inc.	$2.15	1,939.30	9.00	270.00	10.50	2,751.00
Super Excavators, Inc.	$1.00	902.00	1.00	30.00	5.00	1,310.00
D.F. Tomasini Contractors, Inc.	$2.05	1,849.10	8.75	262.50	10.00	2,620.00

Bidders:	Item No. 36 – 919 Lin. Ft. of Pavement Marking Crosswalk Epoxy 6-Inch		Item No. 37 – 10 Pavement Marking Arrows Epoxy Type 2		Item No. 38 – 6 Pavement Marking Words Epoxy	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$7.50	$6,892.50	$275.00	$2,750.00	$335.00	$2,010.00
Zignego, Inc.	$7.50	6,892.50	275.00	2,750.00	335.00	2,010.00
MJ Construction, Inc.	$8.00	7,352.00	281.00	2,810.00	342.00	2,052.00
American Sewer Services, Inc.	$7.87	7,232.53	290.00	2,900.00	352.00	2,112.00
Super Excavators, Inc.	$2.00	1,838.00	100.00	1,000.00	100.00	600.00
D.F. Tomasini Contractors, Inc.	$7.50	6,892.50	275.00	2,750.00	335.00	2,010.00

Bidders:	Item No. 39 – 4 Pavement Marking Railroad Crossings Epoxy		Item No. 40 – 4 Pavement Marking Island Nose Epoxy		Item No. 41 – 449.1 Sq. Ft. of Signs Reflective Type II	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$535.00	$2,140.00	$125.00	$500.00	$21.40	$9,610.74
Zignego, Inc.	$535.00	2,140.00	125.00	500.00	21.40	9,610.74
MJ Construction, Inc.	$546.00	2,184.00	128.00	512.00	17.50	7,859.25
American Sewer Services, Inc.	$560.00	2,240.00	131.00	524.00	22.40	10,059.84
Super Excavators, Inc.	$200.00	800.00	100.00	400.00	10.00	4,491.00
D.F. Tomasini Contractors, Inc.	$535.00	2,140.00	125.00	500.00	27.00	12,125.70

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	Item No. 42 – 7 Moving Signs		Item No. 43 – 5 Moving Small Sign Supports		Item No. 44 – 112 Removing Signs	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$125.00	$875.00	$50.00	$250.00	$18.00	$2,016.00
Zignego, Inc.	$125.00	875.00	50.00	250.00	18.00	2,016.00
MJ Construction, Inc.	$10.50	73.50	41.00	205.00	5.50	616.00
American Sewer Services, Inc.	$131.00	917.00	53.00	265.00	18.90	2,116.80
Super Excavators, Inc.	$100.00	700.00	100.00	500.00	100.00	11,200.00
D.F. Tomasini Contractors, Inc.	$150.00	1,050.00	25.00	125.00	40.00	4,480.00

	Item No. 45 – 30 Removing Small Sign Supports		Item No. 46 – 37 Metal Sign Posts, 2.5-Inch Round		Item No. 47 – 5 Square Break-Away Posts, SPV 0060.12	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$18.00	$540.00	$125.00	$4,625.00	$150.00	$750.00
Zignego, Inc.	$18.00	540.00	125.00	4,625.00	150.00	750.00
MJ Construction, Inc.	$10.50	315.00	118.00	4,366.00	123.00	615.00
American Sewer Services, Inc.	$18.90	567.00	131.00	4,847.00	162.00	810.00
Super Excavators, Inc.	$50.00	1,500.00	25.00	925.00	50.00	250.00
D.F. Tomasini Contractors, Inc.	$20.00	600.00	125.00	4,625.00	200.00	1,000.00

	Item No. 48 – 4,264 Sq. Yds. of Topsoil and Sod		Item No. 49 – 700 Sq. Yds. of Topsoil, Seed, and Erosion Mat		Item No. 50 – 550 Lin. Ft. of Silt Fence, Delivered, Installed and Maintained	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$7.45	$31,766.80	$4.15	$2,905.00	$2.00	$1,100.00
Zignego, Inc.	$7.45	31,766.80	4.15	2,905.00	2.00	1,100.00
MJ Construction, Inc.	$8.00	34,112.00	7.00	4,900.00	2.00	1,100.00
American Sewer Services, Inc.	$7.00	29,848.00	6.00	4,200.00	5.00	2,750.00
Super Excavators, Inc.	$12.00	51,168.00	8.00	5,600.00	2.00	1,100.00
D.F. Tomasini Contractors, Inc.	$9.90	42,213.60	7.30	5,110.00	1.25	687.50

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Bidders:	Item No. 51 – 105 Lin. Ft. of Turbidity Barrier Delivered, Installed and Maintained		Item No. 52 – 50 Straw Bales Delivered, Installed and Maintained		Item No. 53 – 128 Filter Fabric Inlet Protection, Type A and C	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$50.00	$5,250.00	$12.00	$600.00	$68.00	$8,704.00
Zignego, Inc.	$38.00	3,990.00	15.00	750.00	68.00	8,704.00
MJ Construction, Inc.	$31.00	3,255.00	10.50	525.00	61.50	7,872.00
American Sewer Services, Inc.	$50.00	5,250.00	10.00	500.00	40.00	5,120.00
Super Excavators, Inc.	$10.00	1,050.00	10.00	500.00	50.00	6,400.00
D.F. Tomasini Contractors, Inc.	$40.00	4,200.00	8.50	425.00	55.00	7,040.00

Bidders:	Item No. 54 – 1 Temporary Street Lighting	Item No. 55 – 5,544 Lin. Ft. of Non Metallic Conduit, Street Light, Polyethylene Duct, Black, 2-Inch		Item No. 56 – 8 Street Light Pull Boxes, 15-Inch x 30-Inch	
	Lump Sum	Unit	Total	Unit	Total
Advance Construction Inc.	$55,650.25	$5.03	$27,886.32	$322.36	$2,578.88
Zignego, Inc.	$55,650.25	5.03	27,886.32	322.36	2,578.88
MJ Construction, Inc.	$56,764.00	7.00	38,808.00	330.00	2,640.00
American Sewer Services, Inc.	$58,450.00	5.28	29,272.32	338.00	2,704.00
Super Excavators, Inc.	$100,000.00	3.00	16,632.00	500.00	4,000.00
D.F. Tomasini Contractors, Inc.	$55,650.00	5.00	27,720.00	325.00	2,600.00

Bidders:	Item No. 57 – 23 Concrete Bases, Type 5		Item No. 58 – 1 Street Light Control Cabinet		Item No. 59 – 2 Concrete Control Cabinet Bases Type 9 Special (WisDOT 654.0217)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$716.94	$16,489.62	$5,420.79	$5,420.79	$1,693.02	$3,386.04
Zignego, Inc.	$716.94	16,489.62	5,420.79	5,420.79	1,693.02	3,386.04
MJ Construction, Inc.	$732.00	16,836.00	5,530.00	5,530.00	1,727.00	3,454.00
American Sewer Services, Inc.	$752.00	17,296.00	5,691.00	5,691.00	1,777.00	3,554.00
Super Excavators, Inc.	$850.00	19,550.00	2,500.00	2,500.00	2,500.00	5,000.00
D.F. Tomasini Contractors, Inc.	$715.00	16,445.00	5,420.00	5,420.00	1,690.00	3,380.00

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	Item No. 60 – 22,276 Lin. Ft. of Electrical Wire Lighting 4 AWG (WisDOT 655.0630)		Item No. 61 – 1 Electrical Service Meter Breaker Pedestal – (Lighting - E. Moreland Blvd. and White Rock Avenue) (WisDOT 656.0200.02)	Item No. 62 – 7 Remove Existing Roadway Lighting Unit, SPV.0060.09	
Bidders:	Unit	Total	Lump Sum	Unit	Total
Advance Construction Inc.	$1.34	$29,849.84	1,160.99	$206.73	$1,447.11
Zignego, Inc.	$1.34	29,849.84	1,160.99	206.73	1,447.11
MJ Construction, Inc.	$2.00	44,552.00	1,185.00	212.00	1,484.00
American Sewer Services, Inc.	$1.41	31,409.16	1,218.00	217.00	1,519.00
Super Excavators, Inc.	$2.00	44,552.00	5,000.00	500.00	3,500.00
D.F. Tomasini Contractors, Inc.	$1.35	30,072.60	$1,160.00	205.00	1,435.00

	Item No. 63 – 23 Remove and Re-install Lighting Assembly, SPV.0060.10		Item No. 64 – 1 Removing Existing Light Control Cabinet, SPV.0060.11		Item No. 65 – 367 Lin. Ft. of Conduit Rigid Nonmetallic Schedule 40 2-Inch (WisDOT 652.0225)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$396.02	$9,108.46	$413.45	$413.45	$4.77	$1,750.59
Zignego, Inc.	$396.02	9,108.46	413.45	413.45	4.77	1,750.59
MJ Construction, Inc.	$404.00	9,292.00	423.00	423.00	5.00	1,835.00
American Sewer Services, Inc.	$416.00	9,568.00	434.00	434.00	5.00	1,835.00
Super Excavators, Inc.	$500.00	11,500.00	500.00	500.00	1.00	367.00
D.F. Tomasini Contractors, Inc.	$396.00	9,108.00	414.00	414.00	5.00	1,835.00

	Item No. 66 – 1,433 Lin. Ft. of Conduit Rigid Nonmetallic Schedule 40 3-Inch (WisDOT 652.0235)		Item No. 67 – 14 Pull Boxes Steel 24x42-Inch (WisDOT 653.0140)		Item No. 68 – 5 Concrete Bases Type 1 (WisDOT 654.0101)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5.94	$8,512.02	$758.11	$10,613.54	$545.56	$2,727.80
Zignego, Inc.	$5.94	8,512.02	758.11	10,613.54	545.56	2,727.80
MJ Construction, Inc.	$7.00	10,031.00	775.00	10,850.00	557.00	2,785.00
American Sewer Services, Inc.	$6.25	8,956.25	796.00	11,144.00	572.00	2,860.00
Super Excavators, Inc.	$5.00	7,165.00	500.00	7,000.00	500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$6.00	8,598.00	750.00	10,500.00	545.00	2,725.00

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Bidders:	Item No. 69 – 3 Concrete Bases Type 2 (WisDOT 654.0102)		Item No. 70 – 1 Concrete Bases Type 10 (WisDOT 654.0110)		Item No. 71 – 2 Concrete Bases Type 13 (WisDOT 654.0113)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$832.26	$2,496.78	$4,438.25	$4,438.25	$8,144.09	$16,288.18
Zignego, Inc.	$832.26	2,496.78	4,438.25	4,438.25	8,144.09	16,288.18
MJ Construction, Inc.	$850.00	2,550.00	4,528.00	4,528.00	8,308.00	16,616.00
American Sewer Services, Inc.	$873.00	2,619.00	4,660.00	4,660.00	8,551.00	17,102.00
Super Excavators, Inc.	$500.00	1,500.00	500.00	500.00	500.00	1,000.00
D.F. Tomasini Contractors, Inc.	$830.00	2,490.00	4,440.00	4,440.00	8,100.00	16,200.00

Bidders:	Item No. 72 – 602 Lin. Ft. of Cable Traffic Signal 5-14 AWG (WisDOT 655.0230)		Item No. 73 – 138 Lin. Ft. of Cable Traffic Signal 7-14 AWG (WisDOT 655.0240)		Item No. 74 – 2,991 Lin. Ft. of Cable Traffic Signal 12-14 AWG (WisDOT 655.0260)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1.06	$638.12	$1.22	$168.36	$1.78	$5,323.98
Zignego, Inc.	$1.06	638.12	1.22	168.36	1.78	5,323.98
MJ Construction, Inc.	$2.00	1,204.00	2.00	276.00	2.00	5,982.00
American Sewer Services, Inc.	$1.12	674.24	1.28	176.64	1.87	5,593.17
Super Excavators, Inc.	$5.00	3,010.00	5.00	690.00	5.00	14,955.00
D.F. Tomasini Contractors, Inc.	$1.00	602.00	1.25	172.50	1.80	5,383.80

Bidders:	Item No. 75 – 641 Lin. Ft. of Cable Traffic Signal 15-14 AWG (WisDOT 655.0270)		Item No. 76 – 799 Lin. Ft. of Cable Type UF 2-10 AWG (WisDOT 655.0315)		Item No. 77 – 1,447 Lin. Ft. of Electrical Wire Traffic Signals 10 AWG (WisDOT 655.0515)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.14	1,371.74	$1.15	$918.85	$0.76	$1,099.72
Zignego, Inc.	$2.14	1,371.74	1.15	918.85	0.76	1,099.72
MJ Construction, Inc.	$3.00	1,923.00	2.00	1,598.00	1.00	1,447.00
American Sewer Services, Inc.	$2.24	1,435.84	1.20	958.80	0.79	1,143.13
Super Excavators, Inc.	$5.00	3,205.00	5.00	3,995.00	5.00	7,235.00
D.F. Tomasini Contractors, Inc.	$2.15	1,378.15	1.15	918.85	0.75	1,085.25

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Bidders:	Item No. 78 – 900 Lin. Ft. of Electrical Wire Lighting 12 AWG (WisDOT 655.0610) Unit	Total	Item No. 79 – 1 Electrical Service Meter Breaker Pedestal (Signal – E. Moreland Blvd. and White Rock Ave) (WisDOT 656.0200.01) Lump Sum	Item No. 80 – 5 Pedestal Bases (WisDOT 657.0100) Unit	Total
Advance Construction Inc.	$0.64	$576.00	$1,160.99	$227.12	$1,135.60
Zignego, Inc.	$0.64	576.00	1,160.99	227.12	1,135.60
MJ Construction, Inc.	$1.00	900.00	1,185.00	233.00	1,165.00
American Sewer Services, Inc.	$0.67	603.00	1,218.00	238.00	1,190.00
Super Excavators, Inc.	$5.00	4,500.00	2,500.00	500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$0.65	585.00	1,160.00	225.00	1,125.00

Bidders:	Item No. 81 – 3 Transformer Bases Breakaway 11 1/2-Inch Bolt Circle (WisDOT 657.0255) Unit	Total	Item No. 82 – 1 Poles Type 3 (WisDOT 657.0310) Unit	Total	Item No. 83 – 2 Poles Type 4 (WisDOT 657.0315) Unit	Total
Advance Construction Inc.	$380.58	$1,141.74	$2,605.68	$2,605.68	$1,332.78	$2,665.56
Zignego, Inc.	$380.58	1,141.74	2,605.68	2,605.68	1,332.78	2,665.56
MJ Construction, Inc.	$389.00	1,167.00	2,659.00	2,659.00	1,360.00	2,720.00
American Sewer Services, Inc.	$399.00	1,197.00	2,735.00	2,735.00	1,399.00	2,798.00
Super Excavators, Inc.	$500.00	1,500.00	1,000.00	1,000.00	1,000.00	2,000.00
D.F. Tomasini Contractors, Inc.	$380.00	1,140.00	2,600.00	2,600.00	1,330.00	2,660.00

Bidders:	Item No. 84 – 1 Traffic Signal Standards Aluminum 13-Foot (WisDOT 657.0420) Unit	Total	Item No. 85 – 2 Traffic Signal Standards Aluminum 15-Foot (WisDOT 657.0425) Unit	Total	Item No. 86 – 2 Traffic Signal Standards Aluminum 10-Foot (WisDOT 657.0430) Unit	Total
Advance Construction Inc.	$562.62	$562.62	$574.90	$1,149.80	$390.45	$780.90
Zignego, Inc.	$562.62	562.62	574.90	1,149.80	390.45	780.90
MJ Construction, Inc.	$575.00	575.00	587.00	1,174.00	399.00	798.00
American Sewer Services, Inc.	$590.00	590.00	603.00	1,206.00	409.00	818.00
Super Excavators, Inc.	$2,500.00	2,500.00	3,000.00	6,000.00	2,000.00	4,000.00
D.F. Tomasini Contractors, Inc.	$560.00	560.00	575.00	1,150.00	390.00	780.00

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Bidders:	Item No. 87 – 1 Trombone Arms 15-FT (WisDOT 657.0585) Unit	Total	Item No. 88 – 4 Luminaire Arms Single Member 4-Inch Clamp 6-Foot (WisDOT 657.0609) Unit	Total	Item No. 89 – 14 Traffic Signal Face 3-12 Inch Vertical (WisDOT 658.0110) Unit	Total
Advance Construction Inc.	$1,321.79	$1,321.79	$223.43	$893.72	$440.04	$6,160.56
Zignego, Inc.	$1,321.79	1,321.79	223.43	893.72	440.04	6,160.56
MJ Construction, Inc.	$1,349.00	1,349.00	229.00	916.00	449.00	6,286.00
American Sewer Services, Inc.	$1,388.00	1,388.00	234.00	936.00	462.00	6,468.00
Super Excavators, Inc.	$3,000.00	3,000.00	500.00	2,000.00	500.00	7,000.00
D.F. Tomasini Contractors, Inc.	$1,320.00	1,320.00	225.00	900.00	440.00	6,160.00

Bidders:	Item No. 90 – 2 Traffic Signal Face 4-12 Inch Vertical (WisDOT 658.0115) Unit	Total	Item No. 91 – 2 Traffic Signal Face 5-12 Inch Vertical (WisDOT 658.0120) Unit	Total	Item No. 92 – 14 Backplates Signal Face 3 section 12-Inch (WisDOT 658.0215) Unit	Total
Advance Construction Inc.	$539.54	$1,079.08	$645.33	$1,290.66	$89.48	$1,252.72
Zignego, Inc.	$539.54	1,079.08	645.33	1,290.66	89.48	1,252.72
MJ Construction, Inc.	$551.00	1,102.00	659.00	1,318.00	92.00	1,288.00
American Sewer Services, Inc.	$588.00	1,176.00	677.00	1,354.00	94.00	1,316.00
Super Excavators, Inc.	$500.00	1,000.00	500.00	1,000.00	100.00	1,400.00
D.F. Tomasini Contractors, Inc.	$540.00	1,080.00	645.00	1,290.00	90.00	1,260.00

Bidders:	Item No. 93 – 2 Backplates Signal Face 4 section 12-Inch (WisDOT 658.0220) Unit	Total	Item No. 94 – 2 Backplates Signal Face 5 section 12-Inch (WisDOT 658.0225) Unit	Total	Item No. 95 – 8 Pedestrian Signal Face 16-Inch (WisDOT 658.0416) Unit	Total
Advance Construction Inc.	$95.62	$191.24	$106.93	$213.86	$292.79	$2,342.32
Zignego, Inc.	$95.62	191.24	106.93	213.86	292.79	2,342.32
MJ Construction, Inc.	$98.00	196.00	110.00	220.00	299.00	2,392.00
American Sewer Services, Inc.	$100.00	200.00	112.00	224.00	307.00	2,456.00
Super Excavators, Inc.	$100.00	200.00	100.00	200.00	250.00	2,000.00
D.F. Tomasini Contractors, Inc.	$95.00	190.00	107.00	214.00	293.00	2,344.00

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Bidders:	Item No. 96 – 13 LED Modules 12-Inch Red Ball (WisDOT 658.0600) Unit	Total	Item No. 97 – 13 LED Modules 12-Inch Yellow Ball (WisDOT 658.0605) Unit	Total	Unit No. 98 – 12 LED Modules 12-Inch Green Ball (WisDOT 658.0610) Unit	Total
Advance Construction Inc.	$51.56	$670.28	$52.79	$686.27	$54.02	$648.24
Zignego, Inc.	$51.56	670.28	52.79	686.27	54.02	648.24
MJ Construction, Inc.	$53.00	689.00	54.00	702.00	55.00	660.00
American Sewer Services, Inc.	$54.00	702.00	55.00	715.00	57.00	684.00
Super Excavators, Inc.	$250.00	3,250.00	250.00	3,250.00	250.00	3,000.00
D.F. Tomasini Contractors, Inc.	$52.00	676.00	52.00	676.00	54.00	648.00

Bidders:	Item No. 99 – 5 LED Modules 12-Inch Red Arrow (WisDOT 658.0615) Unit	Total	Item No. 100 – 7 LED Modules 12-Inch Yellow Arrow (WisDOT 658.0620) Unit	Total	Item No. 101 – 10 LED Modules 12-Inch Green Arrow (WisDOT 658.0625) Unit	Total
Advance Construction Inc.	$51.56	$257.80	$52.79	$369.53	$54.02	$540.20
Zignego, Inc.	$51.56	257.80	52.79	369.53	54.02	540.20
MJ Construction, Inc.	$53.00	265.00	54.00	378.00	55.00	550.00
American Sewer Services, Inc.	$54.00	270.00	55.00	385.00	57.00	570.00
Super Excavators, Inc.	$250.00	1,250.00	250.00	1,750.00	250.00	2,500.00
D.F. Tomasini Contractors, Inc.	$52.00	260.00	52.00	364.00	54.00	540.00

Bidders:	Item No. 102 – 8 LED Modules Pedestrian Countdown Timer 16-Inch (WisDOT 658.0635) Unit	Total	Item No. 103 – 1 Signal Mounting Hardware (E. Moreland Blvd. and White Rock Ave.) (WisDOT 658.5069.01) Lump Sum	Unit No. 104 – 1 Monotube Poles Type 10, SPV.0060.01 Unit	Total
Advance Construction Inc.	$275.23	$2,201.84	$3,477.74	$4,882.32	$4,882.32
Zignego, Inc.	$275.23	2,201.84	3,477.74	4,882.32	4,882.32
MJ Construction, Inc.	$282.00	2,256.00	3,548.00	4,981.00	4,981.00
American Sewer Services, Inc.	$289.00	2,312.00	3,652.00	5,126.00	5,126.00
Super Excavators, Inc.	$500.00	4,000.00	500.00	2,000.00	2,000.00
D.F. Tomasini Contractors, Inc.	$275.00	2,200.00	3,450.00	4,800.00	4,800.00

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Bidders:	Item No. 105 – 2 Monotube Poles Type 13, SPV.0060.02		Item No. 106 – 1 Monotube Arms 25-FT, SPV.0060.03		Item No. 107 – 2 Monotube Arms 40-FT, SPV.0060.04	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$9,840.07	$19,680.14	$3,372.31	$3,372.31	$5,764.26	$11,528.52
Zignego, Inc.	$9,840.07	19,680.14	3,372.31	3,372.31	5,764.26	11,528.52
MJ Construction, Inc.	$10,037.00	20,074.00	3,441.00	3,441.00	5,881.00	11,762.00
American Sewer Services, Inc.	$10,332.00	20,664.00	3,540.00	3,540.00	6,052.00	12,104.00
Super Excavators, Inc.	$2,000.00	4,000.00	2,000.00	2,000.00	2,000.00	4,000.00
D.F. Tomasini Contractors, Inc.	$9,840.00	19,680.00	3,400.00	3,400.00	5,750.00	11,500.00

Bidders:	Item No. 108 – 3 Luminaire Arm Steel 12-FT, SPV.0060.05		Item No. 109 – 7 Install LED Luminaire, SPV.0060.06		Unit No. 110 – 1 Traffic Signal Controller and Cabinet 8-Phase Fully Actuated, SPV.0060.07	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$456.93	$1,370.79	$183.16	$1,282.12	$15,980.33	$15,980.33
Zignego, Inc.	$456.93	1,370.79	183.16	1,282.12	15,980.33	15,980.33
MJ Construction, Inc.	$467.00	1,401.00	194.00	1,358.00	16,300.00	16,300.00
American Sewer Services, Inc.	$480.00	1,440.00	192.00	1,344.00	16,780.00	16,780.00
Super Excavators, Inc.	$2,000.00	6,000.00	250.00	1,750.00	2,500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$460.00	1,380.00	183.00	1,281.00	16,000.00	16,000.00

Bidders:	Item No. 111 – 1 Battery Backup System, E. Moreland Blvd. and White Rock Avenue, SPV.0060.08		Item No. 112 – 1 Video Vehicle Detection System, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.01	Item No. 113 – 1 Emergency Vehicle Preemption System, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.02
	Unit	Total	Lump Sum	Lump Sum
Advance Construction Inc.	$7,106.36	$7,106.36	$24,417.94	$12,170.85
Zignego, Inc.	$7,106.36	7,106.36	24,417.94	12,170.85
MJ Construction, Inc.	$7,250.00	7,250.00	24,907.00	12,415.00
American Sewer Services, Inc.	$7,461.00	7,461.00	25,638.00	12,780.00
Super Excavators, Inc.	$2,500.00	2,500.00	5,000.00	2,500.00
D.F. Tomasini Contractors, Inc.	$7,100.00	7,100.00	24,500.00	12,000.00

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Bidders:	Item No. 114 – 1 Remove Traffic Signals, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.03 Lump Sum	Item No. 115 – 1 Salvage Copper Communications Cable at the E. Moreland Blvd. and White Rock Avenue Traffic Signal, SPV.0105.04 Lump Sum	Unit No. 116 – 1 Audible Pedestrian Push Button System, Intersection of E. Moreland Blvd and White Rock Avenue, SPV.0105.05 Lump Sum
Advance Construction Inc.	$3,100.88	$413.45	$5,866.90
Zignego, Inc.	$3,100.88	413.45	5,866.90
MJ Construction, Inc.	$3,163.00	423.00	5,985.00
American Sewer Services, Inc.	$3,255.00	434.00	6,160.00
Super Excavators, Inc.	$10,000.00	2,500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$3,100.00	415.00	5,900.00

Bidders:	Item No. 117 – 15 Remove Existing Storm Manhole		Item No. 118 – 20 Remove Existing Inlet		Item No. 119 – 220 Lin. Ft. of Remove Existing 12-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$550.00	$8,250.00	$500.00	$10,000.00	$11.00	$2,420.00
Zignego, Inc.	$550.00	8,250.00	500.00	10,000.00	11.00	2,420.00
MJ Construction, Inc.	$250.00	3,750.00	250.00	5,000.00	47.00	10,340.00
American Sewer Services, Inc.	$300.00	4,500.00	250.00	5,000.00	40.00	8,800.00
Super Excavators, Inc.	$300.00	4,500.00	350.00	7,000.00	35.00	7,700.00
D.F. Tomasini Contractors, Inc.	$500.00	7,500.00	250.00	5,000.00	15.00	3,300.00

Bidders:	Item No. 120 – 190 Lin. Ft. of Remove Existing 15-Inch Storm Sewer		Item No. 121 – 67 Lin. Ft. of Remove Existing 18-Inch Storm Sewer		Unit No. 122 – 54 Lin. Ft. of Remove Existing 24-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$12.00	$2,280.00	$14.00	$938.00	$16.00	$864.00
Zignego, Inc.	$12.00	2,280.00	14.00	938.00	16.00	864.00
MJ Construction, Inc.	$48.00	9,120.00	49.00	3,283.00	50.00	2,700.00
American Sewer Services, Inc.	$40.00	7,600.00	40.00	2,680.00	45.00	2,430.00
Super Excavators, Inc.	$47.00	8,930.00	44.00	2,948.00	44.00	2,376.00
D.F. Tomasini Contractors, Inc.	$15.00	2,850.00	20.00	1,340.00	20.00	1,080.00

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Bidders:	Item No. 123 – 184 Lin. Ft. of Remove Existing 30-Inch Storm Sewer		Item No. 124 – 1,902 Lin. Ft. of Remove Existing 36-Inch Storm Sewer		Item No. 125 – 3 Abandon Existing Storm Manhole	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$20.00	$3,680.00	$30.00	$57,060.00	$450.00	$1,350.00
Zignego, Inc.	$20.00	3,680.00	30.00	57,060.00	450.00	1,350.00
MJ Construction, Inc.	$55.00	10,120.00	40.00	76,080.00	500.00	1,500.00
American Sewer Services, Inc.	$50.00	9,200.00	50.00	95,100.00	350.00	1,050.00
Super Excavators, Inc.	$71.00	13,064.00	71.00	135,042.00	700.00	2,100.00
D.F. Tomasini Contractors, Inc.	$25.00	4,600.00	25.00	47,550.00	500.00	1,500.00

Bidders:	Item No. 126 – 4 Abandon Existing Inlet		Item No. 127 – 1,028 Lin. Ft. of Abandon Existing 12-Inch Storm Sewer		Unit No. 128 – 68 Lin. Ft. of Abandon Existing 15-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$400.00	$1,600.00	$6.00	$6,168.00	$7.00	$476.00
Zignego, Inc.	$400.00	1,600.00	6.00	6,168.00	7.00	476.00
MJ Construction, Inc.	$200.00	800.00	3.00	3,084.00	5.00	340.00
American Sewer Services, Inc.	$250.00	1,000.00	5.00	5,140.00	10.00	680.00
Super Excavators, Inc.	$450.00	1,800.00	28.00	28,784.00	39.00	2,652.00
D.F. Tomasini Contractors, Inc.	$200.00	800.00	15.00	15,420.00	15.00	1,020.00

Bidders:	Item No. 129 – 170 Lin. Ft. of Abandon Existing 30-Inch Storm Sewer		Item No. 130 – 177 Lin. Ft. of Abandon Existing 36-Inch Storm Sewer		Item No. 131 – 974 Lin. Ft. of 12-Inch RCP Storm Sewer, Class III	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$20.00	$3,400.00	$25.00	$4,425.00	$68.00	$66,232.00
Zignego, Inc.	$20.00	3,400.00	25.00	4,425.00	68.00	66,232.00
MJ Construction, Inc.	$15.00	2,550.00	20.00	3,540.00	114.00	111,036.00
American Sewer Services, Inc.	$15.00	2,550.00	20.00	3,540.00	95.00	92,530.00
Super Excavators, Inc.	$36.00	6,120.00	60.00	10,620.00	85.00	82,790.00
D.F. Tomasini Contractors, Inc.	$60.00	10,200.00	75.00	13,275.00	80.00	77,920.00

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Bidders:	Item No. 132 – 292 Lin. Ft. of 15-Inch RCP Storm Sewer, Class III		Item No. 133 – 80 Lin. Ft. of 18-inch RCP Storm Sewer, Class III		Unit No. 134 – 8 Lin. Ft. of 27-Inch RCP Storm Sewer, Class III	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$69.00	$20,148.00	$73.00	$5,840.00	$85.00	$680.00
Zignego, Inc.	$69.00	20,148.00	73.00	5,840.00	85.00	680.00
MJ Construction, Inc.	$168.00	49,056.00	170.00	13,600.00	375.00	3,000.00
American Sewer Services, Inc.	$97.00	28,324.00	98.00	7,840.00	150.00	1,200.00
Super Excavators, Inc.	$83.00	24,236.00	150.00	12,000.00	250.00	2,000.00
D.F. Tomasini Contractors, Inc.	$100.00	29,200.00	150.00	12,000.00	350.00	2,800.00

Bidders:	Item No. 135 – 79 Lin. Ft. of 36-Inch RCP Storm Sewer, Class III		Item No. 136 – 292 Lin. Ft. of 54-Inch RCP Storm Sewer, Class IV		Item No. 137 – 3,165 Lin. Ft. of 66-Inch RCP Storm Sewer, Class IV	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$115.00	$9,085.00	$190.00	$55,480.00	$295.00	$933,675.00
Zignego, Inc.	$115.00	9,085.00	190.00	55,480.00	295.00	933,675.00
MJ Construction, Inc.	$200.00	15,800.00	340.00	99,280.00	475.00	1,503,375.00
American Sewer Services, Inc.	$330.00	26,070.00	485.00	141,620.00	576.00	1,823,040.00
Super Excavators, Inc.	$200.00	15,800.00	300.00	87,600.00	680.00	2,152,200.00
D.F. Tomasini Contractors, Inc.	$350.00	27,650.00	500.00	146,000.00	865.00	2,737,725.00

Bidders:	Item No. 138 – 56 Lin. Ft. of 53x83-inch RCP Horizontal Elliptical Storm Sewer, Class IV		Item No. 139 – 10 - 48-Inch Diameter Storm Tee Manhole		Unit No. 140 – 2 - 72-Inch Diameter Storm Manhole	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$400.00	$22,400.00	$3,000.00	$30,000.00	$4,500.00	$4,500.00
Zignego, Inc.	$400.00	22,400.00	3,000.00	30,000.00	4,500.00	4,500.00
MJ Construction, Inc.	$585.00	32,760.00	5,500.00	55,000.00	7,500.00	7,500.00
American Sewer Services, Inc.	$790.00	44,240.00	10,980.00	109,800.00	13,500.00	13,500.00
Super Excavators, Inc.	$750.00	42,000.00	7,000.00	70,000.00	9,000.00	9,000.00
D.F. Tomasini Contractors, Inc.	$600.00	33,600.00	6,500.00	65,000.00	3,500.00	3,500.00

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Bidders:	Item No. 141 – 1 - 108-Inch Diameter Storm Manhole		Item No. 142 – 3 - 108-Inch Diameter Storm Manhole, with Reduced Riser		Item No. 143 – 2 - 120-Inch Diameter Storm Manhole, with Reduced Riser	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$10,000.00	$10,000.00	$16,800.00	$50,400.00	$20,000.00	$40,000.00
Zignego, Inc.	$10,000.00	10,000.00	16,800.00	50,400.00	20,000.00	40,000.00
MJ Construction, Inc.	$11,000.00	11,000.00	11,000.00	33,000.00	12,000.00	24,000.00
American Sewer Services, Inc.	$21,900.00	21,900.00	22,950.00	68,850.00	28,400.00	56,800.00
Super Excavators, Inc.	$30,000.00	30,000.00	30,000.00	90,000.00	175,000.00	350,000.00
D.F. Tomasini Contractors, Inc.	$15,000.00	15,000.00	17,000.00	17,000.00	20,000.00	40,000.00

Bidders:	Item No. 144 – 1 - 54-Inch RCP Storm Sewer 61-degree Bend		Item No. 145 – 1 - 54-Inch RCP Storm Sewer 66-degree Bend		Unit No. 146 – 1 - 66-Inch RCP Storm Sewer 54-degree Bend	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,317.00	$2,317.00	$2,317.00	$2,317.00	$4,091.00	$4,091.00
Zignego, Inc.	$2,317.00	2,317.00	2,317.00	2,317.00	4,091.00	4,091.00
MJ Construction, Inc.	$3,000.00	3,000.00	3,000.00	3,000.00	3,500.00	3,500.00
American Sewer Services, Inc.	$4,500.00	4,500.00	4,500.00	4,500.00	5,000.00	5,000.00
Super Excavators, Inc.	$4,200.00	4,200.00	4,000.00	4,000.00	8,000.00	8,000.00
D.F. Tomasini Contractors, Inc.	$5,000.00	5,000.00	5,000.00	5,000.00	6,000.00	6,000.00

Bidders:	Item No. 147 – 1 - 66-Inch RCP Storm Sewer 13-degree Bend		Item No. 148 – 1 - 66-Inch RCP Storm Sewer 10-degree Bend		Item No. 149 – 3 - Inlets 2x3-Ft	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,342.00	$4,342.00	$4,342.00	$4,342.00	$1,500.00	$4,500.00
Zignego, Inc.	$4,342.00	4,342.00	4,342.00	4,342.00	1,500.00	4,500.00
MJ Construction, Inc.	$3,500.00	3,500.00	3,500.00	3,500.00	1,500.00	4,500.00
American Sewer Services, Inc.	$5,000.00	5,000.00	5,000.00	5,000.00	3,000.00	9,000.00
Super Excavators, Inc.	$5,500.00	5,500.00	5,500.00	5,500.00	1,200.00	3,600.00
D.F. Tomasini Contractors, Inc.	$6,000.00	6,000.00	6,000.00	6,000.00	1,200.00	3,600.00

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Bidders:	Item No. 150 – 38 Inlets 2x3-Ft, with Sump		Item No. 151 – 4 Concrete Collars 30-Inches and Under		Unit No. 152 – 4 Concrete Collars Over 30-Inches	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1,900.00	$72,200.00	$500.00	$2,000.00	$1,500.00	$6,000.00
Zignego, Inc.	$1,900.00	72,200.00	500.00	2,000.00	1,500.00	6,000.00
MJ Construction, Inc.	$1,200.00	45,600.00	1,200.00	4,800.00	3,500.00	14,000.00
American Sewer Services, Inc.	$2,500.00	95,000.00	2,000.00	8,000.00	6,000.00	24,000.00
Super Excavators, Inc.	$1,300.00	49,400.00	450.00	1,800.00	900.00	3,600.00
D.F. Tomasini Contractors, Inc.	$1,600.00	60,800.00	2,000.00	8,000.00	5,000.00	20,000.00

Bidders:	Item No. 153 – 1 - 54-Inch Apron Endwall		Item No. 154 – 50 Lin. Ft. of 54-Inch RCP Bore and Jack Under Railroad		Item No. 155 – 9 Removing Bulkheads (Wolf Road to Manhattan Drive)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,300.00	$2,300.00	$2,000.00	$100,000.00	$1,000.00	$9,000.00
Zignego, Inc.	$2,300.00	2,300.00	2,000.00	100,000.00	1,000.00	9,000.00
MJ Construction, Inc.	$5,000.00	5,000.00	3,500.00	175,000.00	250.00	2,250.00
American Sewer Services, Inc.	$2,500.00	2,500.00	3,190.00	159,500.00	750.00	6,750.00
Super Excavators, Inc.	$3,000.00	3,000.00	5,700.00	285,000.00	2,700.00	24,300.00
D.F. Tomasini Contractors, Inc.	$7,000.00	7,000.00	3,500.00	175,000.00	1,000.00	9,000.00

Bidders:	Item No. 156 – 2 Bulkheads (Wolf Road to Manhattan Drive)		Item No. 157 – 21 Chimney Replacement		Unit No. 158 – 14 Chimney Seals	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$3,000.00	$6,000.00	$800.00	$16,800.00	$400.00	$5,600.00
Zignego, Inc.	$3,000.00	6,000.00	800.00	16,800.00	400.00	5,600.00
MJ Construction, Inc.	$400.00	800.00	350.00	7,350.00	450.00	6,300.00
American Sewer Services, Inc.	$2,000.00	4,000.00	500.00	10,500.00	300.00	4,200.00
Super Excavators, Inc.	$1,200.00	2,400.00	325.00	6,825.00	450.00	6,300.00
D.F. Tomasini Contractors, Inc.	$1,500.00	3,000.00	1,000.00	21,000.00	500.00	7,000.00

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Bidders:	Item No. 159 – 5,075 Lin. Ft. of Main Line Sewer Televising		Item No. 160 – 81 Lateral Sewer Televising		Item No. 161 – 63 Lin. Ft. of 8-Inch PVC Sanitary Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1.00	$5,075.00	$125.00	$10,125.00	$85.00	$5,355.00
Zignego, Inc.	$1.00	5,075.00	125.00	10,125.00	85.00	5,355.00
MJ Construction, Inc.	$4.00	20,300.00	275.00	22,275.00	195.00	12,285.00
American Sewer Services, Inc.	$1.00	5,075.00	135.00	10,935.00	165.00	10,395.00
Super Excavators, Inc.	$3.00	15,225.00	250.00	20,250.00	200.00	12,600.00
D.F. Tomasini Contractors, Inc.	$3.00	15,225.00	245.00	19,845.00	200.00	12,600.00

Bidders:	Item No. 162 – 1 - 48-Inch Diameter Sanitary Sewer Drop Manhole		Item No. 163 – 2,673 Lin. Ft. of 6-Inch Sanitary Lateral Replacement		Unit No. 164 – 16 Sanitary Lateral Abandonment	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,400.00	$4,400.00	$88.80	$237,362.40	$800.00	$12,800.00
Zignego, Inc.	$4,400.00	4,400.00	88.80	237,362.40	800.00	12,800.00
MJ Construction, Inc.	$6,000.00	6,000.00	108.00	288,684.00	1,750.00	28,000.00
American Sewer Services, Inc.	$2,200.00	2,200.00	96.00	256,608.00	1,000.00	16,000.00
Super Excavators, Inc.	$3,000.00	3,000.00	100.00	267,300.00	1,500.00	24,000.00
D.F. Tomasini Contractors, Inc.	$4,000.00	4,000.00	150.00	400,950.00	800.00	12,800.00

Bidders:	Item No. 165 – 170 Lin. Ft. of 16-Inch DI Water Main and Fittings		Item No. 166 – 257 Lin. Ft. of 16-Inch HDPE Horizontal Direction Drilled Water Main and Fittings		Item No. 167 – 1,447 Lin. Ft. of 12-Inch DI Water Main and Fittings	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$250.00	$42,500.00	$390.00	$100,230.00	$170.00	$245,990.00
Zignego, Inc.	$250.00	42,500.00	390.00	100,230.00	170.00	245,990.00
MJ Construction, Inc.	$325.00	55,250.00	790.00	203,030.00	155.00	224,285.00
American Sewer Services, Inc.	$392.00	66,640.00	630.00	161,910.00	168.00	243,096.00
Super Excavators, Inc.	$350.00	59,500.00	800.00	205,600.00	150.00	217,050.00
D.F. Tomasini Contractors, Inc.	$400.00	68,000.00	1,000.00	257,000.00	300.00	434,100.00

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Bidders:	Item No. 168 – 609 Lin. Ft. of 8-Inch DI Water Main and Fittings		Item No. 169 – 1 Corrosion Protection	Unit No. 170 – 2 - 16-Inch Butterfly Valves	
	Unit	Total	Lump Sum	Unit	Total
Advance Construction Inc.	$170.00	$103,530.00	$8,000.00	$4,550.00	$9,100.00
Zignego, Inc.	$170.00	103,530.00	8,000.00	4,550.00	9,100.00
MJ Construction, Inc.	$135.00	82,215.00	12,000.00	5,000.00	10,000.00
American Sewer Services, Inc.	$210.00	127,890.00	5,100.00	4,500.00	9,000.00
Super Excavators, Inc.	$200.00	121,800.00	6,500.00	4,500.00	9,000.00
D.F. Tomasini Contractors, Inc.	$250.00	152,250.00	8,000.00	4,000.00	8,000.00

Bidders:	Item No. 171 – 3 - 12-Inch Gate Valves		Item No. 172 – 3 - 8-Inch Gate Valves		Item No. 173 – 5 Furnish and Install Hydrant Assembly	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,666.00	$7,998.00	$1,522.00	$4,566.00	$6,275.00	$31,375.00
Zignego, Inc.	$2,666.00	7,998.00	1,522.00	4,566.00	6,275.00	31,375.00
MJ Construction, Inc.	$3,000.00	9,000.00	1,800.00	5,400.00	5,500.00	27,500.00
American Sewer Services, Inc.	$2,800.00	8,400.00	1,600.00	4,800.00	5,400.00	27,000.00
Super Excavators, Inc.	$3,200.00	9,600.00	1,800.00	5,400.00	8,000.00	40,000.00
D.F. Tomasini Contractors, Inc.	$2,800.00	8,400.00	1,600.00	4,800.00	8,000.00	40,000.00

Bidders:	Item No. 174 – 3 Furnish and Install Hydrant Assembly, WWU Provides Direct Tap		Item No. 175 – 4 WL1 - Connect Existing 3/4-Inch Service Lateral		Unit No. 176 – 3 WL2 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5,475.00	$16,425.00	$4,027.00	$16,108.00	$3,895.00	$11,685.00
Zignego, Inc.	$5,475.00	16,425.00	4,027.00	16,108.00	3,895.00	11,685.00
MJ Construction, Inc.	$9,500.00	28,500.00	4,100.00	16,400.00	9,500.00	28,500.00
American Sewer Services, Inc.	$8,000.00	24,000.00	4,200.00	16,8000.00	5,000.00	15,000.00
Super Excavators, Inc.	$8,500.00	25,500.00	5,000.00	20,000.00	6,000.00	18,000.00
D.F. Tomasini Contractors, Inc.	$7,000.00	21,000.00	4,500.00	18,000.00	4,200.00	12,600.00

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Bidders:	Item No. 177 – 1 WL3 - Connect Existing 1-Inch Service Lateral		Item No. 178 – 1 WL4 - Connect Existing 1 1/4- Inch Service Lateral		Item No. 179 – 18 WL6 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,250.00	$2,250.00	$2,760.00	$2,760.00	$2,950.00	$53,100.00
Zignego, Inc.	$2,250.00	2,250.00	2,760.00	2,760.00	2,950.00	53,100.00
MJ Construction, Inc.	$3,500.00	3,500.00	3,800.00	3,800.00	6,500.00	117,000.00
American Sewer Services, Inc.	$2,000.00	2,000.00	2,500.00	2,500.00	3,400.00	61,200.00
Super Excavators, Inc.	$3,000.00	3,000.00	3,600.00	3,600.00	4,000.00	72,000.00
D.F. Tomasini Contractors, Inc.	$3,800.00	3,800.00	4,000.00	4,000.00	3,200.00	57,600.00

Bidders:	Item No. 180 – 3 WL7 - Connect Existing 2-Inch Service Lateral		Item No. 181 – 1 WL8 - Connect Existing 1 1/4-Inch Service Lateral		Unit No. 182 – 3 WL10 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1,745.00	$5,235.00	$2,855.00	$2,855.00	$1,600.00	$4,800.00
Zignego, Inc.	$1,745.00	5,235.00	2,855.00	2,855.00	1,600.00	4,800.00
MJ Construction, Inc.	$3,600.00	10,800.00	3,625.00	3,625.00	1,800.00	5,400.00
American Sewer Services, Inc.	$2,500.00	7,500.00	2,000.00	2,000.00	1,000.00	3,000.00
Super Excavators, Inc.	$2,000.00	6,000.00	3,000.00	3,000.00	1,500.00	4,500.00
D.F. Tomasini Contractors, Inc.	$2,500.00	7,500.00	3,000.00	3,000.00	2,000.00	6,000.00

Bidders:	Item No. 183 – 1 WL11 - Connect Existing 3/4-Inch Service Lateral		Item No. 184 – 4 WL12 - Connect Existing 3/4-Inch Service Lateral		Item No. 185 – 10 Furnish and Install Curb Boxes and Rods (If Required)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,180.00	$41,80.00	$2,283.00	$9,132.00	$250.00	$2,500.00
Zignego, Inc.	$4,180.00	4,180.00	2,283.00	9,132.00	250.00	2,500.00
MJ Construction, Inc.	$6,200.00	6,200.00	2,400.00	9,600.00	115.00	1,150.00
American Sewer Services, Inc.	$5,300.00	5,300.00	3,200.00	12,800.00	200.00	2,000.00
Super Excavators, Inc.	$6,000.00	6,000.00	3,000.00	12,000.00	80.00	800.00
D.F. Tomasini Contractors, Inc.	$5,000.00	5,000.00	2,600.00	10,400.00	750.00	7,500.00

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Bidders:	Item No. 186 – 10 Furnish and Install Curb Stop (If Required)		Item No. 187 – 2 Cap and Abandon Water Service		Unit No. 188 – 8 Remove Existing Hydrant	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$201.00	$2,010.00	$800.00	$1,600.00	$500.00	$4,000.00
Zignego, Inc.	$201.00	2,010.00	800.00	1,600.00	500.00	4,000.00
MJ Construction, Inc.	$225.00	2,250.00	3,500.00	7,000.00	500.00	4,000.00
American Sewer Services, Inc.	$600.00	6,000.00	500.00	1,000.00	500.00	4,000.00
Super Excavators, Inc.	$130.00	1,300.00	550.00	1,100.00	700.00	5,600.00
D.F. Tomasini Contractors, Inc.	$750.00	7,500.00	2,500.00	5,000.00	800.00	6,400.00

Bidders:	Item No. 189 – 10 Abandon Valve Boxes and Manholes		Item No. 190 – 9 Valve Box Adjustment		Item No. 191 – 50 Sq. Yds. of Pipe Insulation, 2-Inch Extruded Polystyrene	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$500.00	$5,000.00	$100.00	$900.00	$20.00	$1,000.00
Zignego, Inc.	$500.00	5,000.00	100.00	900.00	20.00	1,000.00
MJ Construction, Inc.	$50.00	500.00	75.00	675.00	12.00	600.00
American Sewer Services, Inc.	$200.00	2,000.00	200.00	1,800.00	10.00	500.00
Super Excavators, Inc.	$300.00	3,000.00	250.00	2,250.00	35.00	1,750.00
D.F. Tomasini Contractors, Inc.	$500.00	5,000.00	100.00	900.00	25.00	1,250.00

Bidders:	Item No. 192 – 65 Cu. Yds. of Loose Rock Excavation		Item No. 193 – 30 Cu. Yds. of Solid Rock Excavation		Unit No. 194 – 200 Cu. Yds. of Rip Rap Heavy	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$200.00	$13,000.00	$400.00	$12,000.00	$85.00	$17,000.00
Zignego, Inc.	$70.00	4,550.00	35.00	1,050.00	195.00	39,000.00
MJ Construction, Inc.	$120.00	7,800.00	300.00	9,000.00	40.00	8,000.00
American Sewer Services, Inc.	$50.00	3,250.00	1,000.00	30,000.00	60.00	12,000.00
Super Excavators, Inc.	$125.00	8,125.00	250.00	7,500.00	75.00	15,000.00
D.F. Tomasini Contractors, Inc.	$200.00	13,000.00	1,500.00	45,000.00	100.00	20,000.00

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	Item No. 195 – 1 Outfall Grading	Item No. 196 – 150 Cu. Yds. of Slurry Backfill	
Bidders:	Lump Sum	Unit	Total
Advance Construction Inc.	$12,000.00	$100.00	$15,000.00
Zignego, Inc.	$10,000.00	100.00	15,000.00
MJ Construction, Inc.	$15,000.00	65.00	9,750.00
American Sewer Services, Inc.	$15,000.00	55.00	8,250.00
Super Excavators, Inc.	$20,000.00	70.00	10,500.00
D.F. Tomasini Contractors, Inc.	$6,500.00	50.00	7,500.00

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Bids Received: Friday, February 26, 2016 at 11:00 a.m.

Bidders:	Total Contract Price	Item No. 1 – 1 Traffic Control Lump Sum	Item No. 2 – 1 E. Moreland Blvd. Detour Lump Sum
Advance Construction Inc. 2141 Woodale Ave., Green Bay 54313	$4,786,009.56	$105,000.00	$5,600.00
MJ Construction, Inc. 8617 W. Kaul Ave., Milwaukee 53225	$5,639,153.25	65,000.00	6,000.00
American Sewer Services, Inc. N2768 County Road P, Rubicon 53078	$6,184,236.52	50,00.00	6,000.00
Super Excavators, Inc. N59 W14601 Bobolink Ave., Meno. Falls, 53051	$7,374,086.00	70,000.00	10,000.00
D.F. Tomasini Contractors, Inc. N70 W25176 Indian Grass Ln., Sussex 53089	$7,566,758.71	44,500.00	5,000.00

	Item No. 3 – 300 Lin. Ft. of Fence Safety (WisDOT 616.0700.S.)		Item No. 4 – 2,100 Lin. Ft. of Sawcutting at Pavement Limits		Item No. 5 – 195 of Clearing and Grubbing	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$3.00	$900.00	$2.50	$5,250.00	$45.00	$8,775.00
MJ Construction, Inc.	$2.50	750.00	2.00	4,200.00	75.00	146,625.00
American Sewer Services, Inc.	$5.00	1,500.00	2.00	4,200.00	60.00	11,700.00
Super Excavators, Inc.	$10.00	3,000.00	2.00	4,200.00	50.00	9,750.00
D.F. Tomasini Contractors, Inc.	$2.00	600.00	2.40	5,040.00	55.00	10,725.00

	Item No. 6 – 9,440 Lin. Ft. of Concrete Curb and Gutter Removal		Item No. 7 – 27,260 Sq. Yds. of Pavement Removal		Item No. 8 – 25,210 Sq. Ft. of Sidewalk and Drive Approach Removal	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.00	$18,880.00	$2.00	$54,520.00	$1.00	$25,210.00
MJ Construction, Inc.	$4.00	37,760.00	5.00	13,800.00	2.00	50,420.00
American Sewer Services, Inc.	$5.30	50,032.00	6.57	18,133.20	0.37	9,327.70
Super Excavators, Inc.	$5.00	47,200.00	5.00	136,300.00	1.00	25,210.00
D.F. Tomasini Contractors, Inc.	$2.40	22,656.00	15.75	43,470.00	1.60	40,366.00

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Bidders:	Item No. 9 – 28,625 Tons of 1¼-Inch Dense Aggregate		Item No. 10 – 600 Tons of 1¼-Inch Crushed Stone Backfill		Item No. 11 – 1,200 Tons of 3-Inch Crushed Stone Backfill	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$13.00	$372,125.00	$25.00	$15,000.00	$25.00	$30,000.00
MJ Construction, Inc.	$10.00	286,250.00	12.00	7,200.00	11.00	13,200.00
American Sewer Services, Inc.	$13.85	396,456.25	28.00	16,800.00	18.00	21,600.00
Super Excavators, Inc.	$13.00	372,125.00	13.00	7,800.00	11.00	13,200.00
D.F. Tomasini Contractors, Inc.	$16.50	472,312.50	26.00	15,600.00	27.00	32,400.00

Bidders:	Item No. 12 – 2,386 Sq. Yds. of Geotextile Fabric, Type SAS		Item No. 13 – 4,240 Lin. Ft. of Shaping and Grading of Roadway Base		Item No. 14 – 10,205 Lin. Ft. of 30-Inch Combination Concrete Curb and Gutter	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.25	$5,368.50	$25.00	$106,000.00	$15.50	$115,177.50
MJ Construction, Inc.	$1.00	2,386.00	8.25	34,980.00	15.00	153,075.00
American Sewer Services, Inc.	$1.50	3,579.00	7.00	29,680.00	16.25	165,831.25
Super Excavators, Inc.	$2.00	4,772.00	58.00	245,920.00	25.00	255,125.00
D.F. Tomasini Contractors, Inc.	$3.00	7,158.00	6.75	28,620.00	12.50	127,562.50

Bidders:	Item No. 15 – 53 Lin. Ft. of Concrete Curb and Gutter Type 30G (WisDOT 601.0413)		Item No. 16 – 40 Sq. Yds. of 9-Inch Concrete Pavement, Doweled		Item No. 17 – 333 Sq. Yds. of 8-Inch Concrete Pavement, Doweled	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$28.00	$1,484.00	$54.00	$2,160.00	$39.15	$13,036.95
MJ Construction, Inc.	$19.50	1,033.50	38.00	1,520.00	42.50	14,152.50
American Sewer Services, Inc.	$29.00	1,537.00	56.00	2,240.00	41.00	13,635.00
Super Excavators, Inc.	$30.00	1,590.00	50.00	2,000.00	25.00	8,325.00
D.F. Tomasini Contractors, Inc.	$50.00	2,650.00	70.00	2,800.00	35.00	11,655.00

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Bidders:	Item No. 18 – 3,343 Tons of HMA Pavement Type E-3, 19.0 mm PG 64-28		Item No. 19 – 3,343 Tons of HMA Pavement Type E-3, 12.5 mm PG 64-28		Item No. 20 – 2,674 Tons of HMA Pavement Type E-3, 9.5 mm PG 64-28	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$49.20	$164,475.60	$56.50	$188,879.50	$56.80	151,883.20
MJ Construction, Inc.	$51.50	172,164.50	57.50	192,222.50	61.50	164,451.00
American Sewer Services, Inc.	$51.50	172,164.50	59.00	197,237.00	59.00	157,766.00
Super Excavators, Inc.	$54.00	180,522.00	54.00	180,522.00	54.00	144,396.00
D.F. Tomasini Contractors, Inc.	$49.20	164,475.60	56.50	188,879.50	56.80	151,883.20

Bidders:	Item No. 21 – 3,597 Sq. Ft. of 4-Inch HMA Pavement for Driveways		Item No. 22 – 4,410 Sq. Ft. of HMA Butt Joint		Item No. 23 – 104 Lin. Ft. of Concrete Curb - Pedestrian	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$6.00	$21,582.00	$2.15	$9,481.50	$22.00	$2,288.00
MJ Construction, Inc.	$5.00	17,985.00	5.50	24,255.00	22.50	2,340.00
American Sewer Services, Inc.	$6.50	23,380.50	2.25	9,922.50	23.00	2,392.00
Super Excavators, Inc.	$5.00	17,985.00	5.00	22,050.00	50.00	5,200.00
D.F. Tomasini Contractors, Inc.	$6.00	21,582.00	2.15	9,481.50	50.00	5,200.00

Bidders:	Item No. 24 – 514 Sq. Ft. of Remove, Salvage and Re-install Brick Pavers at Frame Park, SPV.0165.01		Item No. 25 – 6,186 Sq. Ft. of Stamped Colored Concrete Sidewalk 4-Inch, SPV.0165.02		Item No. 26 – 17,840 Sq. Ft. of New 4-Inch Concrete Sidewalk and Curb Ramps	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$38.00	$19,532.00	$9.85	$60,932.10	$4.50	$80,280.00
MJ Construction, Inc.	$9.50	4,883.00	8.00	49,488.00	4.50	80,280.00
American Sewer Services, Inc.	$20.00	10,280.00	10.30	63,715.80	4.72	84,204.80
Super Excavators, Inc.	$35.00	17,990.00	10.00	61,860.00	5.00	89,200.00
D.F. Tomasini Contractors, Inc.	$22.50	11,565.00	10.46	64,705.56	6.00	107,000.00

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Bidders:	Item No. 27 – 4,523 Sq. Ft. of New 6-Inch Concrete Sidewalk and Drive Approach		Item No. 28 – 4,749 Sq. Ft. of New 7-Inch Concrete Sidewalk and Drive Approach		Item No. 29 – 360 Sq. Ft. of Concrete Slope Nose	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5.45	$24,650.35	$5.85	$27,781.65	$7.50	$2,700.00
MJ Construction, Inc.	$5.00	22,615.00	5.50	26,119.50	7.50	2,700.00
American Sewer Services, Inc.	$5.72	25,871.56	6.14	29,158.86	8.00	2,880.00
Super Excavators, Inc.	$6.00	27,13800	7.00	33,243.00	10.00	3,600.00
D.F. Tomasini Contractors, Inc.	$6.00	27,138.00	6.00	28,494.00	10.00	3,600.00

Bidders:	Item No. 30 – 384 Sq. Ft. of Detectable Warning Field		Item No. 31 – 75 Extra Bags of Cement for High-Early-Strength Concrete		Item No. 32 – 8,466 Lin. Ft. of Pavement Marking Epoxy 4-Inch	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$32.00	$12,288.00	$15.00	$1,125.00	$1.24	$10,497.84
MJ Construction, Inc.	$30.50	11,712.00	9.00	675.00	1.50	12,699.00
American Sewer Services, Inc.	$34.00	1,152.00	17.00	1,275.00	1.63	13,799.58
Super Excavators, Inc.	$35.00	13,440.00	10.00	750.00	1.00	8,466.00
D.F. Tomasini Contractors, Inc.	$45.00	17,280.00	10.00	750.00	1.55	13,122.30

Bidders:	Item No. 33 – 902 Lin. Ft. of Pavement Marking Epoxy 8-Inch		Item No. 34 – 30 Lin. Ft. of Pavement Marking Diagonal Epoxy 12-Inch		Item No. 35 – 262 Lin. Ft. of Pavement Marking Stop Line Epoxy 18-Inch	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.50	$2,255.00	$5.70	$171.00	$9.60	$2,515.00
MJ Construction, Inc.	$2.00	1,804.00	9.00	270.00	10.00	2,620.00
American Sewer Services, Inc.	$2.15	1,939.30	9.00	270.00	10.50	2,751.00
Super Excavators, Inc.	$1.00	902.00	1.00	30.00	5.00	1,310.00
D.F. Tomasini Contractors, Inc.	$2.05	1,849.10	8.75	262.50	10.00	2,620.00

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Bidders:	Item No. 36 – 919 Lin. Ft. of Pavement Marking Crosswalk Epoxy 6-Inch		Item No. 37 – 10 Pavement Marking Arrows Epoxy Type 2		Item No. 38 – 6 Pavement Marking Words Epoxy	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$7.35	$6,754.65	$225.00	$2,250.00	$230.00	$1,380.00
MJ Construction, Inc.	$7.50	6,892.50	271.00	2,710.00	332.00	1,992.00
American Sewer Services, Inc.	$7.87	7,232.53	290.00	2,900.00	352.00	2,112.00
Super Excavators, Inc.	$2.00	1,838.00	100.00	1,000.00	100.00	600.00
D.F. Tomasini Contractors, Inc.	$7.50	6,892.50	275.00	2,750.00	335.00	2,010.00

Bidders:	Item No. 39 – 4 Pavement Marking Railroad Crossings Epoxy		Item No. 40 – 4 Pavement Marking Island Nose Epoxy		Item No. 41 – 449.1 Sq. Ft. of Signs Reflective Type II	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$810.00	$3,240.00	$150.00	$600.00	$21.40	$9,610.74
MJ Construction, Inc.	$536.00	2,144.00	128.00	512.00	17.50	7,859.25
American Sewer Services, Inc.	$560.00	2,240.00	131.00	524.00	22.40	10,059.84
Super Excavators, Inc.	$200.00	800.00	100.00	400.00	10.00	4,491.00
D.F. Tomasini Contractors, Inc.	$535.00	2,140.00	125.00	500.00	27.00	12,125.70

Bidders:	Item No. 42 – 7 Moving Signs		Item No. 43 – 5 Moving Small Sign Supports		Item No. 44 – 112 Removing Signs	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$125.00	$875.00	$50.00	$250.00	$18.00	$2,016.00
MJ Construction, Inc.	$10.50	73.50	41.00	205.00	5.50	616.00
American Sewer Services, Inc.	$131.00	917.00	53.00	265.00	18.90	2,116.80
Super Excavators, Inc.	$100.00	700.00	100.00	500.00	100.00	11,200.00
D.F. Tomasini Contractors, Inc.	$150.00	1,050.00	25.00	125.00	40.00	4,480.00

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Bidders:	Item No. 45 – 30 Removing Small Sign Supports		Item No. 46 – 37 Metal Sign Posts, 2.5-Inch Round		Item No. 47 – 5 Square Break-Away Posts, SPV 0060.12	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$18.00	$540.00	$125.00	$4,625.00	$150.00	$750.00
MJ Construction, Inc.	$10.50	315.00	118.00	4,366.00	123.00	615.00
American Sewer Services, Inc.	$18.90	567.00	131.00	4,847.00	162.00	810.00
Super Excavators, Inc.	$50.00	1,500.00	25.00	925.00	50.00	250.00
D.F. Tomasini Contractors, Inc.	$20.00	600.00	125.00	4,625.00	200.00	1,000.00

Bidders:	Item No. 48 – 4,264 Sq. Yds. of Topsoil and Sod		Item No. 49 – 700 Sq. Yds. of Topsoil, Seed, and Erosion Mat		Item No. 50 – 550 Lin. Ft. of Silt Fence, Delivered, Installed and Maintained	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$7.45	$31,766.80	$4.15	$2,905.00	$2.00	$1,100.00
MJ Construction, Inc.	$8.00	34,112.00	7.00	4,900.00	2.00	1,100.00
American Sewer Services, Inc.	$7.00	29,848.00	6.00	4,200.00	5.00	2,750.00
Super Excavators, Inc.	$12.00	51,168.00	8.00	5,600.00	2.00	1,100.00
D.F. Tomasini Contractors, Inc.	$9.90	42,213.60	7.30	5,110.00	1.25	687.50

Bidders:	Item No. 51 – 105 Lin. Ft. of Turbidity Barrier Delivered, Installed and Maintained		Item No. 52 – 50 Straw Bales Delivered, Installed and Maintained		Item No. 53 – 128 Filter Fabric Inlet Protection, Type A and C	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$50.00	5,250.00	$12.00	$600.00	$68.00	$8,704.00
MJ Construction, Inc.	$31.00	3,255.00	10.50	525.00	61.50	7,872.00
American Sewer Services, Inc.	$50.00	5,250.00	10.00	500.00	40.00	5,120.00
Super Excavators, Inc.	$10.00	1,050.00	10.00	500.00	50.00	6,400.00
D.F. Tomasini Contractors, Inc.	$40.00	4,200.00	8.50	425.00	55.00	7,040.00

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Bidders:	Item No. 54 – 1 Temporary Street Lighting Lump Sum	Item No. 55 – 5,544 Lin. Ft. of Non Metallic Conduit, Street Light, Polyethylene Duct, Black, 2-Inch Unit	 Total	Item No. 56 – 8 Street Light Pull Boxes, 15-Inch x 30-Inch Unit	 Total
Advance Construction Inc.	$55,650.25	$5.03	$27,886.32	$322.36	$2,578.88
MJ Construction, Inc.	$56,764.00	7.00	38,808.00	330.00	2,640.00
American Sewer Services, Inc.	$58,450.00	5.28	29,272.32	338.00	2,704.00
Super Excavators, Inc.	$100,000.00	3.00	16,632.00	500.00	4,000.00
D.F. Tomasini Contractors, Inc.	$55,650.00	5.00	27,720.00	325.00	2,600.00

Bidders:	Item No. 57 – 23 Concrete Bases, Type 5 Unit	 Total	Item No. 58 – 1 Street Light Control Cabinet Unit	 Total	Item No. 59 – 2 Concrete Control Cabinet Bases Type 9 Special (WisDOT 654.0217) Unit	 Total
Advance Construction Inc.	$716.94	$16,489.62	$5,420.79	$5,420.79	$1,693.02	$3,386.04
MJ Construction, Inc.	$732.00	16,836.00	5,530.00	5,530.00	1,727.00	3,454.00
American Sewer Services, Inc.	$752.00	17,296.00	5,691.00	5,691.00	1,777.00	3,554.00
Super Excavators, Inc.	$850.00	19,550.00	2,500.00	2,500.00	2,500.00	5,000.00
D.F. Tomasini Contractors, Inc.	$715.00	16,445.00	5,420.00	5,420.00	1,690.00	3,380.00

Bidders:	Item No. 60 – 22,276 Lin. Ft. of Electrical Wire Lighting 4 AWG (WisDOT 655.0630) Unit	 Total	Item No. 61 – 1 Electrical Service Meter Breaker Pedestal – (Lighting - E. Moreland Blvd. and White Rock Avenue) (WisDOT 656.0200.02) Lump Sum	Item No. 62 – 7 Remove Existing Roadway Lighting Unit, SPV.0060.09 Unit	 Total
Advance Construction Inc.	$1.34	$29,849.84	$1,160.99	$206.73	$1,447.11
MJ Construction, Inc.	$2.00	44,552.00	1,185.00	212.00	1,484.00
American Sewer Services, Inc.	$1.41	31,409.16	1,218.00	217.00	1,519.00
Super Excavators, Inc.	$2.00	44,552.00	5,000.00	500.00	3,500.00
D.F. Tomasini Contractors, Inc.	$1.35	30,072.60	$1,160.00	205.00	1,435.00

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	Item No. 63 – 23 Remove and Re-install Lighting Assembly, SPV.0060.10		Item No. 64 – 1 Removing Existing Light Control Cabinet, SPV.0060.11		Item No. 65 – 367 Lin. Ft. of Conduit Rigid Nonmetallic Schedule 40 2-Inch (WisDOT 652.0225)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$396.02	$9,108.46	$413.45	$413.45	$4.77	$1,750.59
MJ Construction, Inc.	$404.00	9,292.00	423.00	423.00	5.00	1,835.00
American Sewer Services, Inc.	$416.00	9,568.00	434.00	434.00	5.00	1,835.00
Super Excavators, Inc.	$500.00	11,500.00	500.00	500.00	1.00	367.00
D.F. Tomasini Contractors, Inc.	$396.00	9,108.00	414.00	414.00	5.00	1,835.00

	Item No. 66 – 1,433 Lin. Ft. of Conduit Rigid Nonmetallic Schedule 40 3-Inch (WisDOT 652.0235)		Item No. 67 – 14 Pull Boxes Steel 24x42-Inch (WisDOT 653.0140)		Item No. 68 – 5 Concrete Bases Type 1 (WisDOT 654.0101)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5.94	$8,512.02	$758.11	$10,613.54	$545.56	$2,727.80
MJ Construction, Inc.	$7.00	10,031.00	775.00	10,850.00	557.00	2,785.00
American Sewer Services, Inc.	$6.25	8,956.25	796.00	11,144.00	572.00	2,860.00
Super Excavators, Inc.	$5.00	7,165.00	500.00	7,000.00	500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$6.00	8,598.00	750.00	10,500.00	545.00	2,725.00

	Item No. 69 – 3 Concrete Bases Type 2 (WisDOT 654.0102)		Item No. 70 – 1 Concrete Bases Type 10 (WisDOT 654.0110)		Item No. 71 – 2 Concrete Bases Type 13 (WisDOT 654.0113)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$832.26	$2,496.78	$4,438.25	$4,438.25	$8,144.09	$16,288.18
MJ Construction, Inc.	$850.00	2,550.00	4,528.00	4,528.00	8,308.00	16,616.00
American Sewer Services, Inc.	$873.00	2,619.00	4,660.00	4,660.00	8,551.00	17,102.00
Super Excavators, Inc.	$500.00	1,500.00	500.00	500.00	500.00	1,000.00
D.F. Tomasini Contractors, Inc.	$830.00	2,490.00	4,400.00	4,400.00	8,100.00	16,200.00

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Bidders:	Item No. 72 – 602 Lin. Ft. of Cable Traffic Signal 5-14 AWG (WisDOT 655.0230)		Item No. 73 – 138 Lin. Ft. of Cable Traffic Signal 7-14 AWG (WisDOT 655.0240)		Item No. 74 – 2,991 Lin. Ft. of Cable Traffic Signal 12-14 AWG (WisDOT 655.0260)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1.06	$638.12	$1.22	$168.36	$1.78	$5,323.98
MJ Construction, Inc.	$2.00	1,204.00	2.00	276.00	2.00	5,982.00
American Sewer Services, Inc.	$1.12	674.24	1.28	176.64	1.87	5,593.17
Super Excavators, Inc.	$5.00	3,010.00	5.00	690.00	5.00	14,955.00
D.F. Tomasini Contractors, Inc.	$1.00	602.00	1.25	172.50	1.80	5,383.80

Bidders:	Item No. 75 – 641 Lin. Ft. of Cable Traffic Signal 15-14 AWG (WisDOT 655.0270)		Item No. 76 – 799 Lin. Ft. of Cable Type UF 2-10 AWG (WisDOT 655.0315)		Item No. 77 – 1,447 Lin. Ft. of Electrical Wire Traffic Signals 10 AWG (WisDOT 655.0515)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2.14	$1,371.74	$1.15	$918.85	$0.76	$1,099.72
MJ Construction, Inc.	$3.00	1,923.00	2.00	1,598.00	1.00	1,447.00
American Sewer Services, Inc.	$2.24	1,435.84	1.20	958.80	0.79	1,143.13
Super Excavators, Inc.	$5.00	3,205.00	5.00	3,995.00	5.00	7,235.00
D.F. Tomasini Contractors, Inc.	$2.15	1,378.15	1.15	918.85	0.75	1,085.25

Bidders:	Item No. 78 – 900 Lin. Ft. of Electrical Wire Lighting 12 AWG (WisDOT 655.0610)		Item No. 79 – 1 Electrical Service Meter Breaker Pedestal (Signal – E. Moreland Blvd. and White Rock Ave) (WisDOT 656.0200.01)	Item No. 80 – 5 Pedestal Bases (WisDOT 657.0100)	
	Unit	Total	Lump Sum	Unit	Total
Advance Construction Inc.	$0.64	$576.00	$1,160.99	$227.12	$1,135.60
MJ Construction, Inc.	$1.00	900.00	1,185.00	233.00	1,165.00
American Sewer Services, Inc.	$0.67	603.00	1,218.00	238.00	1,190.00
Super Excavators, Inc.	$5.00	4,500.00	2,500.00	500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$0.65	585.00	1,160.00	225.00	1,125.00

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	Item No. 81 – 3 Transformer Bases Breakaway 11 1/2-Inch Bolt Circle (WisDOT 657.0255)		Item No. 82 – 1 Poles Type 3 (WisDOT 657.0310)		Item No. 83 – 2 Poles Type 4 (WisDOT 657.0315)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$380.58	$1,141.74	$2,605.68	$2,605.68	$1,332.78	$2,665.56
MJ Construction, Inc.	$389.00	1,167.00	2,659.00	2,659.00	1,360.00	2,720.00
American Sewer Services, Inc.	$399.00	1,197.00	2,735.00	2,735.00	1,399.00	2,798.00
Super Excavators, Inc.	$500.00	1,500.00	1,000.00	1,000.00	1,000.00	2,000.00
D.F. Tomasini Contractors, Inc.	$380.00	1,140.00	2,600.00	2,600.00	1,330.00	2,660.00

	Item No. 84 – 1 Traffic Signal Standards Aluminum 13-Foot (WisDOT 657.0420)		Item No. 85 – 2 Traffic Signal Standards Aluminum 15-Foot (WisDOT 657.0425)		Item No. 86 – 2 Traffic Signal Standards Aluminum 10-Foot (WisDOT 657.0430)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$562.62	$562.62	$574.90	$1,149.80	$390.45	$780.90
MJ Construction, Inc.	$575.00	575.00	587.00	1,174.00	399.00	798.00
American Sewer Services, Inc.	$590.00	590.00	603.00	1,206.00	409.00	818.00
Super Excavators, Inc.	$2,500.00	2,500.00	3,000.00	6,000.00	2,000.00	4,000.00
D.F. Tomasini Contractors, Inc.	$560.00	560.00	575.00	1,150.00	390.00	780.00

	Item No. 87 – 1 Trombone Arms 15-FT (WisDOT 657.0585)		Item No. 88 – 4 Luminaire Arms Single Member 4-Inch Clamp 6-Foot (WisDOT 657.0609)		Item No. 89 – 14 Traffic Signal Face 3-12 Inch Vertical (WisDOT 658.0110)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1,321.79	$1,321.79	$223.43	$893.72	$440.04	$6,160.56
MJ Construction, Inc.	$1,349.00	1,349.00	229.00	916.00	449.00	6,286.00
American Sewer Services, Inc.	$1,388.00	1,388.00	234.00	936.00	462.00	6,468.00
Super Excavators, Inc.	$3,000.00	3,000.00	500.00	2,000.00	500.00	7,000.00
D.F. Tomasini Contractors, Inc.	$1,320.00	1,320.00	225.00	900.00	440.00	6,160.00

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	Item No. 90 – 2 Traffic Signal Face 4-12 Inch Vertical (WisDOT 658.0115)		Item No. 91 – 2 Traffic Signal Face 5-12 Inch Vertical (WisDOT 658.0120)		Item No. 92 – 14 Backplates Signal Face 3 section 12-Inch (WisDOT 658.0215)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$539.54	$1,079.08	$645.33	$1,290.66	$89.48	$1,252.72
MJ Construction, Inc.	$551.00	1,102.00	659.00	1,318.00	92.00	1,288.00
American Sewer Services, Inc.	$588.00	1,176.00	677.00	1,354.00	94.00	1,316.00
Super Excavators, Inc.	$500.00	1,000.00	500.00	1,000.00	100.00	1,400.00
D.F. Tomasini Contractors, Inc.	$540.00	1,080.00	645.00	1,290.00	90.00	1,260.00

	Item No. 93 – 2 Backplates Signal Face 4 section 12-Inch (WisDOT 658.0220)		Item No. 94 – 2 Backplates Signal Face 5 section 12-Inch (WisDOT 658.0225)		Item No. 95 – 8 Pedestrian Signal Face 16-Inch (WisDOT 658.0416)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$95.62	$191.24	$106.93	$213.86	$292.79	$2,342.32
MJ Construction, Inc.	$98.00	196.00	110.00	220.00	299.00	2,392.00
American Sewer Services, Inc.	$100.00	200.00	112.00	224.00	307.00	2,456.00
Super Excavators, Inc.	$100.00	200.00	100.00	200.00	250.00	2,000.00
D.F. Tomasini Contractors, Inc.	$95.00	190.00	107.00	214.00	293.00	2,344.00

	Item No. 96 – 13 LED Modules 12-Inch Red Ball (WisDOT 658.0600)		Item No. 97 – 13 LED Modules 12-Inch Yellow Ball (WisDOT 658.0605)		Unit No. 98 – 12 LED Modules 12-Inch Green Ball (WisDOT 658.0610)	
Bidders:	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$51.56	$670.28	$52.79	$686.27	$54.02	$648.24
MJ Construction, Inc.	$53.00	689.00	54.00	702.00	55.00	660.00
American Sewer Services, Inc.	$54.00	702.00	55.00	715.00	57.00	684.00
Super Excavators, Inc.	$250.00	3,250.00	250.00	3,250.00	250.00	3,000.00
D.F. Tomasini Contractors, Inc.	$52.00	676.00	52.00	676.00	54.00	648.00

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Bidders:	Item No. 99 – 5 LED Modules 12-Inch Red Arrow (WisDOT 658.0615)		Item No. 100 – 7 LED Modules 12-Inch Yellow Arrow (WisDOT 658.0620)		Item No. 101 – 10 LED Modules 12-Inch Green Arrow (WisDOT 658.0625)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$51.51	$257.55	$52.79	$369.53	$54.02	$540.20
MJ Construction, Inc.	$53.00	265.00	54.00	378.00	55.00	550.00
American Sewer Services, Inc.	$54.00	270.00	55.00	385.00	57.00	570.00
Super Excavators, Inc.	$250.00	1,250.00	250.00	1,750.00	250.00	2,500.00
D.F. Tomasini Contractors, Inc.	$52.00	260.00	52.00	364.00	54.00	540.00

Bidders:	Item No. 102 – 8 LED Modules Pedestrian Countdown Timer 16-Inch (WisDOT 658.0635)		Item No. 103 – 1 Signal Mounting Hardware (E. Moreland Blvd. and White Rock Ave.) (WisDOT 658.5069.01)	Unit No. 104 – 1 Monotube Poles Type 10, SPV.0060.01	
	Unit	Total	Lump Sum	Unit	Total
Advance Construction Inc.	$275.23	$2,201.84	$3,477.74	4,882.32	$4,882.32
MJ Construction, Inc.	$282.00	2,256.00	3,548.00	4,981.00	4,981.00
American Sewer Services, Inc.	$289.00	2,312.00	3,652.00	5,126.00	5,126.00
Super Excavators, Inc.	$500.00	4,000.00	500.00	2,000.00	2,000.00
D.F. Tomasini Contractors, Inc.	$275.00	2,200.00	3,450.00	4,800.00	4,800.00

Bidders:	Item No. 105 – 2 Monotube Poles Type 13, SPV.0060.02		Item No. 106 – 1 Monotube Arms 25-FT, SPV.0060.03		Item No. 107 – 2 Monotube Arms 40-FT, SPV.0060.04	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$9,840.07	$19,680.14	$3,372.31	$3,372.31	$5,764.26	$11,528.52
MJ Construction, Inc.	$10,037.00	20,074.00	3,441.00	3,441.00	5,881.00	11,762.00
American Sewer Services, Inc.	$10,332.00	20,664.00	3,540.00	3,540.00	6,052.00	12,104.00
Super Excavators, Inc.	$2,000.00	4,000.00	2,000.00	2,000.00	2,000.00	4,000.00
D.F. Tomasini Contractors, Inc.	$9,840.00	19,680.00	3,400.00	3,400.00	5,750.00	11,500.00

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Bidders:	Item No. 108 – 3 Luminaire Arm Steel 12-FT, SPV.0060.05		Item No. 109 – 7 Install LED Luminaire, SPV.0060.06		Unit No. 110 – 1 Traffic Signal Controller and Cabinet 8-Phase Fully Actuated, SPV.0060.07	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$456.93	$1,370.79	$183.16	$1,282.12	$15,980.33	$15,980.33
MJ Construction, Inc.	$467.00	1,401.00	194.00	1,358.00	16,300.00	16,300.00
American Sewer Services, Inc.	$480.00	1,440.00	192.00	1,344.00	16,780.00	16,780.00
Super Excavators, Inc.	$2,000.00	6,000.00	250.00	1,750.00	2,500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$460.00	1,380.00	183.00	1,281.00	16,000.00	16,000.00

Bidders:	Item No. 111 – 1 Battery Backup System, E. Moreland Blvd. and White Rock Avenue, SPV.0060.08		Item No. 112 – 1 Video Vehicle Detection System, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.01	Item No. 113 – 1 Emergency Vehicle Preemption System, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.02
	Unit	Total	Lump Sum	Lump Sum
Advance Construction Inc.	$7,106.36	$7,106.36	$24,417.94	$12,170.85
MJ Construction, Inc.	$7,250.00	7,250.00	24,907.00	12,415.00
American Sewer Services, Inc.	$7,461.00	7,461.00	25,638.00	12,780.00
Super Excavators, Inc.	$2,500.00	2,500.00	5,000.00	2,500.00
D.F. Tomasini Contractors, Inc.	$7,100.00	7,100.00	24,500.00	12,000.00

Bidders:	Item No. 114 – 1 Remove Traffic Signals, Intersection of E. Moreland Blvd. and White Rock Avenue, SPV.0105.03	Item No. 115 – 1 Salvage Copper Communications Cable at the E. Moreland Blvd. and White Rock Avenue Traffic Signal, SPV.0105.04	Unit No. 116 – 1 Audible Pedestrian Push Button System, Intersection of E. Moreland Blvd and White Rock Avenue, SPV.0105.05
	Lump Sum	Lump Sum	Lump Sum
Advance Construction Inc.	$3,100.88	$413.45	$5,866.90
MJ Construction, Inc.	$3,163.00	423.00	5,985.00
American Sewer Services, Inc.	$3,255.00	434.00	6,160.00
Super Excavators, Inc.	$10,000.00	2,500.00	2,500.00
D.F. Tomasini Contractors, Inc.	$3,100.00	415.00	5,900.00

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Bidders:	Item No. 117 – 15 Remove Existing Storm Manhole		Item No. 118 – 20 Remove Existing Inlet		Item No. 119 – 220 Lin. Ft. of Remove Existing 12-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$550.00	$8,250.00	$500.00	$10,000.00	$11.00	$2,420.00
MJ Construction, Inc.	$250.00	3,750.00	250.00	5,000.00	47.00	10,340.00
American Sewer Services, Inc.	$300.00	4,500.00	250.00	5,000.0	40.00	8,800.00
Super Excavators, Inc.	$300.00	4,500.00	350.00	7,000.00	35.00	7,700.00
D.F. Tomasini Contractors, Inc.	$500.00	7,500.00	250.00	5,000.00	15.00	3,300.00

Bidders:	Item No. 120 – 190 Lin. Ft. of Remove Existing 15-Inch Storm Sewer		Item No. 121 – 67 Lin. Ft. of Remove Existing 18-Inch Storm Sewer		Unit No. 122 – 54 Lin. Ft. of Remove Existing 24-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$12.00	$2,280.00	$14.00	$938.00	$16.00	864.00
MJ Construction, Inc.	$48.00	9,120.00	49.00	3,283.00	50.00	2,700.00
American Sewer Services, Inc.	$40.00	7,600.00	40.00	2,680.00	45.00	2,430.00
Super Excavators, Inc.	$47.00	8,930.00	44.00	2,948.00	44.00	2,376.00
D.F. Tomasini Contractors, Inc.	$15.00	2,850.00	20.00	1,340.00	20.00	1,080.00

Bidders:	Item No. 123 – 184 Lin. Ft. of Remove Existing 30-Inch Storm Sewer		Item No. 124 – 1,902 Lin. Ft. of Remove Existing 36-Inch Storm Sewer		Item No. 125 – 3 Abandon Existing Storm Manhole	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$20.00	$3,680.00	$30.00	$57,060.00	$450.00	$1,350.00
MJ Construction, Inc.	$55.00	10,120.00	40.00	76,080.00	500.00	1,500.00
American Sewer Services, Inc.	$50.00	9,200.00	50.00	95,100.00	350.00	1,050.00
Super Excavators, Inc.	$71.00	13,064.00	71.00	135,042.00	700.00	2,100.00
D.F. Tomasini Contractors, Inc.	$25.00	4,600.00	25.00	47,550.00	500.00	1,500.00

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Bidders:	Item No. 126 – 4 Abandon Existing Inlet		Item No. 127 – 1,028 Lin. Ft. of Abandon Existing 12-Inch Storm Sewer		Unit No. 128 – 68 Lin. Ft. of Abandon Existing 15-Inch Storm Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$400.00	$1,600.00	$6.00	$6,168.00	$7.00	$476.00
MJ Construction, Inc.	$200.00	800.00	3.00	3,084.00	5.00	340.00
American Sewer Services, Inc.	$250.00	1,000.00	5.00	5,140.00	10.00	680.00
Super Excavators, Inc.	$450.00	1,800.00	28.00	28,784.00	39.00	2,652.00
D.F. Tomasini Contractors, Inc.	$200.00	800.00	15.00	15,420.00	15.00	1,020.00

Bidders:	Item No. 129 – 170 Lin. Ft. of Abandon Existing 30-Inch Storm Sewer		Item No. 130 – 177 Lin. Ft. of Abandon Existing 36-Inch Storm Sewer		Item No. 131 – 974 Lin. Ft. of 12-Inch RCP Storm Sewer, Class III	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$20.00	$3,400.00	$25.00	$4,425.00	$68.00	$66,232.00
MJ Construction, Inc.	$15.00	2,550.00	20.00	3,540.00	114.00	111,036.00
American Sewer Services, Inc.	$15.00	2,550.00	20.00	3,540.00	95.00	92,530.00
Super Excavators, Inc.	$36.00	6,120.00	60.00	10,620.00	85.00	82,790.00
D.F. Tomasini Contractors, Inc.	$60.00	10,200.00	75.00	13,275.00	80.00	77,920.00

Bidders:	Item No. 132 – 292 Lin. Ft. of 15-Inch RCP Storm Sewer, Class III		Item No. 133 – 80 Lin. Ft. of 18-inch RCP Storm Sewer, Class III		Unit No. 134 – 8 Lin. Ft. of 27-Inch RCP Storm Sewer, Class III	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$69.00	$20,148.00	$73.00	$5,840.00	$85.00	$680.00
MJ Construction, Inc.	$168.00	49,056.00	170.00	13,600.00	375.00	3,000.00
American Sewer Services, Inc.	$97.00	28,324.00	98.00	7,840.00	150.00	1,200.00
Super Excavators, Inc.	$83.00	24,236.00	150.00	12,000.00	250.00	2,000.00
D.F. Tomasini Contractors, Inc.	$100.00	29,200.00	150.00	12,000.00	350.00	2,800.00

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Bidders:	Item No. 135 – 79 Lin. Ft. of 36-Inch RCP Storm Sewer, Class III		Item No. 136 – 292 Lin. Ft. of 54-Inch RCP Storm Sewer, Class IV		Item No. 137 – 3,165 Lin. Ft. of 66-Inch RCP Storm Sewer, Class IV	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$115.00	$9,085.00	$190.00	$55,480.00	$295.00	$933,675.00
MJ Construction, Inc.	$200.00	15,800.00	340.00	99,280.00	475.00	1,503,375.00
American Sewer Services, Inc.	$330.00	26,070.00	485.00	141,620.00	576.00	1,823,040.00
Super Excavators, Inc.	$200.00	15,800.00	300.00	87,600.00	680.00	2,152,200.00
D.F. Tomasini Contractors, Inc.	$350.00	27,650.00	500.00	146,000.00	865.00	2,737,725.00

Bidders:	Item No. 138 – 56 Lin. Ft. of 53x83-inch RCP Horizontal Elliptical Storm Sewer, Class IV		Item No. 139 – 10 - 48-Inch Diameter Storm Tee Manhole		Unit No. 140 – 2 - 72-Inch Diameter Storm Manhole	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$400.00	$22,400.00	$3,000.00	$30,000.00	$4,500.00	$4,500.00
MJ Construction, Inc.	$585.00	32,760.00	5,500.00	55,000.00	7,500.00	7,500.00
American Sewer Services, Inc.	$790.00	44,240.00	10,980.00	109,800.00	13,500.00	13,500.00
Super Excavators, Inc.	$750.00	42,000.00	7,000.00	70,000.00	9,000.00	9,000.00
D.F. Tomasini Contractors, Inc.	$600.00	33,600.00	6,500.00	65,000.00	3,500.00	3,500.00

Bidders:	Item No. 141 – 1 - 108-Inch Diameter Storm Manhole		Item No. 142 – 3 - 108-Inch Diameter Storm Manhole, with Reduced Riser		Item No. 143 – 2 - 120-Inch Diameter Storm Manhole, with Reduced Riser	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$10,000.00	$10,000.00	$16,800.00	$50,400.00	$20,000.00	$40,000.00
MJ Construction, Inc.	$11,000.00	11,000.00	11,000.00	33,000.00	12,000.00	24,000.00
American Sewer Services, Inc.	$21,900.00	21,900.00	22,950.00	68,850.00	28,400.00	56,800.00
Super Excavators, Inc.	$30,000.00	30,000.00	30,000.00	90,000.00	175,000.00	350,000.00
D.F. Tomasini Contractors, Inc.	$15,000.00	15,000.00	17,000.00	51,000.00	20,000.00	40,000.00

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Bidders:	Item No. 144 – 1 - 54-Inch RCP Storm Sewer 61-degree Bend		Item No. 145 – 1 - 54-Inch RCP Storm Sewer 66-degree Bend		Unit No. 146 – 1 - 66-Inch RCP Storm Sewer 54-degree Bend	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,317.00	$2,317.00	$2,317.00	$2,317.00	$4,091.00	$4,091.00
MJ Construction, Inc.	$3,000.00	3,000.00	3,000.00	3,000.00	3,500.00	3,500.00
American Sewer Services, Inc.	$4,500.00	4,500.00	4,500.00	4,500.00	5,000.00	5,000.00
Super Excavators, Inc.	$4,200.00	4,200.00	4,000.00	4,000.00	8,000.00	8,000.00
D.F. Tomasini Contractors, Inc.	$5,000.00	5,000.00	5,000.00	5,00.00	6,000.00	6,000.00

Bidders:	Item No. 147 – 1 - 66-Inch RCP Storm Sewer 13-degree Bend		Item No. 148 – 1 - 66-Inch RCP Storm Sewer 10-degree Bend		Item No. 149 – 3 - Inlets 2x3-Ft	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,342.00	$4,342.00	$4,342.00	$4,342.00	$1,500.00	$4,500.00
MJ Construction, Inc.	$3,500.00	3,500.00	3,500.00	3,500.00	1,500.00	4,500.00
American Sewer Services, Inc.	$5,000.00	5,000.00	5,000.00	5,000.00	3,000.00	9,000.00
Super Excavators, Inc.	$5,500.00	5,500.00	5,500.00	5,500.00	1,200.00	3,600.00
D.F. Tomasini Contractors, Inc.	$6,000.00	6,000.00	6,000.00	6,000.00	1,200.00	3,600.00

Bidders:	Item No. 150 – 38 Inlets 2x3-Ft, with Sump		Item No. 151 – 4 Concrete Collars 30-Inches and Under		Unit No. 152 – 4 Concrete Collars Over 30-Inches	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1,900.00	$72,200.00	$500.00	$2,000.00	$1,500.00	$6,000.00
MJ Construction, Inc.	$1,200.00	45,600.00	1,200.00	4,800.00	3,500.00	14,000.00
American Sewer Services, Inc.	$2,500.00	95,000.00	2,000.00	8,000.00	6,000.00	24,000.00
Super Excavators, Inc.	$1,300.00	49,400.00	450.00	1,800.00	900.00	3,600.00
D.F. Tomasini Contractors, Inc.	$1,600.00	60,800.00	2,000.00	8,000.00	5,000.00	20,000.00

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Bidders:	Item No. 153 – 1 - 54-Inch Apron Endwall		Item No. 154 – 50 Lin. Ft. of 54-Inch RCP Bore and Jack Under Railroad		Item No. 155 – 9 Removing Bulkheads (Wolf Road to Manhattan Drive)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,300.00	$2,300.00	$2,000.00	$100,000.00	$1,000.00	$9,000.00
MJ Construction, Inc.	$5,000.00	5,000.00	3,500.00	175,000.00	250.00	2,250.00
American Sewer Services, Inc.	$2,500.00	2,500.00	3,190.00	159,500.00	750.00	6,750.00
Super Excavators, Inc.	$3,000.00	3,000.00	5,700.00	285,000.00	2,700.00	24,300.00
D.F. Tomasini Contractors, Inc.	$7,000.00	7,000.00	3,500.00	175,000.00	1,000.00	9,000.00

Bidders:	Item No. 156 – 2 Bulkheads (Wolf Road to Manhattan Drive)		Item No. 157 – 21 Chimney Replacement		Unit No. 158 – 14 Chimney Seals	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$3,000.00	$6,000.00	$800.00	$16,800.00	$400.00	$5,600.00
MJ Construction, Inc.	$400.00	800.00	350.00	7,350.00	450.00	6,300.00
American Sewer Services, Inc.	$2,000.00	4,000.00	500.00	10,500.00	300.00	4,200.00
Super Excavators, Inc.	$1,200.00	2,400.00	325.00	6,825.00	450.00	6,300.00
D.F. Tomasini Contractors, Inc.	$1,500.00	3,000.00	1,000.00	21,000.00	500.00	7,000.00

Bidders:	Item No. 159 – 5,075 Lin. Ft. of Main Line Sewer Televising		Item No. 160 – 81 Lateral Sewer Televising		Item No. 161 – 63 Lin. Ft. of 8-Inch PVC Sanitary Sewer	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1.00	$5,075.00	$125.00	$10,125.00	$85.00	$5,355.00
MJ Construction, Inc.	$3.06	15,529.50	250.00	20,250.00	195.00	12,285.00
American Sewer Services, Inc.	$1.00	5,075.00	135.00	10,935.00	165.00	10,395.00
Super Excavators, Inc.	$3.00	15,225.00	250.00	20,250.00	200.00	12,600.00
D.F. Tomasini Contractors, Inc.	$3.00	15,225.00	245.00	19,845.00	200.00	12,600.00

CITY OF WAUKESHA
BOARD OF PUBLIC WORK
E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
HMA ALTERNATE

Bidders:	Item No. 162 – 1 - 48-Inch Diameter Sanitary Sewer Drop Manhole		Item No. 163 – 2,673 Lin. Ft. of 6-Inch Sanitary Lateral Replacement		Unit No. 164 – 16 Sanitary Lateral Abandonment	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,400.00	$4,400.00	$88.80	$237,362.40	$800.00	$12,800.00
MJ Construction, Inc.	$6,000.00	6,000.00	108.00	288,684.00	1,750.00	28,000.00
American Sewer Services, Inc.	$2,200.00	2,200.00	96.00	256,608.00	1,000.00	16,000.00
Super Excavators, Inc.	$3,000.00	3,000.00	100.00	267,300.00	1,500.00	24,000.00
D.F. Tomasini Contractors, Inc.	$4,000.00	4,000.00	150.00	400,950.00	800.00	12,800.00

Bidders:	Item No. 165 – 170 Lin. Ft. of 16-Inch DI Water Main and Fittings		Item No. 166 – 257 Lin. Ft. of 16-Inch HDPE Horizontal Direction Drilled Water Main and Fittings		Item No. 167 – 1,447 Lin. Ft. of 12-Inch DI Water Main and Fittings	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$250.00	$42,500.00	$390.00	$100,230.00	$170.00	$245,990.00
MJ Construction, Inc.	$325.00	55,250.00	790.00	203,030.00	155.00	224,285.00
American Sewer Services, Inc.	$392.00	66,640.00	630.00	161,910.00	168.00	243,096.00
Super Excavators, Inc.	$350.00	59,500.00	800.00	205,600.00	150.00	217,050.00
D.F. Tomasini Contractors, Inc.	$400.00	68,000.00	1,000.00	257,000.00	300.00	434,100.00

Bidders:	Item No. 168 – 609 Lin. Ft. of 8-Inch DI Water Main and Fittings		Item No. 169 – 1 Corrosion Protection	Unit No. 170 – 2 - 16-Inch Butterfly Valves	
	Unit	Total	Lump Sum	Unit	Total
Advance Construction Inc.	$170.00	$103,530.00	$8,000.00	$4,550.00	$9,100.00
MJ Construction, Inc.	$135.00	82,215.00	12,000.00	5,000.00	10,000.00
American Sewer Services, Inc.	$210.00	127,890.00	5,100.00	4,500.00	9,000.00
Super Excavators, Inc.	$200.00	121,800.00	6,500.00	4,500.00	9,000.00
D.F. Tomasini Contractors, Inc.	$250.00	152,250.00	8,000.00	8,000.00	4,000.00

CITY OF WAUKESHA
BOARD OF PUBLIC WORK
E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
HMA ALTERNATE

Bidders:	Item No. 171 – 3 - 12-Inch Gate Valves		Item No. 172 – 3 - 8-Inch Gate Valves		Item No. 173 – 5 Furnish and Install Hydrant Assembly	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,660.00	$7,980.00	$1,522.00	$4,566.00	$6,275.00	$31,375.00
MJ Construction, Inc.	$3,000.00	9,000.00	1,800.00	5,400.00	5,500.00	27,500.00
American Sewer Services, Inc.	$2,800.00	8,400.00	1,600.00	4,800.00	5,400.00	27,000.00
Super Excavators, Inc.	$3,200.00	9,600.00	1,800.00	5,400.00	8,000.00	40,000.00
D.F. Tomasini Contractors, Inc.	$2,800.00	8,400.00	1,600.00	4,800.00	8,000.00	40,000.00

Bidders:	Item No. 174 – 3 Furnish and Install Hydrant Assembly, WWU Provides Direct Tap		Item No. 175 – 4 WL1 - Connect Existing 3/4-Inch Service Lateral		Unit No. 176 – 3 WL2 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$5,475.00	$16,425.00	$4,027.00	$16,108.00	$3,895.00	$11,685.00
MJ Construction, Inc.	$9,500.00	28,500.00	4,100.00	16,400.00	9,500.00	28,500.00
American Sewer Services, Inc.	$8,000.00	24,000.00	4,200.00	16,800.00	5,000.00	15,000.00
Super Excavators, Inc.	$8,500.00	25,500.00	5,000.00	20,000.00	6,000.00	18,000.00
D.F. Tomasini Contractors, Inc.	$7,000.00	21,000.00	4,500.00	18,000.00	4,200.00	12,600.00

Bidders:	Item No. 177 – 1 WL3 - Connect Existing 1-Inch Service Lateral		Item No. 178 – 1 WL4 - Connect Existing 1 1/4- Inch Service Lateral		Item No. 179 – 18 WL6 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$2,250.00	$2,250.00	$2,760.00	$2,760.00	$2,950.00	$53,100.00
MJ Construction, Inc.	$3,500.00	3,500.00	3,800.00	3,800.00	6,500.00	117,000.00
American Sewer Services, Inc.	$2,000.00	2,000.00	2,500.00	2,500.00	3,400.00	61,200.00
Super Excavators, Inc.	$3,000.00	3,000.00	3,600.00	3,600.00	4,000.00	72,000.00
D.F. Tomasini Contractors, Inc.	$3,800.00	3,800.00	4,000.00	4,000.00	3,200.00	57,600.00

CITY OF WAUKESHA
BOARD OF PUBLIC WORK
E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
HMA ALTERNATE

Bidders:	Item No. 180 – 3 WL7 - Connect Existing 2-Inch Service Lateral		Item No. 181 – 1 WL8 - Connect Existing 1 1/4-Inch Service Lateral		Unit No. 182 – 3 WL10 - Connect Existing 1-Inch Service Lateral	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$1,745.00	$5,235.00	$2,855.00	$2,855.00	$1,600.00	$4,800.00
MJ Construction, Inc.	$3,600.00	10,800.00	3,625.00	3,625.00	1,800.00	5,400.00
American Sewer Services, Inc.	$2,500.00	7,500.00	2,000.00	2,000.00	1,000.00	3,000.00
Super Excavators, Inc.	$2,000.00	6,000.00	3,000.00	3,000.00	1,500.00	4,500.00
D.F. Tomasini Contractors, Inc.	$2,500.00	7,500.00	3,000.00	3,000.00	2,000.00	6,000.00

Bidders:	Item No. 183 – 1 WL11 - Connect Existing 3/4-Inch Service Lateral		Item No. 184 – 4 WL12 - Connect Existing 3/4-Inch Service Lateral		Item No. 185 – 10 Furnish and Install Curb Boxes and Rods (If Required)	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$4,180.00	$4,180.00	$2,283.00	$9,132.00	$250.00	$2,500.00
MJ Construction, Inc.	$6,200.00	6,200.00	2,400.00	9,600.00	115.00	1,150.00
American Sewer Services, Inc.	$5,300.00	5,300.00	3,200.00	12,800.00	200.00	2,000.00
Super Excavators, Inc.	$6,000.00	6,000.00	3,000.00	12,000.00	80.00	800.00
D.F. Tomasini Contractors, Inc.	$5,000.00	5,000.00	2,600.00	10,400.00	750.00	7,500.00

Bidders:	Item No. 186 – 10 Furnish and Install Curb Stop (If Required)		Item No. 187 – 2 Cap and Abandon Water Service		Unit No. 188 – 8 Remove Existing Hydrant	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$201.00	$2,010.00	$800.00	$1,600.00	$500.00	$4,000.00
MJ Construction, Inc.	$225.00	2,250.00	3,500.00	7,000.00	500.00	4,000.00
American Sewer Services, Inc.	$600.00	6,000.00	500.00	1,000.00	500.00	4,000.00
Super Excavators, Inc.	$130.00	1,300.00	550.00	1,100.00	700.00	5,600.00
D.F. Tomasini Contractors, Inc.	$750.00	7,500.00	2,500.00	5,000.00	800.00	6,400.00

CITY OF WAUKESHA
BOARD OF PUBLIC WORK
E. MORELAND BLVD.
UTILITY AND STREET IMPROVEMENTS
HMA ALTERNATE

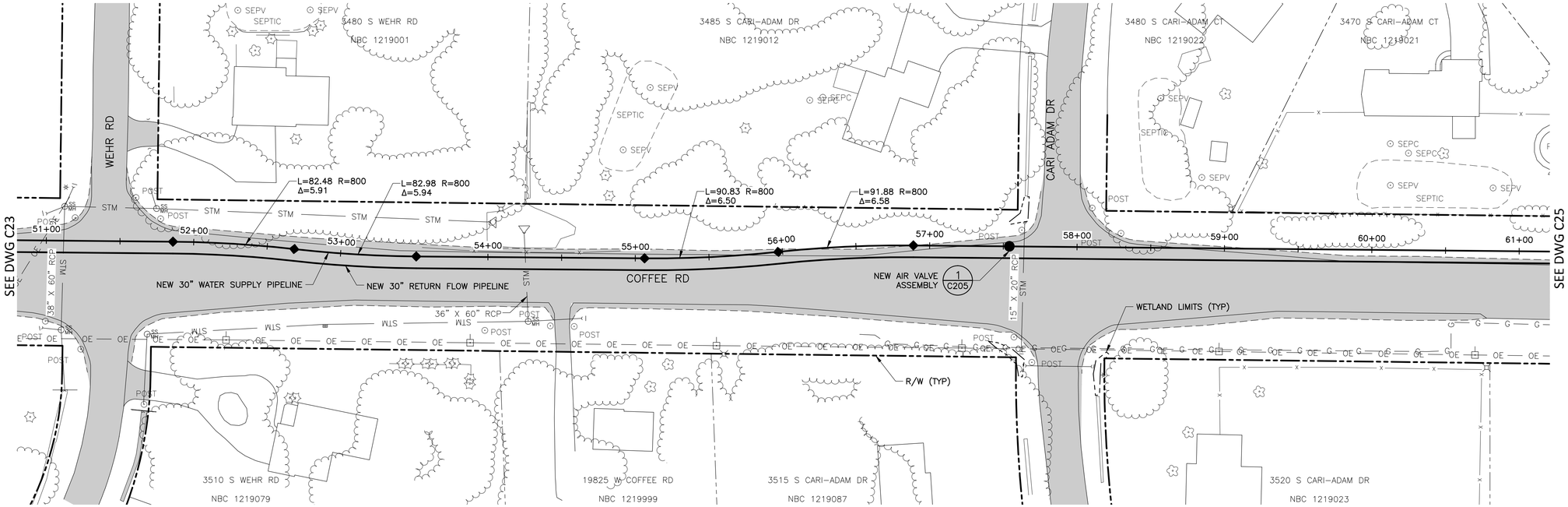
Bidders:	Item No. 189 – 10 Abandon Valve Boxes and Manholes		Item No. 190 – 9 Valve Box Adjustment		Item No. 191 – 50 Sq. Yds. of Pipe Insulation, 2-Inch Extruded Polystyrene	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$500.00	$5,000.00	$100.00	$900.00	$20.00	$1,000.00
MJ Construction, Inc.	$50.00	500.00	75.00	675.00	12.00	600.00
American Sewer Services, Inc.	$200.00	2,000.00	200.00	1,800.00	10.00	500.00
Super Excavators, Inc.	$300.00	3,000.00	250.00	2,250.00	35.00	1,750.00
D.F. Tomasini Contractors, Inc.	$500.00	5,000.00	100.00	900.00	25.00	1,250.00

Bidders:	Item No. 192 – 65 Cu. Yds. of Loose Rock Excavation		Item No. 193 – 30 Cu. Yds. of Solid Rock Excavation		Unit No. 194 – 200 Cu. Yds. of Rip Rap Heavy	
	Unit	Total	Unit	Total	Unit	Total
Advance Construction Inc.	$200.00	$13,000.00	$400.00	$12,000.00	$85.00	17,000.00
MJ Construction, Inc.	$120.00	7,800.00	300.00	9,000.00	40.00	8,000.00
American Sewer Services, Inc.	$50.00	3,250.00	1,000.00	30,000.000	60.00	12,000.00
Super Excavators, Inc.	$125.00	8,125.00	250.00	7,500.00	75.00	15,000.00
D.F. Tomasini Contractors, Inc.	$200.00	13,000.00	1,500.00	45,000.00	100.00	20,000.00

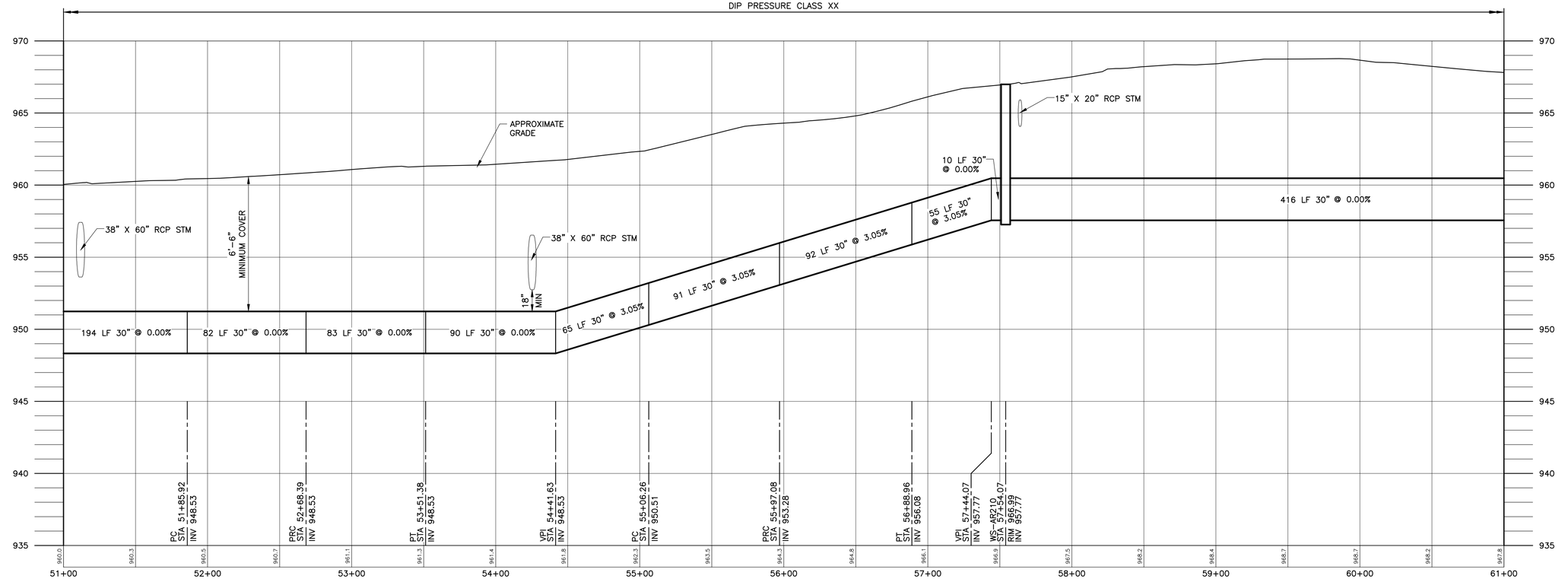
Bidders:	Item No. 195 – 1 Outfall Grading	Item No. 196 – 150 Cu. Yds. of Slurry Backfill	
	Lump Sum	Unit	Total
Advance Construction Inc.	$12,000.00	$100.00	$15,000.00
MJ Construction, Inc.	$15,000.00	65.00	9,750.00
American Sewer Services, Inc.	$15,000.00	55.00	8,250.00
Super Excavators, Inc.	$20,000.00	70.00	10,500.00
D.F. Tomasini Contractors, Inc.	$6,500.00	50.00	7,500.00

Appendix E – Coffee Road Plan and Profile Sheet

BAR MEASURE 1" ON FULLSIZE SHEETS
10/16/2018 10:27:10 AM
FILE: G:\WATER\GREAT LAKES\MAINLINE\SUPPLY\PHASE 2\WSP2_C018_C028.DWG



PLAN
SCALE: 1"=40'



PROFILE
SCALE: 1"=40' HORIZONTAL
SCALE: 1"=4' VERTICAL

40 0 40 80 FT 1"=40'
4 0 4 8 FT 1"=4'

DRAFT 60% PROGRAM DRAWINGS
NOVEMBER 2018

NO.	DATE	APPD	REVISION

Waukesha Water Utility
SERVING WAUKESHA SINCE 1898

GREELEY AND HANSEN
741 N. GRAND AVE. SUITE 308
WAUKESHA, WI 53186

GREAT WATER ALLIANCE™

LAKE MICHIGAN WATER SUPPLY PROGRAM
CONTRACT PACKAGE 2: WATER SUPPLY PIPELINE
PLAN AND PROFILE
STA 51+00 TO STA 61+00

APPROVED

SEAL AFFIXED
MONTH / DAY / YEAR

NOVEMBER 2018

JOB NO.: 15310			
DESGN	CDL	CHCK	RMC
APPRV	AJM	DRWN	TSM
SCALE:	AS SHOWN		

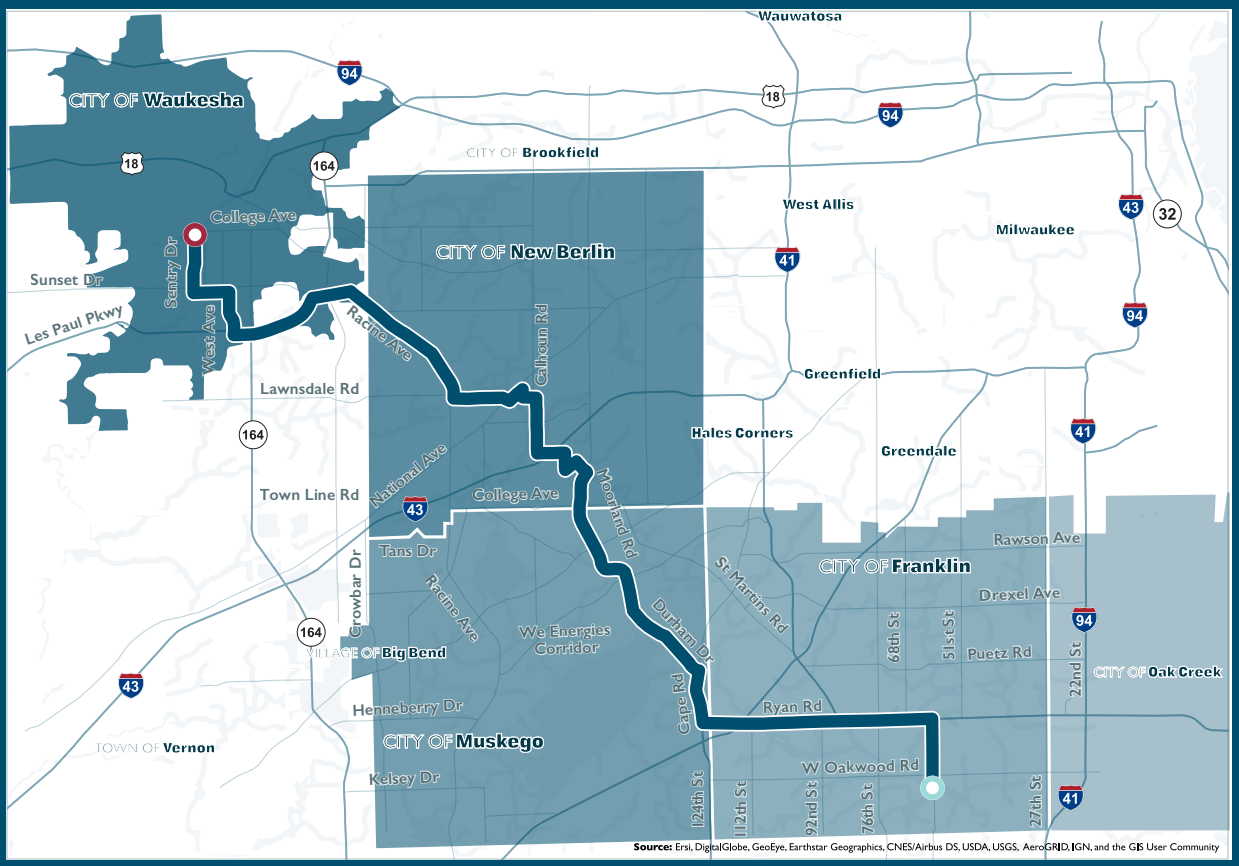
DRAWING NUMBER

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SHEET X OF 461 | REV 0

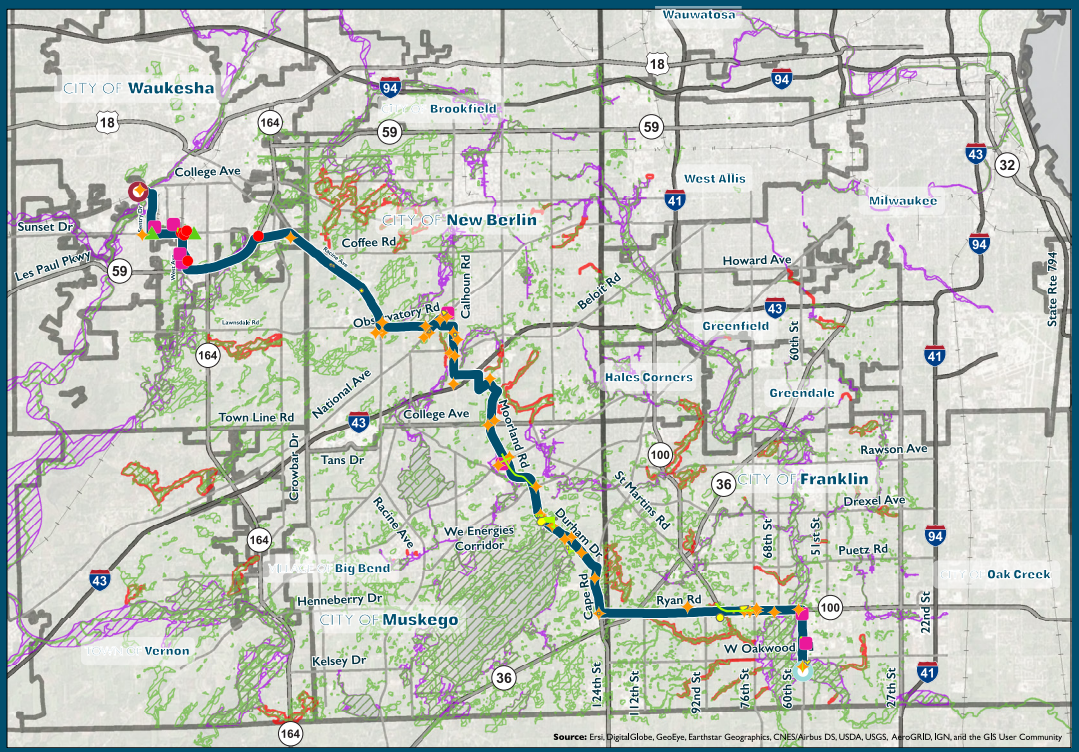
Appendix F – February 15, 2018 New Berlin Open House Route Alternatives

route a



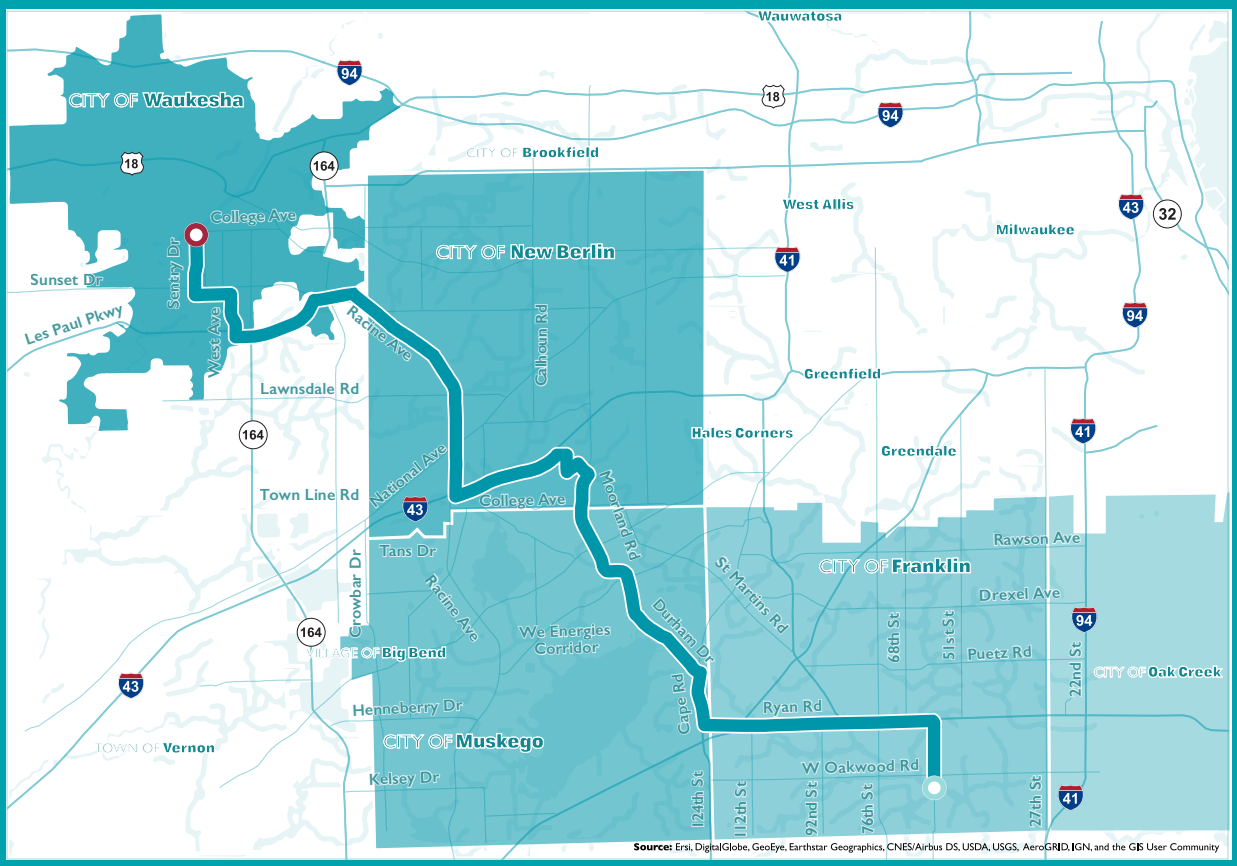
Route Alternative Return Flow Pumping Station Outfall

ENVIRONMENTAL CONSIDERATIONS



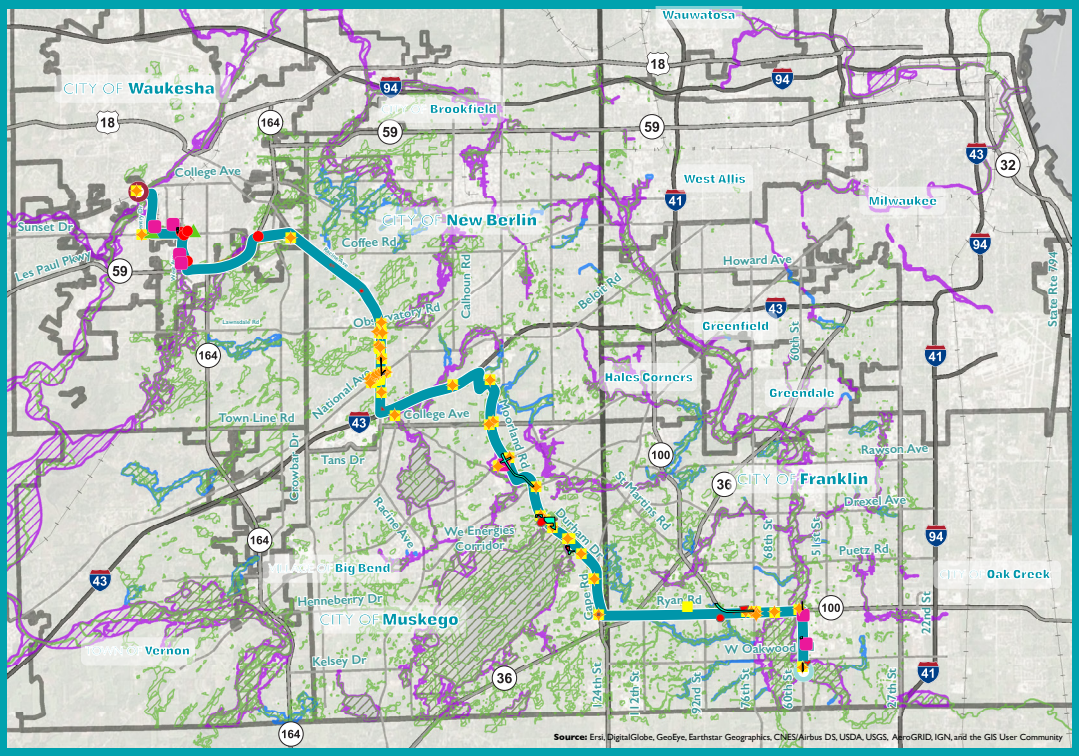
Route Alternative A
Outfall
Return Flow Pumping Station
Groundwater & Soil Contamination
Groundwater Contamination
Soil Contamination
Architecture & History Inventory
Archaeological Report Inventory
Archaeological Sites Inventory
Wetlands
FEMA SFHA - A
FEMA SFHA - AE

route b



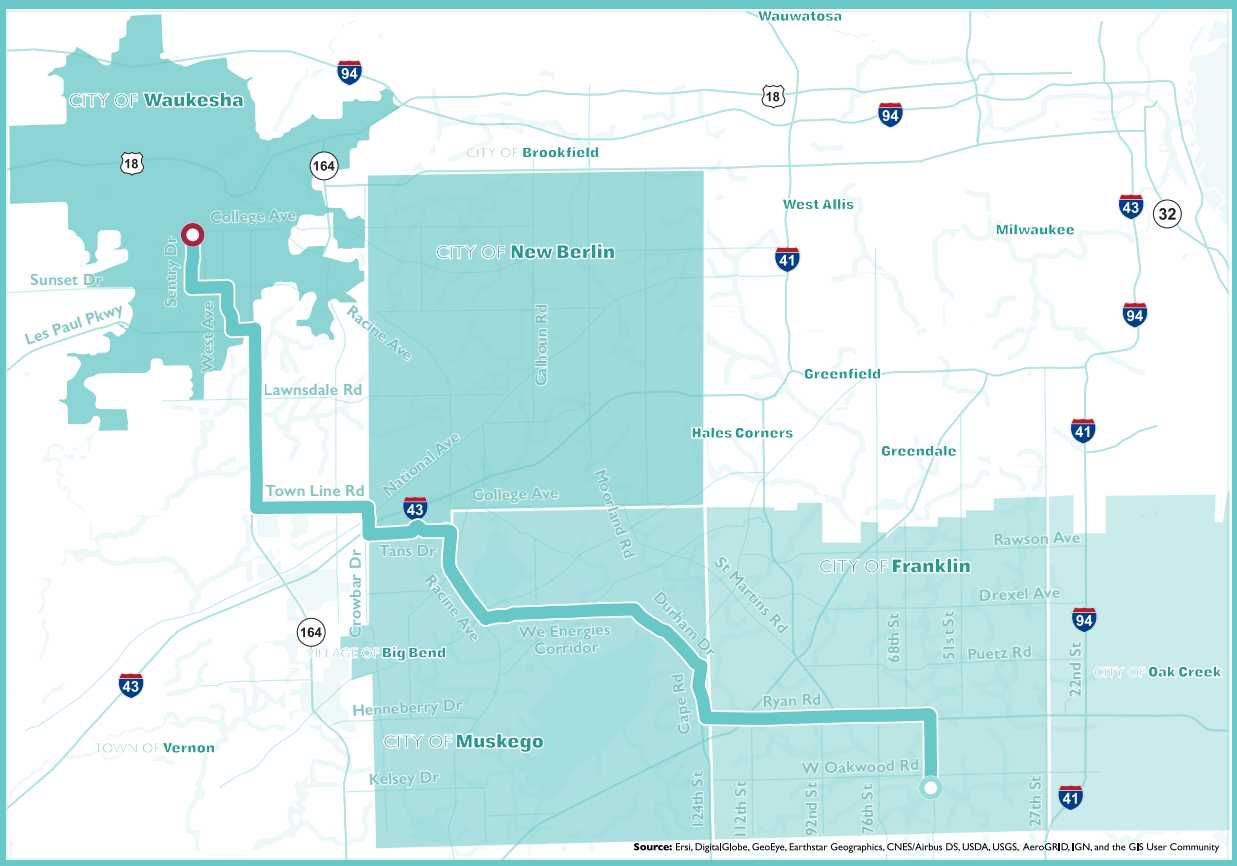
Route Alternative Return Flow Pumping Station Outfall

ENVIRONMENTAL CONSIDERATIONS



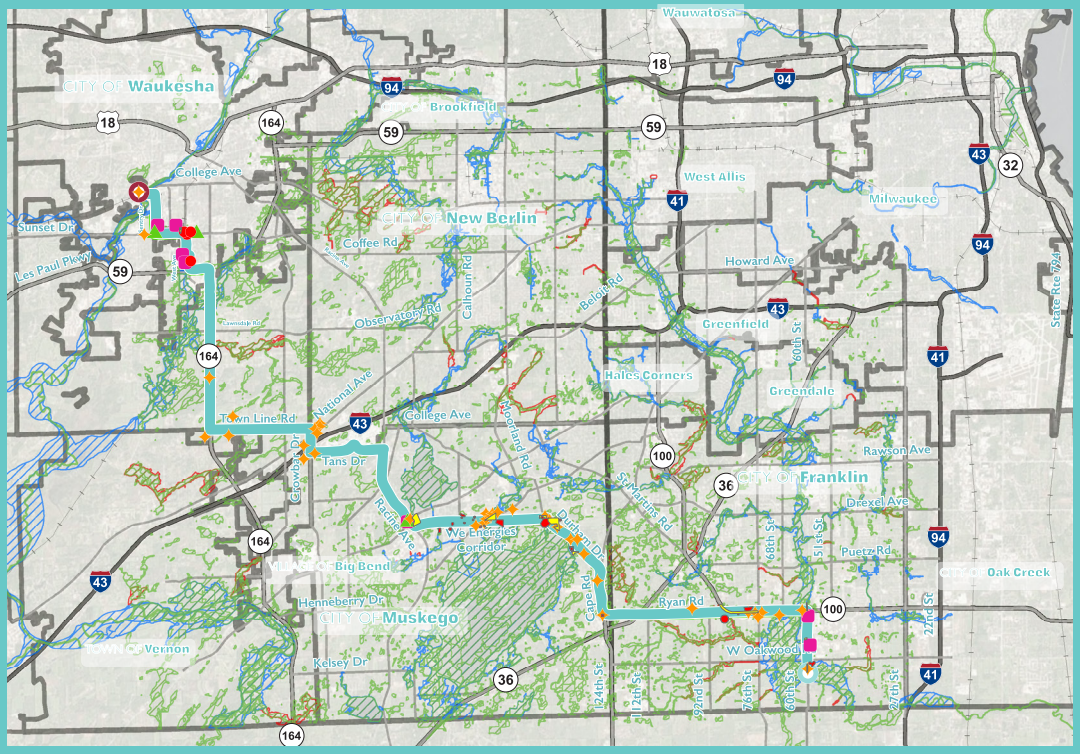
- Route Alternative B
- Outfall
- Return Flow Pumping Station
- Groundwater & Soil Contamination
- Groundwater Contamination
- Soil Contamination
- Architecture & History Inventory
- Archaeological Report Inventory
- Archaeological Sites Inventory
- Wetlands
- FEMA SFHA - A
- FEMA SFHA - AE

route c



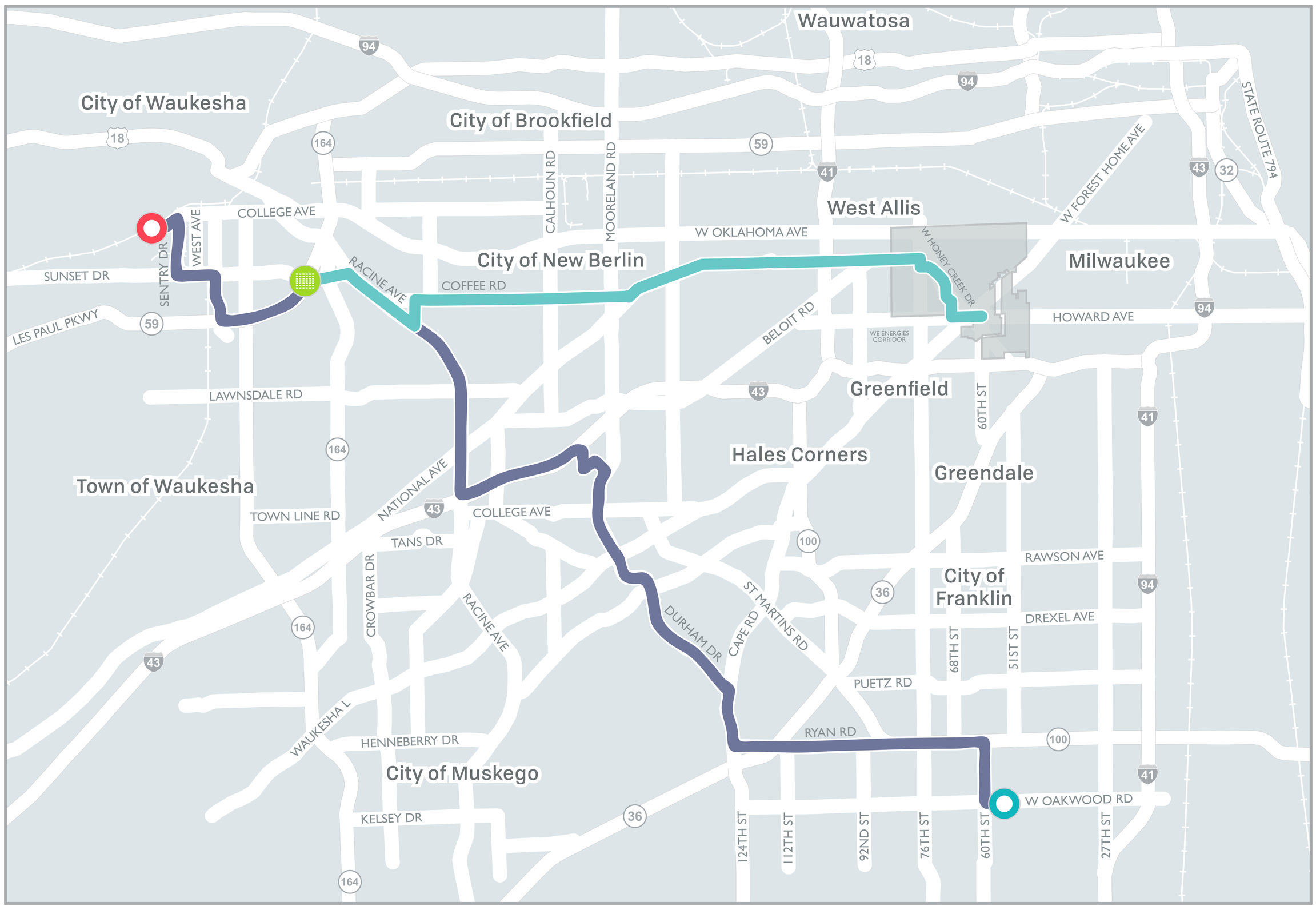
Route Alternative Return Flow Pumping Station Outfall

ENVIRONMENTAL CONSIDERATIONS

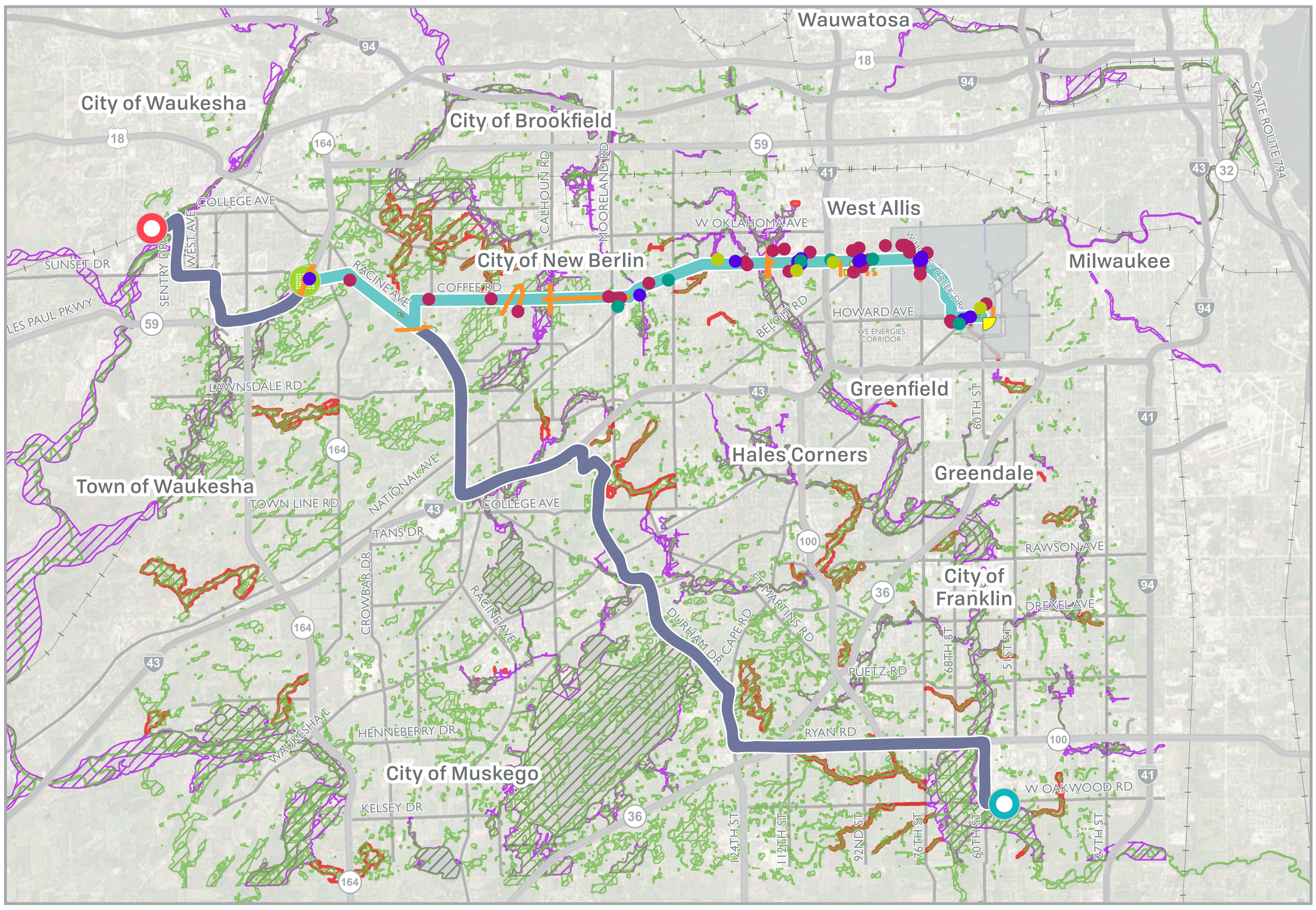


Route Alternative C
Outfall
Return Flow Pumping Station
Groundwater & Soil Contamination
Groundwater Contamination
Soil Contamination
Architecture & History Inventory
Archaeological Report Inventory
Archaeological Sites Inventory
Wetlands
FEMA SFHA - A
FEMA SFHA - AE

Route 1



ENVIRONMENTAL CONSIDERATIONS



Route Alternative 1

Return Flow

Return Flow Pumping Station

Outfall

Waukesha Distribution System

New Water Supply Pumping Station Evaluation Area

Groundwater & Soil Contamination

Groundwater Contamination

Soil Contamination

Architecture & History Inventory

Archaeological Report Inventory

Archaeological Sites Inventory

Wetlands

FEMA SFHA - A

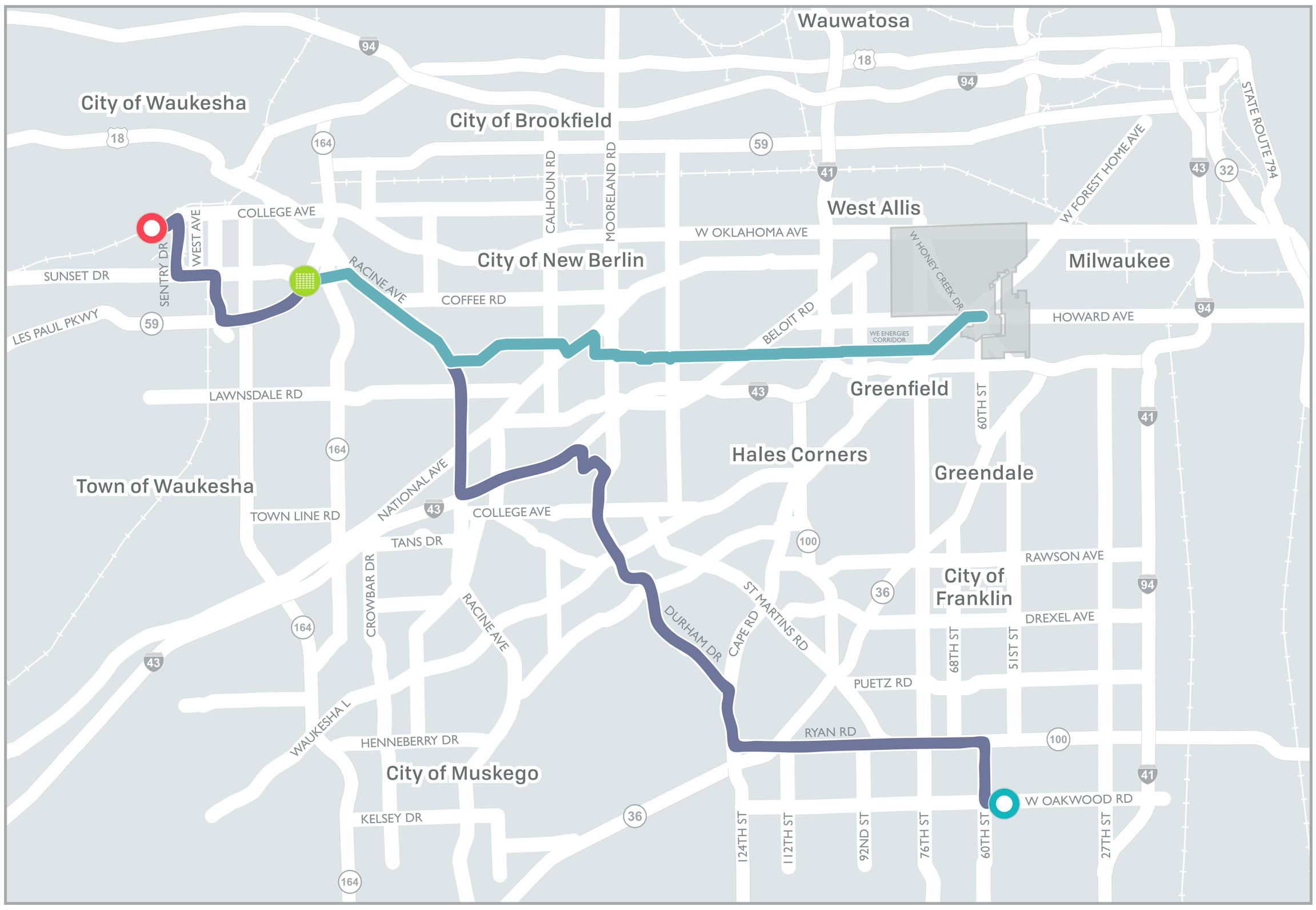
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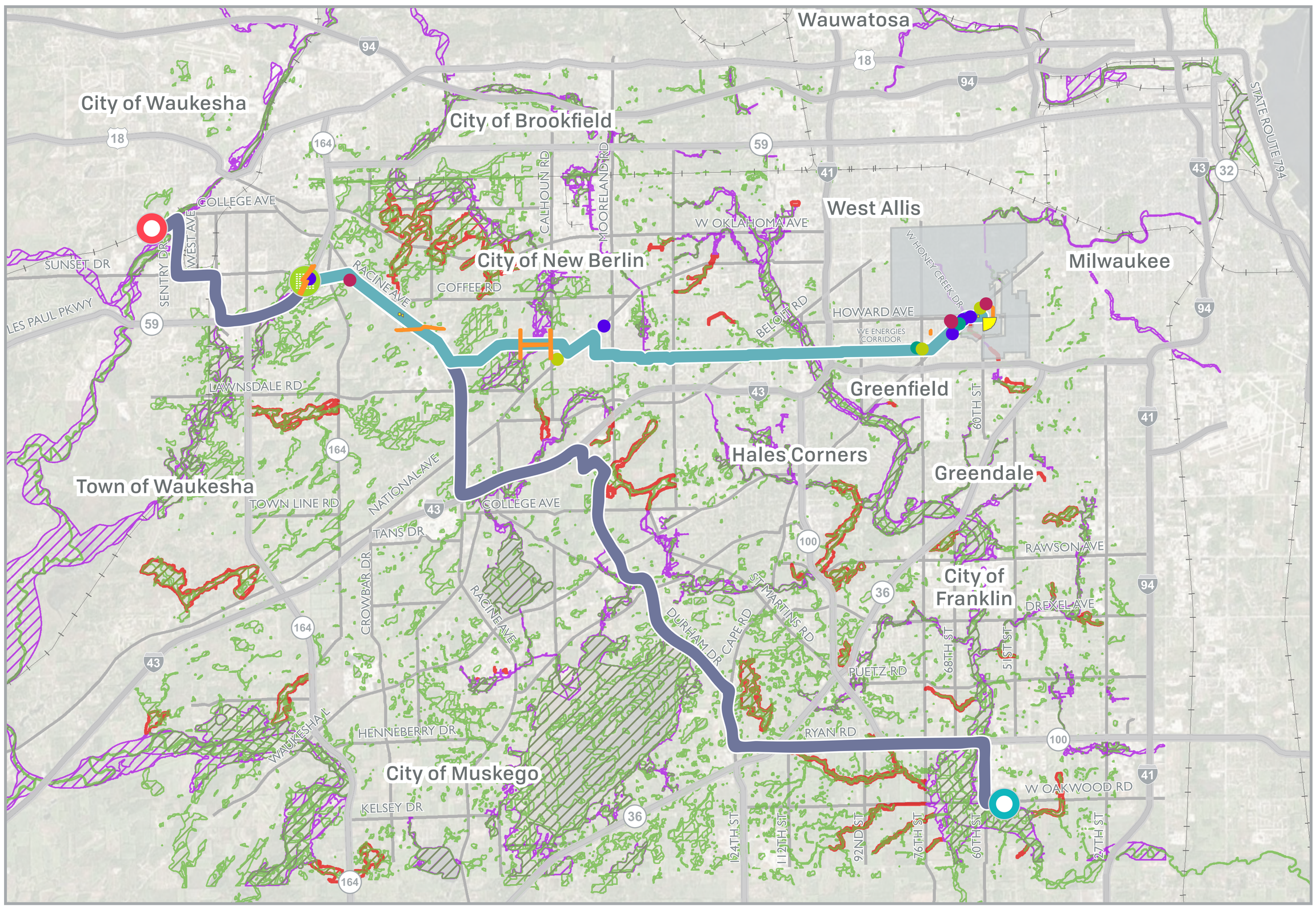
2" = 10,000'

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Route 2



ENVIRONMENTAL CONSIDERATIONS



Route Alternative 2

Return Flow

Return Flow Pumping Station

Outfall

Waukesha Distribution System

New Water Supply Pumping Station Evaluation Area

Groundwater & Soil Contamination

Groundwater Contamination

Soil Contamination

Architecture & History Inventory

Archaeological Report Inventory

Archaeological Sites Inventory

Wetlands

FEMA SFHA - A

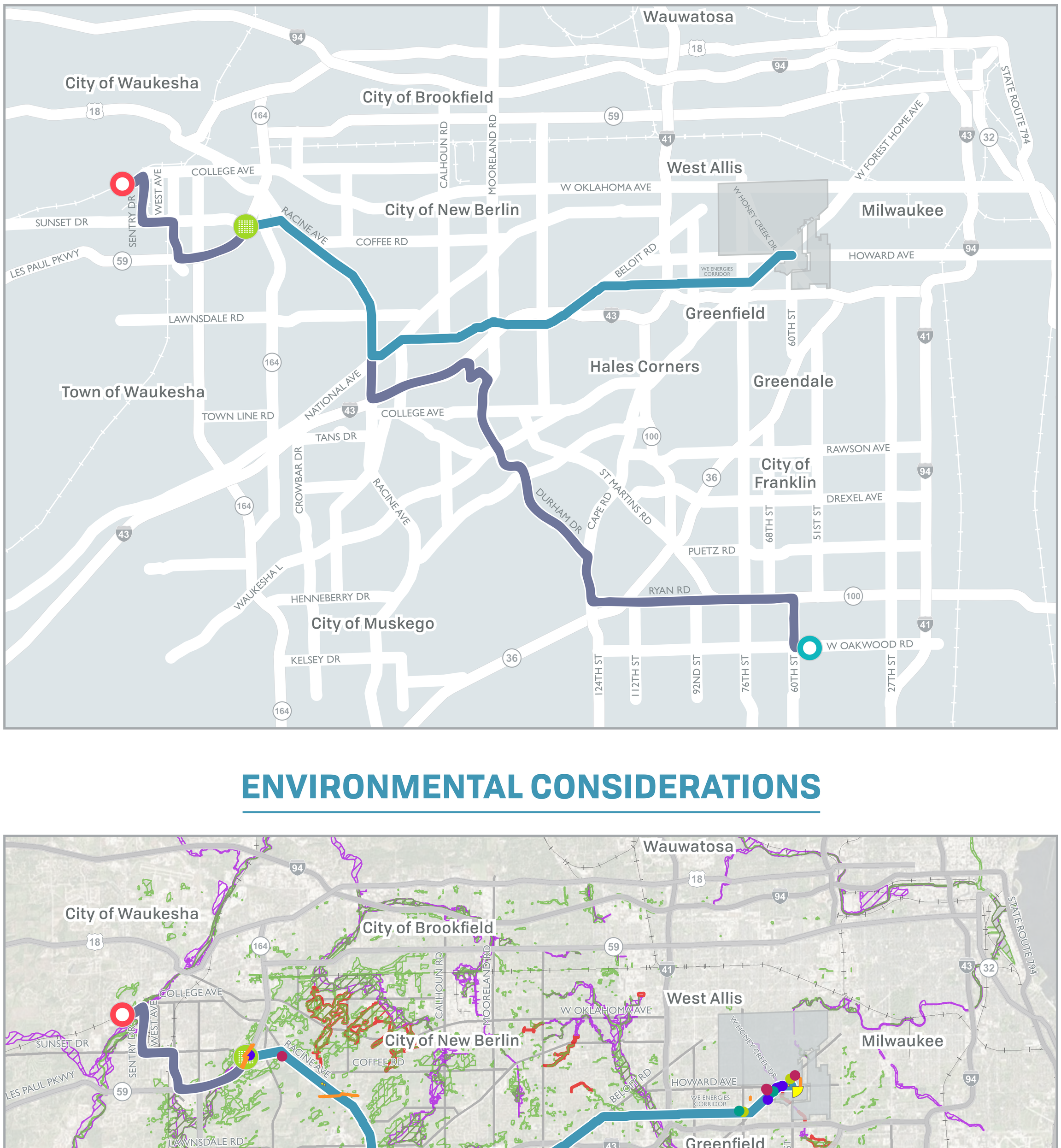
FEMA SFHA - AE

0 5,000 10,000 20,000

2" = 10,000'

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Route 3



ENVIRONMENTAL CONSIDERATIONS

- Route Alternative 3
- Return Flow
- Return Flow Pumping Station
- Outfall
- Waukesha Distribution System
- New Water Supply Pumping Station Evaluation Area
- Groundwater & Soil Contamination
- Groundwater Contamination
- Soil Contamination
- Architecture & History Inventory
- Archaeological Report Inventory
- Archaeological Sites Inventory
- Wetlands
- FEMA SFHA - A
- FEMA SFHA - AE

0 5,000 10,000 20,000

2" = 10,000'

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Appendix G – Amended Stipulation and Order for Amended Judgement

COPY

STATE OF WISCONSIN CIRCUIT COURT BRANCH 1 WAUKESHA COUNTY

CLERK OF CIRCUIT COURT
FAMILY DIVISION
2017 JUL 21 AM 11:41

STATE OF WISCONSIN,

Plaintiff,

FILED
IN CIRCUIT COURT
JUL 27 2017
WAUKESHA CO. WI
CIVIL DIVISION

v.

Case No. 09-CX-04
Complex Forfeiture: 30109

CITY OF WAUKESHA,

Defendant.

AMENDED STIPULATION AND ORDER FOR AMENDED JUDGMENT

The State of Wisconsin commenced this action against the City of Waukesha to enforce the State's safe drinking water laws. The parties resolved the alleged violations by entering into a stipulation and order for judgment that was signed by the Court on April 7, 2009 (2009 Stipulation). The 2009 Stipulation required Waukesha to pay a $55,000 judgment, achieve compliance with all federal and state drinking water radionuclide standards by June 30, 2018, and in the interim comply with other compliance targets required by the 2009 Stipulation.

Since entering into the 2009 Stipulation, Waukesha has sought a long-term supply of radionuclide compliant water through a Great Lakes diversion strategy that was ultimately approved by the Great Lakes – St. Lawrence

River Basin Water Resources Compact Council on June 21, 2016 and reaffirmed on May 4, 2017. Waukesha expects the diversion to be completed by September 1, 2023, and therefore cannot comply with the June 30, 2018 deadline. Waukesha also exceeded the weighted averaging compliance target set forth in the 2009 Stipulation as recently as December 2014 as a result of well equipment failure. The parties have agreed to simultaneously resolve the prior exceedances of the weighted averaging compliance target and acknowledge the approval of the Great Lakes diversion project, and therefore agree to amend and supplement the 2009 Stipulation.

IT IS STIPULATED AND AGREED by the State of Wisconsin and the City of Waukesha (Defendant) that the 2009 Stipulation shall be amended and supplemented on the following terms and conditions:

1. Pursuant to discussions between the parties, Defendant acquired three deep well pumps and three submersible motors, at an estimated cost of $250,000, to have available as standby pumping equipment for Wells No. 3, 8, and 10 to minimize the time needed for well pump and motor replacement. This equipment will be stored per manufacturer instructions within the treatment building at Well No. 8. Upon use of any of the replacement equipment, the Defendant shall immediately reorder such equipment to maintain its replacement capacity.

2. Defendant shall plan for and if necessary install interim radium removal equipment on Well No. 6 as set forth herein. The equipment shall consist of a leased radium treatment system using a selective media filter or equivalent treatment to remove radionuclides.

3. Development of the interim radium treatment system will involve the following two phases.

A. Phase I is system design and approval. The anticipated tasks to be completed in this phase, at an approximate cost of $400,000, include the following over a 21-month period:

- Issue request for proposals (RFP) for design of temporary treatment equipment
- Issue RFP for design of building and site work for temporary treatment equipment
- Award design services and execute professional service agreements
- Initial design work for sizing of temporary equipment
- Site work and building design following sizing of equipment
- Obtain approval from Waukesha Water Commission for site/building to go to Waukesha Plan Commission
- Obtain approval from Waukesha Plan Commission for site/building
- Obtain approval from Waukesha Board of Zoning Appeals for any necessary variances
- Complete pilot testing if required by the Wisconsin Department of Natural Resources (DNR)
- Complete treatment equipment design
- Public Service Commission (PSC) Review for Construction Authority
- DNR review

- Complete bid documents equipment design
- Review of lease agreement of treatment equipment by attorney

B. Phase II is final approval, bid, and construction. The anticipated tasks to be completed in this phase, at an estimated cost of $3,100,000, include the following over a 15-month period:

- Approval of lease agreement of treatment equipment by Waukesha Water Commission
- Approval of lease agreement of treatment equipment by Waukesha Board of Public Works
- Approval of lease agreement of treatment equipment by Waukesha Common Council
- Approval of Waukesha Water Commission to bid project
- Advertise, bid, and award construction contract by Waukesha Water Commission
- Approval of bid by Waukesha Board of Public Works
- Approval of bid by Waukesha Common Council
- Contact execution of construction contract
- Construction
- Punch list items
- Start up, testing, and commissioning

4. Development of the interim radium treatment system shall proceed in accordance with the following schedule:

A. Initiate Phase I no later than October 1, 2020;

B. Complete Phase I by May 31, 2022;

C. Initiate Phase II no later than June 1, 2022 if, as of May 1, 2022, the Defendant's Great Lakes water diversion project

manager and construction manager (PM/CM) cannot certify that all of the Great Lakes water diversion project construction is under contract and is 50% complete; and

D. If required to initiate Phase II under Paragraph 4.C. of this Amended Stipulation and Order for Amended Judgment, then complete Phase II, and start operation of the interim radium treatment system, by September 1, 2023.

5. Within 15 days after each applicable date specified in Paragraph 4 of this Amended Stipulation and Order for Amended Judgment, Defendant shall provide notice to Assistant Attorney General Bradley J. Motl, at the address below, as to whether or not the actions required by that date were completed.

6. Defendant shall provide public notice within one business day after each time Wells No. 3, 8, or 10 are taken out of service by conspicuously posting the notice on the official City of Waukesha website and shall continue to provide the public notice for the duration of the time the well is out of service.

7. Defendant shall send a copy of the annual report required by Paragraph 10 of the 2009 Stipulation to Assistant Attorney General Bradley J. Motl, at the address below, at the same time Defendant sends the annual report to DNR.

8. If Defendant sends DNR a notice under Paragraph 14 of the 2009 Stipulation, it shall send a copy of the notice to Assistant Attorney General Bradley J. Motl, at the address below, at the same time.

9. The date specified in Paragraph 7 of the 2009 Stipulation is changed from June 30, 2018 to September 1, 2023.

10. The date specified in Paragraph 13 of the 2009 Stipulation is changed from June 30, 2018 to September 1, 2023.

11. All provisions of the 2009 Stipulation amended by this Amended Stipulation and Order for Amended Judgment are superseded and no longer effective. All provisions of the 2009 Stipulation not amended by this Amended Stipulation and Order for Amended Judgment shall remain in effect and be enforceable.

Dated this 20th day of July, 2017.

BRAD D. SCHIMEL
Wisconsin Attorney General



BRADLEY J. MOTL
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Dated this 20th day of July, 2017.

STAFFORD ROSENBAUM LLP



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ORDER FOR AMENDED JUDGMENT

The Court approves the terms of the foregoing stipulation in *State of Wisconsin v. City of Waukesha*, Case No. 09-CX-04, which amends and supplements the stipulation approved by the Court on April 7, 2009 in this case and pursuant to which the City of Waukesha will take certain additional measures to achieve compliance with State radionuclide requirements and the April 7, 2009 stipulation. The Court therefore directs the clerk to enter the Amended Judgment incorporating the terms of the foregoing stipulation, and to docket the Amended Judgment.

This is a Final Order under Wis. Stat. § 808.03(1).

Dated this 17 day of July, 2017.

BY THE COURT:

/s/ Patrick C. Haughney

The Honorable Patrick C. Haughney
Waukesha County Circuit Court

"Placement of Tomas at the end of # amounts on pages 2, 3, 4 is unclear to this CT."

/s/ PH

Appendix H – Evaluating the Risks of Distribution System Failure

Evaluating the Risks of Water Distribution System Failure

Effective asset management starts with accurate knowledge of system components. Condition assessment modeling is helping utilities forecast distribution system frailties. BY ROBERT M. CLARK AND ROBERT C. THURNAU

WATER TREATMENT equipment can be evaluated by measuring performance and inspecting the maintenance paper trail. Assessing a distribution system is more complex, because it's mostly buried and unavailable for routine visual and physical inspection.

Water utilities have become increasingly interested in using condition assessment (CA) modeling to manage their infrastructure assets. An important aspect of CA modeling is the ability to quantitatively estimate risks associated with failure of distribution system pipe segments. The US Environmental Protection Agency (USEPA) has identified the repair, replacement, and rehabilitation of distribution system assets as important economically and in the vital interest of public health. Because of the national importance of this issue, USEPA initiated a project to develop a quantitative risk model for drinking water infrastructure repair and replacement.

Filter Effluent Particle Count Comparison

Filter effluent particle counts were consistently below the 20-particles/mL goal.

Inspection Technologies	Pipe Type
Acoustic Emission Monitoring	PCCP
Acoustic Leak Detection	All
Acoustical Leak Detection/Digital Correlator	All
Acoustical Monitoring Soundprint	PCCP
Broadband Electromagnetic	Steel
Closed-Circuit TV	All
Electromagnetic Inspection	PCCP
Long-Range Ultrasonic	Steel
Magnetic Flux Leakage	Steel, Cast Iron, and Ductile Iron
Remote Field Eddy Current	Steel, Cast Iron and Ductile Iron
Remote Field Transformer Coupling	PCCP
Ball Leak Detection	PPCP
Transient Pressure Monitoring	All
Ultrasonic	PCCP, Asbestos Cement

PROJECT SCOPE

The project focused on four aspects of drinking water infrastructure condition and quantitative risk assessment. The first part of the project focused on developing a quantitative, statistically based risk model for pipe-segment failure. The idea was to combine a technique called frailty analysis with a Cox Proportional Hazards Model (CPHM). The study team collaborated with the Laramie (Wyo.) Utility Division (Laramie Water) to quantify the risk of failure associated with individual pipe sections and complete pipelines or runs of steel, cast-iron, ductile-iron, and polyvinyl chloride (PVC) pipe and to identify factors influencing the risks.

The second aspect of the project was to develop a model for estimating costs and benefits, including secondary and societal costs, of pipe repair, rehabilitation, and replacement using the Inspection Value Method evaluation technique. The model was used to examine the advantages of using inspection technology to anticipate needed replacement of pipe-run sections.

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Condition assessment modeling has become an increasingly important tool to help utilities manage their infrastructure assets.

PHOTOGRAPH: AWWA

Robert M. Clark is an environmental engineering and public health consultant based in Cincinnati. Robert C. Thurnau is a project manager and principal investigator with Eastern Research Group (www.erg.com), Lexington, Mass.

The third aspect of the study assessed prestressed cylindrical concrete pipe (PCCP), which is of particular interest because it's frequently the means of transmitting large volumes of water. Therefore, when failure occurs, significant damage likely results. Commonly used in the 1960s and early 1970s, PCCP was thought to solve water-related transmission and collection pipe problems. However, use of large-diameter PCCP has led to increased financial and product-loss risks associated with pipeline failure.

The fourth part of the project was to identify and assess current, state-of-the art pipe inspection technology. Various types of inspection technology have been used to identify failure caused by corrosion or stress in storage tanks, pipes, and pressure vessels. To conduct a CA of distribution system mains, utilities must have access to technologies that are nondisruptive to normal service, accurate and reliable, and affordable. A summary of currently available inspection technologies and their application to various pipeline components is presented in the table at left.

One such technique used in water and wastewater networks is a self-contained electromagnetic device that rolls along a pipeline to detect leaks. The device was used as part of the cost–benefit analysis.

QUANTITATIVE RISK MODEL

The model used data provided by Laramie Water, which provides water and sewer services to Laramie residents. Pipe-break data provided by the city of Laramie were analyzed using the CPHM, which was modified by use of frailty modeling. Frailty analysis is a technique used by medical epidemiologists to identify subpopulations with a common susceptibility to a disease or weakness. In terms of pipe failure, this means identifying a group of pipes that seem to be especially susceptible to failure from specific causes. Frailty is defined as having an expected (mean) value of one, so it doesn't alter conditional expected values from the model but provides an estimate of random factors that might influence pipe breaks.

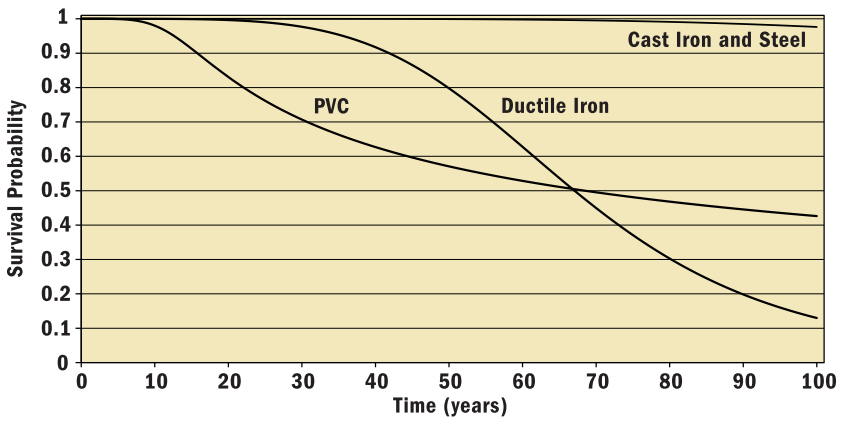
The Laramie dataset contains information about individual pipe sections, pipe runs, and pipelines. Therefore, the first step was to develop a model based on pipe sections. Next, the models were aggregated into pipe-run models. Analysis was limited to pipe diameters between 6 in. and 36 in. and to pipes installed after 1940. Individual pipe-run lengths varied from 1 ft to 9,241 ft.

Pipe Section Model. Risk models were developed for metallic and PVC pipe. According to the model, the frailty variance for PVC pipe and metallic pipe was determined to be 0.94 and 11.43, respectively. Therefore, the PVC frailty variance is an order of magnitude less than the metallic pipe frailty, which means that PVC pipe is much less susceptible to local random external

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Figure 1. Mean Survival Probabilities for 24-in. Pipe Sections

Survival rates are identical for steel and cast-iron sections, but PVC and ductile-iron sections have shorter survival rates.



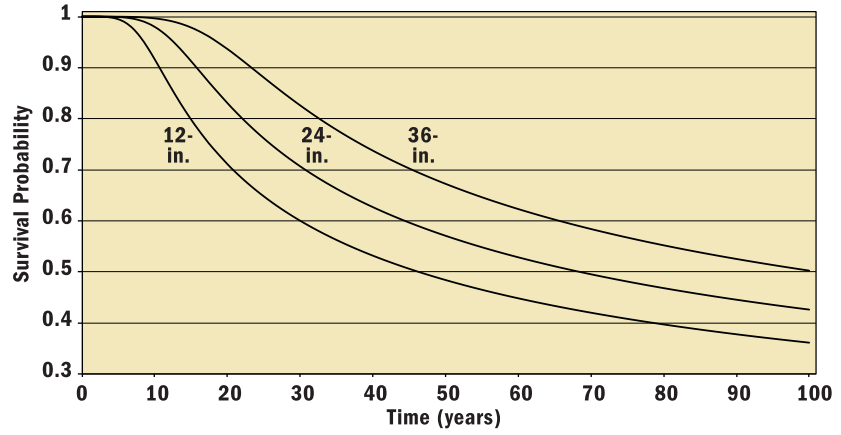
factors than those that affect metallic pipes.

Figure 1 illustrates applying the model to 24-in.-diameter pipe sections. The mean survival probabilities for steel and cast-iron pipe sections are identical, but PVC and ductile-iron pipe (DIP) sections have shorter survival rates. In Laramie, larger-diameter pipes of all types had better survival characteristics than smaller-diameter pipes.

Figure 2 illustrates the effect of diameter on survival probability for DIP sections. The same pattern was also typical for other types of pipe. Figure 3 illustrates the effect of frailty on PVC and DIP sections. For DIP, 5 percent of the pipe had a much shorter survival rate than an equivalent population of PVC pipe. Several implications can be drawn from this analysis. One interpretation is that a fraction of DIP is more vulnerable to unspecified environmental effects then PVC pipe. In addition, it appears that, when DIP begins to break, it may continue to break at a faster rate than PVC.

Figure 2. Survival Probabilities for Ductile-Iron Pipe Sections

Regardless of material used, large-diameter pipes fail less frequently than smaller-diameter pipes.



Cost–Benefit Analysis. The pipe-section model was integrated into a pipe-run model and incorporated into a cost–benefit model. Following is an example:

Assume a 7,000-ft, 24-in. DIP pipe run consisting of 350 sections of 20-ft pipe. Using the model, the pipe-run replacement cost was calculated to be $1.12 million ($3,200 per pipe section). The Producers Price Index (http://data.bls.gov/PDQ/servlet/SurveyOutputServlet) was used to upgrade these costs to current costs (2008). These data yielded a current total replacement cost for the described DIP pipe run of $1,568,000. Therefore, it's assumed that replacing a single section will cost $4,480 and the inspection technology cost would be $20,000/mile/year. So, for a 7,000-ft pipe, the inspection cost is estimated at $30,000/yr. If a break actually occurs, it's assumed that two sections of pipe would need to be replaced, so the repair cost for a 24-in. DIP pipe would be $8,960. It's further assumed that, if a pipe section doesn't break but is identified by the inspection technology device as a candidate for replacement, only one section of pipe is assumed to be replaced.

A cost–benefit model was developed that includes the following factors:

V = value added by the inspection

AIC = annual cost of applying the inspection technology

C = total cost of inspection, including all direct and indirect costs associated with restoration

E(t) = expected number of breaks for a pipe-run at time t

F = percentage of the pipe covered

FR = cost of forced repair

POD = probability of detecting a failure (technology specific)

R = preemptive cost of repair identified by the application of inspection technology

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The study shows that large-diameter pipes fail less frequently than smaller-diameter pipes, and all pipes fail more frequently with age.

SC = cost to society of water loss and other indirect costs

$$V = [(E(t) * POD * F * FR) + (E(t) * POD * F * SC)] - [(E(t) * POD * F * R) + E(t) * (1 - POD) * F * (FR + SC) + AIC)]$$

Illustrating the cost–benefit model, Figure 4 shows the relationship between the benefit and the cost of inspection for a 24-in. ductile iron pipe over time. For the first 10 years, costs exceed benefits. However, after 15 years, the use of inspection technology yields a positive benefit. Analysis shows the largest gains are derived from larger-diameter pipes. A possible asset management strategy might be to delay inspection until the benefits are clear. Analysis of 12-in.- and 36-in.-diameter pipe indicates benefits increase dramatically with diameter. Although this analysis, based on data compiled by Laramie Water, shows a positive benefit for inspection technology, selected results might be dramatically different for another type of device or material.

PCCP ANALYSIS

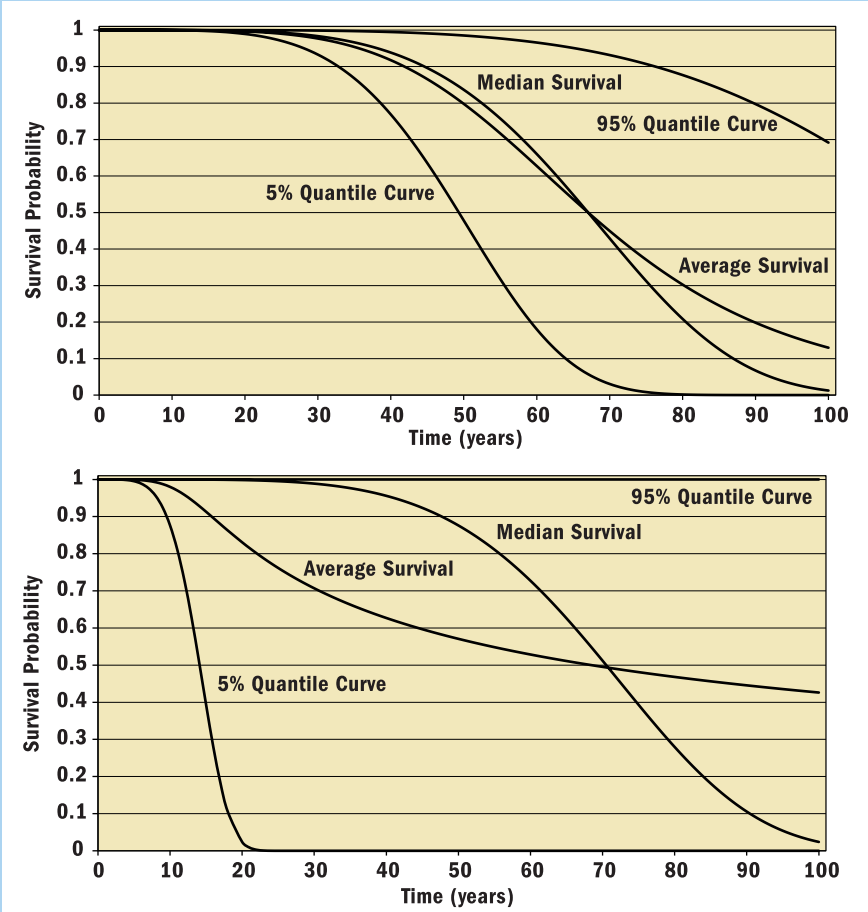
In a recent survey, USEPA found that, of 202,128 mi of reported distribution system pipes, 4,774 mi (2.3 percent) were PCCP. If that number is extrapolated on a national basis, it's estimated that about 1 million mi of pipe are in service, of which 23,000 miles are PCCP. Use of large-diameter PCCPs increased the financial and product-loss risks associated with failure. Some catastrophic drinking water transmission line ruptures have illustrated this problem. For example, in 2006, the San Diego Water Authority responded quickly to a ruptured 96-in. line. Although response was rapid, an estimated 2 mil gal of water were lost before the break was brought under control. When direct and indirect repair costs of the break were totaled, several millions of dollars were spent in repairs. Reducing the failure risk by knowing the breakage probabilities of large-diameter pipes can facilitate targeted maintenance, reduce costs, and allow more efficient use of existing and future assets.

A comprehensive dataset for large-diameter PCCPs was identified and used to analye PCCP breakage rates. The database contained 588 entries from 153 utilities and included pipe diameter and type, wire class and size, age at ruptures and other failures, failure condition, length, pressure, and manufacturer. Thirty-one pipe diameters, ranging from 16 in. to 252 in., were represented in the database.

The database was examined for specific pipelines that had undergone multiple maintenance activities over time. The pipelines that met this requirement were 24 in., 30 in., 36 in., 48 in., 60 in., 72 in., 84 in., 90 in., and 96 in. in diameter. At least one pipeline was selected for analysis from each of the diameters. A total of 15 pipelines was selected, which yielded 226 individual maintenance activities, representing more than 112 service observations. A regression analysis determined that, of the three variables studied affecting breakage rate/mi, only age and diameter were significant.

Figure 3. Frailty Effect on Mean Survival Rate

Some ductile-iron pipe sections (top) had a much shorter survival rate than an equivalent population of PVC pipe sections (bottom).



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Figure 4. Inspection Benefit and Cost Over Time

For 24-in. ductile-iron pipe, inspection technology yields a positive benefit after 15 yr.

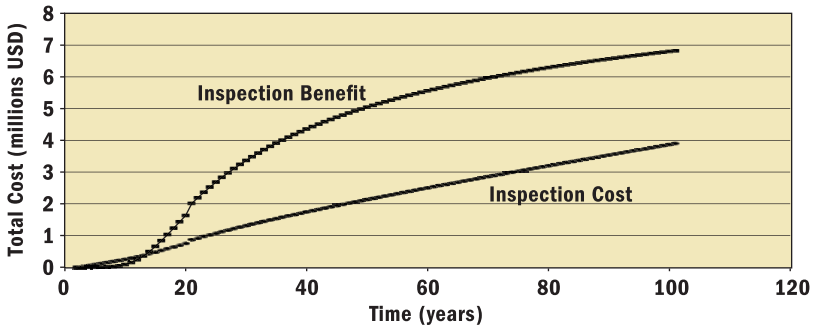
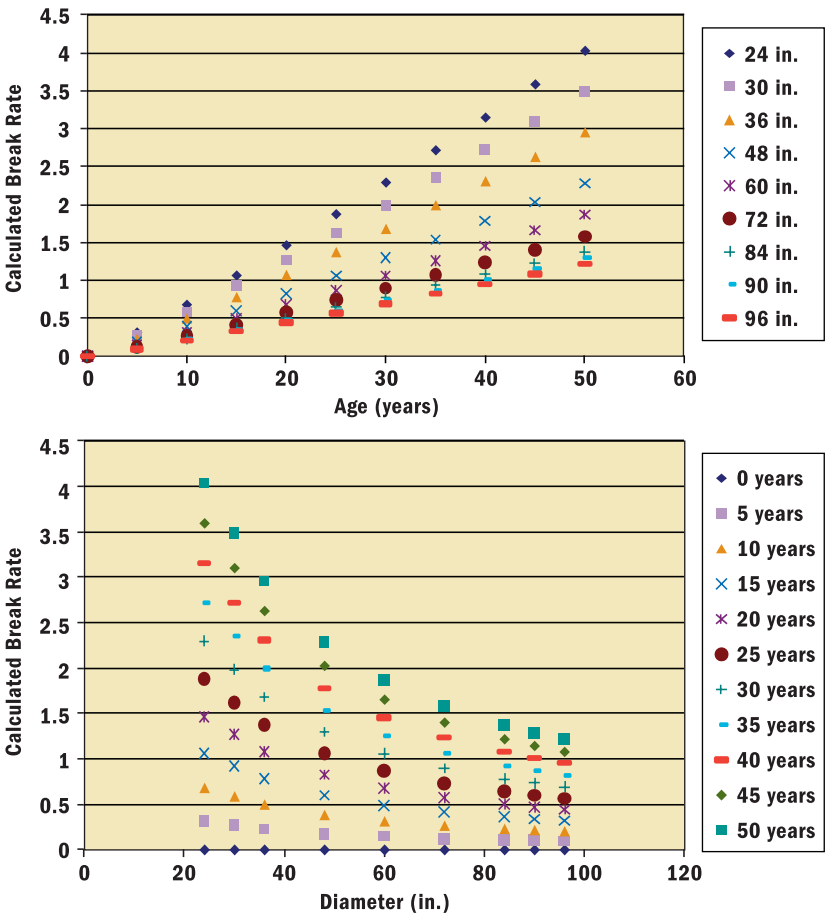


Figure 5. Predicted Break Rate per Mile With Regard to Diameter and Age

Break rate decreased with diameter (top) and increased with age (bottom).



Break rate decreased with diameter and increased with age. Although age and diameter are probably the most important variables, considerable work is required before PCCP break rates can be correlated with a high degree of confidence. The results of those calculations are shown in Figure 5.

The study shows that large-diameter pipes fail less frequently than smaller-diameter pipes, and all pipes fail more frequently with age.

STUDY RESULTS PROMISING

In summary, a model incorporating CPHM with shared frailty (by pipe section) for metallic and PVC pipe was developed to estimate pipe-break risks. The Inspection Value Method, which incorporated CPHM, was applied to Laramie Water's pipeline data based on a hypothetical 24-in. DIP to illustrate relative costs and benefits of using inspection technology. A separate pipe-break analysis for PCCP revealed that larger-diameter PCCP had lower break rates than smaller-diameter PCCP pipes. Various inspection technologies were examined, evaluated, and found to be promising.

Authors' Note: *The authors acknowledge USEPA's Office of Research and Development, which funded, managed, and collaborated in this research, which was subjected to USEPA's administrative review and approved for external publication. Opinions expressed in this article are those of the authors; no official endorsement by USEPA should be inferred. The authors acknowledge the assistance of Peter D. Rogers, University of Texas–Tyler; Neil S. Grigg, Colorado State University; and Cal Van Zee, Laramie Water. In addition, the authors would like to acknowledge John Carson, E.R. Krishnan, and Sri Panguluri of Shaw Environmental & Infrastructure for their assistance in completing this project.*

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Appendix I – Water Main Breaks in the USA and Canada: A Comprehensive Study

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Water Main Break Rates In the USA and Canada: A Comprehensive Study

Steven Folkman
Utah State University

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Water Main Break Rates In the USA and Canada: A Comprehensive Study

March 2018
An Asset Management Planning Tool for Water Utilities



Utah State University
Buried Structures Laboratory
Steven Folkman, Ph.D., P.E.



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Executive Summary

The economic prosperity of modern cities is based on a complex infrastructure network located both above and below ground. A critical component to public health and economic well-being is our drinking water which is brought to the tap through an elaborate network of underground pipe distribution systems. Since most of this infrastructure is underground, it is out of sight and often neglected. Empirical data on water main breaks helps utilities in their repair and replacement decision making processes in order to deliver clean drinking water to their customers at an affordable price. This report documents the survey results of water main breaks and operating characteristics at utilities located in the US and Canada. A similar survey was conducted by Utah State University approximately six years ago and published in 2012 (Folkman, 2012). This 2018 report references this previous study to compare and examine changes over time and discuss the importance of water main break data in the context of water asset management planning.

Evidence of Decline

North America's water infrastructure is in decline. The signs of distress surface daily as water mains break creating floods and service disruptions. The loss of service is more than an inconvenience, causing significant social and economic disruptions. Economic impacts include loss of treated water, increased maintenance budgets, overtime hours for service personnel, traffic and business disruptions, and damage to private property. "Aging and deteriorated water mains are threats to the physical integrity of distribution systems, causing adverse effects on flow capacity, pressure, and water quality in drinking water services" (Grigg, et al., 2017). Disruptions due to water main failures are now a common occurrence. The overall assessment of our infrastructure is not good. In 2009, the American Society of Civil Engineers issued a USA Infrastructure Report Card and gave a D- to drinking water and wastewater infrastructure (ASCE, 2009). In a small sign of improvement, the 2017 ASCE Infrastructure Report Card (ASCE, 2017) grade was raised to a D. In the 1990s, a comprehensive American Water Works Association (AWWA) study also indicated that water main replacement was inadequate (Kirmeyer et al., 1994). The AWWA has formally tracked issues and trends in the US. The top concern in the AWWA surveys for both 2016 and 2017 is "renewal and replacement (R&R) of aging water and wastewater infrastructure" (AWWA, 2017).

The Measurement

The most important and critical factor used to quantify the condition and occurrences of failing underground pipe networks is **water main break rates**. Water main break rates are calculated for all pipe materials used in the transport of water to create a measurement to judge pipe performance and durability. Water main break rates for each utility can vary year to year and even seasonally. However, in aggregate, break rates produce a compelling story which can aid in asset management decision making as it relates to defining pipe criticality and costs of repairing and replacing our underground water pipes.

Purpose and Highlights

This comprehensive water main break rate study for the USA and Canada compiles the collective experience of 308 utilities which should be used for making future pipe replacement decisions. It is the desire of the researchers and participants to offer data and analysis that utility managers, engineers and elected officials can apply to the circumstances of their own operations to facilitate water infrastructure asset management planning and pipe replacement decision making. The objective is to reduce operating costs, service level impacts and health risks to their customers. Highlights of the water main break study include aggregate data on pipe material break rates, the analysis of age and corrosion in failure modes, related observations on pressure, delivery demands, effects of soil corrosivity, and new national metrics for pipe replacement rates and population served per mile of pipe.

The Primary Researcher

Dr. Steven Folkman is a registered Professional Engineer, a member of AWWA and a member of the Transportation Research Board Committee on Culverts and Hydraulic Structures, and has oversight of Utah State University's (USU) Buried Structures Laboratory. The Buried Structures Laboratory at USU has been involved in analysis and testing of all kinds of pipe and associated structures for over 50 years. Previous directors include Dr. Reynold Watkins and Dr. Al Moser who are internationally recognized experts. Dr. Moser and Dr. Folkman are coauthors of the widely used text, *Buried Pipe Design* (McGraw Hill, 3rd Edition). Dr. Folkman's expertise includes structural dynamics, linear and nonlinear finite element analysis utilizing soil/structure interaction, and testing. The USU Buried Structures Laboratory is recognized as one of two laboratories in the United States for performing large scale tests on buried pipes. It is from this expertise and background that the surveys of water main breaks were developed and analyzed to complete this comprehensive study.

Major Findings

The comprehensive nature of this study has provided a national water infrastructure condition assessment and review comparing pipe material performance. Additionally, several national-level metrics which utilities can use for asset management benchmarking purposes are included.

1. Nearly 200,000 Miles of Pipe Condition and Operation Surveyed

A total of 197,866 miles of pipe were reported by the 308 basic survey participants. Of those, 281 participants were able to provide water main break data covering 170,569 miles of pipe. This represents 12.9% of the total length of water mains in the USA and Canada. Equally significant, the utilities providing break data serve a total population of 52,477,346 people. This represents 14.5% of the total population of the US and Canada. The survey recorded 23,803 failures that needed repairs which is a significant basis for break data. It is one of the largest surveys conducted on water main failures and the results give an accurate representation of water main performance and operating conditions in North America. This report can be used to update "average estimated service life" assumptions for pipe materials when considering asset management pipe renewal and replacement decision-making.

2. Break Rates Have Increased 27% in the Past Six Years

Between 2012 and this 2018 report, overall water main break rates increased by 27% from 11.0 to 14.0 breaks/(100 miles)/year. Even more concerning is that break rates of cast iron and asbestos cement pipe, which make up 41% of the installed water mains in the US and Canada, have increased by more than 40% over a 6-year period.

3. 82% of Cast Iron Pipes are Over 50 Years Old and Experiencing a 43% Increase in Break Rates

Cast iron (CI) pipes represent the largest pipe material inventory in North America. 82% of all CI pipe is over 50 years old and their break rates have increased significantly by 43% since 2012 and are expected to continue to increase. 27% of asbestos cement (AC) pipe is also over 50 years in age and AC pipe breaks have increased by 46% in that same 6-year period. CI and AC pipe together are mostly responsible for the spike in overall break rates since 2012. Utilities with large amounts of cast iron and/or asbestos cement pipes may need to accelerate their replacement rates. CI and AC pipes are no longer manufactured and many are reaching the end of their expected lives.

4. Nationwide One Mile of Installed Water Main Serves 308 People

While the industry has assumed 325 people are served for 1 mile of distribution system pipe in urban areas, this survey finds a new national metric of 308 people served per mile of pipe regardless of utility size (or 191 people/km). The data indicates that an average utility has 607 miles of pipe and serves a population of 186,752 people.

5. 85% of Water Main Inventory is Less Than 12" in Diameter

67% of all water mains are 8" (200 mm) or less in diameter and the range of 10" to 12" (250 to 300 mm) sizes make up another 18% of all installed water mains.

6. Smaller Utilities Have Two Times More Main Breaks Than Large Utilities

The survey results show that smaller utilities can have break rates more than twice as high as larger ones. This may be attributable to the fact that larger utilities are better funded which results in improved data, engineering design, installation procedures, and asset management practices. A small or rural utility would typically have more pipe miles per customer. This can result in greater financial burdens in maintaining their water systems compared to larger or urban utilities.

7. Pipe Material Use Differs by Region

Water main pipe material usage varies significantly over geographic regions (see Figure 11). This suggests that the selection and use of pipe materials are based on historical preference versus comparative cost analysis or environmental conditions. The upper northwest and eastern half of the USA (Regions 1, 4, 6, 7, and 8 as illustrated in Figure 1) have either cast iron or ductile iron pipe for much of the installed pipe length. Regions 3, 5, and 9 have more PVC pipe than any other material. The most common pipe material in Region 2 is asbestos cement and it is unique in that respect.

8. A Large Data Set Provides Increased Accuracy

The water main break experiences of one utility may not represent another. Factors such as climate, pipe material, installation practices, and soil corrosivity can greatly affect failure rates. Design and installation practices are very important. Every utility should properly design and install pipe - regardless of material. Many previous studies have

been based on a small subset of large utilities. This study provides an increase in accuracy due to the extensive participation of utilities.

9. Four Types of Pipe Materials Make Up 91% of Water Mains

91% of the installed water mains utilize a combination of cast iron (CI) at 28%, ductile iron (DI) at 28%, polyvinyl chloride (PVC) pipe at 22%, and asbestos cement (AC) at 13%. The remaining 9% of pipes used are represented by polyethylene (HDPE), steel, molecularly oriented PVC (PVCO), concrete steel cylinder (CSC), and other materials.

10. PVC Pipe Has the Lowest Overall Failure Rate

When failure rates of cast iron, ductile iron, PVC, concrete, steel, and asbestos cement pipes were compared, PVC had the lowest overall failure rate. This was also the case in the 2012 survey and is confirmed by other industry sources. A lower failure rate contributes to a lower total cost of ownership and helps confirm the performance and longevity of PVC pipes. PVC is not subject to corrosion, unlike ferrous and concrete steel cylinder pipes.

11. Corrosion is a Major Cause of Water Main Breaks

75% of all utilities surveyed reported one or more areas with corrosive soil conditions. Utilities with a higher percentage of iron pipe may experience a higher percentage of corrosion related breaks. This would especially apply to pipe installed without an increased investment in condition assessment, pipe monitoring and corrosion control measures. Corrosive soils and other environmental risks drive up the total cost of ownership. The most common failure mode reported in the detailed survey is a circumferential crack which is the most common failure mode of cast iron (CI) and asbestos cement (AC) pipes. Corrosion issues can be a contributor to many failure modes.

12. Cast Iron Pipe Has 20 Times More Breaks in Highly Corrosive Soils Than in Low Corrosive Soils

Analyses of soil corrosivity completed in this study shows that a cast iron (CI) pipe in highly corrosive soil is expected to have over 20 times the break rate of a CI pipe in low corrosive soil. Traditionally, the thickness of the iron pipe wall provided the additional corrosion protection. CI pipes manufactured after World War II have significantly higher failure rates due to thinner walls. The resulting higher main breaks with iron pipes due to corrosive soils is consistent with other research and studies.

13. Newer and Thinner-Wall Ductile Iron Pipe Has 10 Times More Breaks in Highly Corrosive Soils Than in Low Corrosive Soils

Ductile iron (DI) pipe in highly corrosive soil has over 10 times the break rate than a DI pipe in low corrosive soil. Cast iron (CI) and DI pipe corrode at about the same rate. Corrosion is an important failure mode for CI pipe and is the predominant failure mode for DI pipe. The many types of corrosion can also be combined with other environmental and operating conditions, all contributing to water main failures. Because the wall thickness of DI pipe has decreased over time, internal and external corrosion are a bigger concern for this pipe product.

14. 80% of Utilities Use Some Form of Corrosion Protection for Ductile Iron Pipe

80% of respondents to the detailed survey indicated they utilized some form of corrosion protection for ductile iron pipe with polywrap being the predominate method.

15. The Average Age of Failing Water Mains is Approximately 50 Years Old

When asked for the typical age of a failing water main, the detailed survey participants reported an average value of 50 years. 43% of water mains are between 20 and 50 years old and 28% of all mains are over 50 years old. In 2012 the average age of failing water mains was reported as 47 years. Based on the detailed survey, the average expected life of installed pipe today is 84 years, up from 79 years in the 2012 study. Given the qualitative nature of these questions, the typical age of a failing water main and expected pipe life have not changed significantly over the past 6 years. While pipe life can be estimated at over 100 years, actual life is affected by soil corrosivity, installation practices, and other factors.

16. 45% of Utilities Conduct Condition Assessment of Water Mains

45% of utilities use some form of regular condition assessment of their water mains. Condition assessment is considered a basic part or early step in the development of an asset management program.

17. Over 16% of Installed Water Mains are Beyond Their Useful Life

A total of 16% of installed water mains are beyond their useful lives (up from 8% reported in the 2012 study) and utilities do not have the funds to replace them. For utilities to survive this trend, and considering 28% of all mains are over 50 years old, improved asset management will be essential. These figures correspond well with an EPA study (EPA, 2002) that shows the amount of pipe needing immediate replacement is growing rapidly.

18. The National Rate of Pipe Replacement is 125 Years

According to the survey, an average of 0.8% of installed pipe is replaced each year. This equates to a 125-year replacement schedule. Pipe replacement rates should be between 1% and 1.6%, equivalent to 100-year and 60-year depreciation and/or replacement schedules, respectively. In general, pipe replacement rates need to increase. Asset management and life cycle costing practices can help a utility optimize its pipe renewal and replacement activities. The report finds that on average, utilities have a 125-year replacement rate on water main pipes as the new national average.

19. Construction Related Failures are the Same for Both Ductile Iron and PVC Pipes

The detailed survey asked utilities to report the number of failures related to construction activities and identify the pipe material that failed. The vast majority of construction related failures involved either ductile iron (DI) or PVC pipe and the number of failures for each material was essentially identical. Therefore, DI and PVC pipe have an equivalent rate of construction related failures. This points to the need to improve construction practices for underground infrastructure regarding installation, location services and inspection.

20. Acceptance of PVC Pipe for Use in Water Systems Has Increased by 23% Since 2012

PVC pipe approval has increased from 60% of water utilities allowing its use in 2012 to 74% of utilities allowing its use in 2018. The number of utilities approving of ductile iron, concrete steel cylinder, and steel pipes for use in water systems remains essentially the same.

21. Open Cut Remains the Primary Pipe Installation Method

Open cut pipe installation/replacement remains the primary method used. Where open cut is difficult, other installation methods are used. 62% of utilities have used directional drilling and it is highly recommended in locations where open cut replacement is difficult.

22. The Average Supply Pressure is 69 psi With the Average Maximum at 119 psi

Pressure is an important component in pipe design and material selection. A well-controlled system operated below design limits will lead to extended pipe life. The basic survey provided an average operating pressure of water mains as 69 psi, which is well below the pressure rating of most water mains. The reported maximum operating pressure in the basic survey had an average value of 119 psi.

23. The Average Daily Gallons Per Day Per Person is 137 With a Peak Demand Factor of 1.8

The average daily water demand for utilities which participated in the detailed survey was 137 gallons per day per person with a peak demand of 251 gallons per day per person. This suggests successful water conservation efforts and “value of water” campaigns nation-wide.

24. Estimated Average Water Loss to Leakage is 10%

A total of 200 utilities provided an estimate of their water loss due to leakage and the average reported value was 10%. This statistically significant number suggests that pressure reduction, leak detection and pipe replacement has contributed to the overall reduction of water loss in water distribution systems.

25. Most Utilities Have a Moderate to High Soil Corrosion Risk

Using soil analysis data, corrosion index values were computed for 281 of the cities that participated in the survey. The study found a direct correlation between soil corrosiveness and break rates of metallic pipes. A typical city has a corrosion risk rating somewhere between moderate and high, demonstrating the importance of corrosion mitigation for water systems.

1.0 Introduction

In the United States and Canada, population growth during three main time periods – 1800s, 1900–1945, and post 1945 – led to the installation of underground water infrastructure. Pipes constructed in each of these three eras could all start to fail at nearly the same time over the next couple of decades for a number of reasons ranging from age and corrosion to inadequate design and poor installation. Additionally, the life span of the materials used has become shorter with each new investment cycle (WIN, 2002).

There are approximately 155,693 public water systems in the United States with 52,110 community water systems providing year-round water services for residents. Over 286 million Americans get their tap water from a community water system (CDC, 2017). These community water systems across the US face the inevitable cost of pipe repair and replacement while dealing with decreasing water quality and increasing water loss. It is believed that at many utilities, pipe replacement levels are inadequate to keep up with the rate of deterioration. Maintaining an obsolete system can cause severe financial hardship for cities as well as increase public health risks. Infrastructure asset management is an approach which can help utilities bring together the concepts, tools, and techniques to manage assets at an acceptable service level at the lowest life-cycle cost. Life-cycle costing and assessment analysis can help utility management select pipe materials with a long-expected life that also contributes to a low cost over the expected life of the pipe, while also considering environmental impacts and risks (see Sustainable Solutions, 2017 or Khurana, 2017).

> This study provides key inputs to water asset management's life-cycle cost analysis through a comparison of break-rates of commonly used pipe materials. Also, utility operating characteristics given in this report can provide the pipeline designers and system operators with reference values to plan for system replacement and expansion.

1.1. Aging Water Infrastructure

In 2007, the Conference of Mayors conducted a survey of over 300 cities representing over 55 million citizens and over 186,149 miles of water distribution mains (US Conference of Mayors, 2007). A high majority (86.2%) of cities use the number of water main breaks per unit length to evaluate drinking water pipe performance. The survey results concluded that water main breaks continue to be a major concern with 45% of cities experiencing more than 50 breaks annually. Cities also stated that repair and replacement cycles require a long-term view: 43% of city drinking water pipe system repair and replacement cycles extend beyond 50 years; and, 65% of city sewer pipe system repair and replacement cycles extend beyond 200 years. Water operation and maintenance managers recognize that older pipe systems may be constructed with multiple materials such as concrete, cast iron, wood, and some of these pipes may be over 125 years old. Asset inventory, condition assessment and asset management planning practices provide valuable information to enable utilities to more efficiently replace older pipes constructed with underperforming materials.

The EPA's Aging Water Infrastructure research program (EPA, 2010) is working toward the goal of making our nation's water infrastructure sustainable by supporting research and by promoting strategic asset management. The current efforts of the American Society of Civil Engineers Grand Challenge (ASCE, 2017) also helps engineers focus on improving the nation's infrastructure report card grade. ASCE's Grand Challenge aims to enhance the performance and value of water infrastructure by 2025 with a focus on innovation, life cycle costing and transformational change from design to delivery.

The water industry has seen many types of academic surveys and studies on water main replacement programs and the benefits of asset management, condition assessment and prioritization. However, many utilities have not historically tracked all of the elements of water main break data. Over the past 20 years, most utilities have come to realize the importance of tracking all aspects of their infrastructure in a GIS-centric platform and have collected records on the types, sizes, and repair histories of their pipes. As this trend continues, more data and

analysis will be available to the industry to improve water distribution system repair and replacement decision making. This comprehensive report based on statistically significant experiences from 308 utilities also draws from other relevant studies to be the most complete and authoritative study on water main break data based on pipe material. Many water utilities consider pipe breaks to be a crucial factor when deciding which pipes to replace. According to a Water Research Foundation (WaterRF) study, 75% of water utilities cited pipe breaks as a key criterion in pipe replacement decisions. Other common factors noted were pipe age (45%), low flows (40%), condition or material type (30%), and need for pipe size changes (30%). In addition, pipe breaks in a water distribution system are one of three critical metrics that can be used to measure the degree of optimization in the system. The other two metrics are chlorine residual (measuring water quality integrity) and pressure management (measuring hydraulic integrity). Breaks reflect the physical condition of a distribution system (WaterRF, Asset Management, 2017).

According to another WaterRF publication, the average pipe break rate (regardless of cause) for water utilities is between 21 to 27 breaks per 100 miles of pipeline per year. An additional WaterRF study cited an average of 25 breaks per 100 miles per year. Although water utilities typically take action to manage and reduce pipe breaks through monitoring, preventing all pipe failures is impossible (WaterRF, Knowledge Portals, 2017).

2.0 The Survey

2.1. Methodology

During 2017, Utah State University conducted a survey of utilities across the USA and Canada to obtain data on water main failures of water supply systems. The study was comprised of two parts: a basic survey and a detailed survey. The focus of the basic survey was to examine the number of failures utilities were experiencing and how those failures related to the pipe materials used and the age of the failing pipes. This effort focused on water supply mains (sewer and force main pipes were excluded) and excluded pipes with diameters under 3 inches. A variety of pipe materials are used in water supply systems and over the past 100 years the materials have evolved with different manufacturing technologies. As a result, pipe performance has changed. A goal of both the basic and detailed surveys was to look at which materials were performing best at a snapshot in time and to track how pipe age affects failure rates. The focus of the detailed survey was to obtain additional utility operational characteristics, pipe age and size, multi-year failure data, and applications of trenchless technologies.

The primary method used to distribute the surveys was email. A subcontractor experienced at mass emailing was utilized along with multiple email lists. Initial emails were sent to personnel at water utilities during April through June of 2017. This report will refer to the survey results herein as the 2018 study to correspond with its date of publication. Participants were given links to both the basic and detailed surveys and requested to complete both, or at a minimum, complete the basic survey. Follow up phone calls were also used to encourage participation. The basic survey participants were asked for data from a previous 12-month time period and thus the results represent a time period that mostly coincides with the year 2016. A total of 308 utilities responded to the basic survey. Of those, 281 utilities were able to provide water main break data in the basic survey and 98 responded to the detailed survey. This comprehensive study covers 170,569 miles of pipe with water main break data. An additional 27 utilities responded with partial data but are not included in the 170,569 mile total to simplify this report. The USA and Canada

were divided into nine regions and the 281 basic survey respondents were categorized according to the region and the size of the utility based on amount of pipe. This comprehensive study documents the results from both the basic and detailed surveys and draws from other relevant industry sources.

2.2. Objectives and Goals of the Study

There were many objectives of the surveys. These objectives include:

- Understanding the age and size distribution of pipe in water utilities
- Providing utilities with data they can use such as typical and maximum water pressure in water mains, average and maximum daily demands of water, and leakage rates
- Itemizing pipe failures over a time period with the data broken down by material type and age
- Identifying the most common pipe failure modes and materials as identified by the utility
- Determining whether corrosive soils are present, analyzing the influence of corrosive soils on break rates, and identifying corrosion prevention methods being used
- Highlighting pipe replacement plans, expected pipe life of new pipe and condition assessment methods
- Determining which pipe materials are allowed

FIGURE 1: REGIONS USED TO REPORT SURVEY RESULTS

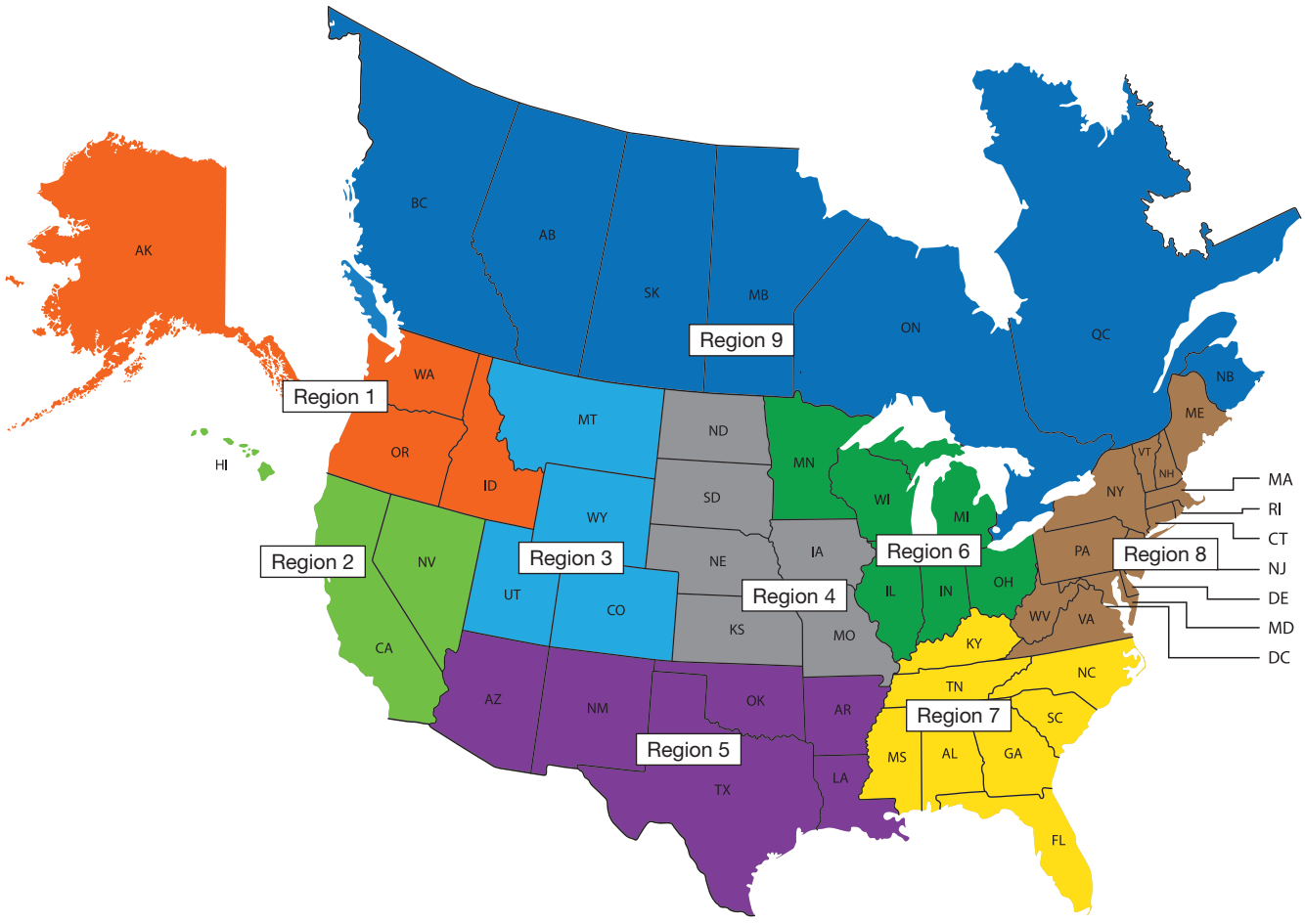


TABLE 1: NUMBER OF SURVEY RESPONDENTS WITH WATER MAIN BREAK DATA BY REGION

Region	Basic Survey			Detailed Survey		
	Number of Respondents	Miles of Pipe	Population Served	Number of Respondents	Miles of Pipe	Population Served
1	18	10,395	3,790,992	9	5,361	2,142,784
2	33	28,096	13,047,139	10	14,781	7,768,396
3	14	9,676	2,611,838	6	7,237	1,729,838
4	24	11,039	1,965,740	7	5,041	960,148
5	44	28,649	5,779,390	18	23,080	3,522,330
6	64	24,220	6,922,536	21	13,312	3,896,092
7	28	20,291	5,508,899	8	8,632	1,020,243
8	35	21,064	5,584,389	9	9,345	1,996,568
9	21	17,138	7,266,423	10	11,307	4,112,900
Total	281	170,569	52,477,346	98	98,097	27,149,299

FIGURE 2: LENGTH OF PIPE FROM EACH REGION THAT RESPONDED TO THE BASIC AND DETAILED SURVEYS

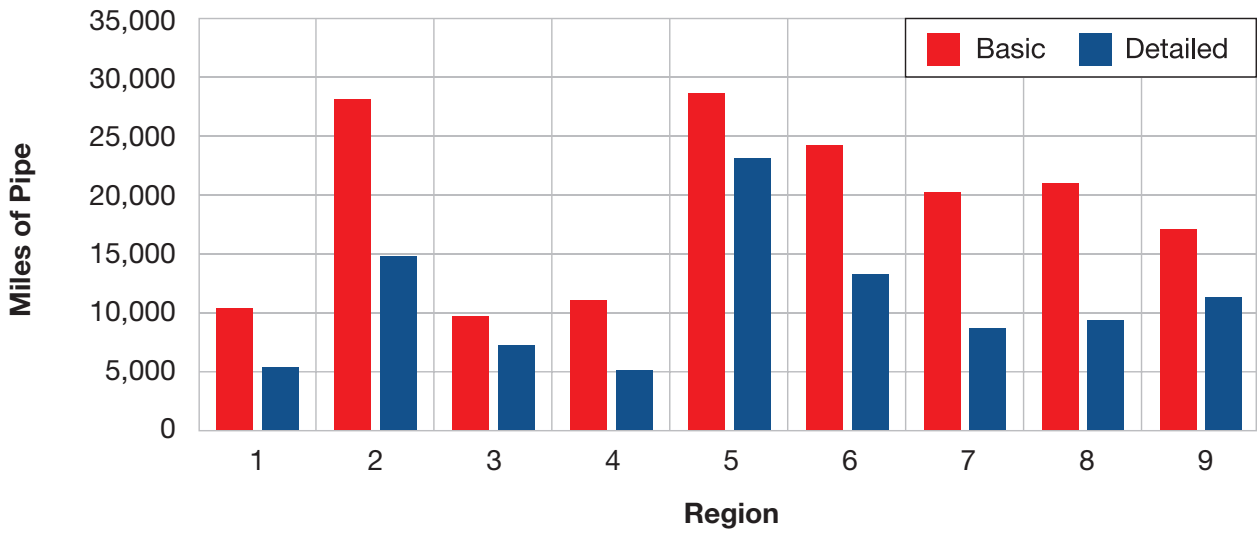
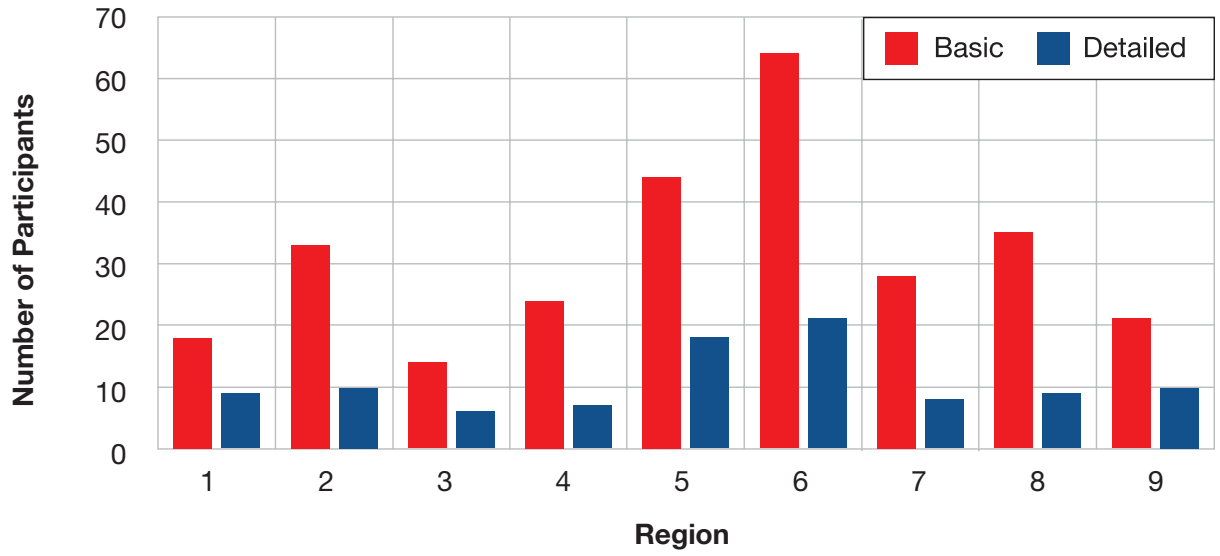


FIGURE 3: NUMBER OF RESPONDENTS FROM EACH REGION THAT RESPONDED TO THE BASIC AND DETAILED SURVEYS



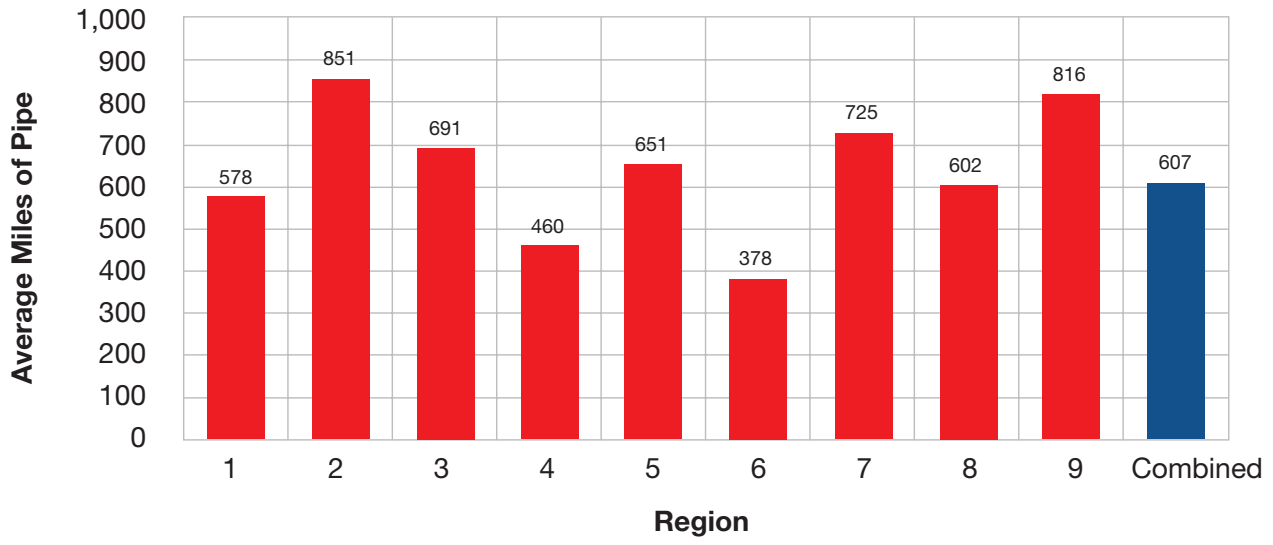
2.3. Survey Regions

In total, 281 utilities participated in the surveys and provided failure data. To examine regional variations, nine survey regions in the United States and Canada were selected. The regions defined in the study are used here to indicate the wide geographical distribution of the respondents. Table 1 lists the number of respondents with failure data, the miles of pipe, and the population served in the basic and detailed surveys from each region. Figure 1 illustrates the locations of the nine different regions used in this report. Respondents were asked to report the length of water supply mains in their system but not to include sewer or force mains or lines with a diameter less than 3 inches. Figure 2 illustrates the miles of water main pipe that were reported in the basic and detailed surveys on a regional basis. A total of 170,569 miles and 98,097 miles of pipe was reported by respondents in the basic and detailed surveys, respectively. Figure 3 illustrates the number of respondents from each region. There were 26 additional respondents to the basic survey that could not provide failure data and these are not included in the miles of pipe or populations served in Table 1. The respondents are distributed across a large survey area. The basic survey was able to get respondents from 48 of the 50 states in the US and 7 out of 10 provinces in Canada. This study is more comprehensive than other studies to date.

Based on miles of pipe shown in Figure 2, the basic survey got the most miles of pipe from Regions 2 and 5. Figure 3 shows that the peak number of respondents came from Region 6.

Figure 4 shows the average miles of pipe per utility for the basic survey by region. Region 2 had the highest average pipe length of 851 miles and Region 6 had the smallest with 378 miles. Overall, based on the basic survey, an average utility participant had 607 miles of pipe and served 186,752 people. For comparison, the 2012 survey results reported an average utility had 626 miles of pipe and served 164,325 people, which are similar results. The 2012 survey had 188 respondents covering 117,603 miles of pipe with failure data and thus the 2018 basic survey had a 49% increase in respondents and 45% more miles of pipe. This increase in survey coverage increases the statistical validity of this study.

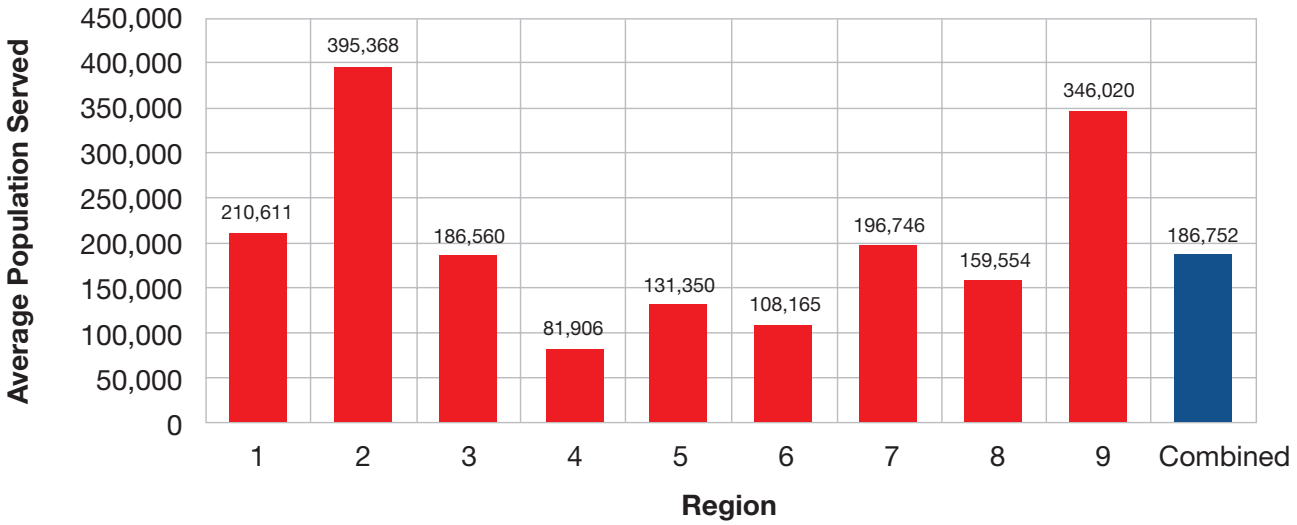
FIGURE 4: AVERAGE MILES OF PIPE FROM EACH REGION RESPONDING TO THE BASIC SURVEY



2.4. Size of Survey Participants

Figure 5 shows the average population served per utility for each region in Figure 1. The average population served per utility for the entire basic survey was 186,752.

FIGURE 5: AVERAGE POPULATION SERVED FROM EACH REGION RESPONDING TO THE BASIC SURVEY

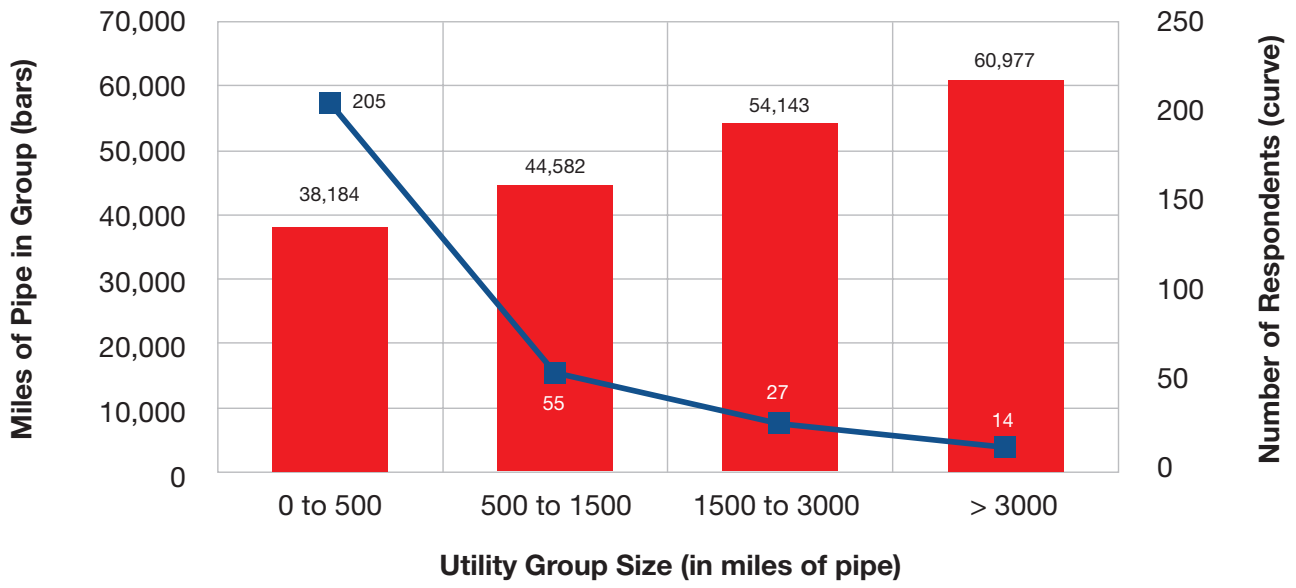


Four categories of utility size were used as shown in Table 2 and each survey participant was allocated to one of the categories based on the miles of installed water mains. Figure 6 shows the distribution of total miles of pipe from the basic survey based on these categories (bar graph) along with the number of respondents (line graph with right axis). Respondents covered the range from very small to very large with each group from Table 2 well represented. In terms of total length of pipe from each of the size groups in Table 2, this survey has reasonable uniform distribution of pipe length from small to large utilities.

TABLE 2: GROUPING OF UTILITY SIZE

Description	Miles of Pipe Installed
Small Utility/City	0 to 500 miles
Medium Utility/City	500 to 1500 miles
Large Utility/City	1500 to 3000 miles
Very Large Utility/City	Over 3000 miles

FIGURE 6: TOTAL MILES OF PIPE IN THE BASIC SURVEY IN EACH SIZE GROUP DEFINED IN TABLE 2 AND THE NUMBER OF RESPONDENTS (CURVE AND RIGHT AXIS)



2.5. Miles of Pipe vs. Population

Figure 7 illustrates the relationship between the population served by the utilities participating in the basic survey and the number of miles of water main pipe. The trend line and equation are a best fit to the data. The slope of this line indicates that there are on average 322 people served for each mile of water main installed. Figure 7 tends to be biased by the points most distant from the origin. Figure 8 utilizes the data in Table 1 to compute average population served per mile of pipe for each region. We see that this produces an overall average of 308 people served per mile. More rural areas such as Regions 3, 4, and 5 have lower population to miles of pipe ratios as expected. Utilities that were exclusively transmission systems were excluded. This compares with a commonly used estimate of 325 people per mile (Eidinger, 2001). The 2012 survey reported this value as 264 people served per mile. Pipe breaks in utilities with a higher count of people per mile would have a greater impact on the community.

FIGURE 7: POPULATION SERVED RELATIVE TO TOTAL MILES OF PIPE FROM THE BASIC SURVEY

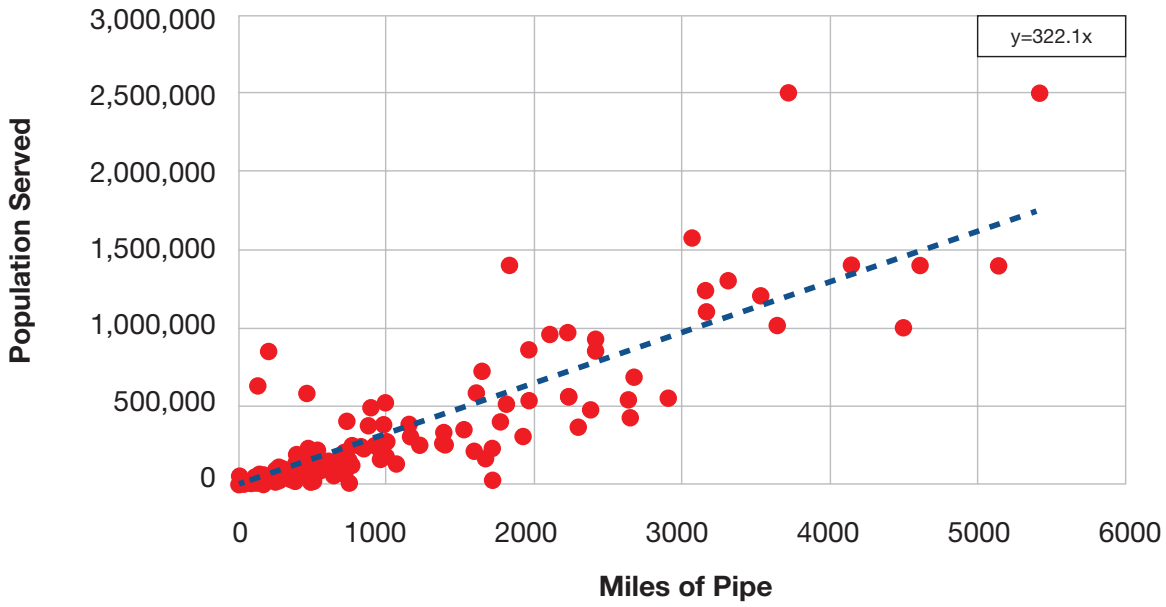
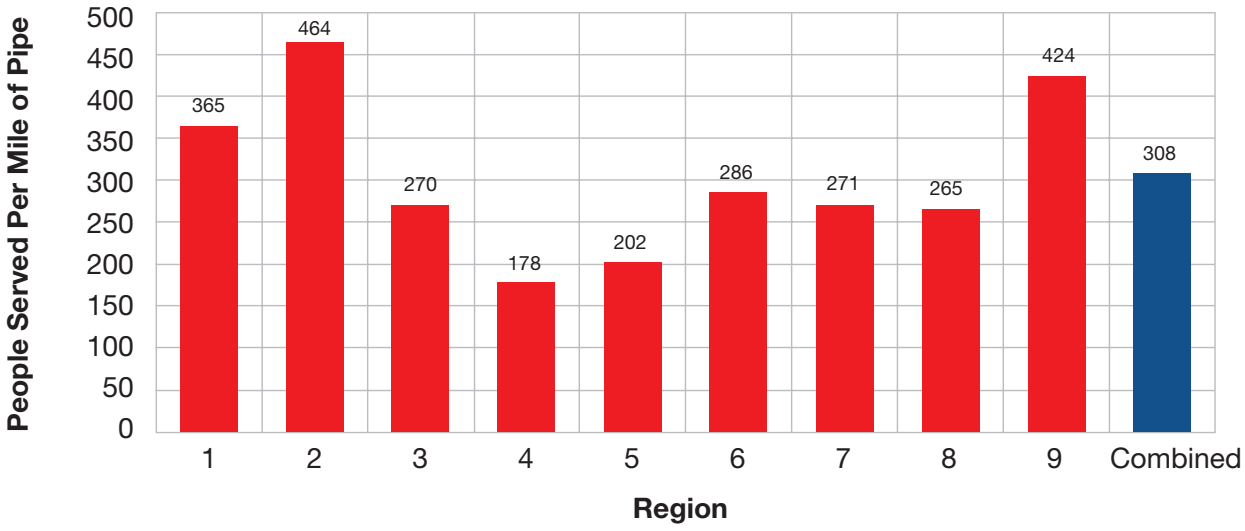
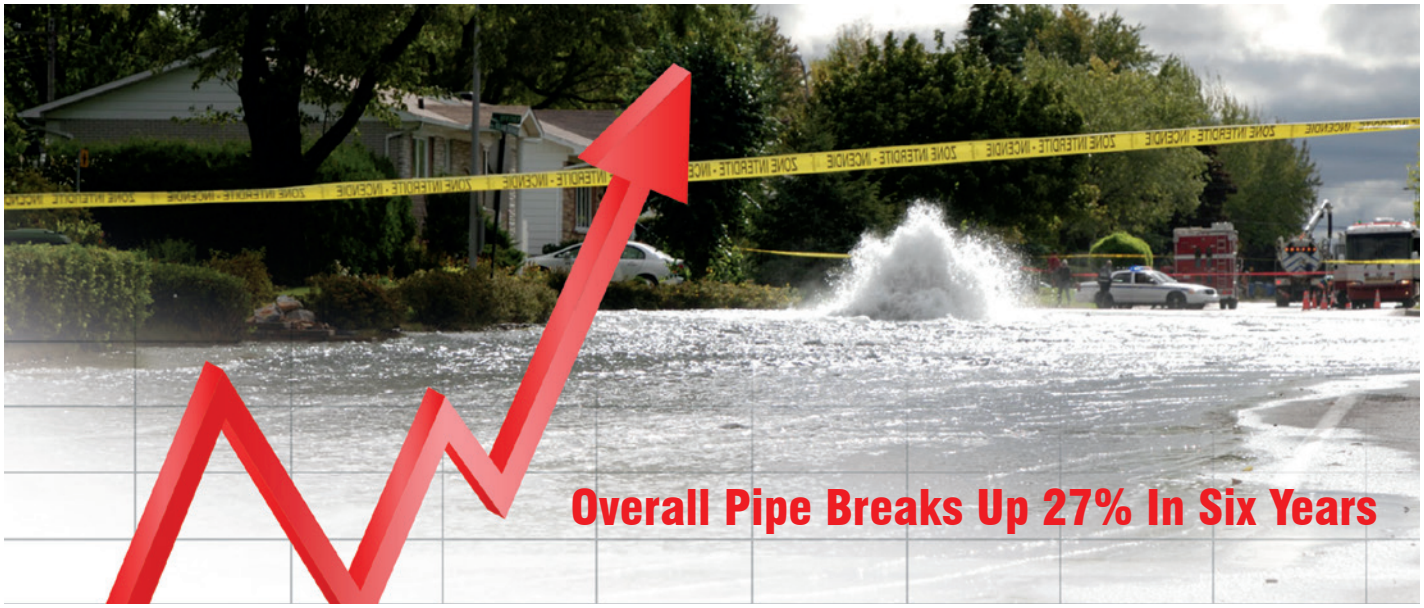


FIGURE 8: POPULATION SERVED PER MILE BY REGION





2.6. Survey Sample Size

The total length of water main pipe reported by the 281 basic survey participants with break data was 170,569 miles (the survey did not include sewer or force mains). Based on an EPA report, there are approximately 880,000 miles of distribution pipe in the USA (EPA, 2007). Other EPA reports (EPA, 2002 and EPA, 2013) estimate the amount of installed water main pipe in the USA at over 1 million miles and 1.5 million miles. Using the above result of 308 people/mile of water main and the current US population of 326.0 million, this produces an estimate of 1.06 million miles of pipe. Currently, a commonly cited value for the length of water mains in the US is 1.2 million miles (Walton, 2016). The population of Canada is estimated at 36.7 million. Assuming there are 308 people served per mile of pipe in Canada, then an estimate of the miles of pipe in Canada is 119,156 miles. Table 3 summarizes this data along with survey results from Table 1 to show that this survey covered approximately 14.5% of the population and 12.9% of the miles of water mains in both the US and Canada. Thus, survey sample size is significant and therefore can provide reliable results.

Small and rural communities may find it challenging to renew their water infrastructure in the coming years. Small utilities have fewer people, and those people are often more spread out, requiring more pipe "miles per customer" than urban systems (AWWA, 2012). This has the effect of increasing the financial burden of maintaining these systems.

TABLE 3: SUMMARY CALCULATIONS OF THE COVERAGE OF THE BASIC SURVEY

	Population	Miles of Pipe
US	326,000,000[1]	1,200,000[3]
Canada	36,700,000[2]	119,156[4]
Total	362,700,000	1,319,156
Survey Response (with break data)	52,477,346	170,569
Survey Coverage (%)	14.5%	12.9%

1- Source: https://www.census.gov/popclock/
2- Source: http://www.worldometers.info/world-population/canada-population/
3- Source: (Walton, 2016)
4- From: the population of Canada 36,700,000 and there are 308 people/mile of pipe.

3.0 Pipe Materials

Table 4 lists the pipe materials and their abbreviation used in this report. Many pipe products have evolved over the years of use, and most pipe products could be broken down into subcategories based on pipe manufacturing and surface treatments. These changes along with new installation techniques should affect life expectancy of the pipe. Both the basic and detailed surveys were intended to be relatively simple to complete and, thus, encourage wide scale participation of the water utilities. Most utilities have limited records as to which specific pipe materials were installed decades ago and what corrosion protection measures were used. Therefore, tracking subcategories of material types was not part of this study.

Figure 9 illustrates the length of pipe reported in the basic survey broken down by pipe material. The "Other" category in Figure 9 includes materials such as copper, fiberglass (FRP), and some galvanized steel. It is noted that galvanized steel was reported in both the steel and other categories by participants, which was unfortunate. Figure 10 illustrates the percentage of total length of water mains separated by pipe material. There is so little HDPE pipe (859 miles) and PVCO pipe (83 miles) in this survey, that these two pipe materials will be added to the of the "Other" category in the remainder of this report. If there are only small amounts of a pipe material utilized, break rates can be highly inaccurate because of large scatter in the data. It is significant to consider that over 91% of the water mains are made from asbestos cement, cast iron, ductile iron, and PVC materials. This is consistent with earlier studies (Stone et al., 2002).

TABLE 4: MATERIAL TYPES AND THEIR ABBREVIATIONS

Abbreviation	Description
AC	Asbestos Cement
CI	Cast Iron
CSC	Concrete Steel Cylinder
DI	Ductile Iron
HDPE	High Density Polyethylene
PVC	Polyvinyl Chloride
PVCO	Molecularly Oriented PVC
Steel	Steel

FIGURE 9: LENGTH OF PIPE SEPARATED BY MATERIAL TYPE FROM THE BASIC SURVEY

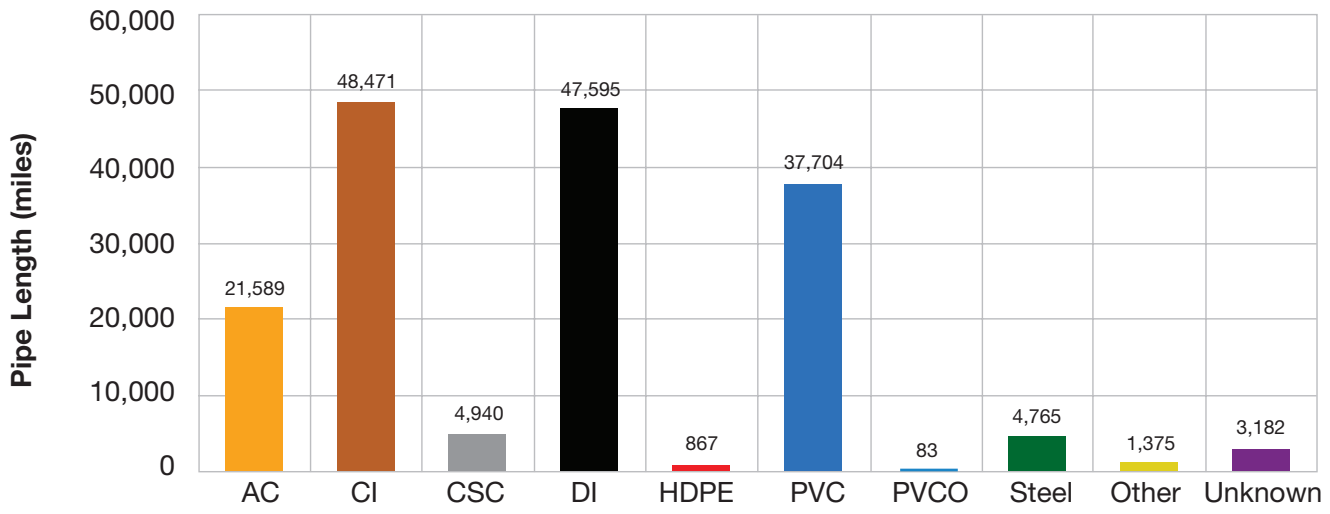


FIGURE 10: PERCENT OF TOTAL LENGTH OF PIPE SEPARATED BY MATERIAL TYPE

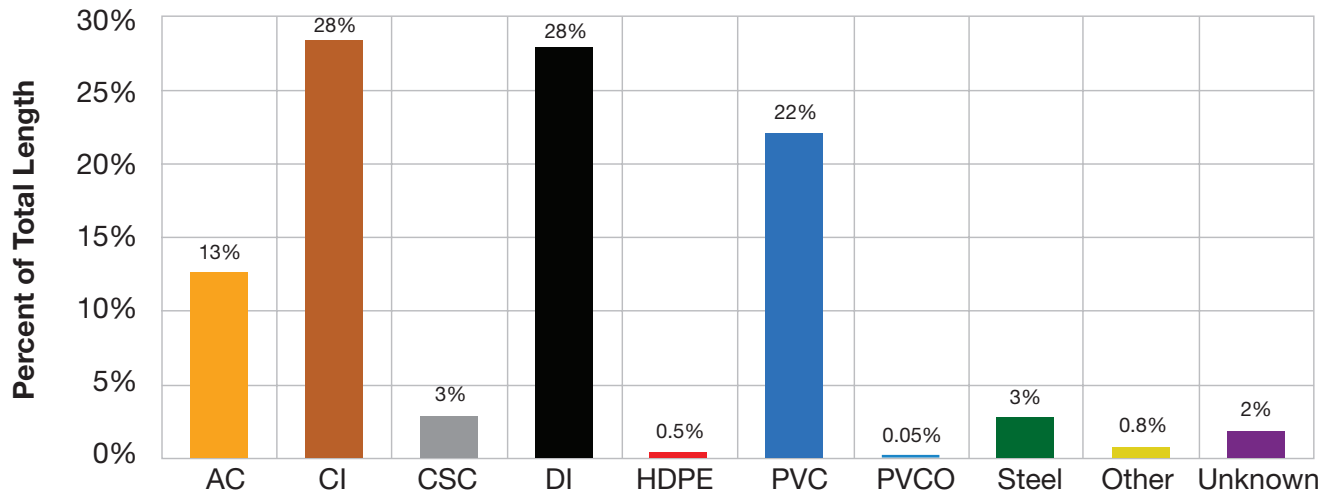


Figure 11 illustrates the regional distribution of pipe material usage as a percentage of the total length in that region. It is interesting to note the significant differences in regional pipe material utilization. Cast iron (CI) and ductile iron (DI) pipe represent approximately 86% of the water mains in Region 6 and over 75% in Regions 4, 7, and 8. PVC has a leading role in Regions 3, 5 and 9 and is slightly behind asbestos cement (AC) pipe in Region 2. AC pipe has a significant presence in Regions 2 and 5. Region 2 is unique in that it is the only region where AC pipe is the most common material. This suggests that the selection and use of pipe materials are based on historical preference versus comparative cost analysis or environmental conditions. Since CI and AC pipes are no longer manufactured in the US and Canada, the use of these materials in water systems should be decreasing with time as they are replaced. By applying asset management best practices, life cycle cost analysis should be used to do a comparative total cost of ownership evaluation of what pipe material should replace the CI and AC pipes.

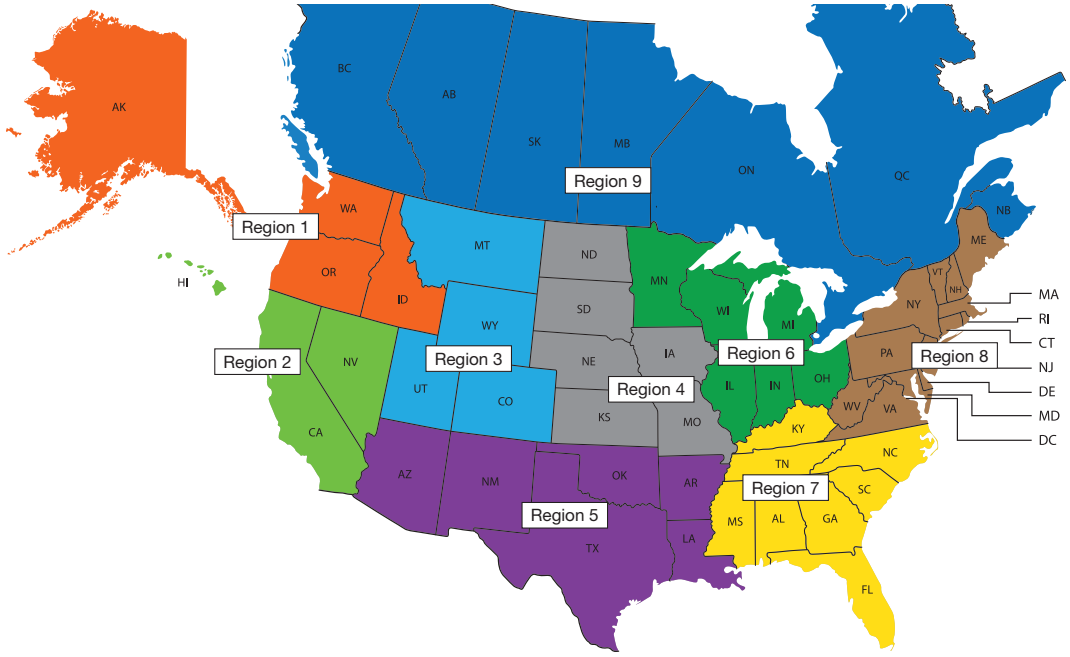
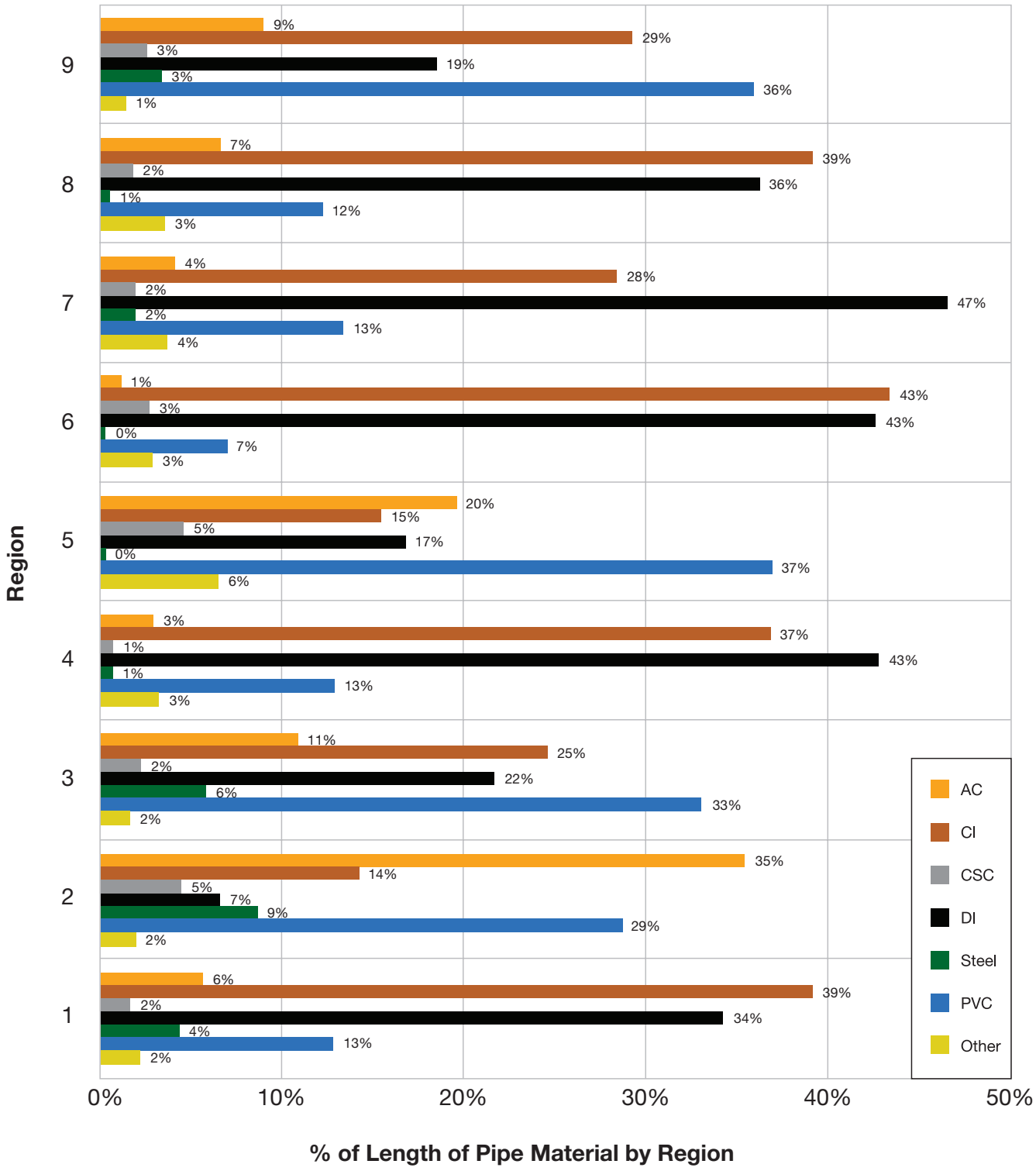


FIGURE 11: REGIONAL PERCENTAGE OF LENGTH OF PIPE BY MATERIAL TYPE (BASIC SURVEY)



3.1. Pipe Age and Diameter

The detailed survey asked respondents to provide the distribution of installed pipe by age and by material type. Four age groups were provided; 0 to 10 years, 10 to 20 years, 20 to 50 years, and over 50 years. Figure 12 shows the age distribution for all pipe materials combined and shows 28% of installed pipes are over 50 years old. Figure 13 illustrates the age distribution for each material type by length. For example, essentially all cast iron pipe is over 20 years old and 18% of it is in the 20 to 50 year category while 82% is over 50 years of age.

Figure 14 shows the age distribution as a percentage of total length of all pipe materials. For example, cast iron pipe older than 50 years is 20% of all installed pipe. For ages between 0 to 10 years, ductile iron (DI) and PVC both have about 5% of the total installed length. The most common pipe materials installed during the last 10 years are DI and PVC.

FIGURE 12: PIPE AGE DISTRIBUTION FOR ALL MATERIAL TYPES FROM THE DETAILED SURVEY

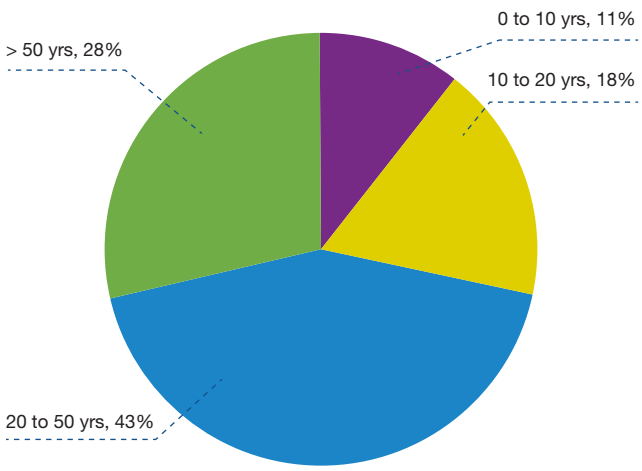


FIGURE 13: PIPE AGE DISTRIBUTION FOR EACH MATERIAL TYPE FROM THE DETAILED SURVEY

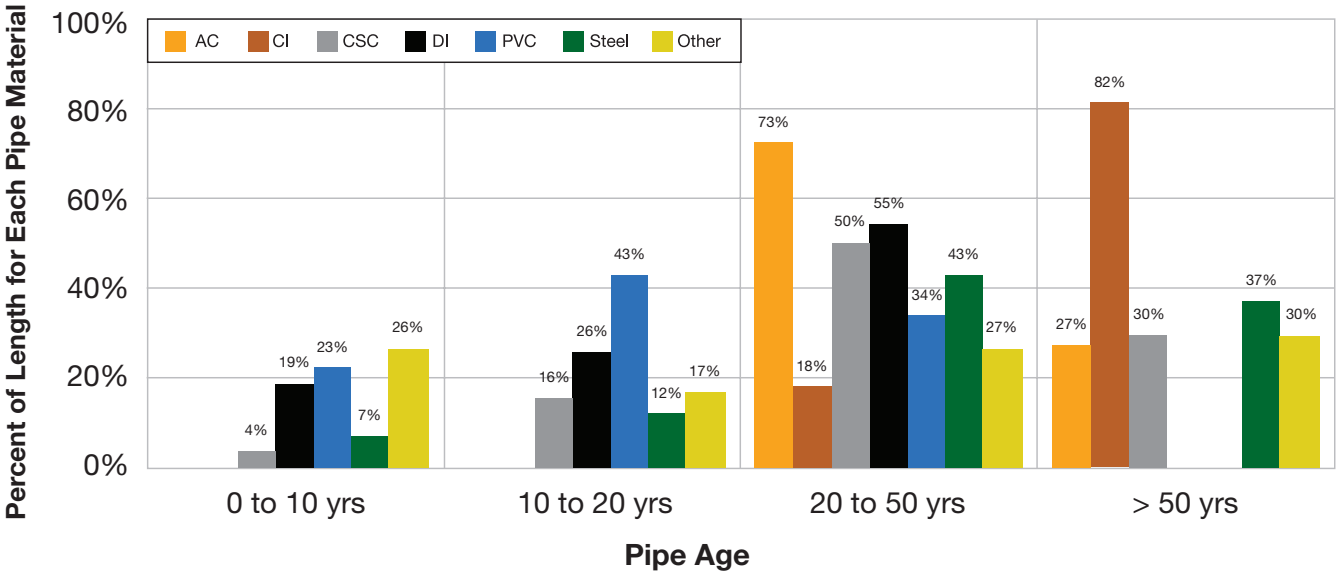
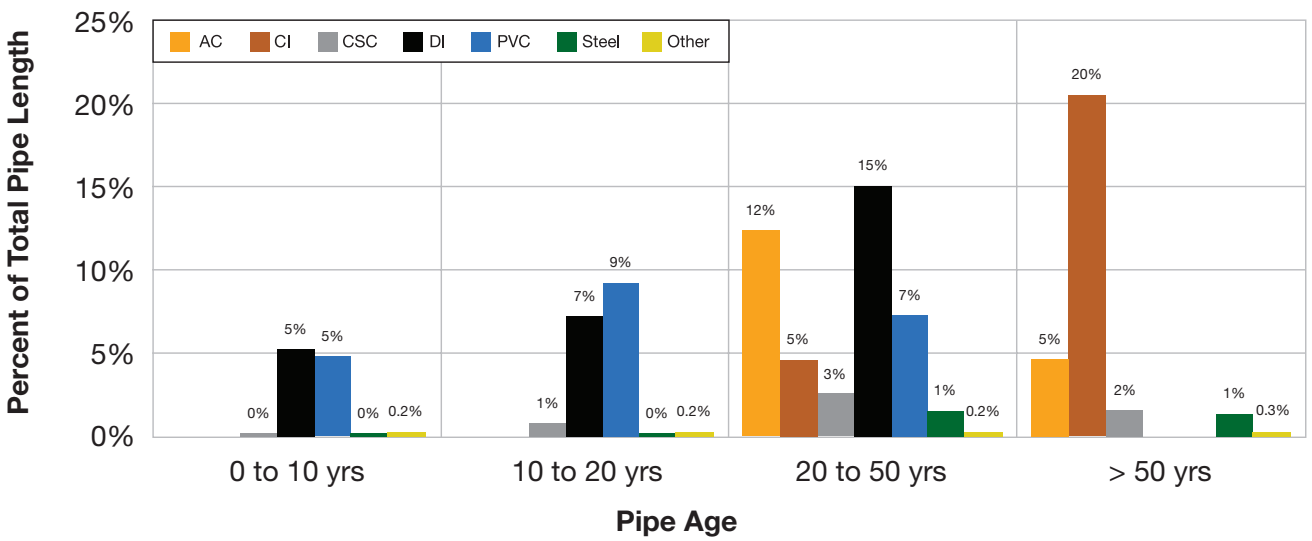


FIGURE 14: PERCENT OF TOTAL LENGTH OF PIPE BY AGE FROM THE DETAILED SURVEY



The detailed survey respondents were also asked to break down the fraction of total installed pipe length by six pipe diameter categories. Figure 15 illustrates the percentage of water main that fit into each size range. Figure 15 indicates that approximately 67% of the installed pipe is 8 inches or less in diameter. The 2012 survey found that 66% of the pipe was 8 inches or less in diameter showing good agreement. Earlier studies assumed 73% of water pipes were 10 inches or less in diameter (Stone et al., 2002). Figure 16 illustrates the diameter distribution for each material type. Figure 16 shows that large diameter transmission pipes are dominated by steel and concrete pipe materials with 18% of all concrete pipe and 14% of all steel pipe having a diameter greater than 48-inches. Figure 17 illustrates the percent of total length of all pipe materials broken down by material type and diameter. Figure 17 illustrates that cast iron pipe from 3 to 8 inches in diameter represents over 19% of the installed pipe.

FIGURE 15: PERCENT OF TOTAL LENGTH OF PIPE BY SIZE FROM THE DETAILED SURVEY

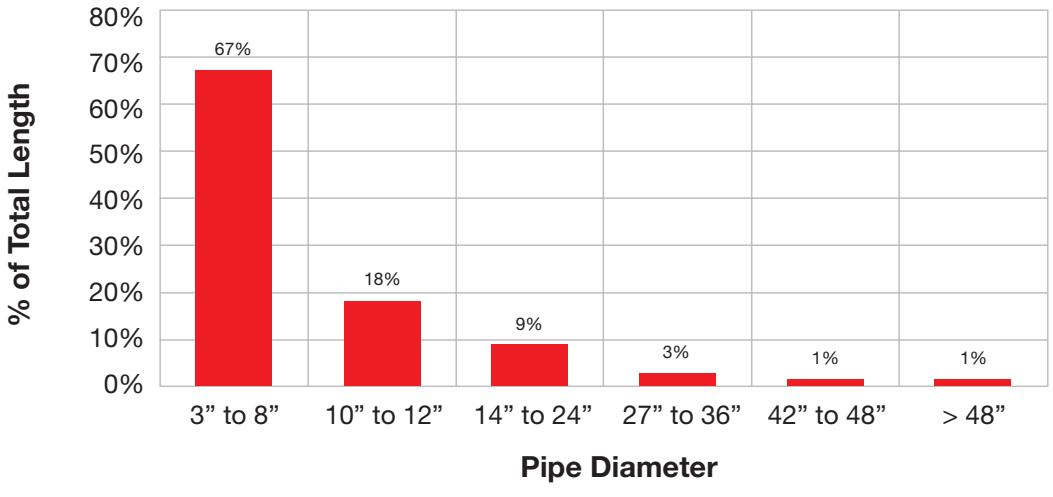


FIGURE 16: PIPE DIAMETER DISTRIBUTION BY MATERIAL TYPE FROM THE DETAILED SURVEY

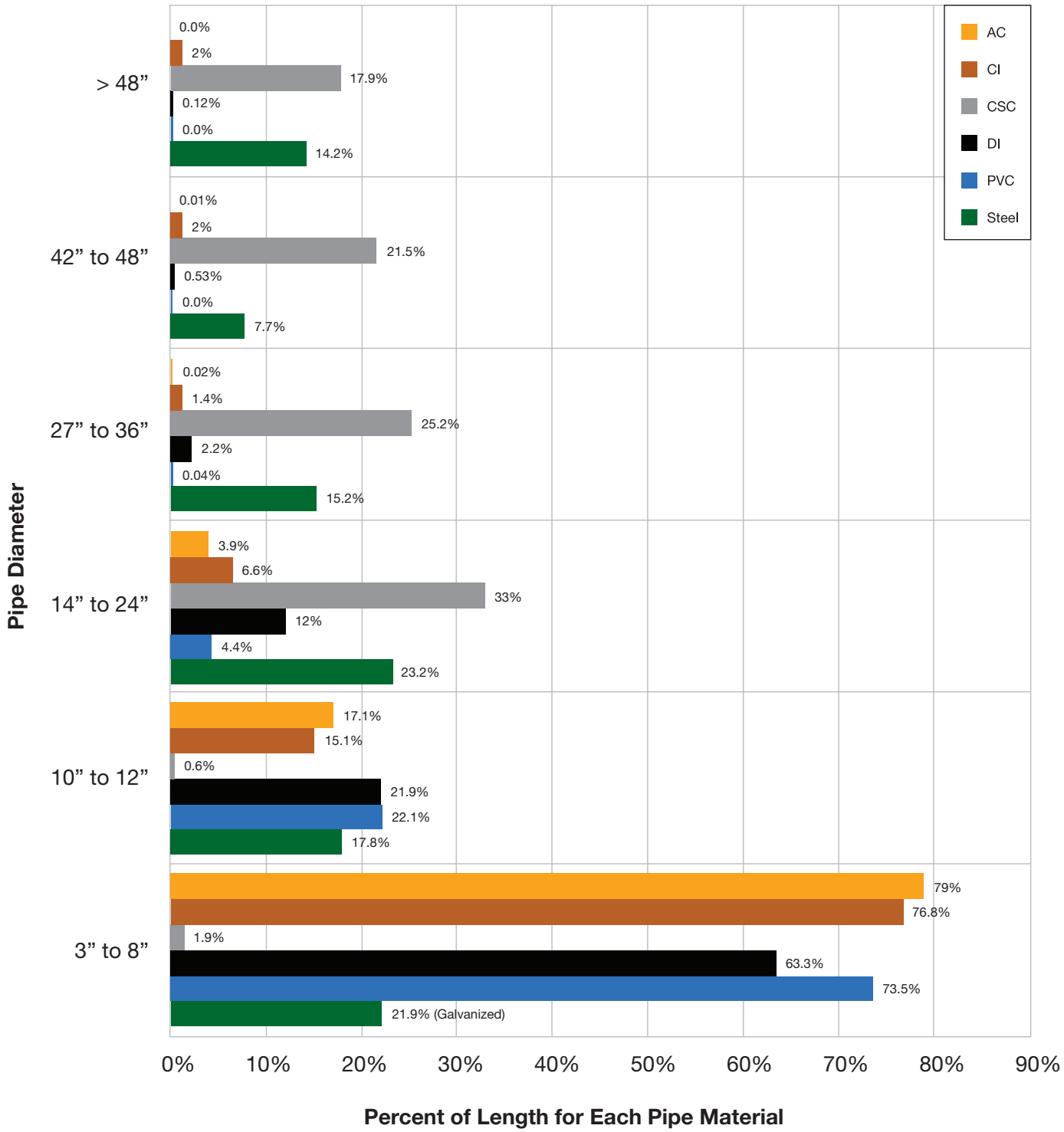
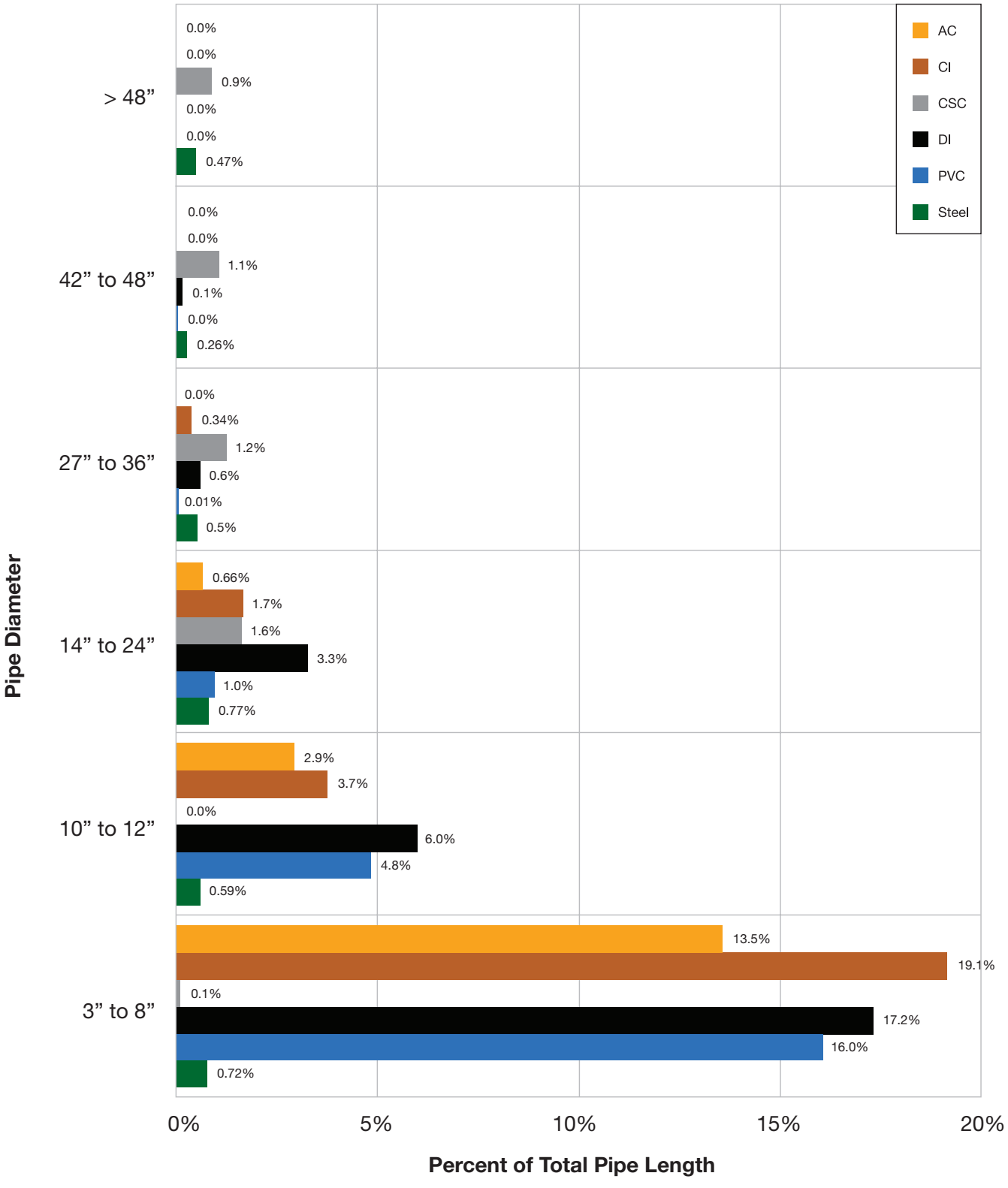


FIGURE 17: PERCENT OF TOTAL PIPE LENGTH BROKEN DOWN BY PIPE DIAMETER AND MATERIAL TYPE FROM THE DETAILED SURVEY



4.0 Delivery Pressure and Volume

The basic survey asked for the average and maximum water supply pressures. The mean values are 69 and 119 psi. The average of the reported values is illustrated in Figure 18. In the 2012 survey, the average pressure was 77 psi which has good agreement with this survey result but also indicates a possible downward trend. It is noted that some utilities have reduced operating pressures to reduce leakage rates. Pressure control and reduction is a common methodology to both reduce water leaks and reduce water main breaks.

The detailed survey asked for the average and maximum daily water demand. The reported values were divided by the population served and averaged. Utilities that were only transmission systems were excluded. The average water demand is 137 gallons per day for each person. The maximum water demand is 251 gallons per day for each person. Water demands are related to the population served. Figure 19 plots each utility's average and maximum demand values in units of MGD (millions of gallons per day) versus the population served in millions. Also provided are linear fit equations to the data (the dotted lines) and their equations. For example, a utility with a population of one million people would have a maximum water demand of 215 MGD and an average demand of 131 MGD.

FIGURE 18: AVERAGE AND MAXIMUM WATER SUPPLY PRESSURES

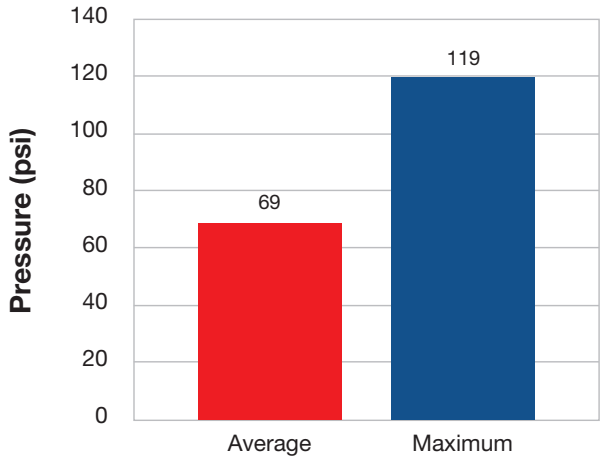
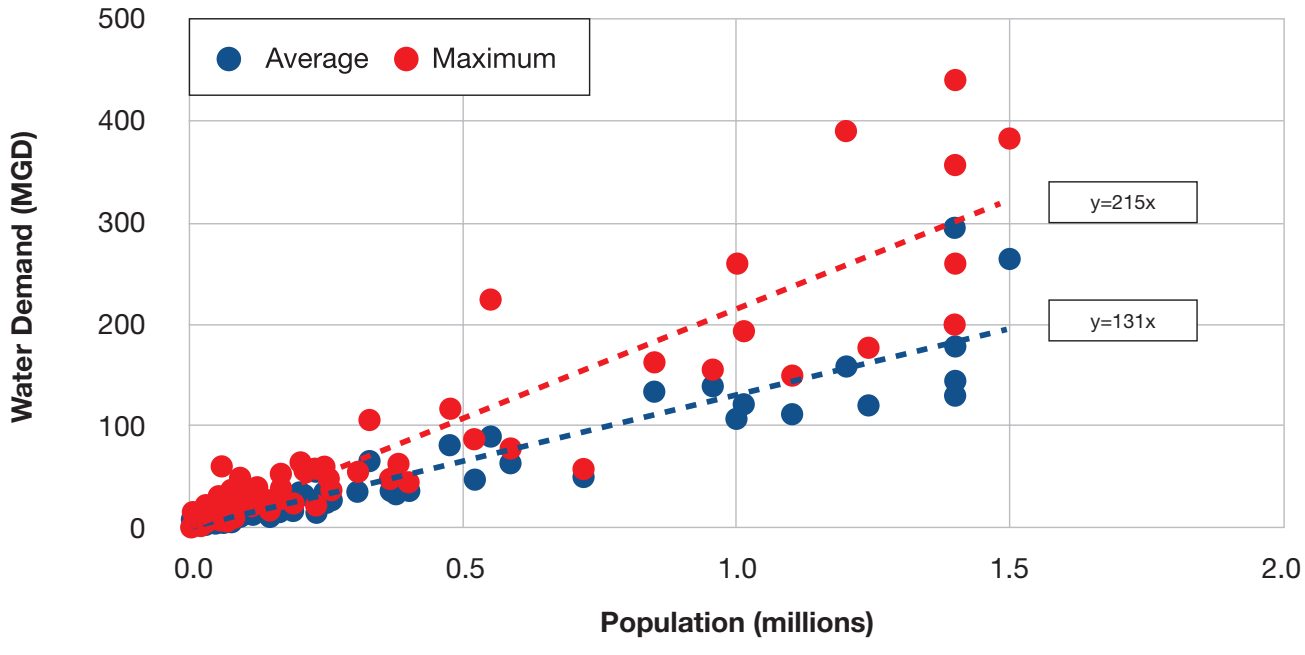


FIGURE 19: AVERAGE AND MAXIMUM WATER DEMAND VERSUS POPULATION



5.0 Computing Water Main Failure Rates

Both the basic and detailed surveys asked respondents to consider a water main failure as one where leakage was detected, and repairs were made. However, they were requested to not report failures due to joint leakage, construction damage, or tapping of service lines because these failures are not indicative of pipe degradation and are often identified early in the first year of operation. The goal was to examine pipe longevity.

Utilities reported the number of failures over a recent 12-month period for each pipe material and the installed length of each pipe material. The failure rate was computed by dividing the total number of failures from all utilities for a particular pipe material by the total length of that pipe material.

For example, the survey reported a total of 23,803 failures of water mains during a recent 12-month period for all pipe materials. The total installed water main length from the survey was 170,569 miles (or 1705.69 hundreds of miles). Thus, the overall failure rate is 23,803/1705.69 = 14.0 failures/(100 miles)/year. This represents a 27% increase from the 2012 survey which had a rate of 11 failures/(100 miles)/year.

This simple method for computing failure rates was used because it discourages biases toward large or small utilities. It is noted that utilities experience widely different failure rates for the same pipe material. Indeed, this should not be surprising. Several significant variables affect the results including pipe age, soil types (corrosive or noncorrosive), different corrosion prevention techniques, different installation practices, and climate such as extreme cold and drought events.

Literature reviews indicate that between 250,000 and 300,000 breaks occur every year in the U.S., which corresponds to a rate of 25 to 30 breaks/(100 miles)/year (Grigg, 2007; Deb et al., 2002). The AWWA Partnership for Safe Water Distribution System Optimization Program goal for a fully-optimized distribution system is 15 breaks per 100 miles of pipe annually (AWWA Partnership for Safe Water, 2011). Pipe material performance and selection is an important component of optimizing distribution systems.

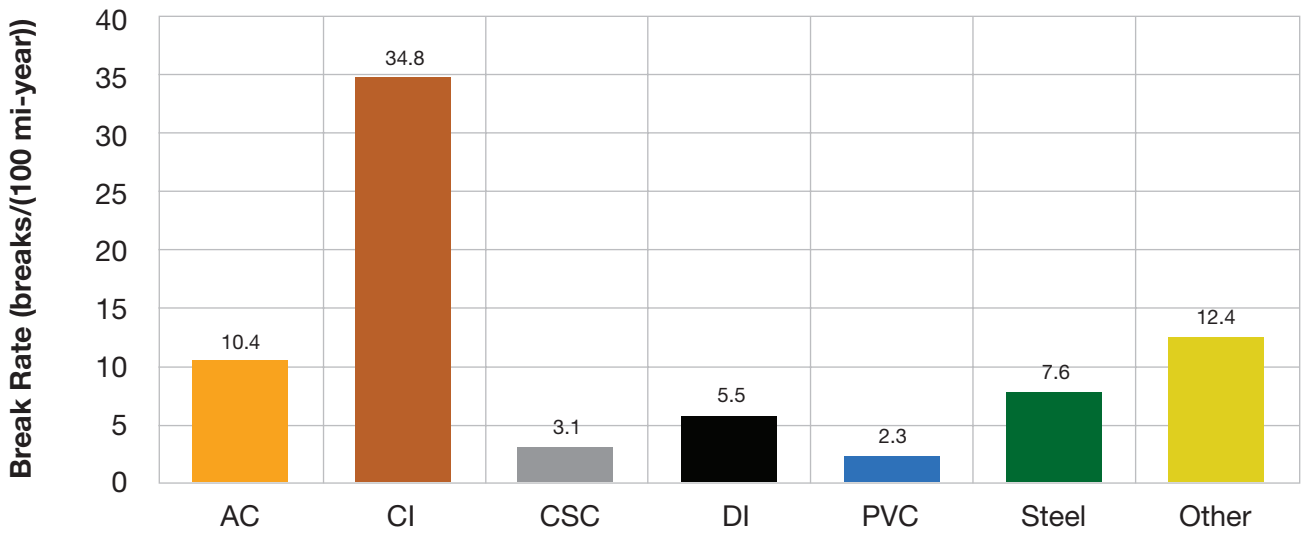
5.1. Failure Rates for Each Pipe Material

The survey measured pipe failures over a recent 12-month period and was broken down by material type. Table 5 lists the total length of pipe by material type, the number of failures (breaks) over a recent 12-month period, the break rate for each pipe material, the 2012 survey break rates, and the percent change in break rates. Figure 20 illustrates the failure rates as a function of material type. In both the 2012 and 2018 surveys, PVC was the pipe material with the lowest break rate.

TABLE 5: SUMMARY OF FAILURE DATA FROM THE BASIC SURVEY OVER A 12-MONTH PERIOD

	Length	Failures	2018 Break Rate	2012 Break Rate	% Change
AC	21,589	2,240	10.4	7.1	46%
CI	48,471	16,864	34.8	24.4	43%
CSC	4,940	152	3.1	5.4	-43%
DI	47,595	2,627	5.5	4.9	13%
PVC	37,704	878	2.3	2.6	-10%
Steel	4,765	362	7.6	13.5	-44%
Other	5,506	680	12.4	21	-41%
Total	170,569	23,803	14.0	11	27%

FIGURE 20: BREAK RATES OF EACH PIPE MATERIAL FROM THE BASIC SURVEY



Comparing this 2018 survey with the 2012 survey in Table 5 shows that overall, break rates increased by 27%. The change is primarily due to failures in asbestos cement (AC) and cast iron (CI) pipes with increases of break rates by over 40%. As Figure 14 shows, AC and CI pipe represent the largest percentage of oldest pipe currently installed and thus are nearing the end of their useful lives. Many studies show that water-main failure rates generally increase exponentially over time (Kleiner, 2002). One could envision a rapid increase in break rates in the future as illustrated in Figure 21. Certain utilities could experience the need to rapidly accelerate the rate at which they are replacing CI and AC water mains. If a break rate doubles, the economic impact is significant; one would need to double the number personnel repairing the breaks along with supplies while loss of treated water increases, and societal impacts could be devastating.

Figure 22 compares the break rates of the 2012 and 2018 surveys. Since over 90% of installed pipe consists of AC, CI, DI, and PVC, the break rates for those material types will be most accurate. From 2012 to 2018, Figure 22 shows a small decrease in break rates for PVC and a small increase for DI pipe. The overall consistency of those values demonstrates they are accurate. Again, the increase in break rates for AC and CI pipes is a very significant observation.

The amount of concrete and steel pipe in this survey is less than 6% of the total installed pipe length. When only a small amount of pipe break data is available, the accuracy of the break rates from survey data will be decreased. The 42% decrease in break rate for concrete pipe was likely due to the fact that over twice as much concrete pipe is in this 2018 survey and should be more accurate. Steel pipe also saw a large decrease in break rates. The break rate for steel pipes are largely attributed to smaller diameter galvanized steel pipes that are rapidly being replaced. Large diameter steel pipes used in transmission lines have a very low break rate.

FIGURE 21: EXPONENTIAL CHANGE IN BREAK RATES

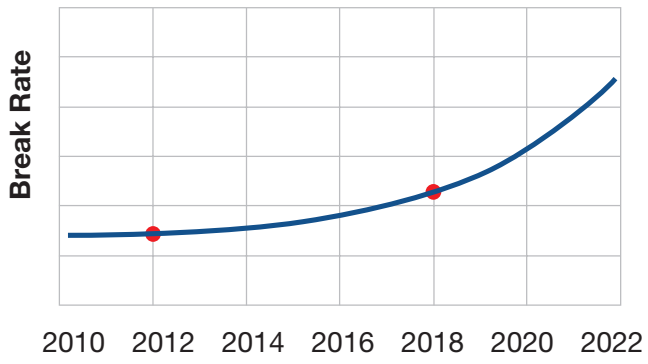
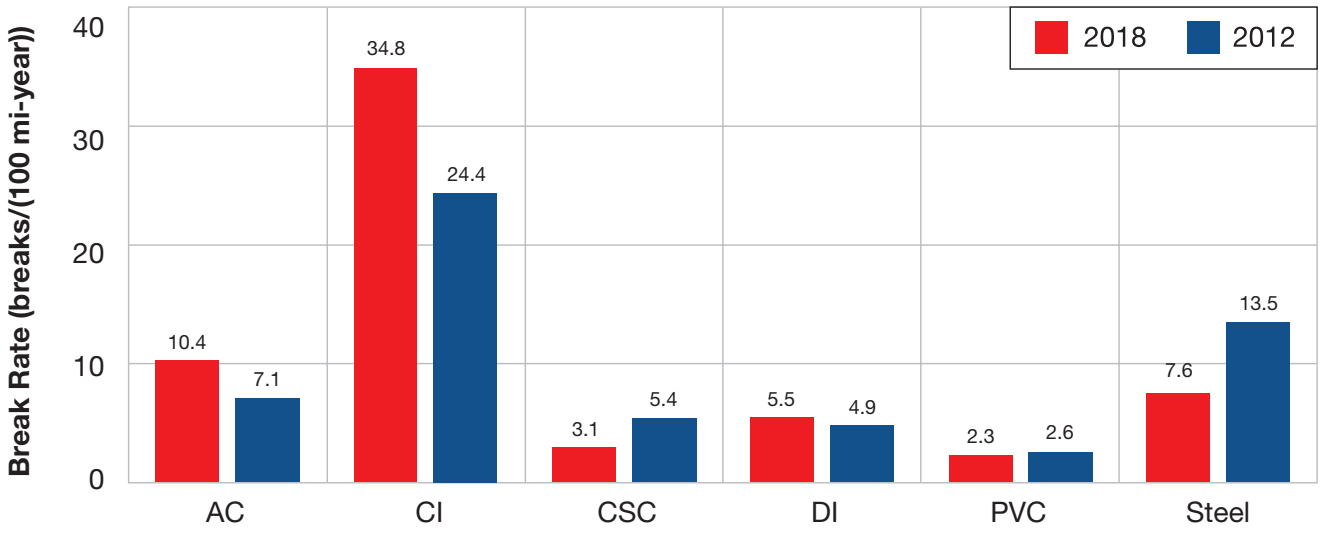


FIGURE 22: COMPARISON OF BREAK RATES OF THE 2018 AND 2012 SURVEYS



The size of a utility can affect break rates. Three sizes of utilities are considered here based on the length of pipe; small with less than 200 miles, intermediate with 200 to 1000 miles, and large with over 1000 miles. Figure 23 illustrates the overall break rate (for all pipe materials) and then separated by the four most common pipe materials in these three utility sizes. The large utilities consistently had lower break rates than intermediate and smaller utilities. This is likely due to better funding and larger staffs for engineering design, monitoring and information gathering, installation oversight, and repair of water mains. It is very significant that small utilities consistently have break rates at least double that of a large utility.

FIGURE 23: BREAK RATES BY UTILITY SIZE FROM THE BASIC SURVEY

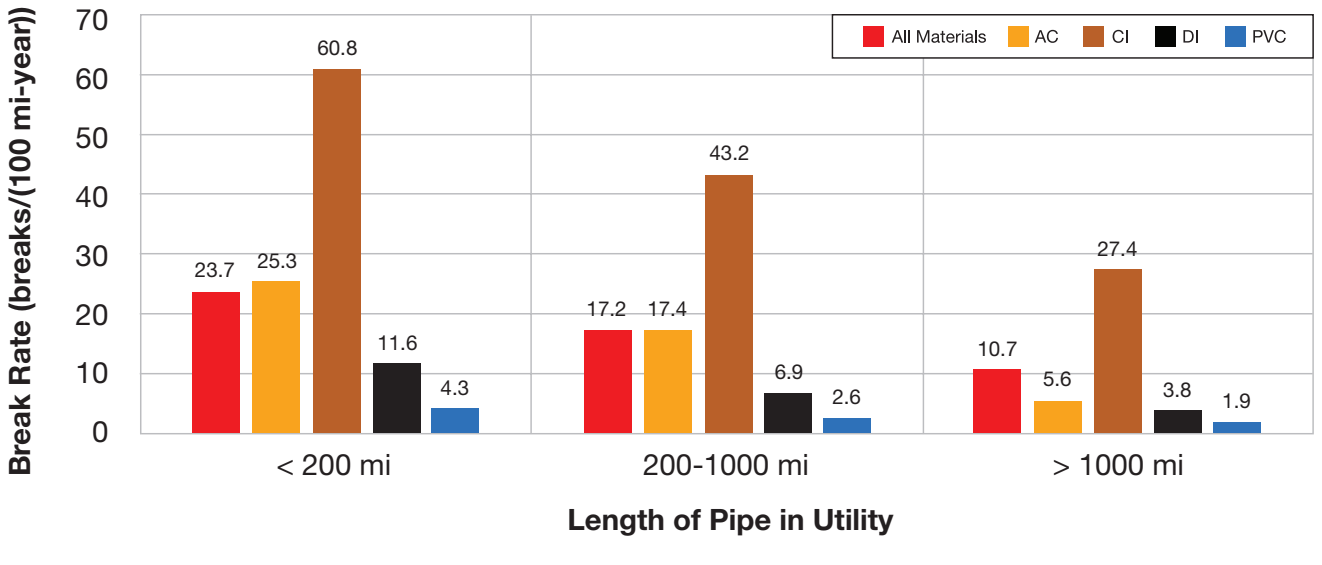


Figure 24 illustrates the overall break rate broken down by region. Clearly not all regions are experiencing the same failure rate. In Table 1, the number of respondents for each region is reported. It was desired to separate US and Canadian break rate data. This is illustrated in Figure 25. Canada can have very corrosive soils (Seargeant, 2013) and this is reflected in the high break rates of cast and ductile iron pipes in Figure 25. Seargeant reported that the highly corrosive soil in Edmonton necessitated a transition from cast iron to asbestos cement pipes in 1966 and then to PVC starting in 1977. The transition to PVC has produced a dramatic reduction in water main break rates for the city.

FIGURE 24: OVERALL BREAK RATES BY REGION FROM THE BASIC SURVEY

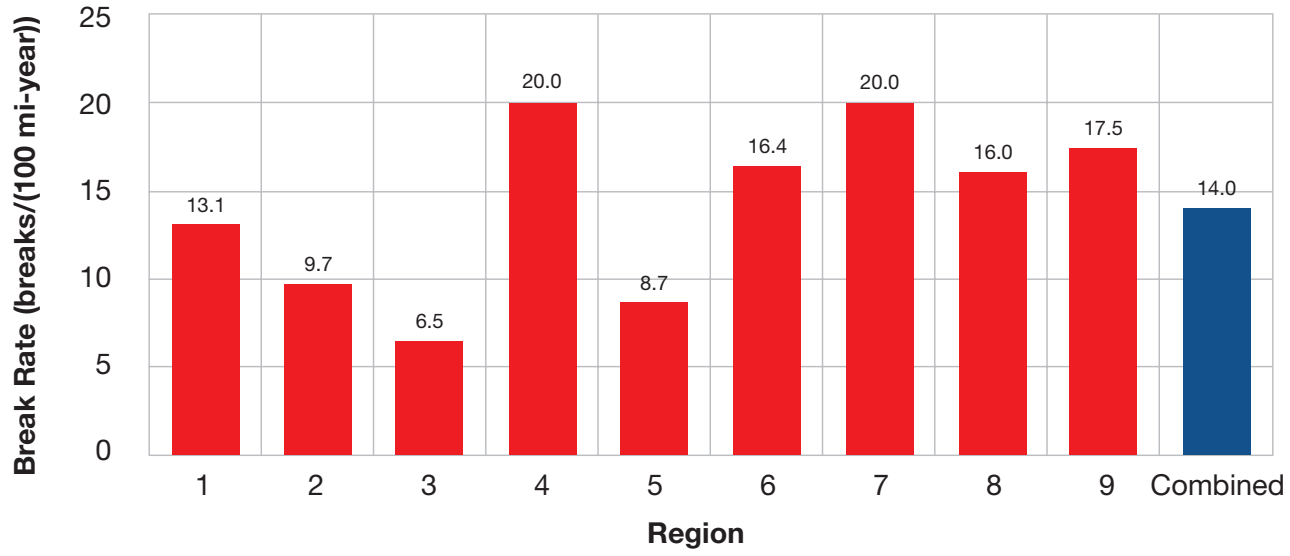
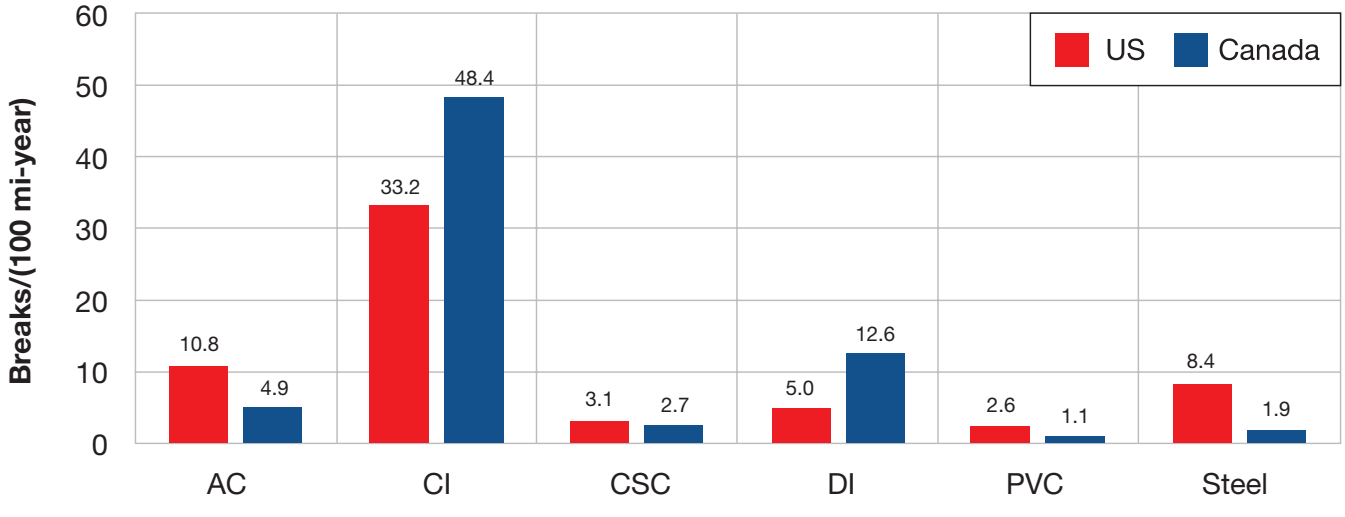


FIGURE 25: BREAK RATES FROM THE US AND CANADA FOR SELECTED MATERIAL TYPES



5.2. Effects of Age

The basic survey asked respondents to break down the failures into the decade when they were installed. Some of the respondents did not know the age of the failed pipes and they were not included in the results. Figure 26 illustrates the percentage of failures of each pipe material based on the decade of installation. For example, asbestos cement (AC) pipe had 60% of the breaks from pipe installed in the 1960's, 28% in the 1970's, and 12% of the breaks in pipes installed in the 1980's. Note that the largest percentage of failures is usually not in the oldest pipes (AC being an exception), which has several possible causes. One important cause is the amount of pipe present in a given age range. As the older pipe is replaced there is less available to fail. Also, cast iron and ductile pipe wall thickness has decreased over the years which can affect time to failure. The results in Figure 26 are also related to when a pipe material was introduced or removed from the market. AC pipe has not been installed in the USA and Canada in the past 25 years, and thus, all AC pipe failures date from the 1980's and earlier. Little cast iron pipe has been installed since the 1980's and that is reflected in Figure 26. Widespread ductile iron and PVC pipe production in the USA did not start until about 1970, so we should expect to see a small failure percentage for both DI and PVC installed in the 1960's and none in the 1950's and earlier.

Most of the failure versus age distributions in Figure 26 seem to be quasi bell-shaped (again, asbestos cement pipe failures are an exception). It would appear the AC pipe installed in the 1960's may be near its end of life and utilities may want to consider planning for rapid replacement of that pipe. Cast iron pipe shows the most uniform failure distribution and does not give much guidance on which pipe age needs replacement first.

5.3. Target Replacement Break Rate

The detailed survey asked participants if they utilized a target break rate at which pipe replacement was implemented. Only 28% of the respondents said that they had a specific value. The average response was a target rate of 11 breaks/(100 miles)/year. Most respondents commented that they do not have a specific target break rate. However, break rates are a very important factor when locations for critical services are considered and when roads are being reconstructed. Although Figure 26 provides some insight to when pipe needs to be replaced, the most appropriate metric to making this decision should come from looking at break rates at sections of pipe with a similar age and material.

5.4. Most Common Failure Age and Mode

The detailed survey asked the participants the typical pipe age of most water main failures. The average response was 50 years with a range from 10 to 100 years. In 2012 the average age of failing water mains was reported as 47 years. Given the qualitative nature of this question, the typical age of a failing water main has not changed significantly over the past six years.

The detailed survey requested participants to select the most common failure mode from the following: corrosion, bell split, circumferential crack, longitudinal crack, leakage at joints, fatigue, or other. Figure 27 illustrates that 56% of the respondents identified a circumferential crack as the most common followed by corrosion at 28%. These are the typical failure modes of CI and AC pipe.

An alternate approach to examine the failure modes is by using those reported in the basic survey. Participants were asked to provide a cause of failure from the following list; circumferential crack, longitudinal crack, corrosion (internal or external), bell splitting, rock impingement, other, or unknown. Where multiple failures occurred, multiple causes were given, and each was given equal weight. Figure 28 illustrates the percentage of each failure mode with unknown responses ignored. Again, the top two failure modes are circumferential cracks followed by corrosion.

FIGURE 26: PERCENT OF FAILURES PER DECADE OF INSTALLED PIPE MATERIAL

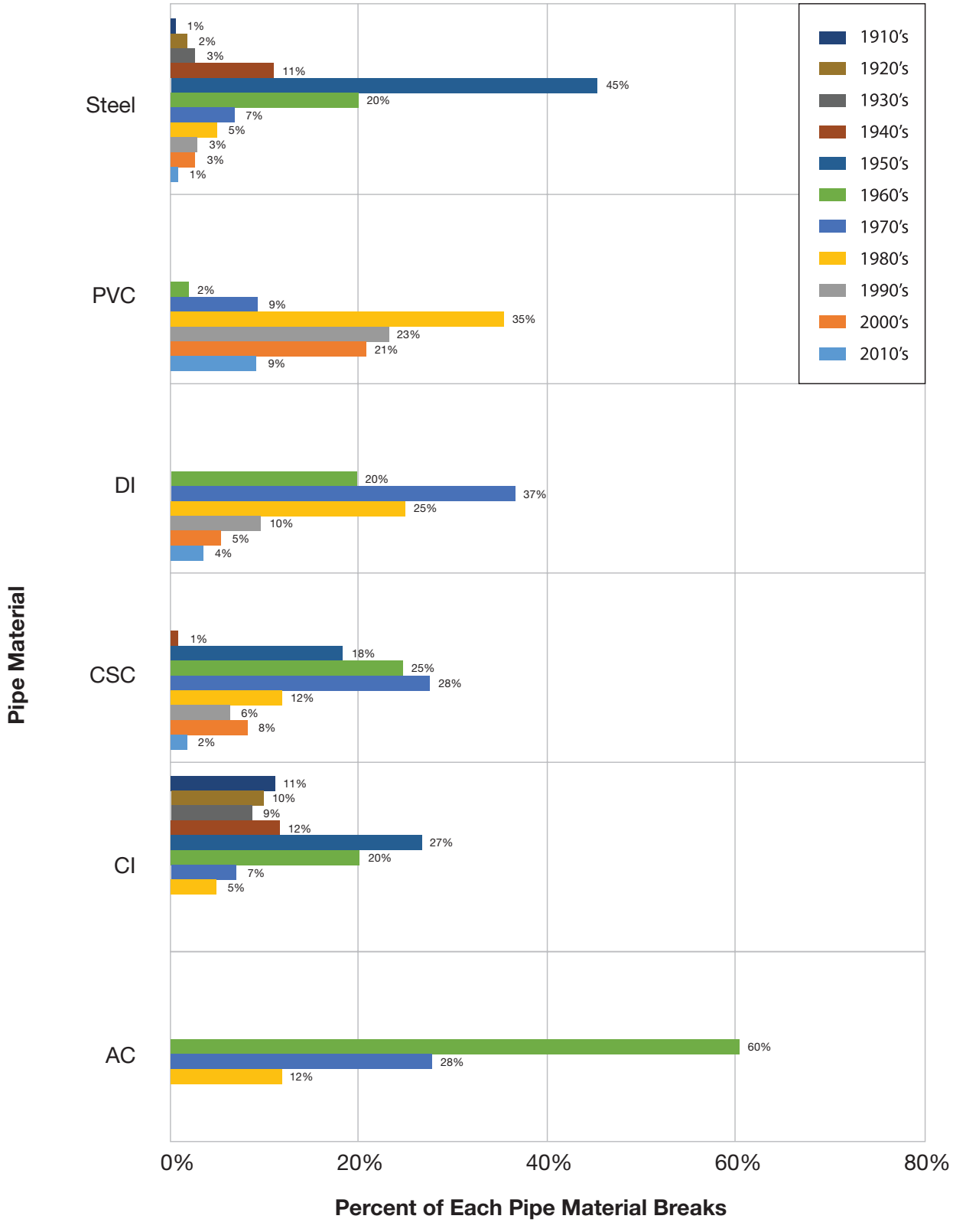


FIGURE 27: PERCENT OF RESPONDENTS SELECTING A MOST COMMON FAILURE

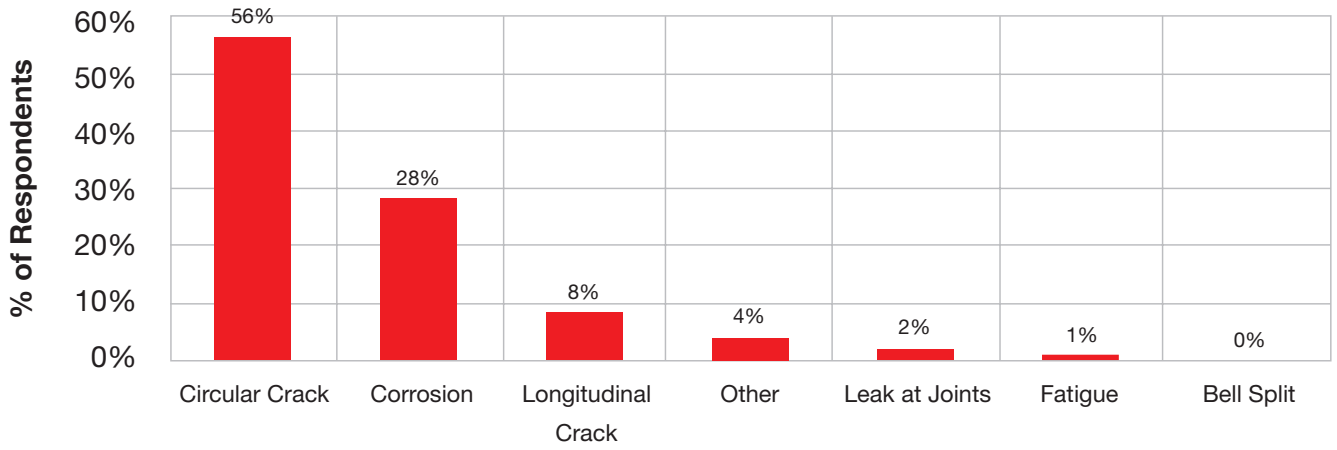
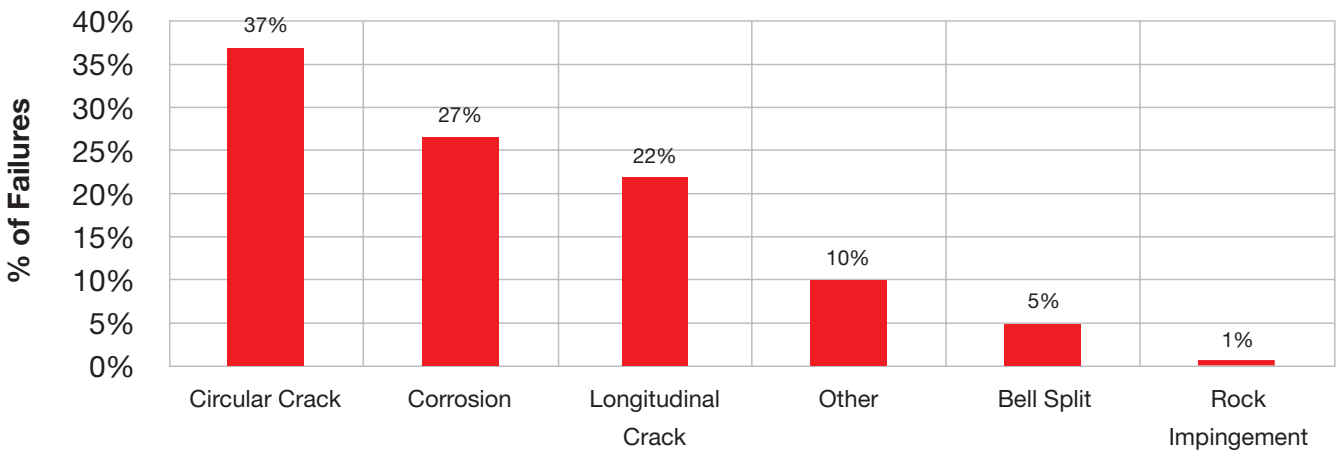


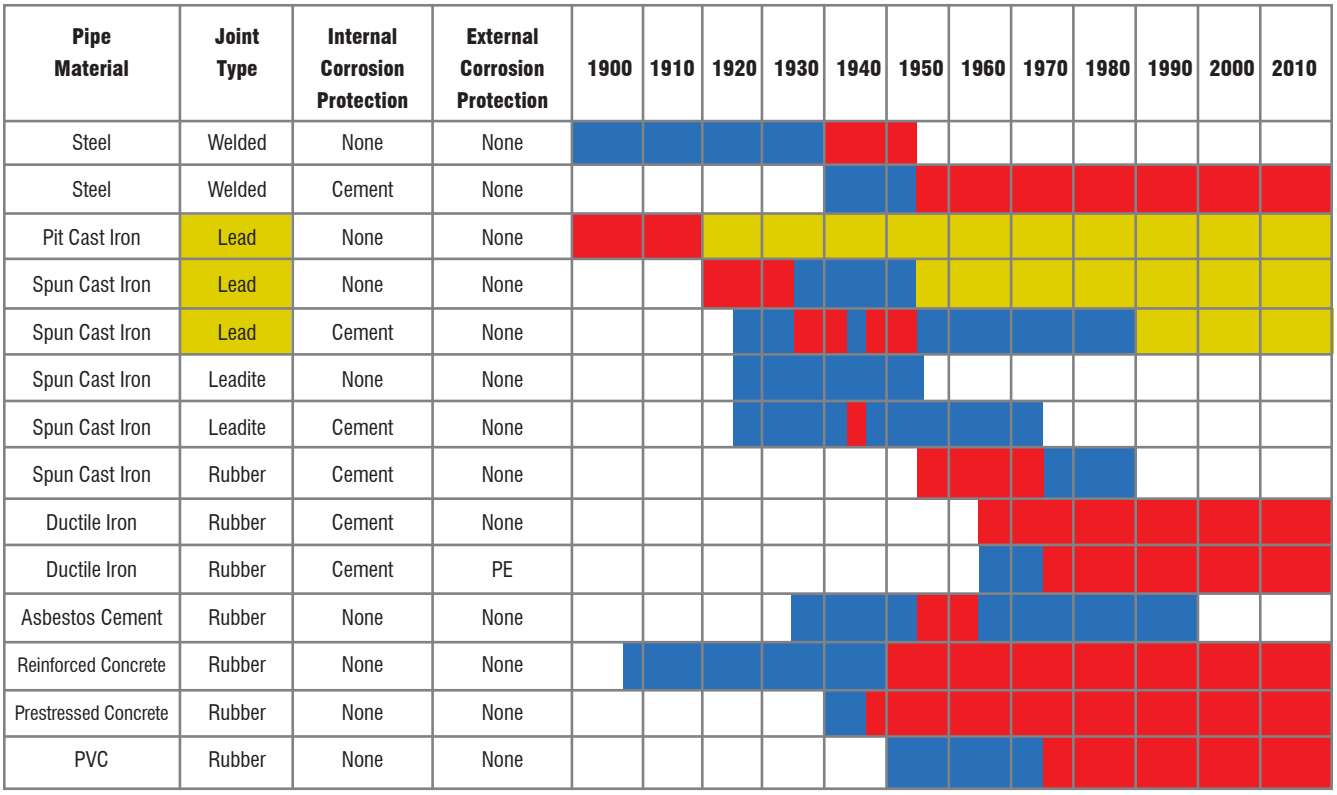
FIGURE 28: DISTRIBUTION OF FAILURE MODES FROM THE BASIC SURVEY



5.5. Pipe Cohorts and Vintage

As mentioned in section 3.0, the survey did not track the many subclasses of pipe that have been installed because many utilities do not have that information. Individual utilities should try to add to their database as much as they can about what is referred to as a pipe cohort and other details about their installation. Copeland, et al. (2015) provides a good example of data to record. A pipe cohort is a group of pipes with similar characteristics. This concept is useful in pipe management because defining different pipe cohorts can be helpful in identifying pipes that have different risk characteristics (see Figure 29).

FIGURE 29: TIMELINE OF PIPE TECHNOLOGY IN THE US IN THE 20TH CENTURY



Adapted from Figure 8.3, Sustainable Solutions Corporation, 2017

Changes in pipe manufacturing, such as the introduction of new pipe-making technologies, are a major criterion when identifying pipe cohort concerns (e.g., longevity of a pipe and risk of breakage). For instance, pit cast gray iron pipe and centrifugally cast gray iron pipe of the same diameter should likely be considered in different pipe cohorts, because the significant differences in manufacturing cause the pipes to behave differently. Other factors that can affect pipe longevity and breakage include transportation and installation methods (WaterRF, 2013).

Another pipe cohort is cast iron with leadite joints. There are at least two reasons for high failure rates associated with leadite joints: "First, leadite has a different coefficient of thermal expansion than cast iron and results in additional internal stresses that can ultimately lead to longitudinal splits in the pipe bell. Secondly, the sulfur in the leadite can facilitate pitting corrosion resulting in circumferential breaks on the spigot end of the pipe near the leadite joint. The failure rate in the industry for leadite joint pipe is significantly higher than for lead joint pipe even though the pipe may not be as old." (EPA, 2002, p3)

6.0 Corrosive Soils and Corrosion Prevention Methods

The detailed survey asked respondents if they have one or more regions in their service area with soils that tend to be corrosive. A total of 75% of the respondents reported that they do have at least one area with corrosive soils. This corresponds to the results found in the 2012 survey. The survey also asked if they utilized any kind of corrosion protection methods. A total of 80% of the respondents reported that they do utilize some kind of corrosion protection. The respondents were also asked to describe the method(s) they used. The most common answer was polywrap installation. Table 6 lists most of the methods mentioned ordered from most common (rank 1) to least common (rank 5).

TABLE 6: TYPICAL CORROSION PREVENTION METHODS

Rank	Corrosion Prevention Methods
1	Polywrap
2	Anodes or cathodic protection
3	V-bio polywrap
4	Impressed current
5	Dielectric coatings

Water utilities often do not know the specific cause of external corrosion observed on their water mains, and consequently, the chosen preventative measure may not work effectively. Historically, these choices are based on data from other industries (e.g., gas and oil) and may not be suitable for the water industry. Corrosion of metallic pipes can be caused by a variety of mechanisms, each of which requires a different solution. Determining which corrosion mechanism is at work is not a simple matter, because the resulting pipe damage looks similar for all of them. The failure to properly identify corrosion sources may produce prevention systems that are ineffective or do not last. For example, it is not effective to install an anode on a main that has a bacteriological corrosion problem. Similarly, an anode bag installed to reduce corrosion caused by a stray impressed current would be quickly used up and would provide only short-term protection. Also, polywrap does not protect a pipe from all corrosion types and may get damaged during the installation (Romer, 2005).

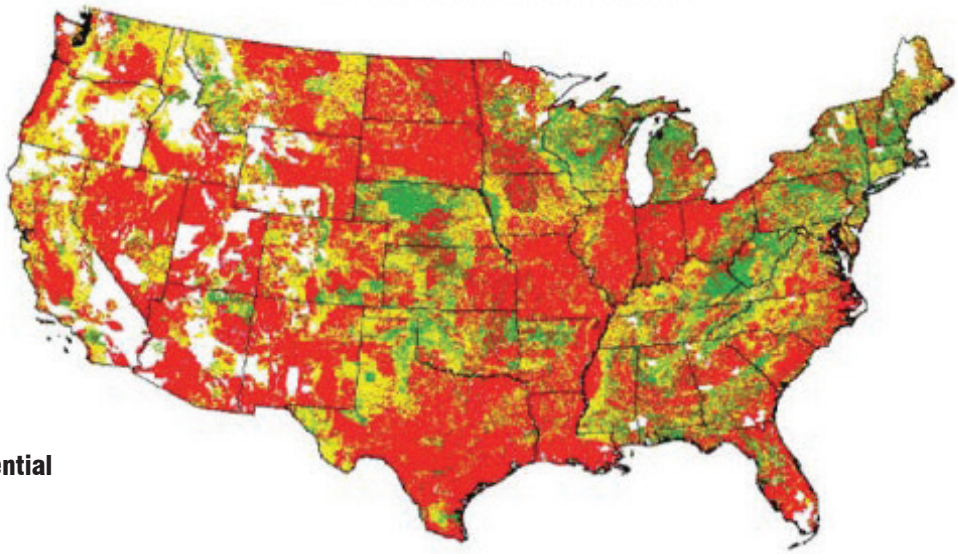
6.1. Effect of Corrosive Soils on Break Rate

The USDA Natural Resources Conservation Service provides results of soil surveys across the US. One of the aspects of the soil surveys is a “risk of corrosion” analysis that pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The soil is rated as either “low,” “moderate,” or “high” based on measurements of moisture, particle size, acidity, and electrical conductivity. This is not a precise analysis and additional factors may be neglected. Nevertheless, it is a reasonable estimate of soil corrosiveness in lieu of better data. The USDA soil survey website (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx) allows the user to select an area of interest (AOI) and then produces a plot coloring low risk areas in green, moderate risk areas in yellow, and high risk areas in red. An overview of soil across the US is given in Figure 30.

Soil risk can change over a distance of a few blocks. This is illustrated in Figure 31 which shows a screen capture of soil risk colors inside the boundaries of a town in California. This town has all three regions present; low (green), moderate (yellow), and high (red). Soil analysis data is not available in regions with a light gray color.

It was desired to relate water main break rates to soil corrosivity. Since most cities have a combination of low, moderate, and high regions, a numerical ranking was developed that provided an overall level of soil corrosiveness. To do that, pictures of each area served by the utilities in the basic survey were created. Next a program was developed that counted the number of reddish, greenish, and yellowish pixels in each photo. To provide a numerical ranking, pixels that were low risk were given a value of 1, moderate pixels were given the value 2, and high risk pixels were given the value 3. The pixel values were summed and then divided by the total number of red, yellow, and green pixels. The computed value is called a corrosion index. Cities with a corrosion index near 1 have low corrosion risk while those close to 3 have high corrosion risk. For the area in Figure 31, the computed corrosion risk was 2.1 or slightly above a moderate level.

FIGURE 30: US CORROSIVE SOILS MAP (CONUS POTENTIAL FOR STEEL CORROSION)



Source: *Data collected from Soil Survey Staff, Natural Resources Conservation Service, U.S. Department of Agriculture Soil Survey Geographic Database.*

Corrosion index values were computed for 281 cities in the US. Some US cities had little or no data for the soil inside their boundaries preventing computation of a corrosion index. For analysis, the corrosion index values were broken down into seven ranges and the number of utilities in each range is plotted in Figure 32. The average corrosion index for all the US utilities in the basic survey was 2.4 or close to midway between moderate and high corrosion risk. That is, most utilities in the US have a moderate to high soil corrosion risk which is consistent with the detailed survey report that showed 75% of utilities have one or more areas with corrosive soils.

FIGURE 31: CORROSIVE SOIL RISK PLOT

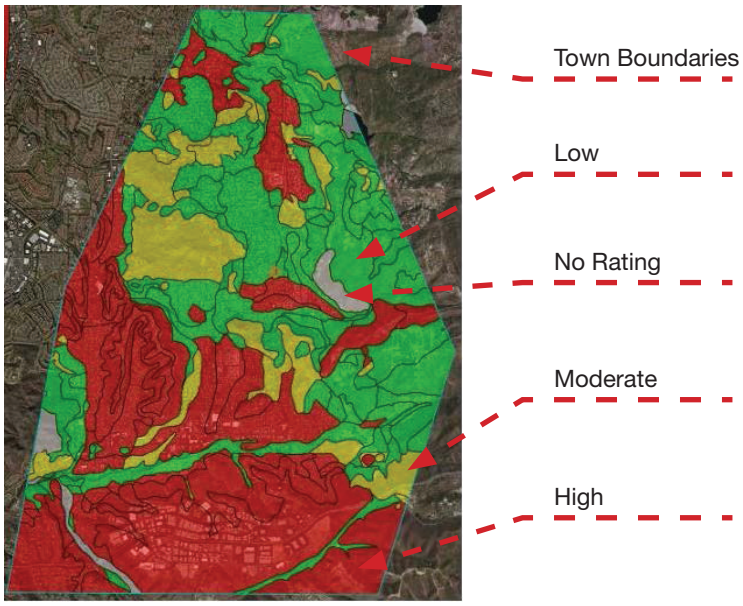
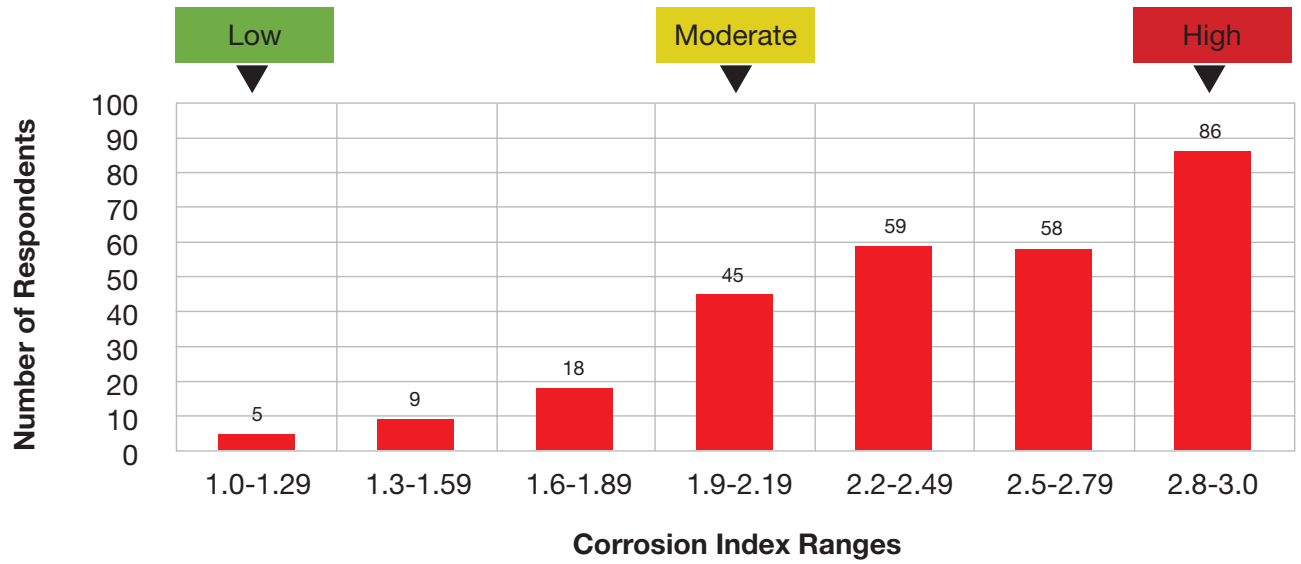
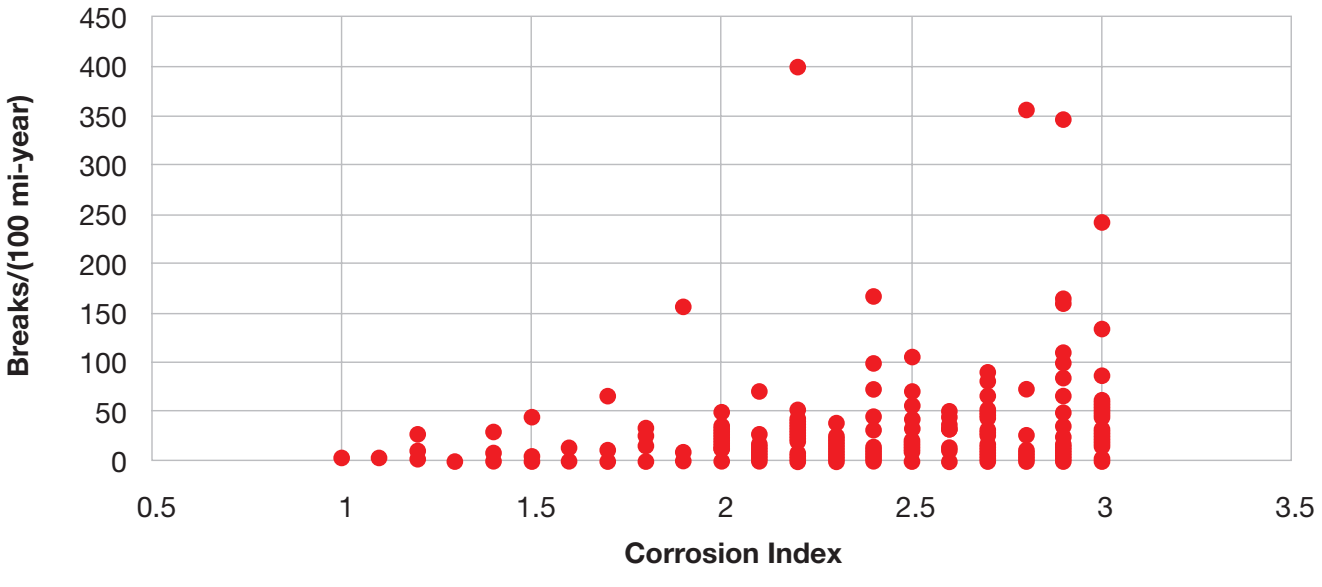


FIGURE 32: NUMBER OF UTILITIES VERSUS THEIR CORROSION INDEX



It is reasonable to expect break rates would increase when pipe is installed in corrosive soils. To examine this, plots were made of a utility's corrosion index versus break rate. Figure 33 illustrates this for cast iron pipe. There is a trend of higher break rates with increasing corrosion index, but the wide scatter in the data makes analysis difficult. The high break rates in Figure 33 are associated with small utilities that have a small amount of pipe. Consider a utility with 1 mile of cast iron pipe with 2 breaks during the past year. That would translate to a break rate of 200 breaks/(100 miles)/year. If that utility had no breaks the following year, the break rates drop to zero.

FIGURE 33: INDIVIDUAL UTILITY BREAK RATES FOR CAST IRON PIPE VERSUS THEIR CORROSION INDEX

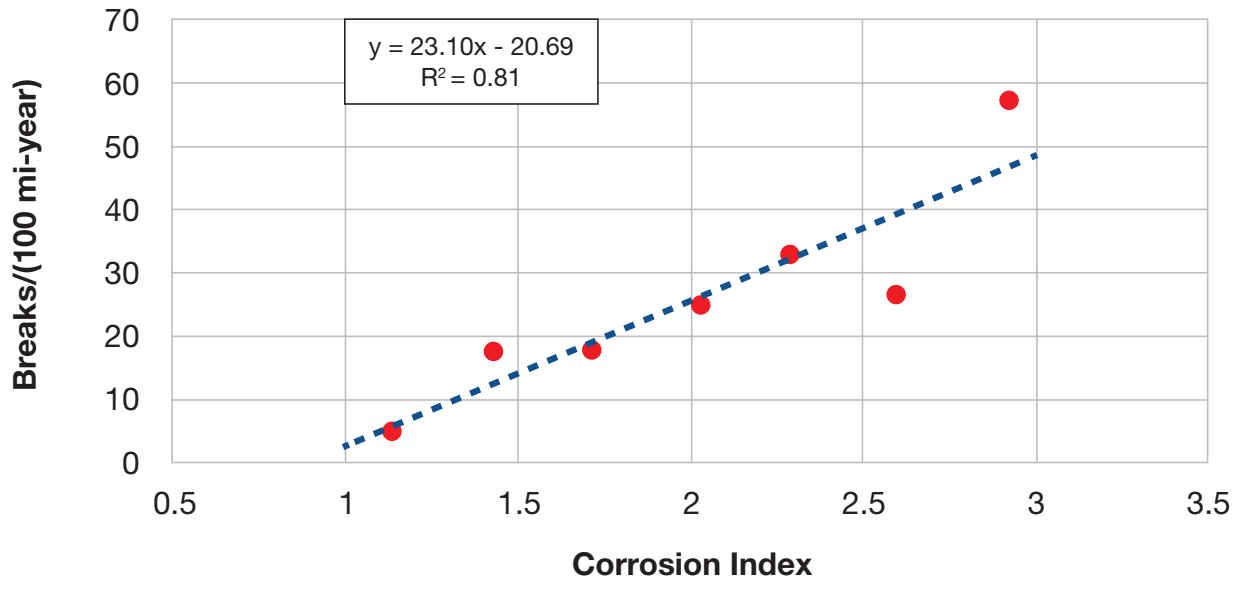


To get a realistic estimate of break rates, we need to add the number of breaks of a pipe type from several utilities and divide by the sum of the length of that pipe type to compute break rates. The corrosion index data was broken down into the same seven categories used in Figure 32. The results are listed in Table 7. The break rates versus corrosion index data are plotted in Figure 34 for cast iron pipe and Figure 35 for ductile iron pipe. The figures also contain a regression equation fit and a correlation coefficient. Correlation coefficients close to 1.0 indicates an excellent correlation and zero indicate no correlation. Both cast and ductile iron results in reasonably good fits to the data.

TABLE 7: BREAKDOWN OF CORROSION INDEX VALUES INTO SEVEN CATEGORIES

Category	Corrosion Index Range	# of Utilities	Average Corrosion Index	Break Rates (breaks/(100 mi-year))	
				Cast Iron	Ductile Iron
1	1.0 - 1.29	5	1.14	4.93	0.57
2	1.3 - 1.59	9	1.43	17.59	2.89
3	1.6 - 1.89	18	1.72	17.76	3.27
4	1.9 - 2.19	45	2.03	24.96	3.09
5	2.2 - 2.49	59	2.29	32.79	6.63
6	2.5 - 2.79	58	2.60	26.39	4.09
7	2.8 - 3.0	86	2.93	57.20	7.69

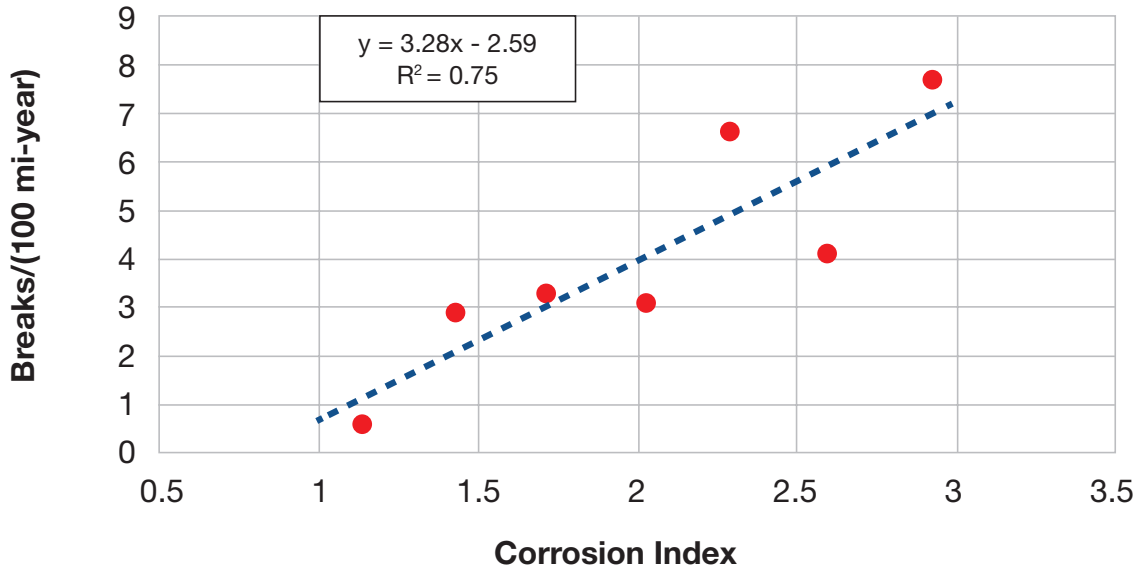
FIGURE 34: CAST IRON PIPE BREAK RATE VERSUS CORROSION INDEX





Using the equations in Figure 34 with x=1 for a low corrosion risk and x=3 for a high corrosion risk, one can show that a cast iron pipe in a high corrosion soil is expected to have over 20 times the break rate of one in a low corrosion soil. Similarly, ductile iron pipe in a high corrosion soil has over 10 times the break rate than one in a low corrosion soil. Very poor correlations were found for the other material types in this survey.

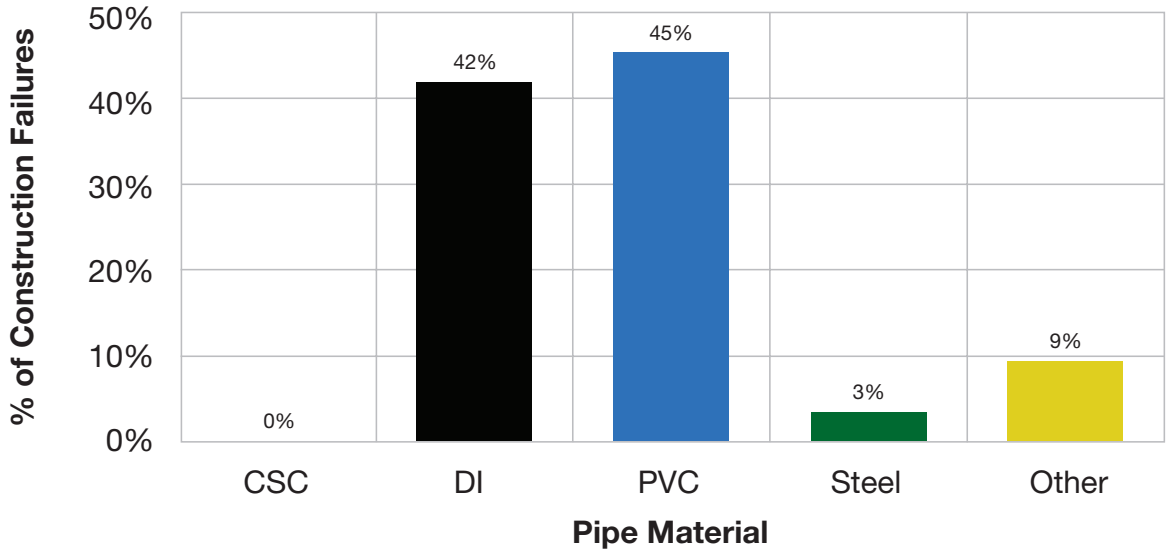
FIGURE 35: DUCTILE IRON PIPE BREAK RATE VERSUS CORROSION INDEX



7.0 Construction Related Failures

The detailed survey asked respondents to report failures related to construction activities. Figure 36 illustrates the percentage of total construction failure related to a particular pipe material. Ductile iron and PVC pipes have the majority of construction related failures at a nearly equal frequency. Figure 14 shows that DI and PVC are the two pipe materials that are also most commonly being installed today. This points to the need to improve construction practices for underground infrastructure regarding installation, location services and inspection.

FIGURE 36: PERCENT OF TOTAL REPORTED CONSTRUCTION RELATED FAILURES FROM THE DETAILED SURVEY



8.0 Condition Assessment Methods

The detailed survey asked if utilities utilize condition assessment methods to monitor the condition of their water mains. 45% of the respondents reported that they do use some kind of condition assessment process but normally limited this effort to larger diameter transmission system pipes. A large percentage of those reported using some visual assessment along with electromagnetic, acoustic, tapping coupons, and other means.

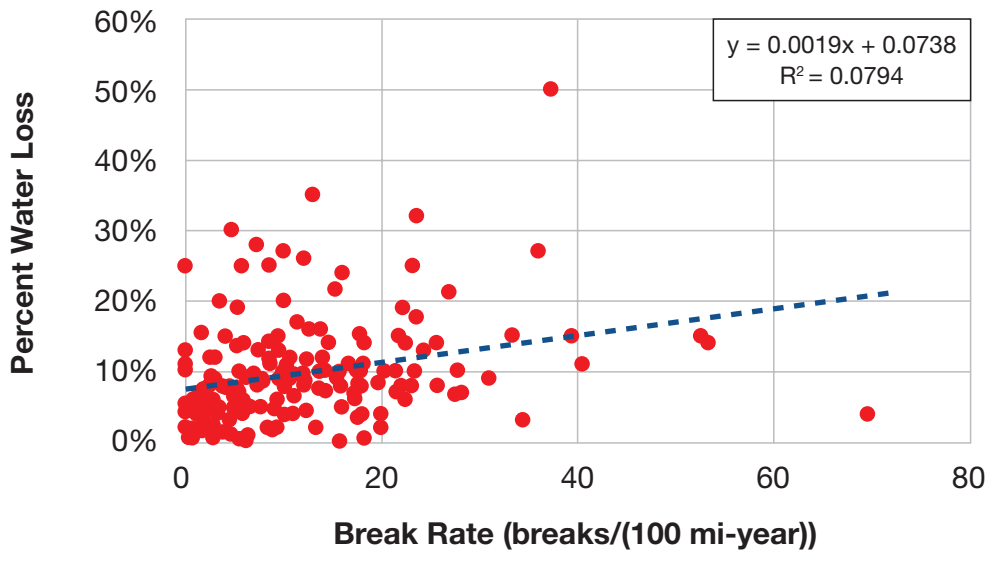
9.0 Water Loss Due to Leakage

Water loss due to leakage is reaching critical levels where in some cases 20% to 30% of water is leaking from water mains (New Jersey 101.5, 2017). The basic survey asked what percentage of water volume input to the system is water loss (due to leakage). A total of 201 utilities were able to provide a water loss value. The reported average leakage from the basic survey was 10% with a standard deviation of 7.7%. It is recognized that there are multiple ways to express and account for water loss (see Taylor, 2008). Water loss can be due to unbilled authorized consumption such as flushing water mains and fire-fighting, unauthorized consumption, and real losses due to leakage. The term non-revenue water comprises all of those losses. It was not anticipated that most of our respondents would have a recent detailed water audit that would provide just the water leakage amount. Thus, the 10% value may include authorized losses. For example, a recent analysis of utilities in Indiana which had a 100% participation rate showed that non-revenue water averaged 19% to 24% of the potable water supplied. The study also noted that a significant number of the state's water pipes are reaching the end of their useful lives (Indiana Finance Authority, 2017). More accurate audits of water utilization would be beneficial to understanding water losses and their cause.

It was postulated that there may be a correlation between water main break rates and water losses. Figure 37 plots individual overall break rates (breaks/(100 miles)/year) versus the reported utility loss rate. A linear regression to the data yields the equation in the figure which is illustrated in the dotted line in Figure 37. This plot omits a few small utilities with failure rates greater than 100 that skew the equation fit considerably. There is considerable scatter in the data and the correlation coefficient is very small indicating essentially no correlation. However, the trend of high leakage values with increasing break rates might be inferred. Perhaps if more accurate leakage values were used, a better correlation might be obtained.

Leaks can occur from pipe damage caused by third parties or corrosion in the pipes, as well as from joints in the distribution system. There are two ways in which water utilities can assess leakage. One way is through conducting a system-wide water audit, which estimates water consumption and water loss. The process enables water utilities to develop performance indicators to assess water loss, benchmark themselves with other water utilities, and set performance metrics. Another way in which water utilities can assess leakage is through conducting leakage investigations on all or part of the water system, using technologies to find the leaks. Many of these technologies can track the sound of a leak, allowing the utility to identify the exact point of the leakage and make needed repairs. There is also increasing use of various "smart technologies," typically tied to newer "smart meters," that can also aid in leak identification" (WaterRF, 2013).

FIGURE 37: PERCENT WATER LOSS VERSUS UTILITY BREAK RATES



10.0 Plans for Replacing Water Mains

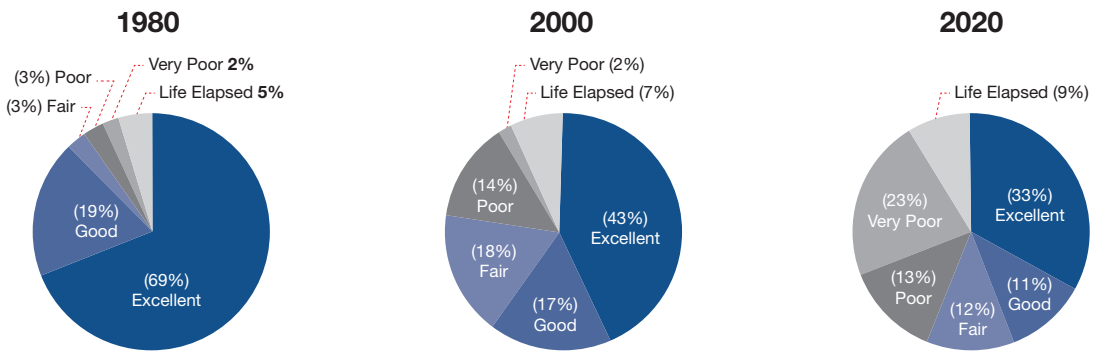
The detailed survey respondents were asked questions about expected pipe life and pipe replacement and the answers are summarized in Table 8. The typical age of failing water mains had an average response of 50 years (up from 47 years in 2012) which is well below what most manufacturers say should be expected. The average expected life of a newly installed pipe is 84 years (up from 79 years in 2012). Given the quantitative nature of these questions, the typical age of failing water mains and expected pipe life have not changed significantly over the last six years. The basic survey asked if utilities have a pipe replacement program and 77% said they did. However, the detailed survey asked utilities if they had a regular pipe replacement program and only 58% of the respondents stated they did and of those that did, the average amount replaced each year was 0.8% of their total installed length. Respondents were asked for the percentage of their water mains that are beyond their useful life but lacked funds to replace them. The average response was 16% of water mains are beyond their useful life. In the 2012 survey the same question was asked and the response was 8.4%. This would indicate that the backlog of needed pipe replacement is growing.

It is of interest to compare these results with a study done by the EPA (EPA, 2002). The report classified water main pipe condition into six categories: "Excellent," "Good," "Fair," "Poor," "Very Poor," and "Life Elapsed." The study examined data for the years 1980 and 2000 and provided forecasted data for 2020. Figure 38 below is reproduced from the EPA report and estimates that the condition of 9% of pipes will be categorized as "Life Elapsed" and 23% as "Very Poor" by the year 2020. Of note is the projected growth in the "Very Poor" category during this period as shown in Figure 38. This is consistent with the results of this survey. The rapid rate of growth of pipes in the "Very Poor" category will make it very difficult for utilities to keep pace and replace them before they reach end of life or their "Life Elapsed" condition. An AWWA study (AWWA, 2012) echoes this trend as illustrated in Table 9. Table 9 shows aggregate costs to cover both replacement and growth in water mains in the USA.

TABLE 8: QUESTIONS ABOUT REPLACEMENT OF FAILING WATER MAINS

Questions	Average or Response
Typical age of failing water main	50 years
Expected life of new water mains	84 years
Percentage with plan to replacing water mains	77%
Percentage regularly replacing water mains	58%
Percentage of total water main length replaced annually	0.8%
Percentage of water mains beyond useful life but lack funds to replace (overall response)	16%

FIGURE 38: ASSESSMENT OF PIPE CONDITION WITH TIME (FROM EPA, 2002)



Percentage of Pipe by Classification

TABLE 9: AGGREGATE NEEDS FOR INVESTMENT IN WATER MAINS THROUGH 2035 AND 2050 BY REGION OF THE UNITED STATES (AWWA, 2012)*

	2011 - 2035 Totals			2011 - 2050 Totals		
Region	Replacement	Growth	Total	Replacement	Growth	Total
Northeast	$92,218	$16,525	$108,744	$155,101	$23,200	$178,301
Midwest	$146,997	$25,222	$172,219	$242,487	$36,755	$279,242
South	$204,357	$302,782	$507,139	$394,219	$492,493	$886,712
West	$82,866	$153,756	$236,622	$159,476	$249,794	$409,270
Total	$526,438	$498,285	$1,024,724	$951,283	$802,242	$1,753,525

** (2010 $M)*

Table 9 represents an estimate of pipe material investment (in millions of dollars) which is needed in each region based on an AWWA report (AWWA 2012). Investment is needed in two areas - replacement (where existing users pay for the pipe at the end of its useful life) and growth (where system expansion needs to occur due to population growth). These two drivers impact each region differently. Over the coming 40-year period, through 2050, these needs exceed $1.7 trillion. Replacement needs account for about 54% of the national total, with about 46% attributable to population growth and migration over that period.

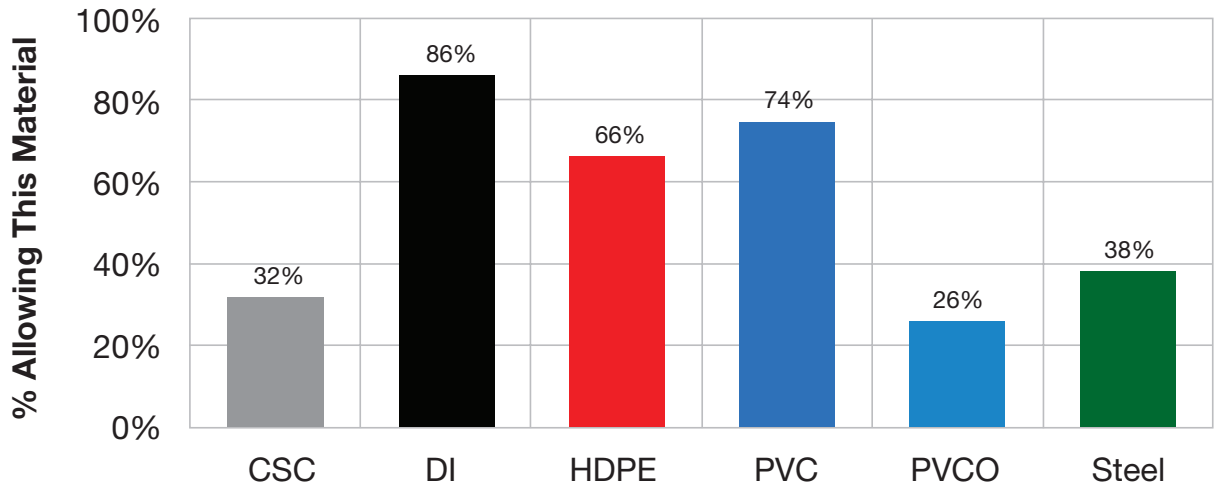
America's water main investment needs impact the nation's regions in different ways. The South and West will face the steepest investment challenges but this will be paid for through growth, unlike the Northeast and other parts of the country facing population decline or only modest growth, which means it will be difficult for them to pay for the needed upgrades (AWWA, 2012).

The US Conference of Mayors 2013 report, "Municipal Procurement: Procurement Process Improvements Yield Cost-Effective Public Benefits," provides expert advice on developing a business case for pipe material selection when evaluating pipe replacement strategies. It reads:

> "The conventional approach to water pipe replacement decision making has been to merely replace the pipe with roughly the same product regardless of price, and based on manufacturer's recommendations. In fact, this replacement ideology and tradition is still heavily imprinted upon the thinking of even modern engineers. Communities in the United States, a century ago, used thick cast iron pipes that are now failing. The majority of these pipes are failing for one basic reason – corrosion. Failure to recognize this systemic performance problem in metallic pipes has allowed traditional procurement practice to make suboptimal materials procurement decisions…"
>
> "An important step in effectively managing assets is to create an open procurement and selection process which allows for all appropriate materials to be considered and accurately and fairly compared. Any improvement in this area can represent a huge cost savings for rate payers considering the perpetual high cost of underground infrastructure replacement. Procurement habituation in pipe material consideration combined with a failure to take advantage of the open bidding process impedes competitive cost savings. Closed procurement processes lead to unnecessary costs, and may diminish public confidence in a local government's ability to provide cost effective services."
>
> *Source: US Conference of Mayors, 2013*

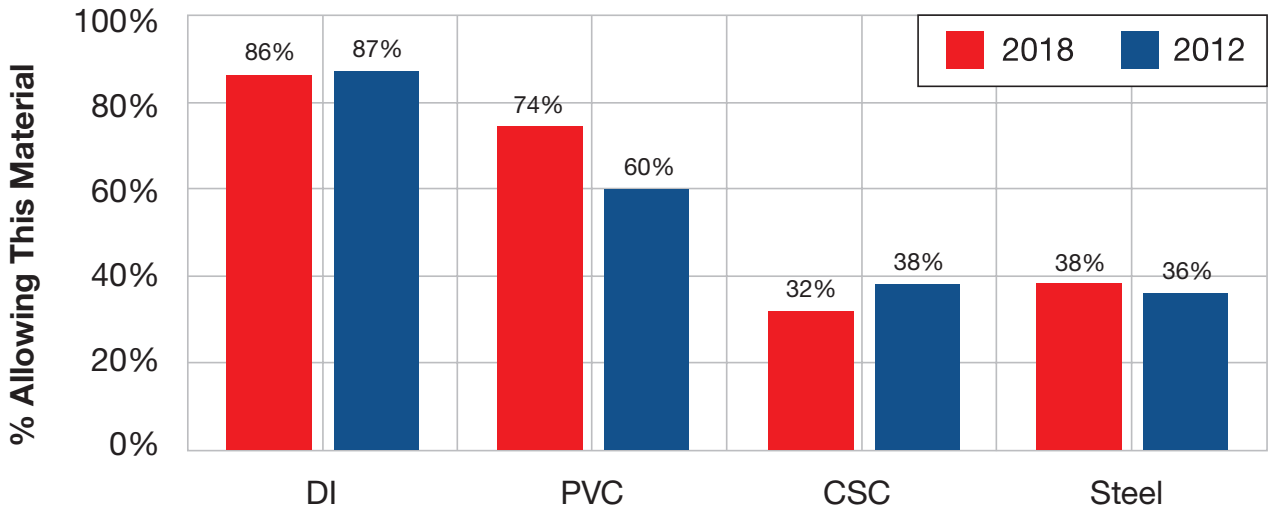
11.0 Approved Pipe Materials

FIGURE 39: RESPONDENTS ALLOWING INSTALLATION OF THESE WATER MAIN MATERIALS



The detailed survey also asked respondents what water main pipe materials are currently approved for use at their utility. Figure 39 illustrates the percentage of respondents that allow a particular pipe material to be installed. HDPE pipe at 66% allowance for use in water systems represents a high degree of acceptance for trenchless applications such as pipe bursting and directional drilling, whereas for open cut installations PVC and ductile iron pipe are the predominantly accepted materials (see Table 10). Figure 40 compares the pipe materials approved for use by utilities in the 2018 survey with the data obtained in the 2012 survey. Figure 40 shows a 23% increase in the acceptance of PVC water pipe by North American utilities since 2012. Specifically, PVC pipe approval among survey respondents increased from 60% of water utilities allowing its use in 2012 to 74% of utilities allowing its use in 2018. The number of utilities approving of ductile iron, concrete steel cylinder, and steel pipes for use in water systems remains essentially the same.

FIGURE 40: COMPARISON WITH 2012 SURVEY FOR ALLOWED MATERIALS



12.0 Preferences for Pipe Installation

The detailed survey asked respondents about experiences with three techniques of repairing, replacing, and installing water main pipes. They were relining deteriorated pipes, replacing pipes with a pipe bursting technique, and installation of new pipes using directional drilling. Table 10 summarizes their responses. The rating scale in Table 10 is from 1 to 5 with 1 being “Not Satisfied” to 5 being “Very Satisfied.” Not many respondents have utilized pipe bursting, but an increasing number are looking at using both pipe relining and pipe bursting techniques. A majority of respondents have utilized directional drilling and are very happy with the results, but it is usually only used where open cut replacement is problematic. Open cut replacement remains the most commonly used method of pipe replacement.



TABLE 10: QUESTIONS ABOUT REPLACEMENT OF FAILING WATER MAINS

	Pipe Relining	Pipe Bursting	Directional Drilling	Open Cut
% of respondents that have used this technique	35%	10%	62%	100%
Most common materials installed	HDPE, CIPP, cement lining, epoxy	PVC, HDPE, DI	HDPE, PVC, DI	PVC, DI, CSC, Steel
Average Rating 1 to 5	3.8	3.8	4.4	4.7
% of respondents that will use this technique in the future	58%	44%	93%	100%
Comments	High cost, used when open cut not feasible, only for large diameter pipe, many not happy with it	High cost, useful in some situations, need to excavate for service lines	Worked well particularly for river and street crossings, more expensive	Standard installation method

13.0 Infrastructure Asset Management

Infrastructure asset management is an approach which can help utilities bring together the concepts, tools, and techniques to manage assets at an acceptable service level at the lowest life-cycle cost. Asset management practices applied to underground infrastructure help utilities understand the timing and costs associated with replacement activities. The knowledge gained from these efforts also helps in the development of effective pipe material selection through comparative financial analysis called "life cycle costing" as part of replacement strategies and funding plans. Understanding the longevity of a pipe improves the ability for management to make better infrastructure investment decisions with improved affordability results for customers.

Traditionally, there has been a lack of analysis which would combine both underground pipe performance and affordability. Existing practices tended to ignore the effect of environmental conditions on different pipe materials. Yet, every engineer understands how the complexity of underground infrastructure has increased along with the array of choices. The ability to change old habits and consider new materials requires additional analysis, and improved design and installation practices. This enhanced analysis of pipe design, selection and installation sets forth the longevity and life-cycle costs critically influencing water service affordability and sustainability for the next 100-200 years.

There have been many studies on water main failure rates in the US, Canada, Australia, and Europe over the last three decades. These studies mainly compared the number of pipe breaks by general pipe type and by length. While these studies have been very helpful to the water industry, the new driver has been the need to take into consideration the reduction of repair and replacement costs and improvement of water service affordability in underground pipe decisions. This new level of fiscal accountability and demand for transparent utility management back to their owners and stakeholders has increased the need for additional evidence to demonstrate the improved decision-making. Dig-up reports and pipe performance and longevity studies form the next body of evidence needed to corroborate water main break surveys and studies. The simple formula in a life cycle cost framework is essentially that "a pipe which has a long life at a low cost is the most affordable." Engineers are to make available every alternative that can answer the simple question of longevity and cost at each relevant point within the underground network providing service. A key issue in the life cycle cost framework is the expected life of a pipe.

Accurate pipe service and performance life estimates are critical to the effective management of underground infrastructure. This study provides accurate break data which can be used to improve life cycle costing analysis of water pipelines. Pipe break rate data is fact-based quantitative information which can help to precisely assess the durability, performance and longevity of pipe networks. Water main break rates are a critical decision making metric used in infrastructure asset management repair and replacement planning. Some of the data provided in this study, however, such as the average age of failing water mains and average expected pipe life, is qualitative in nature, i.e., subjective since it is based on perception rather than on quantitative data like break rates. While this can be helpful to utility officials, it lacks needed precision. A similar problem exists with the AWWA 2012 *Buried No Longer* report, which provides estimated service lives of different pipe materials based on a mixture of data which includes perceptions of service life versus quantitative data; and therefore is only of limited value for use in pipe material comparisons, asset management replacement planning, life cycle cost projections, and pipe service life estimates.

There is a large body of information on the importance of asset management and particularly as it relates to water systems. The reader is encouraged to refer to the following excellent documents that are available:

- *Asset Management for Water and Wastewater Utilities* https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities
- *What is Asset Management?* https://www.michigan.gov/documents/deq/deq-ess-mfs-formsguidance-DWassetmngmntguide_426744_7.pdf
- *Life Cycle Assessment of PVC Water and Sewer Pipe and Comparative Sustainability Analysis of Pipe Materials* http://www.sustainablesolutionscorporation.com/paper-unibell.html

13.1. Life Cycle Cost Analysis and Life Cycle Assessment

According to Dr. Sunil Sinha, Professor of Civil and Environmental Engineering and Director of the Sustainable Water Infrastructure Management (SWIM) Center at Virginia Tech, "In order to meet the important challenges of the 21st century, a new paradigm for the planning, design, construction, and management of water pipeline infrastructure is required, one that addresses the conflicting goals of diverse economic, environmental, and societal interests." (Sinha, 2018) The new paradigm must include life cycle costs analysis (LCCA). LCCA helps in justifying the selection process of a particular system, product or activity based on the total life cycle cost rather than the initial design and installation cost. It enables a transparent selection process. Life cycle cost analysis helps in the identification of high cost areas during the life cycle of the asset and helps in minimizing the costs. Attributing costs to each phase in an asset's life cycle and understanding the full cost to deliver services is important for determining costs for various service levels, maintenance and renewal decision making and rate setting. For example, in a model utilizing utility cost data, PVC was found to have an overall lower total cost of ownership because each cost element (initial pipe cost, installation cost, condition assessment cost, pipe repair cost, rehabilitation cost, replacement cost, indirect and recurring costs and disposal costs) for PVC pipe was lower than ductile iron pipe (Khurana, 2017).

Life cycle assessment (LCA) is a tool used to measure the environmental impacts of different products or systems during their life cycle. By measuring the environmental impacts throughout the life cycle, life cycle assessment provides a complete picture related to sustainability and helps in providing true environmental tradeoffs in the product selection. For example, in a 2017 study following an ISO framework, PVC was found to have a lower carbon footprint than ductile iron pipe (Sustainable Solutions, 2017).

Life cycle cost analysis provides justification from the economic point of view to make better investment decisions, whereas life cycle assessment provides justification related to sustainability issues. It is important to integrate both life cycle cost analysis and life cycle assessment to provide a holistic picture to the decision maker.

14.0 Conclusion

This comprehensive water main break report for 2018 surveyed a statistically significant number of utilities that have collected data on underground infrastructure. The study was focused on material usage in water mains across the USA and Canada and was successful in getting 281 participants to respond to a basic survey and 98 utilities to respond to a detailed survey. The central focus was to obtain average values for water main break rates across North America. These results were presented in Figure 20, but are repeated in Figure 41. PVC has the lowest break rate of all the pipe materials considered. Lower break rates mean lower costs and improved longevity. Compared with the 2012 survey results, break rates for asbestos cement and cast iron pipes have increased significantly and should therefore be cause for concern for policy makers and utility officials alike.

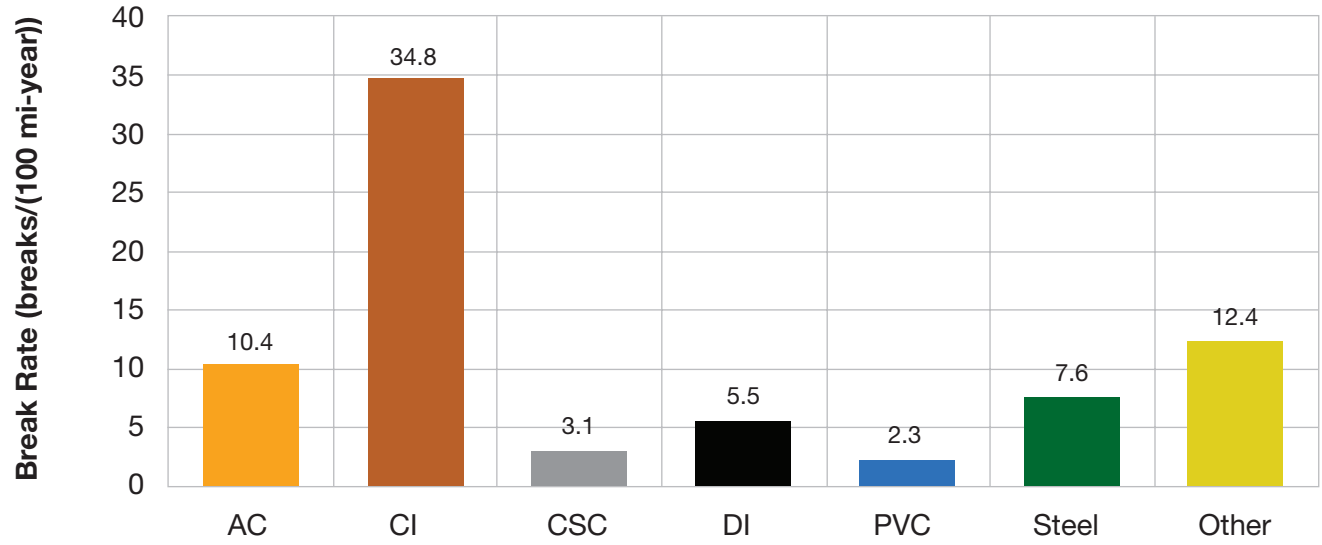
It is hoped that this study will be helpful to utility managers in comparing their experiences with the survey results and thereby make better decisions regarding possible changes in their asset management and procurement practices. Through greater understanding of the risks and issues surrounding the performance of our underground water infrastructure, utilities will be better able to manage our pipe networks and ensure their cost-effectiveness and sustainability.

14.1. Significant Results From This Study

Highlights of the water main break report also include:

- Pipe failure rate data for seven commonly used pipe materials
- Pipe break rates as a function of utility size
- Data on the distribution of pipe failures with pipe age for each material
- Data on the distribution of pipe failure modes for each material
- Analysis of the impact of soil corrosiveness on break rates
- The computation of a national corrosion index value for utilities
- A revised correlation of people served per mile of installed water main
- Average and maximum daily water demand correlations
- Current pipe material usage with a regional breakdown
- Pipe age and size distribution
- Average and maximum operation pressure data
- Most common pipe failure age and modes
- Percentage of utilities that allow installation of certain pipe materials
- Data on water main replacement rates and condition assessment
- Average water loss rate and correlation with break rates
- Preferences about pipe replacement methods

FIGURE 41: BREAK RATES OF EACH PIPE MATERIAL FROM THE BASIC SURVEY



14.2. Acknowledgements

This work was completed with support from Uni-Bell PVC Pipe Association and the Water Finance Research Foundation. Utah State University would like to thank the more than 300 water utilities that participated in this survey.

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Appendix J – The Design Decision Model for Corrosion Control of Ductile Iron Pipelines

dipra
Ductile Iron Pipe Research Association

Strength and Durability for Life®

CORROSION CONTROL

The Design Decision Model for Corrosion Control of Ductile Iron Pipelines

Last Revised:
May 2016

The iron pipe industry has a long tradition of innovation, consistently providing the preferred pipe material for utility engineers across the generations. While the success of iron pipe has been remarkable, manufacturers continue to seek new ways to make a proven product even more reliable.

One area of improved reliability is in the field of corrosion control. Since the first use of polyethylene encasement to protect iron pipe in an operating system in 1958, corrosion control has come increasingly to the forefront. As utilities become more aware of the need to protect their infrastructures, more are seeking the advice of corrosion engineers.

These experts bring considerable knowledge of corrosion protection solutions for various piping materials to the water and wastewater industry. However, the experience of many corrosion engineers with Ductile Iron varies widely and is generally more limited than with steel or other materials. Therefore, corrosion control recommendations for new Ductile Iron Pipelines also vary widely. As a result, utility engineers face the unfortunate necessity of having to choose among corrosion control design recommendations that contradict one another.

To better serve the water and wastewater industries, the Ductile Iron Pipe Research Association (DIPRA) and Corrpro Companies, Inc.* tapped their extensive knowledge and experiences to jointly develop a practical, cost-effective corrosion control solution. The result is a Design Decision Model (DDM†) that both DIPRA and Corrpro use as an engineering tool to address corrosion on proposed Ductile Iron transmission and distribution pipeline projects.

The DDM represents a significant advancement in the area of corrosion control for Ductile Iron Pipelines. In the three years of development of this practical design tool, DIPRA and Corrpro evaluated many factors, including:

- Shared corrosion experiences and know-how.
- Analysis of DIPRA's and Corrpro's extensive databases on corrosion.
- Laboratory and field testing of standard, as-manufactured Ductile Iron Pipe.
- Field inspections of existing Ductile and Gray Iron pipe, including test site and in-service pipes.
- Joint field investigations of proposed Ductile Iron Pipelines.
- A comparison of soil-testing protocols and results.

The advanced, two-dimensional DDM incorporates a comprehensive system of corrosion control recommendations. The result is a highly effective, economical corrosion control strategy that gives utility managers confidence that, throughout its intended life, the pipeline they install tomorrow will provide the reliable service they insist upon for their customers.

* Corrpro Companies, Inc. is the world's largest provider of corrosion-engineering services. Additional information on Corrpro may be found at www.Corrpro.com.

† DDM™ (Design Decision Model) is a trademark for the statistical corrosion decision model jointly owned by Corrpro Companies, Inc. and the Ductile Iron Pipe Research Association (DIPRA).

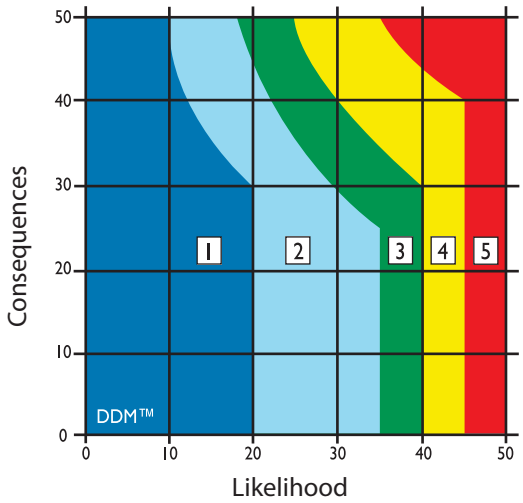
The Design Decision Model

The DDM is a risk matrix concept that incorporates an evaluation of the likelihood of corrosion along a proposed Ductile Iron Pipeline route and the consequences that may result from a corrosion-related problem. In this way, a utility is provided with a recommendation for corrosion control that is best suited for the particular installation under design. Recommendations range from simply installing the Ductile Iron Pipe as-manufactured with its protective standard shop coating and annealing oxide layer, to encasing the pipe in polyethylene, to providing cathodic protection currents to control the rate of corrosion.

Figure 1 shows that the recommendations for corrosion control result from obtaining a point count for both Likelihood and Consequence Factors. Entering the graph at the appropriate points, a color-coded intersection is found that establishes the appropriate corrosion mitigation recommendation. As enumerated in Figure 1, the methods include:

FIGURE 1

The Design Decision Model™



1. Installing the pipe as-manufactured with its protective standard shop coating/annealing oxide system.
2. Encasing the pipe in polyethylene.
3. Encasing the pipe in polyethylene or encasing the pipe and providing bonded joints.
4. Encasing the pipe in polyethylene and providing bonded joints or providing life-extension cathodic protection currents, with or without encasement.
5. Cathodic protection.

Likelihood Factors

Using the 10-Point System as described in Appendix A of ANSI/AWWA C105/A21.5[1] as a basis, the DDM evaluates the following factors in determining the likelihood that corrosion could be a problem for a proposed Ductile Iron Pipeline:

- Resistivity
- Sulfides
- Moisture Content
- Redox Potential
- Ground Water Influence
- Bi-metallic Considerations
- pH
- Known Corrosive Environments
- Chlorides

Of the above, resistivity, pH, redox, sulfides, and moisture content are criteria that carry over from the 10-Point Soil Evaluation System that the Ductile Iron Pipe industry has used for decades. For a discussion of the importance of these factors in contribution to a corrosion cell, please refer to Appendix A of ANSI/AWWA C105/A21.5.

New likelihood factors include considerations related to the concentrations of chlorides in the soil and whether bi-metallic couplings such as corporation stops or connections to other pipe materials will be present. Also added to this system is an evaluation regarding the influence of the ground water that may be present and whether that ground water will fluctuate, such as would be found in tidal areas, on a multiple-times daily basis into and out of the pipe zone.

Also, as noted in Appendix A of ANSI/AWWA C105/A21.5, there is a need to recognize that there are soils and installations that are known to be corrosive regardless of the results of any testing that might be done. Examples include cinders, landfills, and peat bogs. These “known corrosive environments,” when encountered, tell us that the likelihood of a corrosion problem would be significant if the pipe were to be installed as-manufactured.

Consequence Factors

Consequence factors relate to operational reliability and the difficulties that may exist in affecting a repair to a Ductile Iron Pipeline. The following core factors are used to establish those consequences:

- The diameter of the pipe.
- The location of the pipe.
- The depth of cover.
- Whether an alternative supply of water is available.

These factors are used to evaluate access to the pipe at a particular location and the relative difficulty in affecting repairs. Access can be categorized as good, with minimal traffic considerations, typical excavation depths, the availability of an alternative supply of water, etc., or increasingly more difficult where depth of cover, right-of-way considerations, utility congestion, or unstable soil conditions may have an impact on repair efforts.

Taking the results of the likelihood and consequence assessments made at discrete locations along the proposed pipeline's right of way, the two-dimensional Design Decision Model grid is used to find a recommended mitigation method at each location. In doing so, the corrosion decision-making process is simplified and yields a corrosion control strategy that reflects a proven state-of-the-art solution. Using the DDM results in tailor-made corrosion control for the various conditions that may exist along the pipeline's length, rather than using a broad brush solution that applies the worst case to the pipeline as a whole. In doing so, the DDM process provides a value-engineering approach that effectively, economically controls corrosion.

The Basis of the DDM™

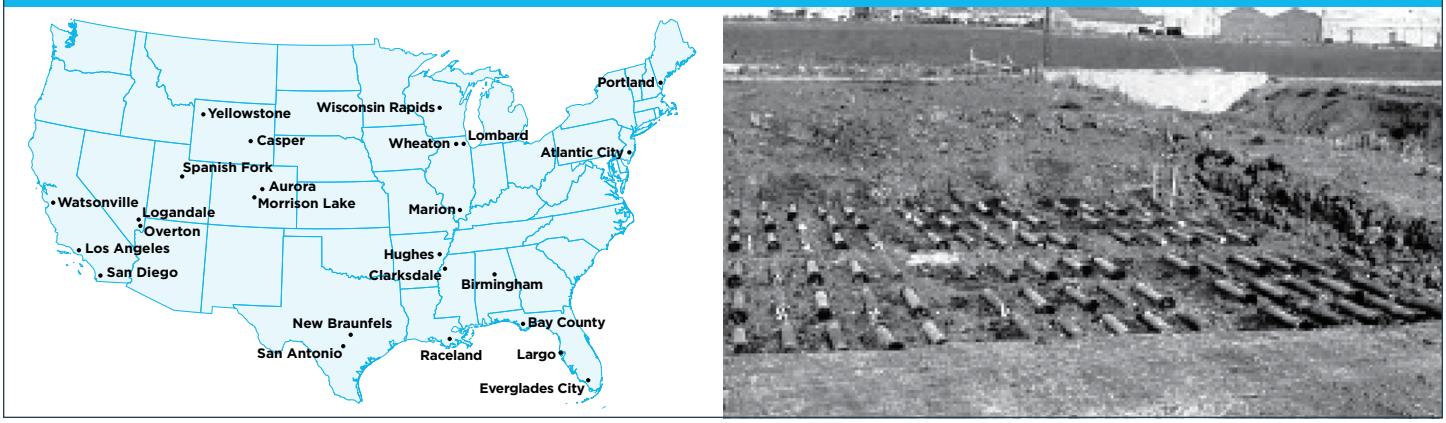
The DDM™ began with an evaluation of decades of corrosion-related research and field experience involving Gray and Ductile Iron Pipes.[2] Combining data from DIPRA and Corrpro resulted in a database comprising more than 60,000 individual data entries that included all of the compiled test site and field investigation results from the iron pipe industry and from Corrpro. In addition, Corrpro conducted laboratory and field studies to ascertain polarization characteristics, corrosion rates, and corrosion protection current requirements for Ductile Iron Pipe. These data helped formulate the recommendations in the DDM.

The Database: A Statistical Analysis

Research into corrosion of iron pipe was initiated by what is now DIPRA in 1928. Through the years, DIPRA has conducted more than 115 corrosion-related research projects involving more than 2,000 individual production-run Gray and Ductile Iron specimens that were placed throughout the United States in test sites (see Figure 2) with varying soil environments, including some of the most corrosive found in nature.

FIGURE 2

DIPRA Test Sites

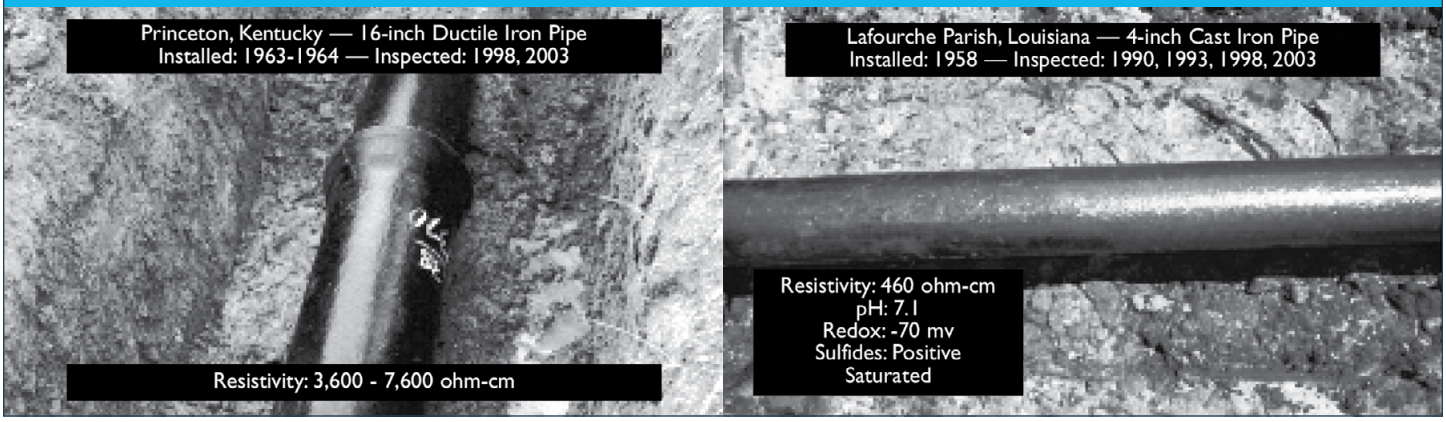


DIPRA's test site locations represent a variety of soil conditions, from relatively non-aggressive soils to the most corrosive found in nature. Typical specimens are capped to prevent internal corrosion and removed incrementally to evaluate the effects of external corrosion over time. Weight loss and deepest pit measurements are taken and analyzed for each.

The database also included the results of some 300 inspections of in-service installations of Gray and Ductile Iron Pipes in both aggressive and non-aggressive soils, with and without specifically applied corrosion control (see Figure 3).

FIGURE 3

Typical Field Investigation Results



From the database, a subset consisting of nearly 1,400 specimens and inspections in more than 300 different soil environments was developed. This subset was used to analyze the need for and effectiveness of encasement as a corrosion control method for Ductile Iron Pipe. Included in that database were 1,379 pipe specimens that were either sand blasted (annealing oxide removed), bare (the standard shop coating not provided, but the annealing oxide layer intact), as-manufactured (including the standard shop coating and annealing oxide layer), or polyethylene-encased Gray and Ductile Cast Iron pipes.

The soil data that was collected allowed DIPRA to analyze the behavior of these pipes according to whether the soil was considered corrosive. Table 1 shows the results of the investigations that were conducted on pipe in soils that were not considered to be aggressive according to the 10-Point Soil Evaluation System found in Appendix A of ANSI/AWWA C105/A21.5.

TABLE 1
Investigations of Gray and Ductile Iron Pipes in Non-Aggressive Soils

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate (in./yr.)	Years to Penetration*
As-manufactured (Standard Shop Coating)	43	0.00067	373
Polyethylene Encased	12	0.0000	∞

The data indicate that as-manufactured Ductile Iron Pipe placed in soils that are not considered to be aggressive will not suffer from meaningful corrosion attack.

The Effectiveness of Polyethylene Encasement

As shown in Table 2, another analysis of the database considered pipe specimens and investigations that were taken from corrosive soils as evaluated by the 10-Point System in Appendix A of ANSI/AWWA C105/A21.5‡.

TABLE 2
Investigations of Gray and Ductile Iron Pipes in Corrosive Soils

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate (in./yr.)	Years to Penetration*
Sand Blasted (Annealing oxide layer removed)	102	0.025	10
Bare (Uncoated)	22	0.0151	17
As-manufactured (Standard Shop Coating)	103	0.0105	24
Polyethylene Encased	151	0.00045	556

Comparing the pitting rates for the unprotected versus polyethylene-encased iron pipes, the results show that polyethylene encasement is a very effective way to control corrosion on Ductile Iron Pipelines in most corrosive soils. These results have been confirmed through more than 45 years of successful usage of polyethylene encasement on tens of millions of feet of water and wastewater lines throughout North America.

* "Years to Penetration" is calculated using the single deepest pit in each specimen and the assumptions that a linear pitting rate would exist and the pipe had a wall thickness of 0.25 inches (the minimum nominal Ductile Iron Pipe wall that is manufactured). These assumptions result in a conservative evaluation.

‡ This analysis does not include specimens that were placed in what are defined as "Uniquely Severe Environments" in Appendix A of that standard.

Summary: The Performance of Iron Pipe

In addition to the results shown previously, the statistical work conducted in analyzing the DIPRA/Corrpro databases also addressed related questions regarding comparisons of Gray and Ductile Iron corrosion rates and the corrosion rate at damaged areas in polyethylene encasement compared to as-manufactured specimens.

In summary, the results of the statistical analyses of the database showed:

- Ductile Iron Pipe's mean deepest pitting rate was less than that of Gray Iron. This allowed the corrosion data for Gray Iron to be conservatively analyzed in combination with the data for Ductile Iron Pipe.
- Polyethylene encasement provides effective corrosion control for Ductile Iron Pipe in most corrosive environments.
- As-manufactured, shop coated Ductile Iron Pipe does not require additional corrosion protection in non-aggressive environments.
- The corrosion rate of iron pipe at damaged areas in polyethylene encasement is not greater than that of non-encased iron pipe.
- The 10-Point Soil Evaluation System in Appendix A of ANSI/AWWA C105/A21.5 is a reliable tool for evaluating the corrosivity of soils to Ductile Iron Pipe.

Corrpro's Research: Controlling the Rate of Corrosion

As part of the cooperative effort between DIPRA and Corrpro in the development of the DDM, Corrpro undertook research in its laboratories and at DIPRA test sites.[3] The research included laboratory studies that evaluated the protective value of Ductile Iron Pipe's standard shop coating and annealing oxide layer on corrosion rates, as well as laboratory and field studies to evaluate polarization characteristics, corrosion rates, and corrosion-protection current requirements for production Ductile Iron Pipe. The laboratory work involved some 100 specimens in five aqueous solutions of known resistivity and 40 samples in five different soils, including soils from DIPRA test sites. The field work was conducted on 32 as-manufactured pipes installed at four DIPRA test sites having a range of soil corrosivities.

Corrpro's ultimate goal in this research was to document the benefits of established corrosion-mitigation techniques that ensure an acceptable minimum pipeline service life for Ductile Iron Pipelines to be installed in more aggressive, higher-consequence locations.

The Value of the Standard Shop Coating/Annealing Oxide Layer — a Unique Combination

Corrpro used specimens taken from production pipe of varying shop coating conditions, placed them in various aqueous solutions of known resistivity, and measured the resulting corrosion rates. These specimens included pipe that was uncoated as well as shop coated pipes of varied coating thickness and age. The results indicated that the corrosion rates were lower on coated samples and that the standard asphaltic shop coating/annealing oxide layer does provide a good degree of corrosion protection.

Soil Testing — Coating Resistance, Polarization Levels, and Corrosion Rates

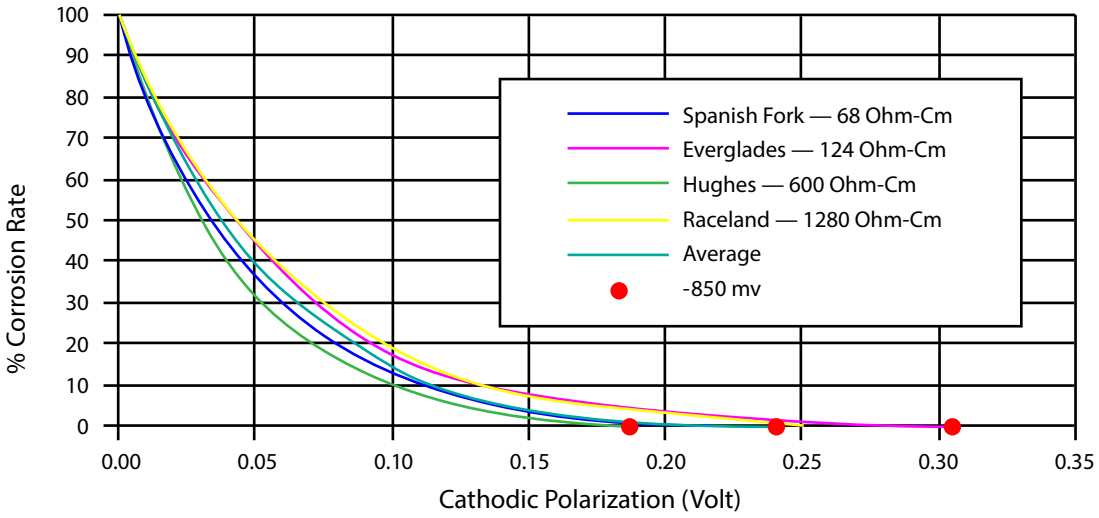
Corrpro tested production pipes in soils, both in the laboratory and in the field. The soils used in the laboratory work were selected to obtain a range of conditions and included soils from four DIPRA test sites where field tests were also conducted[§]. The soils were largely selected because they were aggressive to Ductile Iron.

The results of the field and laboratory soil testing confirmed that corrosion rates could be established at desired levels within reasonable parameters through the application of cathodic currents. Specifically, the research established a basis for corrosion-protection design strategies that were intended to control corrosion at a desired rate without the use of incompatible bonded coatings (see the discussion on bonded coatings that follows). For example, the field and laboratory work indicated that the service life of an as-manufactured Ductile Iron Pipe could be quadrupled by the application of current that produced a cathodic polarization potential of approximately 0.070 volts (see Figure 4). This research demonstrated that cathodic currents considerably less than typical industry design norms could effectively be applied to manage corrosion rates and provide for an effective service life for a pipeline.

[§] Test sites included Spanish Fork, UT, Everglades, FL, Hughes, AR, and Raceland, LA.

FIGURE 4

Polarization Versus Corrosion Rate



Field and laboratory testing demonstrated the feasibility of controlling corrosion rates on as-manufactured Ductile Iron Pipes in a variety of soils. For example, referring to the above graph, the service life of Ductile Iron Pipe could be quadrupled (corrosion rate reduced to 25 percent) by the application of a cathodic current that would polarize the pipe approximately 0.070 volts.

Bonded Coatings and Ductile Iron Pipe

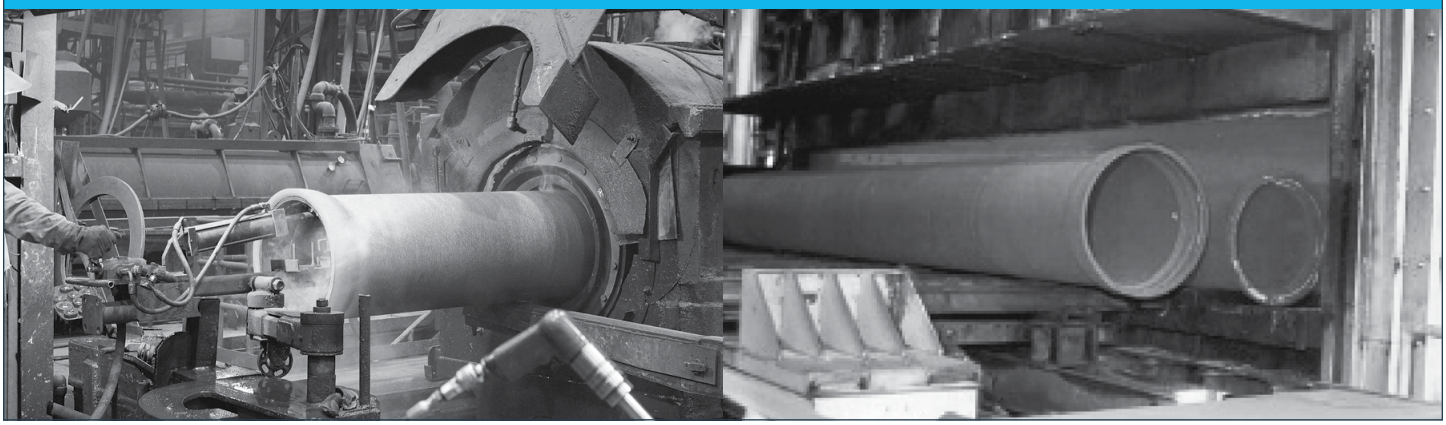
In the DDM, the use of bonded coatings on Ductile Iron Pipe is excluded. Reasons for this relate to the nature of the external surface of Ductile Iron Pipe, which results from the manufacturing process, and the incompatibility of Ductile Iron Pipe and bonded coatings. More practical and equally effective methods are included in the model, offering lower-cost options for corrosion control to the owner.

The Manufacture of Ductile Iron Pipe

Ductile Iron Pipe is a cast product. The manufacturing process involves centrifugal casting to form the pipe and subsequent annealing of the pipe to set its physical properties (see Figure 5).

FIGURE 5

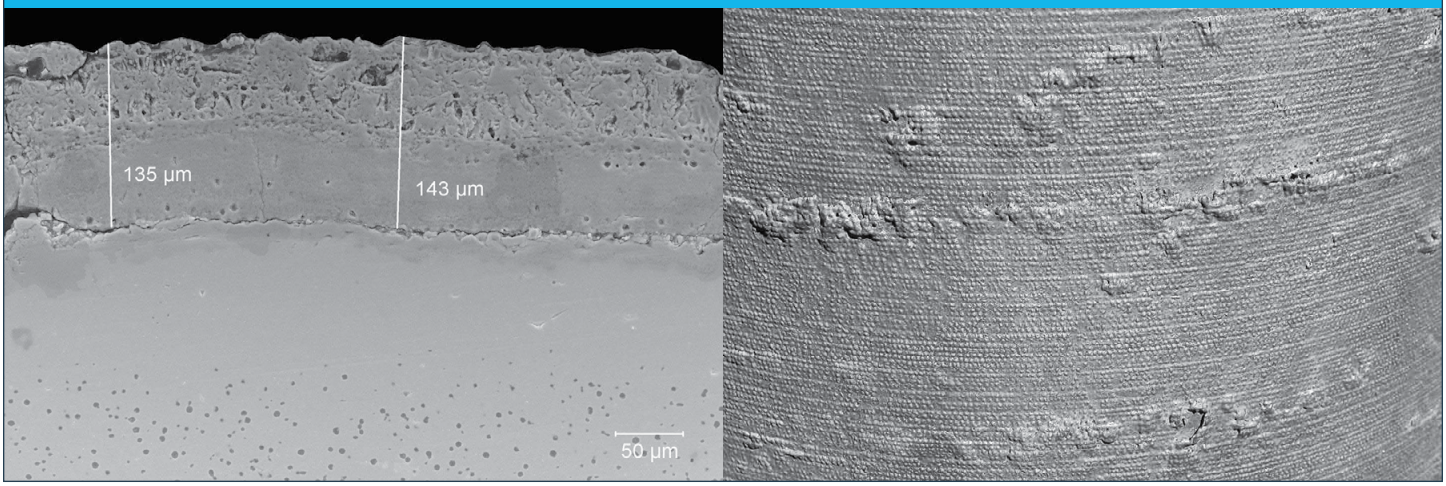
The Manufacturing of Ductile Iron Pipe



Manufacturing Ductile Iron Pipe is a dynamic process that includes the centrifugal casting of molten iron into pipe and subsequent annealing of the pipe after removal from the casting machine. The resulting product includes a pronounced peen pattern and annealing oxide layer in the outer surface of the pipe.
The manufacture of Ductile Iron Pipe includes an annealing process that results in a protective iron oxide layer on the outside surface of the pipe, as shown

FIGURE 6

Annealing Oxide Layer



above on the left. Blasting of the pipe often results in the blistering or slivering of the pipe surface that is evident on the right, making the pipe unusable.

The casting process results in a pronounced peen pattern on the outside surface of the pipe. This peening is transferred from the casting mold and is used to improve the quality of the casting in many ways,[4] including helping to anchor the molten iron and distribute it circumferentially against the mold. Annealing the pipe relieves residual stresses within the pipe wall and establishes the desired ferritic character of the final product. Without this annealing process, the pipe would be brittle and subject to mechanical failures — not what the water and wastewater industries have come to expect from Ductile Iron Pipe.

Annealing the pipe also results in the formation of a corrosion-resistant oxide layer on the outside surface of Ductile Iron Pipe (see Figure 6). The oxide layer, in conjunction with the shop coating, plays a part in providing the inherent resistance of Ductile Iron Pipe to corrosion in most soil environments.
In order to apply a bonded coating used in underground pipeline corrosion control, Ductile Iron Pipe, like any

metallic pipe, would require a surface preparation that includes a sand or shot blasting to help the coating adhere. Unfortunately, this blasting often results in a "blistering" or "slivering" of the annealing oxide (see Figure 6) and, in effect, ruins the pipe.[5]

Further, while bonded coatings require a "blast profile" for their application, these profiles are generally on the order of 1 to 4 mils thick. However, the peen pattern in Ductile Iron Pipe is on the order of 20 to 30 mils, exceeding these typical blast profiles many times over. Such a deep profile raises concerns as to whether the coating can properly cover the peened surface without numerous thin spots and holidays. This, added to concerns over the damage that may occur to the pipe surface during blasting, makes the prospect of good coating performance over the long term questionable.

These concerns, in addition to those that relate to the difficulties in the coating of Ductile Iron Pipe's irregular-shaped joints and fittings in the field, the need to repair coating damage that results from in-transit handling, the inability to make ready field adjustments when installing the pipe, and the unfamiliarity of Ductile Iron Pipe contractors with bonded coatings lead DIPRA, Corrpro, and the manufacturers of Ductile Iron Pipe to recommend that they not be specified. The ability of bonded coatings to provide the level of service desired is problematic at best, and there are alternative mitigation methods described in the DDM that are more cost effective.

Polyethylene Encasement and Cathodic Protection

One aspect of the DDM includes the application of cathodic protection currents to Ductile Iron Pipe either with or without polyethylene encasement. According to Kroon, "The use of corrosion-protection currents improves the effectiveness of polyethylene encasement by protecting the pipe where the film was damaged or not properly applied resulting in uncovered surfaces. The methods are not exclusive and there is synergy when used in combination."[6]

The use of polyethylene encasement and cathodic protection has seen an increase in recent years, with some of the more significant installations on large pipeline projects in the Dakotas and elsewhere. These projects, involving nearly 2 million feet of polyethylene encased, cathodically protected iron pipe, have provided excellent opportunities to evaluate the effectiveness of cathodic protection in conjunction with unbonded films, and investigations into such installations have indicated successful corrosion control. The successes of these pipelines point to the efficacy of this system. One example, a pipeline in North Dakota, involves some 42 miles of 12- through 30-inch polyethylene-encased Ductile Iron raw water main. Installed in 1989, the pipeline was provided cathodic protection in 1991.[7] In April 2004, the pipeline was investigated at several locations to evaluate the effectiveness of the cathodic protection/polyethylene-encasement system. The results, as indicated in Figure 7, showed the pipe to be in excellent condition, with no evident corrosion pitting.

FIGURE 7

Ductile Iron Pipe: Polyethylene Encasement and Cathodic Protection Investigation



The above 30-inch Ductile Iron Pipe was installed in 1989 with polyethylene encasement and supplemented with cathodic protection two years later. The investigation was conducted on April 21, 2004, at two locations where the native soils exhibited resistivities of 520 and 480 ohm-cm, respectively. The results showed that the pipe was in excellent shape, with no evidence of pitting.

The Design Decision Model — a Cooperative Effort

The work performed by DIPRA and Corrpro in the development of the DDM provides utility owners with improved mitigation techniques in combating the effects of corrosion on Ductile Iron Pipe. The effort consisted of an analysis of combined data into the performance of iron pipe in soils, laboratory and field tests, comparing soil-testing protocols, and an overall sharing of corrosion experiences and knowledge to help establish that corrosion rates can be economically controlled. The results of these efforts led to conclusions that:

1. The standard shop coating and annealing oxide layer of Ductile Iron Pipe provide a good measure of corrosion protection.
2. Ductile Iron Pipe can be expected to provide a long service life when placed as-manufactured in non-aggressive environments.
3. Polyethylene encasement is an effective and economical method of corrosion control.
4. Corrosion rates can be effectively and economically controlled through life-extension cathodic protection currents, when necessary.
5. Bonded coatings are not a cost-effective solution to potential corrosion problems on Ductile Iron Pipe.

The Design Decision Model Provides Effective, Economical Corrosion Control

With the DDM, water and wastewater pipeline engineers and utilities are provided an effective, economical corrosion control system for their proposed installations. They are also afforded a recommendation upon which both corrosion engineering and Ductile Iron Pipe experts agree. In this way, utilities and consultants can make design decisions for Ductile Iron Pipelines that are based on agreement, rather than on varying recommendations that are difficult to resolve. For more information on the use and development of the DDM™, please contact your local DIPRA Regional Engineer.

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For more information contact DIPRA or any of its member companies.

Ductile Iron Pipe Research Association

An association of quality producers dedicated to the highest pipe standards through a program of continuing research and service to water and wastewater professionals.

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Research Association

Appendix K – Hardship Application Comments and Responses

GREELEY AND HANSEN

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August 23, 2018

Robert Fasick
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4822 Madison Yards Way, 5th Floor South
Madison, WI 53705
(608) 266-3438

Subject: Waukesha Water Utility - Great Water Alliance
Utility Accommodation Policy Draft WisDOT Interstate 43 Hardship Application

Dear Mr. Fasick:

The Great Water Alliance (Program) has been developed to transition the City of Waukesha's water supply from groundwater to Lake Michigan water. Per a July 2017 Amended Stipulation and Order for Amended Judgment, Waukesha's water supply transition must be completed by September 1, 2023. In addition to the infrastructure required to supply water from the City of Milwaukee to the City of Waukesha, 23 miles of main (referred to as the "Return Flow Pipeline") is required to achieve a net zero water balance in the Great Lakes-St. Lawrence River Basin by conveying highly treated effluent to the Root River. After completing the route study, the preferred route for the Return Flow Pipeline was identified. Approximately two miles of the preferred route lies within the Interstate 43 right-of-way between Racine Avenue and approximately 1,800 feet east of Calhoun Road in the City of New Berlin.

Under the Wisconsin Department of Transportation's (WisDOT's) Utility Accommodation Policy, water facilities are not allowed to longitudinally occupy limited access highway (i.e., freeway/expressway) right-of-way unless an exception is granted to the policy. Per 23 CFR 1.23 (c), an exception to the policy may be approved if the use of right-of-way is "in the public interest and will not impair the highway or interfere with the free and safe flow of traffic thereon." We are submitting this Hardship Application for an exception to this policy. The included evaluation outlines how utilizing the Interstate 43 right-of-way is in the public's interest and will not impair the highway or interfere with the free and safe flow of traffic thereon. A draft WisDOT Interstate 43 Hardship Application (Hardship Application) was shared on May 17, 2018 to provide the documentation to support an exception to 23 CFR 1.23 (c). Your comments on the Hardship Application were received on June 28, 2018. A conference call was held with you and members of the Program on July 20, 2018 to discuss WisDOT's comments on the Hardship Application and gain consensus on refinements to the Hardship Application to address the comments received.

As per previous correspondence between WisDOT and Greeley and Hansen, Greeley and Hansen, on behalf of the City of Waukesha Water Utility, is hereby resubmitting for your review an updated Utility Accommodation Policy Draft WisDOT Interstate 43 Hardship Application for Utility Accommodation within the Interstate 43 right-of-way. Responses to your comments are enclosed following this cover letter. We will be in touch with you to discuss the next steps.

Yours very truly,

Greeley and Hansen LLC

Catharine M. Richardson, P.E.
Program Manager
Encl (1): DRAFT WisDOT Interstate 43 Hardship Application (electronic version)
C: Mr. Daniel S. Duchniak, WWU General Manager; Ms. Kelly L. Zylstra, WWU Operations Manager

Draft 4-110 D1 I-43 Hardship Application
WisDOT Utility Accommodation Policy

Please find our responses to the WisDOT comments received June 28, 2018 on the draft Hardship Application. Each comment is organized with the text from the May 17, 2018 Hardship Application in italics, followed by WisDOT's corresponding comment and then the response to each comment.

1. **Comment No. 1:** *From Section 2.1, first paragraph: The pipeline is anticipated to be 24 or 30 inches in diameter and comprised of ductile iron pipe, steel pipe, or prestressed concrete cylinder pipe.*

   Why wasn't HDPE considered? The material is available in in sizes up to 63" in diameter, has the same longevity as the project required (100 years), and can be installed with horizontally directional drilling (HDD). See the attached brochure. The latter advantage plays a critical factor in minimizing open trench construction, traffic disruption, and construction time.

   Response to Comment No. 1: HDPE pipe was considered as a material for the entire length of the pipeline. Use of HDPE pipe along the entire pipeline would produce pressures in excess of the maximum rated pressure for the material at the diameter of pipe that is recommended based on hydraulic analysis. HDPE pipe is being considered for segments of the pipeline that would use trenchless construction via HDD. Refer to the second paragraph of Section 3 of the enclosed Hardship Application for details.

2. **Comment No. 2:** *From Section 2.1 Second paragraph: The pipeline is not anticipated to be located under pavement after installation or at any point in the future.*

   Except for the crossing of I-43…

   Response to Comment No. 2: The statement has been removed from the Hardship Application.

3. **Comment No. 3:** *From Section 2.3 Traffic: Impacts on local traffic will affect the public's perception of the Program during and after construction.*

   This is a subjective statement since no facts were presented to achieve this conclusion.

   Response to Comment No. 3: The maintenance of traffic was evaluated for route alternatives within right-of-way. Route Alternatives 2, 4, and 8 were not evaluated for maintenance of traffic as they utilize easements beyond right-of-way that would not impact traffic along those segments. Route Alternatives 1 and 11 were not evaluated for maintenance of traffic as they are the two most costly route alternatives. Route Alternative 10B was developed as a sub-alternative to Route Alternative 10A to avoid a portion of College Avenue that is a narrower corridor with tight bends flanked with overhead electric lines and a tree canopy. Thus, maintenance of traffic was evaluated for Route Alternative 10B rather than Route Alternative 10A. The remaining Route Alternatives 3, 5, 6, 7, 9, and 10B were evaluated for maintenance of traffic impacts. Refer to Section 4.1 of the enclosed Hardship Application for the evaluation of lost travel time, additional travel distance, and equivalent dollars lost due to detours for the route alternatives.

4. **Comment No. 4:** *From Section 2.3 Easements: There are added risks to the Program costs and schedule in cases where the property owner opposes the purchase of an easement. In these instances, the pipeline may need to be rerouted, which could increase cost and lengthen schedule.*

   A municipal public utility has the authority to construct, own and operate water utility property and facilities both inside and outside the municipality's corporate limits. This includes intake and return pipes. There is no requirement that all of a municipal public utility's facilities be located within the municipalities it is serving. A municipality may obtain needed property rights through

negotiation and purchase. In reviewing Wisconsin Statutes, it also appears that a municipality may acquire property outside its borders by condemnation under ss. 32.05 or 32.06. Assuming this is true, then the pipeline would not need to be rerouted if owners refuse to sell easements.

Response to Comment No. 4: Section 32.05 of the Wisconsin Administrative Code allows for WWU to condemn property for the pipeline. Per Section 32.05(9)(a), the owners have the ability to appeal the easement offer for up to two years. While WWU may acquire an easement based on eminent domain, it would be a hardship for WWU to exercise eminent domain for the following reasons:

- Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way.
- Waukesha ratepayers will incur additional costs to construct permanent access roads for pipeline maintenance purposes. Additionally, New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to a reduced harvestable area.
- There is a negative public perception associated with exercising eminent domain in New Berlin, a neighboring community whose citizenry will not benefit from the Program. WWU is endeavoring to maintain good relationships with the neighboring communities who are being negatively impacted during the construction of the infrastructure to serve the community of Waukesha.
- New Berlin, who is not receiving a direct benefit from the Program, has expressed concern over reconstructing recently reconstructed roads in their community. In addition to WWU's desire to maintain good relationships with their neighboring communities, per New Berlin City Ordinance 275-15, the planning commission has the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin.

There are added risks to the Program costs and schedule in cases where the property owner opposes the purchase of an easement. Section 32.05 of the Wisconsin Administrative Code allows for WWU to condemn property for the pipeline if WWU can defend the public necessity of the Program. The process to use eminent domain can take six to 14 months and, in addition to that, per Section 32.05(9)(a), the owners have the ability to appeal the easement offer for up to two years. While WWU may own the easement based on eminent domain, the costs for the Program have the potential to increase. Additionally, by avoiding condemnation, WWU reduces its risk of not meeting the milestone dates specified in the July 2017 Amended Stipulation and Order for Amended Judgement. If there are multiple owners, they can organize themselves into class action lawsuits that can take time to resolve and also increase the potential costs to WWU due to legal fees. With the costs, negative public perception, and schedule risks associated with easements, it has been the goal of the Program to limit the number of easements. The above items are described in the enclosed Hardship Application.

5. **Comment No. 5***: From Section 2.3 Wetlands:*

Discussion should include the use of HDD construction methods that would significantly reduce wetland impacts and any needed wetlands/waterways permits from Wisconsin DNR.

Response to Comment No. 5: The Program has been working closely with the Wisconsin Department of Natural Resources (WDNR) in preparation for a Wetlands and Waterways Individual Impact Permit Application. Route alternatives were evaluated based on economic and non-economic evaluation criteria, including impacts to wetlands.

As part of the Wetlands and Waterways Individual Impact Permit Application, the Program is required to demonstrate that when pipelines are going through wetlands, there is no practicable alternative to avoid impacting the wetlands. Trenchless construction via HDD through wetlands would mitigate impacts to the wetlands but the cost for HDD is higher than open-cut construction.

As part of the evaluation to select the preferred route, the Program's approach has been to avoid wetlands to minimize wetland impacts. The cost for trenchless construction via HDD to avoid wetland impacts would significantly increase the cost of construction and is, therefore, not considered a practicable alternative. Refer to Section 3.1.2 of the enclosed Hardship Application for a discussion on trenchless construction methods.

6. **Comment No. 6:** *From Section 2.3 Stakeholder Challenges:*

   Where were the other meetings? How does WisDOT know for sure feedback from the other meetings should not be considered? Also, since 4 of the 10 alternatives were not presented at these meetings, it gives undo weight to the other 6 alternatives when trying to analyze and compare them fairly.

   Response to Comment No. 6: Multiple Open House Meetings were held in the municipalities where the Water Supply and Return Flow Pipelines are anticipated to be located. The Program only received feedback from stakeholders at the Open House Meetings held in New Berlin regarding the route alternatives in that study area for the Hardship Application. The feedback for the routes along Calhoun Road were negative. No feedback was received from stakeholders related to the Hardship Application study area from the Open House Meetings held in other municipalities. Refer to Section 1.3 of the enclosed Hardship Application for a complete list of Open House Meetings in municipalities impacted by the pipelines as well as a list of coordination meetings with New Berlin city officials. See Appendix C for Waukesha Freeman quotes from the February 15, 2018 Open House Meeting held in New Berlin related to feedback on the routes in the study area.

7. **Comment No. 7:** *From Section 2.3 Opinion of Probable Construction Cost: The cost opinions are shown relative to Route Alternative 1.*

   How and why was Alternative 1 selected to compare the other alternatives? Figure 2-1 does not show any costs, which WisDOT expected. There should be line item costs for the various alternatives, and maybe a better comparison would be a Benefit/Cost ratio assessment.

   Response to Comment No. 7: The comparative cost relative to a single route alternative has been removed from the Hardship Application. The Class 4 Opinion of Probable Construction Cost for each route alternative is provided in Section 4.2 of the enclosed Hardship Application.

8. **Comment No. 8:** *Class 5 Opinion of Probable Construction Cost are typically prepared during studies, long-term capital improvement planning, and initial alternative viability screening.*

   Using the chart below, AACE Class 4 should probably be used since this is a study and to gain better cost accuracy.

18R-97: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries 3 of 15

March 1, 2016

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%

Response to Comment No. 8: The Opinion of Probable Construction Costs are now being completed to an AACE Class 4 level. Refer to Section 4.2 of the enclosed Hardship Application.

9. **Comment No. 9:** *From Section 2.4 Analysis of Alternatives: Route Alternative 10 was eliminated from consideration, as it routes through College Avenue, which is a narrow corridor flanked with overhead electrical utilities and an overhanging tree canopy. Since the corridor is narrow, it would require full closure during construction. The corridor is hilly with tight bends. Production during construction through this corridor is anticipated to be slower than those in wider corridors where there is more room to operate construction equipment. For these reasons, Route Alternative 10 was eliminated from further consideration in advance of Open House Meetings.*

   Use of HDD construction would likely bring at least part of this road, from Racine Ave to Small Rd, back into consideration. The rest of the alternative could tie in with the remainder of Small Rd currently shown in the draft report. An assumption was made that the road would have to be closed. Even with trench construction, a daily flagging operation could be used with the trench box filled back in each day to facilitate traffic movement. A flagging operation could also be used for HDD construction.

   Response to Comment No. 9: The portion of College Avenue west of Small Road would utilize open-cut construction. The corridor appears wide enough to only require lane closures. However, Small Road is flanked with trees and overhead electric lines, which would increase the potential for tree removal and the need for road closures with the pipeline under pavement.

   Route Alternative 10B has the third highest potential maintenance of traffic impacts at an anticipated Additional Total Road User Cost of over $5M.

   Refer to Sections 3.11 and 3.12 of the enclosed Hardship Application for updates to Route Alternative 10. Route Alternative 10 was split into two route alternatives, 10A and 10B. Route Alternative 10A would follow the original alignment but utilize HDD east of the intersection with Small Road where the corridor is narrower. Due to the large size equipment needed to drill HDPE pipe at diameters required for the Program, the corridor would still require road closure with the use of trenchless construction. Route Alternative 10B would follow Small Road northeast of its intersection with College Avenue to avoid the need to HDD a long segment of road.

10. **Comment No. 10:** *From Section 2.4 Analysis of Alternatives: Route Alternatives 2, 4, and 8 were developed as routes that would predominantly not utilize public right-of-way. Route Alternatives 2 and 4 were developed to follow section lines in order to minimize the number of easements required. However, these two route alternatives would still require 11 and 10 easements, respectively. Route Alternative 8 was developed to follow Interstate 43 just beyond the right-of-way line, and would require 13 easements. These route alternatives will require additional cost to acquire the easements. There are added risks for Program costs and schedule in cases where a given property owner opposes the purchase of an easement.*

    While some property owners may not want to sell easements, it appears that WWU has the legal authority to condemn. Since a DOJ stipulation is involved, any condemnation procedures that have legal challenges would likely be handled in a prompt manner. In addition, there is no discussion about possible enhancements that may be created with the easements. For example, a multi-purpose recreational trail could be built over the top of the pipeline. This may foster good public relations with the project. It should also be noted that while acquiring private easements along I-43 does require additional costs upfront, it protects WWU in the future if the facility needs

to be moved in conjunction with a WisDOT highway improvement project. By policy, WisDOT pays utility easement holders who have to move or adjust their facilities as a result of a project. If the WWU facilities are located on I-43, then WWU would have to pay to move or adjust its facilities.

Response to Comment No. 10: Section 32.05 of the Wisconsin Administrative Code allows for WWU to condemn property for the pipeline. Per Section 32.05(9)(a), the owners have the ability to appeal the easement offer for up to two years. While WWU may acquire an easement based on eminent domain, it would be a hardship for WWU to exercise eminent domain for the following reasons:

- Waukesha ratepayers would incur additional costs to acquire more easements than to locate the pipeline in public right-of-way.
- Waukesha ratepayers will incur additional costs to construct permanent access roads for pipeline maintenance purposes. Additionally, New Berlin property owners who own farmland where easements are required will incur a permanent reduction in revenue due to a reduced harvestable area.
- There is a negative public perception associated with exercising eminent domain in New Berlin, a neighboring community whose citizenry will not benefit from the Program. WWU is endeavoring to maintain good relationships with the neighboring communities who are being negatively impacted during the construction of the infrastructure to serve the community of Waukesha.
- New Berlin, who is not receiving a direct benefit from the Program, has expressed concern over reconstructing recently rebuilt roads in their community. Refer to **Appendix B** of the enclosed Hardship Application for a letter from the Mayor of New Berlin expressing concern on some of the route alternatives evaluated. In addition to WWU's desire to maintain good relationships with their neighboring communities, per New Berlin City Ordinance 275-15, the planning commission has the ability to approve, approve with conditions, or deny the conditional use permits required to build Program infrastructure in New Berlin.

There are added risks to the Program costs and schedule in cases where the property owner opposes the purchase of an easement. Section 32.05 of the Wisconsin Administrative Code allows for WWU to condemn property for the pipeline if WWU can defend the public necessity of the Program. The process to use eminent domain can take six to 14 months and, in addition to that, per Section 32.05(9)(a), the owners have the ability to appeal the easement offer for up to two years. While WWU may own the easement based on eminent domain, the costs for the Program have the potential to increase. Additionally, by avoiding condemnation, WWU reduces its risk of not meeting the milestone dates specified in the July 2017 Amended Stipulation and Order for Amended Judgement. If there are multiple owners, they can organize themselves into class action lawsuits that can take time to resolve and also increase the potential costs to WWU due to legal fees. With the costs, negative public perception, and schedule risks associated with easements, it has been the goal of the Program to limit the number of easements. The above items are described in the enclosed Hardship Application.

In meetings with the municipalities that will be affected by the installation of the pipelines, WWU has discussed about additional improvements for the general public to utilize. Those discussions are ongoing.

WWU is aware that they will be responsible for relocating the pipeline in conjunction with future WisDOT improvements along the Interstate 43 right-of-way.

11. **Comment No. 11:** *From Section 2.4 Analysis of Alternatives: The public voiced more concerns regarding route alternatives located along Lawnsdale and Observatory Roads, which are narrower corridors in closer proximity to local residents. These include portions of Route Alternatives 3, 5, and 6.*

What are these concerns? How would they affect the end result once the pipeline was installed? A large section on the west end of Lawnsdale is rural and could easily accommodate the pipeline using HDD construction.

Response to Comment No. 11: Open House Meetings were held in New Berlin on June 29, 2017 and February 15, 2018. Stakeholders that attended the Open House Meetings expressed concern with the route alternatives along Observatory and Lawnsdale Roads. The concern was that the narrow corridors have trees and overhead electric lines in close proximity to the road as well as the effects of construction on residents along Observatory and Lawnsdale Roads. To mitigate impacts to nearby residents, the method of construction was adjusted to trenchless construction via HDD. While utilizing HDD would limit the impact to residents, the road would likely need to be closed and open to local traffic only.

Refer to Section 3.4 and 3.6 of the enclosed Hardship Application for the description of the construction method along Observatory and Lawnsdale Roads.

12. **Comment No. 12:** *From Section 2.4 Analysis of Alternatives: The property owner through the proposed easement southwest of the intersection of National Avenue and Calhoun Road was not open to selling the easement required. This easement would be required for Route Alternative 5.*

    As stated previously, WWU appears to have statutory authority to condemn for easements.

    Response to Comment No.12: WWU has the ability to condemn property per Section 32.05 of the Wisconsin Administrative Code. The property owner southwest of the intersection of National Avenue and Calhoun Road is opposed to selling an easement to the Program. The Program has decided to avoid acquiring an easement on this property through condemnation. Route Alternative 5 was refined to use a different easement to avoid exercising eminent domain.

13. **Comment No. 13:** *From Section 2.4 Analysis of Alternatives: Beloit Road was reconstructed in 2017 and stakeholders expressed concern that route alternatives along Beloit Road would negatively impact the new pavement. Beloit Road is along portions of Route Alternatives 6 and 7.*

    The use of HDD construction could alleviate this concern.

    Response to Comment No. 13: The construction method along segments of Route Alternatives 6 and 7 that utilize Beloit Road were adjusted to utilize trenchless construction via HDD. This would minimize impacts to Beloit Road that was recently reconstructed and reopened in 2018. It is anticipated that the limits of construction of HDD would still require Beloit Road to be closed for portions and would impact traffic.

    Refer to Sections 3.7 and 3.8 of the enclosed Hardship Application for the description of the method of construction for Route Alternatives 6 and 7. Refer to Section 4.1 for the maintenance of traffic impacts for Route Alternatives 6 and 7.

14. **Comment No. 14:** *From Section 2.4 Analysis of Alternatives: Coffee Road was recently improved and stakeholders expressed concern that route alternatives along Coffee Road would require rebuilding the road. Coffee Road is along portions of Route Alternative 1.*

    The use of HDD construction could alleviate this concern.

    Response to Comment No. 14: The construction method along segments of Route Alternatives 1 and 11 that utilize Coffee Road were adjusted to utilize trenchless construction via HDD. The Water Supply Pipeline from the City of Milwaukee is anticipated to utilize Coffee Road from National Avenue to Swartz Road. With both pipelines in the Coffee Road right-of-way and to minimize impacts to the newly reconstructed Coffee Road, the construction method for the Return

Flow Pipeline would utilize HDD. Even with the use of HDD, road closures are still anticipated for Coffee Road due to the limits of construction required for trenchless construction via HDD.

Refer to Sections 3.1.2 and 3.2 of the enclosed Hardship Application.

15. **Comment No. 15:** *From Section 2.4 Analysis of Alternatives: In consideration of stakeholder feedback received, Route Alternatives 3, 5, 6, and 7 were eliminated from further consideration.*

    Stakeholder feedback by itself is not sufficient to eliminate route alternatives from the overall analysis especially since the HDD construction method was not considered except for a small portion of I-43.

    Response to Comment No. 15: The initial draft of the Hardship Application utilized trenchless construction along portions of all route alternatives, including Interstate 43, to mitigate traffic impacts at intersections and to cross waterways. The enclosed Hardship Application has been revised to utilize trenchless construction via HDD along route alternatives to minimize public impact per stakeholder feedback. The route alternatives were evaluated using economic and non-economic evaluation criteria in order to determine the preferred route alternative.

    Refer to Section 3.1 for an overview of construction methods and Sections 3.2 - 3.13 of the enclosed Hardship Application that summarizes the construction method for each route alternative.

16. **Comment No. 16:** *From Section 2.4 Analysis of Alternatives: After the above evaluation, two route alternatives remained for further consideration, Route Alternatives 1 and 9. Route Alternative 1 has a higher Class 5 Opinion of Probable Construction Cost than Route Alternative 9, predominantly attributed to the additional pavement replacement anticipated along portions of Calhoun Road. Calhoun Road is a narrower, hillier corridor that is anticipated to have a slower production during construction.*

    Since estimated construction costs were not provided in the report, the actual difference may not be as significant as expected especially if HDD construction is primarily utilized, which requires minimal pavement replacement. In addition, it was not investigated if parts of alternatives could be combined, for example using College Ave and Small Rd. Other possible alternatives should also be investigated, for example using Coffee Road to Moorland, then to the location on Moorland Rd where the route is already planned. The median of Moorland Rd may be a good location especially with HDD construction.

    Response to Comment No. 16: Class 4 Opinion of Probable Construction Costs were completed to evaluate each route alternative. New route alternatives were added to the enclosed Hardship Application, including evaluating the use of Moorland Road and the potential of combining other route alternatives together.

    HDD was considered for segments of numerous route alternatives. Refer to the following sections of the enclosed Hardship Application for specific instances:

    - Section 3.2 that demonstrates Route Alternative 1 utilizing trenchless construction via HDD along its Coffee Road segment.
    - Section 3.11 and 3.12 that demonstrates potential combinations of Route Alternative 10.
    - Section 3.13 for the additional Route Alternative 11 that demonstrates a route that follows from Coffee Road to Moorland Road.
    - Section 4.2 for Class 4 Opinion of Probable Construction Costs per route alternative.

17. **Comment No. 17:** *From Section 2.5 Summary of Justification for Preferred Route: Based on the evaluation of route alternatives, use of the Interstate 43 right-of-way (Route Alternative 9) will minimize stakeholder challenges by being the least disruptive to the public.*

This should be reevaluated since HDD was not considered as a primary construction method for any of the alternatives, except for small areas on I-43.

Response to Comment No. 17: The initial draft of the Hardship Application utilized trenchless construction along portions of all route alternatives, including Interstate 43, to mitigate traffic impacts at intersections and to cross waterways. The enclosed Hardship Application has been revised to utilize trenchless construction via HDD along route alternatives to minimize public impact per stakeholder feedback based on WisDOT's comments on the previous draft of the Hardship Application. The route alternatives were evaluated using economic and non-economic criteria in order to determine the preferred route alternative.

18. **Comment No. 18:** *From Section 2.5 Summary of Justification for Preferred Route: The other alternatives require construction in narrower corridors flanked by overhead electric utilities, in close proximity to trees and passing numerous residential properties. Construction along many of the other route alternatives would require extensive detours because of the necessity to close the roadways. The detours would have longer travel durations and travel distances until the roads could be reconstructed.*

    This may not be true if HDD construction is utilized. Even with trench construction, a daily flagging operation could be used and then the trench box filled in at night. This method is used on other utility projects to give residents and business owners' access to their property until construction is over.

    Response to Comment No. 18: HDD has been considered for many of the route alternatives. It is anticipated that the limits of construction for HDD would still require narrow corridors to be closed to through traffic. Refer to Section 3.1 of the enclosed Hardship Application for the description of construction methods. Refer to Section 4.1 for the anticipated maintenance of traffic impacts per route alternative. It is acknowledged that road closure would allow local traffic access only.

19. **Comment No. 19:** *From Section 2.5 Summary of Justification for Preferred Route: Compared to the other route alternatives, Route Alternative 9 requires fewer easements, lowers potential impacts to parks and open spaces, and reduces suspected wetland impacts. Route Alternative 9 reduces maintenance of traffic requirements pertaining to additional travel time and travel distance due to detours, thereby minimizing public impacts. Route Alternative 9's benefits would be realized in design and construction through improved scheduling, less permitting time and cost, as well as increased overall public acceptance of the Program.*

    Discussion about eliminating detours if HDD construction is used has been discussed previously. Less permitting time is not totally accurate. With a project of this magnitude, many regulatory authorities will be involved. Whether it's WisDOT or another highway authority, permits will still be needed. In addition, the Federal Highway Administration would have to give its approval of this installation since it involves a longitudinal installation on an Interstate, which requires an exception to WisDOT's Utility Accommodation Policy. Thus, additional review and processing time may be required if I-43 was used.

    Response to Comment No. 19: The enclosed Hardship Application has been revised to include additional evaluation of route alternatives using different construction methods. Additional information on construction methods, including using HDD have been added to the Hardship Application. Refer to Section 3.1.2 of the enclosed Hardship Application that describes maintenance of traffic requirements for trenchless construction via HDD. As discussed in that section, it is anticipated that, due to the large size equipment needed to drill HDPE pipe at diameters required for the Program, many of the corridors would require closure with or without use of trenchless construction.

Permitting is a critical part of this Program. The Program has been engaged with local, state, and federal regulatory agencies since 2016 when the Program began. Coordination and approvals from the various regulatory agencies will be required for any route alternative that is selected, including WisDOT.

The enclosed Hardship Application evaluates the route alternatives and concludes that the requested use of the Interstate 43 right-of-way through an exception per 23 CFR 1.23 (c) is the recommended route.

20. **Comment No. 20:** *From Section 2.5 Summary of Justification for Preferred Route: It was determined Route Alternative 9 is more preferable than the other route alternatives and is in the public's interest.*

    Use of HDD construction and the possibility that WWU may condemn for easements were not adequately presented or vetted in the draft report with discussion of all 10 alternatives. Estimated costs for those alternatives were not presented either. There was no discussion on the fact that WWU would be charged a fee for the longitudinal occupation of controlled-access highway ROW (I-43). This is outlined in WisDOT's Utility Accommodation Policy HMM 09-15-40. WWU's proposed installation would occupy ~2.1 miles of I-43 ROW. At $10,000/mile, this equates to a $21,000 fee. The fee is good for a 20-year period. If at the end of 20 years WWU wants to keep its facility in WisDOT I-43 ROW, WWU would be charged again at the going rate as published in the Policy for the next 20 years. Additional research should be done to present an accurate and detailed report to request for an exception to WisDOT policy to longitudinally occupy I-43 ROW for WWU's water return pipeline.

    Response to Comment No. 20: Additional route alternatives were added per comments provided by WisDOT. The method of construction for route alternatives were revised per comments provided by WisDOT.

    The Class 4 Opinion of Probable Construction Cost provided for Route Alternative 9 in Section 4.2 includes the present value of the Utility Accommodation fees required to occupy approximately 2.1-miles of Interstate 43 right-of-way over 100-years.

    - Refer to Section 3.1 for a description of the construction methods.
    - Refer to Sections 3.2 through 3.13 for a description of the construction methods for each route alternative.

21. **Comment No. 21:** *From Section 4.1 Liability and Responsibilities:*

    A bullet should be added to detail that, "WWU shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes harmless, as allowed by Wisconsin law,..." in addition to other indemnification language listed on the back of WisDOT's DT1553 utility permit/application form.

    Response to Comment No. 21: Language will be added to the Contract Documents to indemnify WisDOT if the Interstate 43 right-of-way is used. Refer to Section 7.1 of the enclosed Hardship Application.

GREELEY AND HANSEN

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November 16, 2018

Robert Fasick
State Right-of-Way Permits Engineer
Bureau of Highway Maintenance
4822 Madison Yards Way, 5th Floor South
Madison, WI 53705
(608) 266-3438

Subject: Waukesha Water Utility - Great Water Alliance
Utility Accommodation Policy WisDOT Interstate 43 Hardship Application

Dear Mr. Fasick:

The Great Water Alliance (Program) has been developed to transition the City of Waukesha's water supply from groundwater to Lake Michigan water. Per a July 2017 Amended Stipulation and Order for Amended Judgment, City of Waukesha's water supply transition must be completed by September 1, 2023. In addition to the infrastructure required to supply water from the City of Milwaukee to the City of Waukesha, 23 miles of main (referred to as the "Return Flow Pipeline") is required to achieve a net zero water balance in the Great Lakes-St. Lawrence River Basin by conveying highly treated effluent to the Root River, which ultimately discharges into Lake Michigan. After completing the Route Study, the preferred route for the Return Flow Pipeline was identified. Approximately two miles of the preferred route lies within the Interstate 43 right-of-way between Racine Avenue and approximately 1,800 feet east of Calhoun Road in the City of New Berlin.

Under the Wisconsin Department of Transportation's (WisDOT's) Utility Accommodation Policy, water facilities are not allowed to longitudinally occupy limited access highway (e.g., freeway/expressway) right-of-way unless an exception is granted to the policy. Per 23 CFR 1.23 (c), an exception to the policy may be approved if the use of right-of-way is "in the public interest and will not impair the highway or interfere with the free and safe flow of traffic thereon." We are submitting this Hardship Application for an exception to this policy. The included evaluation outlines how utilizing the Interstate 43 right-of-way is in the public's interest and will not impair the highway or interfere with the free and safe flow of traffic thereon.

A draft WisDOT Interstate 43 Hardship Application (Hardship Application) was shared on May 17, 2018 to provide the documentation to support an exception to 23 CFR 1.23 (c). Comments from WisDOT on the Hardship Application were received on June 28, 2018. A conference call was held with you and members of the Program on July 20, 2018 to discuss WisDOT's comments on the Hardship Application and gain consensus on refinements to the Hardship Application to address the comments received.

A revised draft Hardship Application was shared August 23, 2018 to address the comments provided by WisDOT. WisDOT and Federal Highway Administration (FHWA) comments on the revised draft Hardship Application were received on October 5, 2018. A meeting to review the comments and provided responses was held October 23, 2018 at WisDOT Central Office (Farm Hills State Office Building, 4822 Madison Yards Way, Madison) with the following people in attendance:

Name	Agency / Company
Dan Duchniak	Waukesha Water Utility
Ted Bluver	Great Water Alliance
Ryan Christopher	Great Water Alliance
Chris DeSilva	Great Water Alliance
Katie Richardson	Great Water Alliance
Kevin Richardson	Great Water Alliance

Name	Agency / Company
Ian Chidster	Federal Highway Administration
Pete Garcia	Federal Highway Administration
Steve Kemna	Public Service Commission
Stacy Schumacher	Public Service Commission
Ben Callen	Wisconsin Department of Natural Resources
Greg Berry	Wisconsin Department of Transportation
Joel Brown	Wisconsin Department of Transportation
Robert Fasick	Wisconsin Department of Transportation
Dylan Gates	Wisconsin Department of Transportation
Terry Kittson	Wisconsin Department of Transportation
Margaret Liedtke	Wisconsin Department of Transportation
Sheri Schmidt	Wisconsin Department of Transportation

A decision is needed from WisDOT and FHWA on the Hardship Application by November 30, 2018 to meet the Program milestones or to allow the Program sufficient time to develop other route alternatives.

As per previous correspondence between WisDOT and Greeley and Hansen, Greeley and Hansen, on behalf of the City of Waukesha Water Utility, is hereby resubmitting for your review an updated Utility Accommodation Policy WisDOT Interstate 43 Hardship Application for Utility Accommodation within the Interstate 43 right-of-way. Responses to your comments are enclosed following this cover letter.

We will be in touch with you to discuss the next steps.

Yours very truly,

Greeley and Hansen LLC

Catharine M. Richardson, P.E., ENV SP
Program Manager

C: Mr. Daniel S. Duchniak, P.E., WWU General Manager
Ms. Kelly L. Zylstra, P.E., WWU Operations Manager

Encl (1): WisDOT Interstate 43 Hardship Application (electronic version)

Please find our responses to the WisDOT comments received October 5, 2018 on the Hardship Application from the Federal Highway Administration (FHWA) and Wisconsin Department of Transportation (WisDOT).

FHWA Comments:

1. **Comment No. 1***: In order for the proposed action to comply with applicable federal requirements, the following conditions must be satisfied:*

    a. *The scope of the environmental review must be broad enough to assess each potential alternatives' impacts, including, among other things*
        i. *The effect of ROW joint use on the travelling public: (23 CFR 645.209(a)).*
        ii. *The direct and indirect environmental and economic effects of any loss of productive agricultural land or any impairment of the productivity of any agricultural land that would result from a denial of Interstate ROW use (23 CFR 645.211(c)).*

    b. *Development of a use and occupancy agreement which describes the requirements for location, construction, protection of traffic, maintenance, access restriction and any special conditions application to the occupation and use of Interstate ROW (23 CFR 645.213(a)).*

    Response to Comment No. 1 (a):

    a. The traffic impacts of right-of-way joint use on the Interstate 43 corridor and other route alternatives are presented in Section 5.1 of the WisDOT Interstate 43 Hardship Application (Hardship Application). If the Hardship Application is approved, a Traffic Management Plan would be developed as part of the contract documents in accordance with 23 CFS 645.209(j) to minimize traffic impacts during construction.

    b. The impacted agricultural acreage for each alternative is presented in Section 5.1 of the Hardship Application. These will be referenced in a completed Categorical Exclusion Checklist.

    Response to Comment No. 1 (b):

    A use and occupancy agreement containing descriptions of the size, type, nature and extent of the pipeline as well as drawings showing the proposed location of the pipeline within the Interstate 43 right-of-way with respect to existing and planned Interstate 43 improvements, the traveled way, right-of-way lines, and the control of access lines and approved access points will be provided to WisDOT and FHWA if the Hardship Application is approved.

2. **Comment No. 2:** *The assessment in the Hardship Application is not a NEPA document and does not meet NEPA process and documentation standards in FHWA regulations and the WisDOT Facilities Development Manual.*

    Response to Comment No. 2:

    The Program has been coordinating with the Wisconsin Department of Natural Resources (WDNR), who issued a Preliminary Final Environmental Impact Statement (EIS) in January 2016 regarding the environmental impacts of the Program. WDNR is currently updating the EIS to reflect the current preliminary design. The EIS is intended to support compliance with the Wisconsin Environmental Policy Act (WEPA). This document can be used as an additional reference.

As agreed at the October 23 WisDOT meeting, a Categorical Exclusion Checklist will be submitted to WisDOT to demonstrate National Environmental Protection Act (NEPA) compliance. The Program team will work with Joel Brown of WisDOT's Environmental Section to meet the requirements of the Categorical Exclusion Checklist.

3. **Comment No. 3:** *The environmental process, document, and analysis methods used must meet NEPA standards*.

   Response to Comment No. 3:

   Refer to Response to Comment No. 2.

4. **Comment No. 4:** *The environmental study scope must be broad enough to appropriately assess potential impacts.*

   Response to Comment No. 4:

   Refer to Response to Comment No. 2.

5. **Comment No. 5***: WisDOT environmental staff should review this action and assist you in proposing an appropriate class of action and scope for the NEPA analysis and documentation. The proposal must include public and agency involvement commensurate with the action.*

   Response to Comment No. 5:

   Refer to Response to Comment No. 2.

6. **Comment No. 6:** *We recommend assessing environmental analysis and documentation that has already been prepared to meet other environmental requirements associated with this proposal to ensure consistency between what has already been prepared and the documentation submitted to comply with FHWA NEPA requirements. Also, previous documentation may be suitable for incorporation into a NEPA document to meet FHWA requirements.*

   Response to Comment No. 6:

   Refer to Response to Comment No. 2.

7. **Comment No. 7***: In addition to the normal elements of the NEPA process (e.g. purpose and need, alternatives, impacts and mitigation, etc.), the following aspects of the proposal warrant analysis:*

   a. *Potential for a pipe breakage or failure, impacts of a failure on interstate traffic, and provisions to prevent a failure or mitigate the impacts of a failure.*

   b. *Discussion of how the proposal is compatible with future interstate maintenance or expansion such as specifically addressing compatibility of any programmed or planned projects.*

   Response to Comment No. 7, Part (a):

   The Return Flow Pipeline will be designed in accordance to American Water Works Association (AWWA) standards. Design provisions in excess of AWWA standards are being implemented to provide for a 100-year service life for the pipeline in order to mitigate the risk of a pipe breakage or failure occurring. Pressure in the pipeline will be measured downstream of the Interstate 43 corridor in order to monitor for pipe failure. If a failure occurs in the Interstate 43 corridor, the

pressure in the pipeline will drop significantly and signal an alarm. The Return Flow Pumping Station would then be turned off, while the maintenance to pipeline is completed in coordination with WisDOT. Refer to Section 3.2 of the enclosed Hardship Application for details.

Response to Comment No. 7, Part (b):

The pipeline design will take into consideration future improvements and maintenance by coordinating with WisDOT and locating the pipeline sufficient distance from existing and future anticipated pavement limits to mitigate impact on Interstate 43. Refer to the enclosed Hardship Application, Section 3.3, with regards to how the Return Flow Pipeline is compatible with future interstate maintenance and expansion.

8. **Comment No. 8:** *Throughout the application is the premise that schedule impacts caused by easement condemnation could threaten compliance with terms of the July 2017 Amended Stipulation and Order for Amended Judgment. To evaluate the merits of such a contention will require access to the Stipulation document.*

Response to Comment No. 8:

A copy of the Amended Stipulation and Order for Amended Judgment dated July 2017 was provided in the October 23, 2018 meeting at Hill Farms with the Program, WisDOT, FHWA, WDNR, and Public Service Commission (PSC) and is included in Appendix G of the Hardship Application.

9. **Comment No. 9:** *Statements relating to condemnation procedure and applicable time frames require further development and explanation.*

    a. *e.g., eminent domain can take six to 14 months.*

    b. *multiple owners "can organize themselves into class action lawsuits that can take time to resolve …"*

Response to Comment No. 9a:

As previously noted, the Waukesha Water Utility (WWU) is able to acquire land through the condemnation process, even outside its borders, per Wisconsin Statutes 32.05. The Program is working with The Highland Group and Terra Venture, two real estate companies that specialize in real estate acquisition and the condemnation process, to acquire the required land for easements for the Return Flow Pipeline.

The process and schedule for acquiring easements are described in the table below:

Task List	Duration (days)	
	Minimum	Maximum
Develop plat of easement with legal description, prepare easement language, and prepare resolution.	--	--
Waukesha Water Utility legal review of easement package	--	--
Pass resolution authorizing easement process with Waukesha Water Utility Commission and City of Waukesha Common Council	--	--
File Package with County Clerk a maximum of 20 days after the resolution is passed.	20	20
Run Title Report	7	14
Draft letter of introduction to property owner stating the Waukesha Water Utility will be purchasing their property	7	14
Review draft letter to property owners	14	28
Send out letters and information regarding the property owner's	14	28

Task List	Duration (days)	
	Minimum	Maximum
rights		
Proposed easement gets staked out	28	53
Conduct Appraisal	28	53
Review and Share Appraisal with Waukesha Water Utility. Approve appraisal, authorizes Highland Group to make an offer on WisDOT Offering Price Report form	--	--
Extend offer to property owner, who have 60 days to accept or reject the offer	60	60
Upon the property owners accepting the offer, payment made and easement recorded	--	--
Total (days)	**178**	**270**
Total (months)	**6**	**9**
If the property owner rejects the offer, the eminent domain process will begin. The property owner has up to 120 days from the date that the Waukesha Water Utility approves the Offering Price Report to accept.	120	120
If that offer is rejected, Waukesha Water Utility to make jurisdictional offer. The property owner has up to 20 days to accept or reject.	--	--
Upon offer rejection and Jurisdictional offer acceptance, easement is received and recorded	--	--
If the property owner rejects the offer and jurisdictional offer, make Award of Damages, and the easement is received and recorded, and payment made. This process can take up to 120 days.	--	--
The property owner has the right to contest the right of condemnation.	40	40
Provide written notice to the property owner of the required move date within 90 days.	--	--
Total (days)	338	430
Total (months)	**11**	**14**
Any party having ownership interest in the acquired property has 2 years from the date of evaluation to challenge the compensation award.	--	730

Response to Comment No. 9b:

One of the goals of the Program was to minimize the use of easements and maximize the use of public right-of-way for the pipeline routes. In some instances easements were required due to environmental impacts, constructability, or coordination with the local municipalities to minimize impacts to roadways.

For routes with a number of easements, there is a concern that the property owners could organize themselves and file class action lawsuits against the Program and WWU. The property owners could take WWU and the Program to court the right to utilize eminent domain or the value of the land. This has occurred in some instances per our real estate consultants. While the lawsuits would ultimately be worked out, there is a concern that the schedule could be impacted and costs for WWU could increase to pay for additional legal costs.

10. **Comment No. 10:** *Improved accuracy of ROW cost estimates and estimating method.*

    a. *Explanation for $25,200/acre easement value.*

    b. *Explanation for ROW administrative fee of $19,400/parcel.*

Response to Comment No. 10:

The Program estimated the value of land when acquiring easements to be $25,200 per acre. These costs were meant to be an average of the different types of land in the various communities that the pipeline is passing through. It is estimated that agricultural land will cost $6,000-$10,000 per acre and residential land will cost $55,000-$65,000 per acre.

The administrative costs for the Program to acquire easements were estimated to be $19,400 per parcel. This takes into account the work that the real estate companies have to complete, title searches, appraisals, and recording fees. The Program's surveyor also requires time to complete a field survey and prepare the legal description.

11. **Comment No. 11:** *Class 4 Opinion of Probable Construction Cost – accuracy of methodology, e.g., Section 4.2 Economic Evaluation: "A Class 4 Opinion of Probable Construction Cost (OPCC) has been developed for each route alternative to provide a means for evaluating route alternatives on an economic basis in accordance with the Association for the Advancement of Cost Engineering's (AACE) Recommended Practice No. 18R-97. A Class 4 OPCC per AACE standards are typically used for project screening, determination of feasibility, and concept evaluation."*

    a. *Explain why this method is this the best available method for comparing route alternative costs.*

Response to Comment No. 11:

The Program is utilizing the American Association for Cost Engineering (AACE) standards for all costs developed for the Program and is recognized as an industry standard. This provides for consistency throughout the planning and design phases of the Program.

12. **Comment No. 12:** *Document lacks substantive discussion of potential mitigation methods and techniques that could improve the project's negative public perception.*

    a. *Multi-use path construction.*

    b. *Other in-kind municipal contributions.*

    c. *Merits of employing multi-media public relations advertising campaign.*

Response to Comment No. 12:

The Program has been coordinating with the local municipalities impacted by the construction of the Water Supply and Return Flow Pipelines. Where appropriate, the Program is looking at repairing or installing new sidewalks or paths for the municipality. For instance, in the City of Muskego, the Return Flow Pipeline will be located under a multi-use path for long stretches. After the installation of the Return Flow Pipeline, the multi-use path will be rebuilt.

The Program has a support team that is responsible for public relations. This includes creating and updating the Program website, social media, public open houses, public outreach through newspapers and other media, among other types of outreach.

The PSC has rules that limit the amount of recoverable funds attributed to public outreach per Wisconsin Administrative Code 196.595. The Program public outreach effort to date has been in accordance with what PSC regulations will allow to be recovered from ratepayers.

WisDOT Comments:

1. **Comment No. 1:** *WisDOT and FHWA reviewed the report's analysis and conclusions, and we recommend that the approach be more uniform and consistent throughout the document. Our*

review suggests that the document's current organization and analysis adversely impacts the level of confidence reasonably placed on the report's conclusions. We offer the following suggestions:

a. *A possible method for strengthening the analysis may be to combine all facts for each alternative including maintenance of traffic (work zone traffic control), construction methods, etc. into section 3 and incorporate all of section 6 – Construction Strategy. It may also require pulling facts from section 5. Further, it might be more useful (persuasive) if the analysis were to evaluate the same aspects for all alternatives, e.g., the review noted that maintenance of traffic for alternatives 1 and 11 were not evaluated. It is understood that this would not be required for alternatives 2, 4 and 8, but you may want to include a footnote in the table as to why.*

b. *It may be more practical to combine section 4 and the evaluation portions for each alternative of section 5 into one section labeled "Route Evaluation" rather than "Preferred Route Evaluation." A preferred route many be listed in this section, but the alternatives should be kept in sequential order (i.e., don't place your preferred alternative at the end). You may want to consider creating a whole new paragraph (i.e., X.X) that highlights the preferred alternative or perhaps two or three viable alternatives with a preferred one, and the others dropping out for various reasons.*

c. *From the Executive Summary: "The wetlands along Route Alternative 9 have been field-delineated and documentation has been prepared for the Wetlands and Waterways Individual Impact Permit Application. Survey has been completed and horizontal and vertical alignments are being designed in preparation for a 60% design submittal. Route changes will delay design and submittal of the Wetlands and Waterways Individuals Permit Application." This is just one example of partiality in the report towards the preferred alternative. Proper procedure is usually to request and obtain the hardship waiver first, and then start the design since the exception may not be granted.*

Response to Comment No. 1 (a) and (b):

The Hardship Application will be reorganized to reflect the comments above. An outline of the reorganized Hardship Application was shared and discussed with Bob Fasick on October 25, 2018 and agreed to.

Response to Comment No. 1 (c):

The Program construction deadline is dictated in the Amended Stipulation and Order for Amended Judgement, included in Appendix G of the Hardship Application. Based on the Program schedule requirements and the plant growing season which spans approximately April to October, it was necessary to perform survey and wetland delineation work on the preferred alternative route during the preliminary design stage. Delaying field delineation until after a hardship waiver is obtained and subsequently applying for the appropriate permits is not a feasible approach to meet the milestones set forth in the Amended Stipulation and Order for Amended Judgement.

2. **Comment No. 2:** *Please review FHWA's comments regarding the Federal NEPA requirements under 23CFR 771.117(c)(2) for the portion of WWU's project (longitudinal and crossing) that will affect Interstate 43. In addition, how does DNR's environmental impact statement align with Federal environmental requirements? A separate NEPA document may be needed with the hardship application using a categorical exclusion checklist. Information on this checklist and other environmental actions can be found on WisDOT's website. Joel Brown of WisDOT's Environmental Section can assist you with any questions. He is copied on the email or call him at (608) 630-3202.*

Response to Comment No. 2:

Refer to Response to FHWA Comment No. 2.

3. **Comment No. 3:** Add a bullet point to the Executive Summary: "A decision is needed from WisDOT and FHWA on the hardship application by _____ (insert date) to meet project milestones or allow Greely and Hansen time to develop other route alternatives."

   Response to Comment No. 3:

   The following language has been added to the Executive Summary: "A decision is needed from WisDOT and FHWA on the hardship application by November 30 to meet the Program milestones or to allow the Program sufficient time to develop other route alternatives."

4. **Comment No. 4:** *How many gallons per day will be carried by the return pipe? Add other facts such as no lift stations will be needed, i.e., the return line is all gravity fed, etc.*

   Response to Comment No. 4:

   The Return Flow Pipeline is required to convey the equivalent amount of potable water conveyed to the City of Waukesha back to the Great Lakes-St. Lawrence River Basin. Refer to Section 3.1 of the enclosed Hardship Application for details of the gallons per day conveyed by the Return Flow Pipeline.

5. **Comment No. 5:** *What is the likelihood of a pipeline failure on Interstate 43? What would be the ramifications of such a failure (consequences of potential impacts to traffic, freight movement, etc.)? What can be done to mitigate a leak once it occurs (i.e., shut-off valves)? These answers will help vet the public interest finding regarding, "…not impair the highway nor the free and safe flow of traffic."*

   Response to Comment No. 5:

   See response to FHWA Comment No. 7.

6. **Comment No. 6:** *We disagree with your approach referenced to the response in comment 5. Utility construction using HDD is frequently performed under wetland areas to avoid impacts to them. Just because the cost may be higher is not an adequate reason to dismiss evaluating an alternative that must go through wetland areas.*

   Response to Comment No. 6:

   The Program has been developing the Wetlands and Waterways Individual Permit Application in coordination with WDNR and the United States Army Corps of Engineers (USACE).

   As part of this application, a practicable alternatives analysis was completed to minimize wetland impacts along various route alternatives. Route alternatives that went through wetlands were not eliminated because they traverse wetlands. Instead, the practicable alternative analysis demonstrated that the use of horizontal directional drilling (HDD) through those wetlands is cost prohibitive and is, therefore, not the proposed construction method. The route alternative itself is not eliminated, instead the use of open-cut construction is the practicable alternative for that route alternative.

7. **Comment No. 7***: Response to comment 6: The newspaper article did not specifically address a "supply" or "return" pipeline. It just discusses a pipeline. Would you be able to provide a copy of the displays showing the proposed alternatives discussed at the 2/15/18 New Berlin meeting? We are curious to see what the public saw.*

Response to Comment No. 7:

The displays showing the proposed route alternatives from the New Berlin Open House on February 15, 2018 are included in Appendix F of the Hardship Application. The figures are also available to the public through the Great Water Alliance website. The figures that were shared at the New Berlin Open House are public and located here:

http://greatwateralliance.com/routes

8. **Comment No. 8:** *Are the parks and green space noted in alternative 1 at Calhoun Park? If not, they should be better described. For alternative 1, would an easement be obtained adjacent to the park lands in the farm field? The crops could still be planted over the top of the easement, correct? Re-review other comments made where it states that easements required on farmland will incur a permanent reduction in harvestable area. Again, if the pipeline is buried, why can't crops be planted over the top of the easement area?*



Response to Comment No. 8:

Calhoun Park is accounted for in the parks and green space for Route Alternative 1. There are other parks and green spaces along the route alternative together totaling approximately 1.74 acres. The only easement that would be obtained for Route Alternative 1 would be the farm field, parcel NBC 1286999001, on the southeast side of the Interstate 43 crossing. There is no easement anticipated to be required on the park land.

When the pipeline is in an easement that is not adjacent to a road, an access road will be required in order to access the pipeline for maintenance. It is anticipated that the gravel access road would be approximately 12-feet wide with the pipeline adjacent to it. The property owner would be allowed to continue to use some of the land within the easement for agricultural purposes, but would not be able to plant crops over the pipeline. The use of easements through agricultural land would result in a permanent reduction in harvestable area.

9. **Comment No. 9:** *If the Public Service Commission issues a Certificate of Public Convenience and Necessity (CPCN), which is their approval for the project, this action trumps a local authority's ability to withhold its permit approval, i.e., the City of New Berlin cannot "deny the conditional use permits" (responses to comments 4 & 10, 4th bullets). The authority may still issue a permit with reasonable conditions, but cannot stop the project. This should be clarified in your report.*

Response to Comment No. 9:

The PSC will review WWU's application for a Certificate of Authority (CA), not a Certificate of Public Convenience and Necessity (CPCN). PSC's issuance of a CA does not dictate that local

authorities have to grant WWU permits for construction within their jurisdiction. The public is also able to contest PSC's approval of a CA.

To better coordinate with local authorities and municipalities, the Program has held numerous meetings with local authorities to understand the permitting process. Open House Meetings were held in the communities that are impacted to receive input into the selection of route alternatives.

10. **Comment No. 10:** *Define the necessary easement widths, both permanent and temporary in each alternative. We did not find discussion on the use of temporary easements, which could aid with construction. For example, temporary easements on private property could be used for staging areas.*

    Response to Comment No. 10:

    The Program has defined easements required on private property to be 50-feet wide to accommodate construction of a single pipeline. The contractor will be constrained to work within the 50-foot wide easement. No temporary easements will be provided as part of the contract documents.

    The contractor may elect to acquire additional easements based on the means and methods the contractor utilizes to most efficiently and effectively complete the work. Any such additional easements will be identified and acquired, if needed, by the contractor after design is complete. The contractor will be required to meet all local, state, and federal laws and regulations if they decided to utilize temporary easements.

11. **Comment No. 11***: Eminent domain issue: While it may take 6 to 14 months to develop a plat, the eminent domain process still allows construction to continue if there is an appeal. Thus, the extra two years noted would not affect project milestones. It may affect the real estate budget for the project. If you are locating nearly all of the return pipeline in road right-of-way, the eminent domain issue for any alternative (especially if it is in New Berlin) is negligible.*

    Response to Comment No. 11:

    See response to FHWA Comment No. 9a for the schedule for acquiring easements.

    It is agreed that if easements are acquired through the use of eminent domain, the two years noted for appeals would not affect the Program schedule as construction is able to begin while the appeals process is worked out in court.

12. **Comment No. 12:** *Referencing WisDOT draft #1 comments regarding HDPE, it was stated that, "HDPE was considered as a material for the entire length of the pipeline. Use of HDPE pipe along the entire pipeline would produce pressures in excess of the maximum rated pressure for the material at the diameter of pipe that is recommended based on hydraulic analysis. HDPE pipe is being considered for segments of the pipeline that would use trenchless construction via HDD." Please provide computations to prove this claim. We found HDPE materials in sizes from 24" –30" that could handle 200 psi, which is well above the stated normal operating pressure of 100 psi at the top of page 5-6.*

    If HDPE is still being considered for those segments using HDD, why couldn't it be used in more locations in alternative 1 or other alternatives? Could HDPE be used for the entire length of Interstate 43? Also, ductile iron pipe, which is stated to be the most economical and therefore used to develop construction methods, has a propensity to leak more at the joints as compared to a fused joint with HDPE pipe. Was this considered in your evaluation? Is PVC pipe also being considered for HDD? We have been reading information on the Internet of successful sewer projects that used HDD with 24" diameter PVC pipes.

Response to Comment No. 12:

The Program reviewed various materials for the Return Flow Pipeline, including steel, ductile iron, high density polyethylene (HDPE), polyvinyl chloride (PVC), and prestressed concrete cylinder pipe (PCCP). Due to many factors, including cost, WWU's familiarity with the pipe material and ability to complete future maintenance, contractor familiarity in Southeast Wisconsin, ductile iron pipe (DIP) was selected as the pipe material for the Return Flow Pipeline.

Note that HDPE pipe will be specified for HDD.

Further, some of the challenges with using HDPE pipe is nominal pipe size and cost. The maximum normal operating pressure required to convey the maximum flow rate of 13.6 million gallons per day changes based on pipe material. The change is predominantly attributed to the inner diameter (ID) of the pipe material. The ID for HDPE pipe increases the head loss incurred relative to DIP.

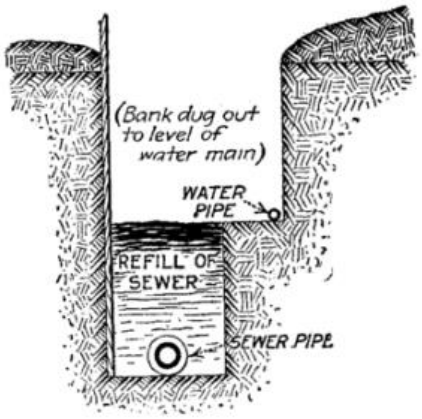
The outer diameter (OD), nominal wall thickness (t), and ID of HDPE and DIP at 30-inch nominal diameter pipe for rated pressures of 200 pounds per square inch (psi) are presented in Section 2.1 of the WisDOT Interstate 43 Hardship Application.

HDPE pipe is also more expensive than DIP. The costs for DIP and HDPE pipe are shown in Section 2.1 of the WisDOT Interstate 43 Hardship Application for 30-inch HDPE pipe rated to 200 psi. As shown, HDPE pipe is more costly than DIP.

PVC pipe, in addition to DIP and other materials, can be used in HDD application (see reference). WWU selected to not use PVC pipe because when it fails it tends to fail longitudinally along the pipe (see reference), which is difficult to repair. PVC pipe is more costly than DIP for 30-inch nominal diameters rated for 200 psi as shown in Section 2.1 of the enclosed Hardship Application.

13. **Comment No. *13:*** *3.2 Route alternative 1 – Coffee Road: We disagree with the analysis that if both pipelines were placed in the same corridor that one of them would have to be placed under the pavement. With a 100-foot ROW, there is sufficient distance to locate the pipes in the same corridor. The supply and return lines will be installed together in the same corridor on Racine Ave (north of Swartz) and on Sunset Ave. Since it is being done there, also investigate alternative 1 (Coffee Rd – Calhoun Rd) for the same thing. The 8-foot separation may be reduced to 5 feet or more with proper engineering reasons under NR 811.74(2)(b). You may want to check with Cathy Wunderlich at DNR for their input. Include discussion on horizontal and vertical separation. Include a typical section showing both pipes in relation to the road. It may save the project money to have both pipes in the same corridor. If so, by how much? How will traffic control be handled for supply line on Coffee Road? Blend that in with alternative 1 discussion. Also include a picture of the corridor as you did for the other alternatives.*

    It is stated on page 3-2, "The limits of construction are anticipated to increase an additional 15 feet to account for the water supply pipeline if both pipelines are located in the same corridor and utilize open-cut construction." Please include a diagram to show this (I provided one as an example). We think the pipelines may only be separated 5 feet or more. If so, how would that affect your construction distance? It also appears the excavator could be centered over the gap between the two pipelines. Even with an 8-foot separation and assuming 2 – 30" pipes, the total distance required is 13 feet, which is only one foot more than the 12 feet shown in figure 3-2. This may affect the 44-foot wide anticipated construction width for Coffee Road.



Response to Comment No. 13:

An eight-foot horizontal separation is utilized between the Return Flow Pipeline and the Water Supply Pipeline. The Program team met with WDNR on October 17, 2017, and confirmed that the minimum horizontal separation between the two pipelines is eight-feet, centerline to centerline, per NR 811.74(5). It was confirmed in that meeting that the Return Flow Pipeline is classified by WDNR as a sanitary sewer force main and is being designed as such.

Per NR 811.74 (5), no exception to the eight-foot separation distance may be granted for sanitary sewer force main installations unless the requirement in NR 811.74(2) (b) is met, which states that shallow bedrock must be the reason behind a narrower horizontal separation. Geotechnical borings have been completed along the Water Supply and Return Flow Pipeline routes and have confirmed that the installation of the pipelines in the corridor will not be within bedrock along Coffee Road. Therefore, the eight-foot horizontal separation is required per code.

Further, both the Water Supply and Return Flow Pipelines will be pressurized. A break in either pipeline would have a greater likelihood of damaging the other pipeline if a narrower horizontal separation was provided than that required per code. Furthermore, the Water Supply Pipeline will be City of Waukesha's primary source of potable water and will be required to provide uninterrupted service. WWU has decided not to cause undue risk to either pipeline by provided a horizontal separation narrower than that required per code.

Draft plan and profile drawings and a section of both pipelines along Coffee Road have been developed and are included in Appendix E of the Hardship Application. The drawings show that additional pavement would be impacted if both pipelines are installed along Coffee Road, something that New Berlin has requested the Program minimize.

Response to Comment No. 13 Part 3, Common Corridor Savings:

On the initial draft of the Hardship Application, dated May 17, 2018, trenchless construction was added to multiple corridors in the evaluation as per WisDOT's request. Trenchless construction via HDD was added to Coffee Road to mitigate excessive impacts to new pavement. This increases the cost of the Program by $11.2M above that if the Interstate 43 right-of-way were to be used. No savings is anticipated with this method of construction. Considering maintenance of traffic savings of 2.5% on the portion of the Return Flow Pipeline located in Coffee Road, the increase in cost would reduce to $10.9M. Thus, maintenance of traffic savings are not large enough to balance out the additional cost to HDD the Return Flow Pipeline along Coffee Road.

To have both pipelines in the same corridor that utilize open-cut construction is anticipated to cost $2.3M more than the route alternative that utilizes the Interstate 43 right-of-way, including

maintenance of traffic savings by limiting construction to one corridor for both pipelines. The increase in cost is attributed to additional pavement replacement along Coffee Road as well as the additional select fill required as backfill material along Coffee Road.

Response to Comment No. 13 Part 4, Common Corridor Section:

A section to construct the two pipelines in Coffee Road using open-cut construction is shown in Section 4.3.1.1 of the Hardship Application based on the draft plan and profiles shown in Appendix E of the Hardship Application. As shown, Coffee Road would be required to be closed during construction and open to local traffic only.

14. **Comment No. 14:** *At the top of page 3-3, the report states that, "…trenchless construction has higher linear foot unit cost than open-cut construction beneath pavement in the diameter ranges required for the pipeline." Does this include maintenance of traffic or the user delay costs to motorists due to lane or road closures for open cut pavement? What about using HDD longitudinally within the ROW but outside the pavement core and foreslopes? Some information we have read points to the contrary, i.e., that HDD saves more money than traditional open cutting. See the following link. You may want to provide other evidence to support your claim, such as the following link.*

Response to Comment No. 14, Part 1, Bid Tab Data:

The cost for Program construction will be determined during the bidding phase by contractors. The Program team relies on past design / construction experience, quotes from manufacturers, construction cost estimating data sources like RS Means, and bid tab information from recent nearby projects in order to develop the Opinion of Probable Construction Cost.

Recent bid tabs from Southeastern Wisconsin are included in Appendix D of the Hardship Application. The bid tabs show that open-cut construction is less expensive than HDD.

As discussed during the meeting on October 23, 2018, the links provided from WisDOT were found to be either qualitative without providing any specific metrics to regions or localities, focus on rehabilitation of existing pipe noted above, or note the need for additional data. WisDOT indicated the bid tab information is sufficient to demonstrate trenchless construction is more costly than open-cut construction for the type of HDD applications required for the Program.

15. **Comment No. 15:** *At the top of page 3-3, why does the size of the HDPE pipe jump to 36" when using HDD when the report states that the return line will be 30"?*

Response to Comment No. 15:

A larger HDPE pipe diameter is utilized when paired with DIP in order to accommodate for HDPE pipe's smaller ID (refer to Section 2.1 of the enclosed Hardship Application for details).

16. **Comment No. 16:** *Clarify the following sentence near the end of page 3-4: "Note that equipment required for HDD construction could be staged in a different manner than shown in Figure 3-3 and Figure 3-4, i.e., does this mean that there could be a better way to complete the HDD construction?*

Response to Comment No. 16:

The Hardship Application included a typical setup for HDD construction for the purpose of estimating maintenance of traffic requirements and limits of construction. The contract documents prepared by the Program will not dictate means and methods that the contractor has to utilize for construction, including HDD. The contract documents will include a limit of construction on the drawings that the contractor is required to stay within. The contractor will have the autonomy to

stage equipment within the limits of construction shown in a manner so as to more efficiently and effectively complete the work.

17. **Comment No. 17***: In the middle of page 3-3 regarding wetlands, the report states, "If the Return Flow Pipeline route was changed from using the Interstate 43 right-of-way, additional time and effort would be required to evaluate wetlands in different corridors and alternatives defended via a practicable alternatives analysis. This would negatively impact the overall Program schedule." This is another example of partiality towards the preferred alternative. When reviewing all alternatives, shouldn't all benefits and impacts for those alternatives be identified and analyzed? Also, is this an accurate statement for the Coffee Road alternative since you should have been analyzing wetland impacts for the supply line?*

    Response to Comment No. 17:

    Refer to Response to FHWA Comment No. 2.

    Coffee Road was delineated as part of the Water Supply Pipeline. The Return Flow Pipeline alternatives that include Coffee Road also include portions of the route that have not been delineated, such as Calhoun Road. In order for those routes to be selected as the preferred route, additional delineation would be required. Wetland delineation can only be completed during the growing season, typically April to October, depending on when the first frost occurs.

18. **Comment No. 18:** *Figure 3-3 on page 3-4 may be reduced in width if the slurry tank and pump were allowed to occupy a traffic lane and a flagging operation was used during work hours. The staging area may be able to go behind the rig thereby reducing the necessary footprint.*

    Response to Comment No. 18:

    See response to WisDOT Comment No.16.

    The contract documents prepared by the Program will not dictate means and methods that the contractor has to utilize for construction, including HDD. Section 2.1.2 of the Hardship Application discusses trenchless construction and anticipated limits of construction.

19. **Comment No. 19***: In the October 2013 City of Waukesha Environmental Report for Water Supply Alternatives, the return flow pipeline route was described in the table and map that follow. In July 2017, Milwaukee and Waukesha entered into an agreement whereby Waukesha would purchase water from Milwaukee instead of Oak Creek. This did not alter the proposed route for the return pipeline to the Root River. Should there be more emphasis on this alternative since it was mentioned in the initial environmental document? The main point here is the fact that the alignment shows a crossing of Interstate 43 – not a longitudinal installation.*

3.2.2 Return Flow Pipeline

A screening level layout was developed for the return flow pipeline (Figure 3-8 and Appendix 3-1). The alignment begins at the City of Waukesha WWTP and proceeds southeast through the Cities of New Berlin, Muskego and Franklin. The pipeline mainly follows major roads listed in Table 3-4. The pipeline follows previously disturbed transportation corridors to minimize environmental impacts. In total, the pipeline consists of about 20.2 miles of 30-inch pipe. Table 3-5 summarizes the return flow pipeline.

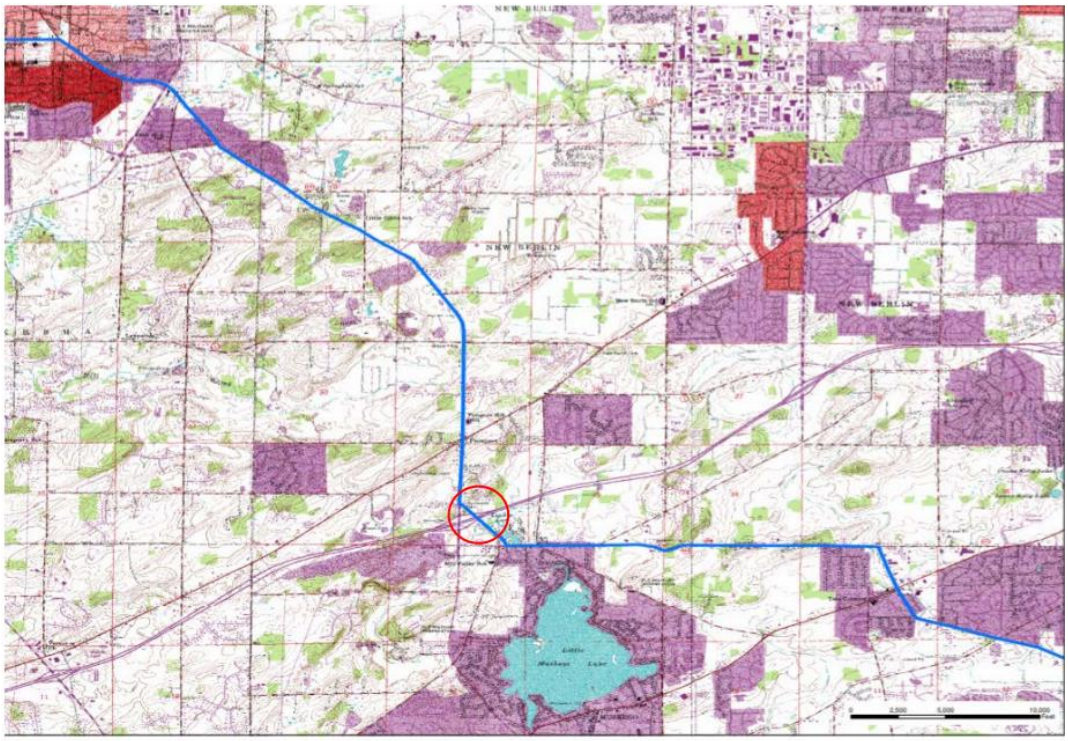
TABLE 3-4
Roads Parallel to Root River Return Flow Alignment 2

Direction	Length (miles)	Road	City
NE	0.4	Offroad	Waukesha
E	1.6	College Avenue	Waukesha
SE	6	Racine Avenue	Waukesha/New Berlin
SE	0.5	Minor Roads	New Berlin
E	2.7	W. College Avenue	New Berlin/Muskego
SE	2	Tess Corners Drive	Muskego
SE	2.5	W. Martins Road	Franklin
E	1.9	W. Puetz Road	Franklin
S	0.9	S. 68th Street	Franklin
E	0.5	W. Ryan Road	Franklin
S	1.2	S. 60th Street	Franklin

TABLE 3-5
Proposed Project Pipeline Facilities

Alternative	Diameter (inches)	Length (miles)	Counties
Return Flow for Lake Michigan Supply			
Root River to Lake Michigan Alignment 2	30	20.2	Milwaukee and Waukesha

Note: The final pipeline diameter may be 30 or 36 inches depending upon final design considerations. Either diameter pipe will have essentially the same construction width impacts due to construction staging requirements.



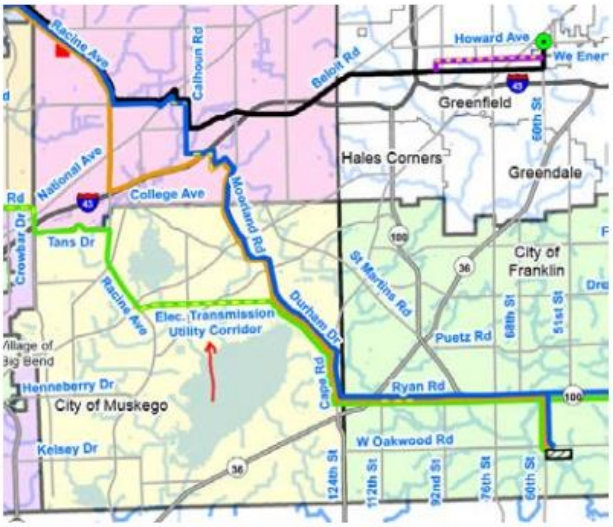
ROOT RIVER RETURN FLOW ALIGNMENT 2 - TILE 1

Response to Comment No. 19:

This route was eliminated from further evaluation during the initial phase of the Program Route Study in early 2017.

No emphasis is needed on this route as this has been discussed with the WDNR and an update to the Environmental Impact Report has been provided to WDNR reflecting that discussion so that they can finalize their Environmental Impact Statement.

20. **Comment No. 20:** *Why wasn't the alternative considered that is shown in "Figure 1: Potential Supply and return Routes" that uses the existing electric and transmission? This was included in the initial environmental document.*



Response to Comment No. 20:

The route alternatives shown in the figure were evaluated as part of the 4-100 D1 Route Study: Oak Creek. The route alternative noted above, Route Alternative 4, was eliminated by WWU predominantly due to constructability reasons. Route Alternative 4 would be routed through an Electrical Transmission Utility Corridor. The Electrical Transmission Utility Corridor contains multiple low-hanging power lines as shown in **Figures 1** and **2** below. Residents have extended backyard landscaping and other surface features into the Electrical Transmission Utility Corridor. Metallic pipelines would also require additional corrosion control to mitigate corrosion that could be induced by the power lines and to mitigate the potential of bleeding power from the electrical utility. Route Alternative 4 would also be routed through Tans Drive, as shown in **Figures 3** and **4**, which is a narrow corridor flanked with overhanging trees that would slow production during construction.

WisDOT concurred with the decision to not use Route Alternative 4 and indicated that further justification for eliminating Route Alternative 4 is not required other than that provided in this response.



Figure 1
Electrical Transmission Utility Corridor at Lannon Drive Looking West



Figure 2
Electrical Transmission Utility Corridor at Woods Road Looking West



Figure 3
Tans Drive Looking West



Figure 4
Tans Drive Looking East

21. **Comment No. 21:** *For any crossing of Interstate 43, include a section on how the installation under Interstate 43 would take place. Be specific on construction methods and possible duration.*

Response to Comment No. 21:

An Interstate 43 crossing would occur via the jack and bore method. The pipe would be installed inside a steel casing. The detail for the crossing is provided in Section 4.3.1.1 of the Hardship Application, while the plan drawing is provided as Figure 4-4 of the Hardship Application. The construction of the crossing is anticipated to last 6-8 weeks.

22. **Comment No. 22:** *In section 7, include a sentence or two that FHWA would also be held harmless for any construction on Interstate 43.*

Response to Comment No. 22:

Language will be added to Section 7 of the Hardship Application to hold the Federal Highway Administration harmless for any construction or maintenance work done in the Interstate 43 right-of-way that is associated with the Return Flow Pipeline.

Christopher, Ryan

From: Fasick, Robert - DOT <Robert.Fasick@dot.wi.gov>
Sent: Thursday, January 17, 2019 1:16 PM
To: GParish@trcsolutions.com; Christopher, Ryan; Richardson, Catharine; DeSilva, Christopher
Cc: Brown, Joel R - DOT; Garcia, Pete; Chidister, Ian (FHWA); Dan S. Duchniak
Subject: RE: Great Water Alliance Categorical Exclusion Checklist

Thank you for submitting the CEC document. In doing a cursory review, I noticed that FHWA's comments (excerpted below) were not addressed. We last talked about this around Christmas. They were looking for some type of risk-failure analysis if the return pipeline broke. Did I miss something, or were you planning to add this later? Just curious of its status. Thanks. >>Bob

Bob Fasick
State Right-of-Way Permits Engineer
Bureau of Highway Maintenance
(608) 266-3438
robert.fasick@dot.wi.gov

From: Garcia, Pete (FHWA) [mailto:pete.garcia@dot.gov]

Regarding clarity for FHWA comments, specifically, [FHWA requests] a failure risk analysis to address dismissal as a potential environmental consequences with respect to adversely affecting the highway and motorists in reference to FHWA Policy 23 CFR 645.205 …when such use and occupancy of the highway right-of-way do not adversely affect highway or traffic safety… and likewise provision of the UAP for hardship, we have the following:

Some reasonable level of evaluation performed describing:

- The volume of water this pipe may transfer can be very high and under pressure - If there were a future break in the pipe placed along the I-43 right-of-way that caused flooding, would that flooding likely not or not likely impact the roadway?
- Since the pipeline has a very long design life - Based on some form of risk assessment, what is the likelihood of a break occurrence and what supports that notion – historical data, similar type placements.

Some industry guidance suggests:

- identifying the potential events which could cause a release
- predicting the likelihood of such events occurring by comparison with the historical rate at which such incidents have occurred on similar systems (probability analysis);
- assessing the hazard or environmental impact of a release events identified
- (consequence analysis); and
- presenting risk as a combination of likelihood and consequence of the potential accidents (risk estimation).

We hope this is helpful and suggest on-going coordination throughout the NEPA phase as the way to proceed.

Thank you,

Pete

/s./

Peter Michael Garcia, PE., VMA.
Operations Engineer, Construction, Utilities & Value Engineering Programs
FHWA | Wisconsin Division | 525 Junction Road, Suite 8000 | Madison, WI 53717
Phone: 608-829-7513 | Fax: 608-829-7526 | pete.garcia@dot.gov

-----Original Message-----
From: GParish@trcsolutions.com [mailto:GParish@trcsolutions.com]
Sent: Thursday, January 17, 2019 10:47 AM
To: Fasick, Robert - DOT <Robert.Fasick@dot.wi.gov>
Subject: Great Water Alliance Categorical Exclusion Checklist

Mr. Fasick,
The NEPA Categorical Exclusion Checklist (CEC) for the Great Water Alliance water supply program is at the referenced file transfer location. A transmittal letter and zip file of CEC Word documents are also at the location. The CEC evaluated the return water pipeline proposed for the I-43 ROW described in the WisDOT Interstate 43 Hardship Application. The CEC was initially sent Joel Brown at WisDOT and we were notified he is out of the office until January 22, 2019.
Geof Parish

Please click the following link to download your files:
https://secure-web.cisco.com/1wA9jhx-Nntjz4t_VeBf-gpn8xmo1_BP5R__kbbzWWUcrOVNuU4aiwlSIXwZWUNdpSbZnswNjXDDv3BTd-SW9DBHXRnlUEJMf3joxuymxhEQMlxFJLFMiPb3LcbXlRrFnO0oysdo_Rxszl6TB_8I9k_O4Qh7DlyNY08smTVMr2vMj0GGEusR7QSociZlP0xZBF2cdlY3P2rDXnLoP-fiF21mE9Hb7l4YbjVVwg_Ai8Kd6pfDxBamXWJ4wRVqX-4sw/https%3A%2F%2Fadhocftp.trcsolutions.com%3A443%2FAHT%2FAHT_UI%2Fpublic%2F#/password?package=kRpk8wTRVXpPglZYlyxaKSjTZcAOurP3Qz0KzdCxy5SQlMMC9b9nx%2bx233PSuNQCvVb4Xfdgy3Eoauv9S6vWrRt3VsuoedhSm4sog1q3lmo%3d

GREELEY AND HANSEN

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