US Army Corps of Engineers®
St. Paul District

Appendix G: Interior Flood Control

CAP Section 205 Flood Risk Management Study

Arcadia, WI

Final Feasibility Study Report with Integrated Environmental Assessment

This page intentionally left blank

Contents

Interior Flood Control Appendix G 3

1. Summary 3

   1.1 Hydrology & Hydraulics 3

   1.2 Mechanical 3

2. References 5

3. Attachments 5

Interior Flood Control Appendix G

1. Summary

This appendix summarizes the study of interior flood control features for the Arcadia CAP 205 flood control project. Strand Associates, Inc. was hired by the city of Arcadia to complete an interior drainage analysis that evaluates the capacity of the storm sewer and pump stations. USACE provided preliminary hydrologic and hydraulic data to Strand that was further refined for input into a two-dimensional XP-SWMMM model for existing conditions. Additional analysis was completed to model upgrades to the storm sewer system to reduce the volume of water directed to the main pump station, and upgrades to the existing pump stations to meet USACE requirements for levee accreditation including piping modifications, redundant power, redundant backflow preventions, and the installation of trash racks and controls. A summary of the interior drainage flood analysis is included in Attachment 1.

1.1 Hydrology & Hydraulics

The contributing drainage areas were developed and checked using Trempealeau Country LiDAR topography. Rainfall data was obtained from National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Natural Resource Conservation Service (NRCS) soil types were used to develop curve numbers (CN) and the time of concentration (Tc) was computed based on NRCS TR-55 Urban Hydrology for Small Watersheds. The analysis was completed assuming a blocked gravity condition in which all interior runoff needs to be pumped out of the system.

1.2 Mechanical

For accreditation, all pump stations providing interior drainage for the Arcadia storm sewer system must meet USACE design requirements. This guidance is provided in EM 1110-2-3105, Mechanical and Electrical Design of Pumping Stations and EM 1110-2-3102, General Principles of Pumping Station Design and Layout. According to Strand's analysis, the Massuere Street Pump Station will essentially be replaced. Applying the USACE design guidance will be easiest at this station because they will be starting with a new design. The Deer Creek and Ashley Way Pump Stations will require minor modifications for compliance. The Main Pump Station will require major modifications for compliance. These upgrades are summarized below.

a. All pump discharge lines must have two means of backflow prevention. The discharge pipe invert elevations on all pumps are high enough to be considered as the first line of backflow prevention but each pipe will need a redundant closure method. The two new diesel pumps and the 6,000 GPM vertical electric pump will each need to be outfitted with flap valves at the discharge—two 42" flap valves on the diesel pumps and one 15" flap valve on the electric pump. These must all be flap valves intended for use with HDPE pipe. The two older diesel pumps (cranberry bog pumps) will also need to have flap valves added at the discharge. These discharges are rectangular (approximately 3.5' X 4') and will likely require a custom fabricated adapter in order to connect with any commercially available flap valve. The configuration of the 1,500 GPM electric submersible pump discharge line is not suited for flap valve installation because the pipe discharges vertically into the downstream side of the gatewell. A check valve could be used but is not necessary because the gatewell will have its own secondary closure (see b).

b. All gravity outlets passing through the line of protection are also required to have two means of backflow prevention. The sluice gates in the gatewells serve as the primary means of backflow prevention. Stoplogs are probably the most economical way to add a secondary means of closure. Minor modifications to the gatewells will be required. The stoplogs on the 60" gatewell will also serve as the secondary means of backflow protection for the 1,500 GPM electric submersible pump.

c. PVC is not allowed for pump discharge piping. All pipe on the 1,500 GPM electric submersible pump will need to be replaced. Pipe that attaches to the pump and is below the water line must be ductile iron or steel. Above the water line, HDPE pipe may be used (HDPE is not in the current guidance but will be allowed in the forthcoming update of EM 1110-2-3105).

d. The two 42" HDPE pipes appear to only be supported where they are connected to the pumps. Some miscellaneous metal fabrications will be required to restrain these piped from movement. The new discharge pipe on the 1,500 GPM electric submersible pump will also need to be permanently supported/restrained—chain and ratchet strap restraints are not acceptable.

e. The fuel storage tanks should provide for a minimum of two days of continuous operation of all pumps. Four diesel pumps operating continuously for two days at 12 gallons per hour each would require about 2,300 gallons of fuel. An additional 1,750 gallon fuel tank (or multiple fuel tanks with a total capacity of 1,750 gallons), complete with all required plumbing, is needed.

f. Redundant power for the two electric pumps is likely required. This is determined by conducting a service reliability/availability analysis. The analysis takes into account frequency and duration of power outages and the consequences that would result if an outage occurred when the pumps were needed. This type of analysis will not be completed at this time but it is assumed that, at a minimum, a connection for a portable generator will be required.

g. All electric pump control enclosures need to be replaced with NEMA 3R or 4X enclosures. Stainless steel enclosures are recommended. The wooden post and plywood mounting frame and support structure is not acceptable. This needs to be replaced with an all steel (galvanized or stainless) structure permanently mounted to a concrete pad. The enclosure(s) and frame/supports must be grounded.

h. The existing trash racks will need to be replaced on all pump inlet pipes to include the inlet to the gatewell containing the electric submersible pump. The new trash racks should be mounted to a permanent structure such as a headwall and not to the inlet pipes, themselves. Trash rack bar spacing must be 1-3/4” to 3” depending on the size of solid the pump can safely handle. Spacing on the new diesel pump inlets is probably too large. Trash racks should be installed so that they can easily be accessed for raking and removal of debris.

i. Operation and Maintenance Manuals are required for each piece of equipment. This includes but is not limited to pumps, pump motors or engines, pump controls (to include float switches), gates, gate actuators, flap valves, etc. O&M Manuals should include operating, troubleshooting, and maintenance procedures as well as replacement parts lists. If the O&M information is not available from the original equipment manufacturer, O&M procedures must be developed and documented by a qualified person regularly engaged in the operation and repair of that type of equipment.

All new pump station designs and modifications to existing designs will be reviewed by USACE. The proposals in the Interior Drainage Flood Analysis report (Attachment 1) are conceptual and lack the full level of detail that will go into the final design; however, the details provided appear to comply with the USACE guidance.

2. References

EM 1110-2-1413, “Hydrologic Analysis of Interior Areas,” August 2018.

EM 1110-2-3102, “General Principles of Pumping Station Design and Layout,” February 1995.

EM 1110-2-3105, “Mechanical and Electrical Design of Pumping Stations,” November 1999.

3. Attachments

Attachment 1. Report for City of Arcadia, Wisconsin – Interior Drainage Flood Analysis

DRAFT-(10.22.19)

Report for

City of Arcadia, Wisconsin

Interior Drainage Flood Analysis

Prepared by:

STRAND ASSOCIATES, INC.®
910 West Wingra Drive
Madison, WI 53715
www.strand.com

October 2019

STRAND ASSOCIATES®

TABLE OF CONTENTS

Page No.
or Following

INTERIOR DRAINAGE FLOOD ANALYSIS

Introduction 1
Description of Interior Drainage System 3
Interior Drainage Assessment 4
Interior Drainage Improvements 8

TABLES

Table 1 Existing Condition Pumping Station Parameters 3
Table 2 NOAA Atlas 14 Rainfall Depths 5
Table 3 Assumed Outfall Conditions 6

FIGURES

Figure 1 Drainage Map 1
Figure 2 Impervious Area Map 1
Figure 3 Basin Map 5
Figure 4 Soils Map 5
Figure 5 10-Year Flood Event
10 Percent Probability Flood Event 6
Figure 6 25-Year Flood Event
4 Percent Probability 6
Figure 7 100-Year Flood Event
1 Percent Probability Flood Event 6
Figure 8 Proposed Drainage Improvements 8
Figure 9 10-Year Flood Event
10 Percent Probability Flood Event 9
Figure 10 25-Year Flood Event
4 Percent Probability Flood Event 9
Figure 11 100-Year Flood Event
1 Percent Probability Flood Event 9
Figure 12 100-Year Special Flood Hazard Area 9

APPENDICES

APPENDIX A–MODELED STORM SEWER MAPPING
APPENDIX B–LINK DATA TABLES
APPENDIX C–EDA PER

INTRODUCTION

The City of Arcadia (City) has been working with the United States Army Corps of Engineers (USACE) on a large-scale flood control project intended to protect the municipality from riverine flooding caused by the Trempealeau River and other adjacent tributaries. USACE is currently completing a feasibility study to develop a plan to protect flood prone areas in the City that are located on the south side of the Trempealeau River and Turton Creek by constructing a flood protection levee.

In order to meet minimum Federal Emergency Management Agency (FEMA) levee accreditation requirements, the City is required to prepare an interior drainage analysis that identifies the source and extent of interior flooding. This analysis is to be based on the joint probability of interior and exterior flooding, taking into account the capacity of facilities such as storm sewers and pumping stations for evacuating interior floodwaters. Those areas that have an average depth of flooding greater than 1 foot for a 1 percent probability exceedance base flood event are to be mapped as regulatory special flood hazard areas (SFHAs) on the City's FEMA floodplain maps.

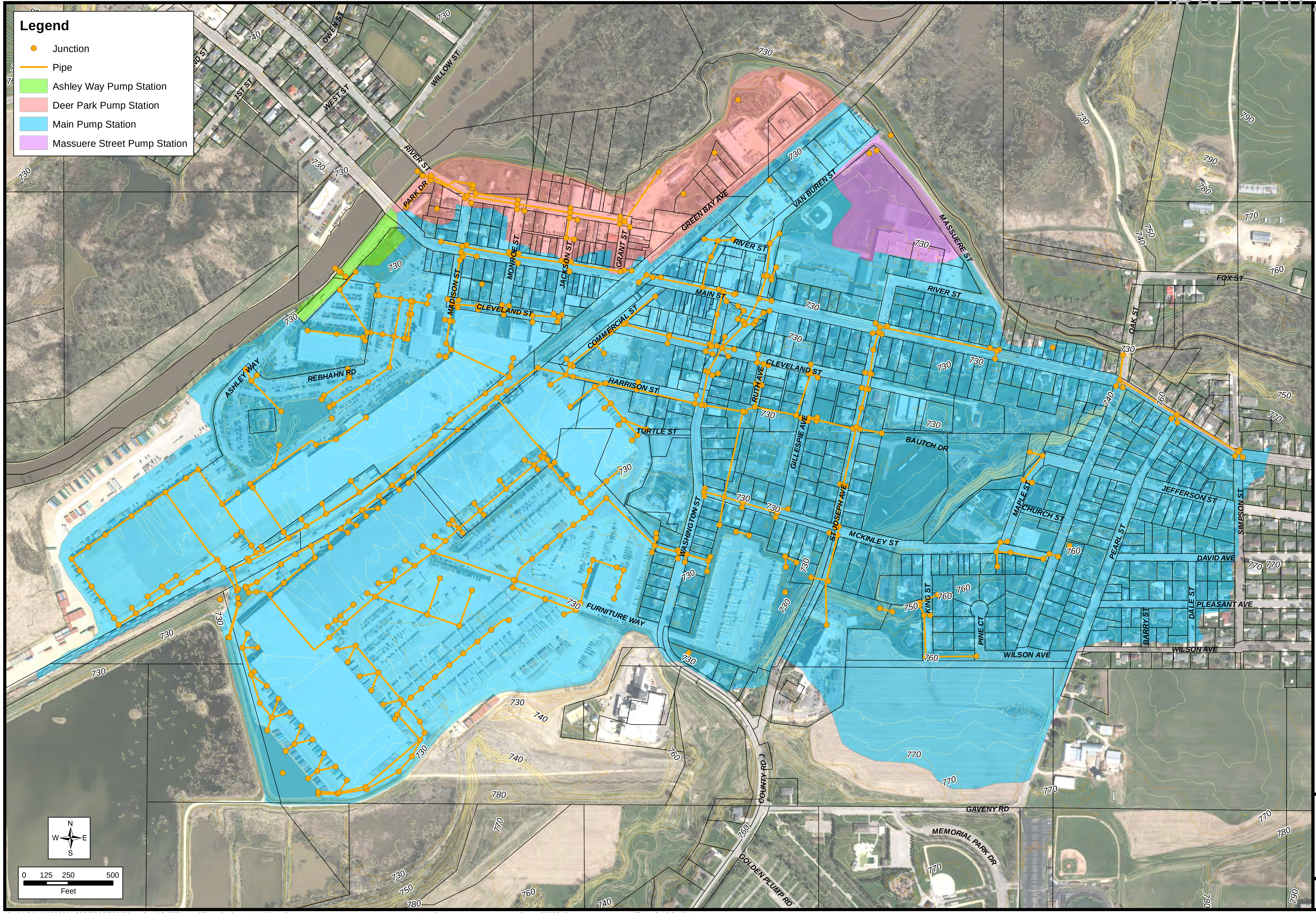
This analysis summarizes the results of a hydrologic and hydraulic evaluation of the existing interior drainage network and provides sizing recommendations for an interior drainage plan to improve flood control at several flood prone areas within the City. It is Strand's understanding that this analysis will be included as an attachment to USACE's Feasibility Study Report.

A. Watershed Description

The City's interior drainage network serves an approximate 373-acre watershed that is generally bounded by the Trempealeau River to the northwest and Turton Creek to the northeast (refer to Figure 1). Land use in the interior drainage watershed area includes single family residential, commercial, industrial, and row-crop agricultural. Notable entities located in this area include the Arcadia Elementary School, Ashley Furniture Industries (Ashley Furniture) distribution center and production facilities, three city parks, the Arcadia Fire Department, and the Arcadia Area Historical Society. Of the total 373-acre watershed area, approximately 60 percent of the surface cover is impervious and the remaining 40 percent of the watershed is pervious. An impervious area map of the watershed is included as Figure 2. Generally speaking, the study watershed has very flat topography, including the majority of the Ashley Furniture facilities and the City's downtown area. Some moderate topographic relief is present within the easterly upstream portions of the watershed. Given the flat topography present in the watershed, positive drainage is achieved via an extensive network of storm sewer systems that are directed to four existing stormwater pumping stations. Further discussion regarding each of the four pumping stations and their watershed service areas is provided later in this analysis.

B. Flood History

The downtown area of the City has a long history of significant flooding, with the most recent events occurring in 2010 and 2017. Repetitive flooding events have resulted in millions of dollars in flood damage and have negatively impacted the economic and social vitality of the City's downtown business district. Flooding in the City's downtown area is caused by both riverine flooding from the Trempealeau River and its adjacent tributaries, and from localized flooding of the interior drainage system. During the 2017 flood

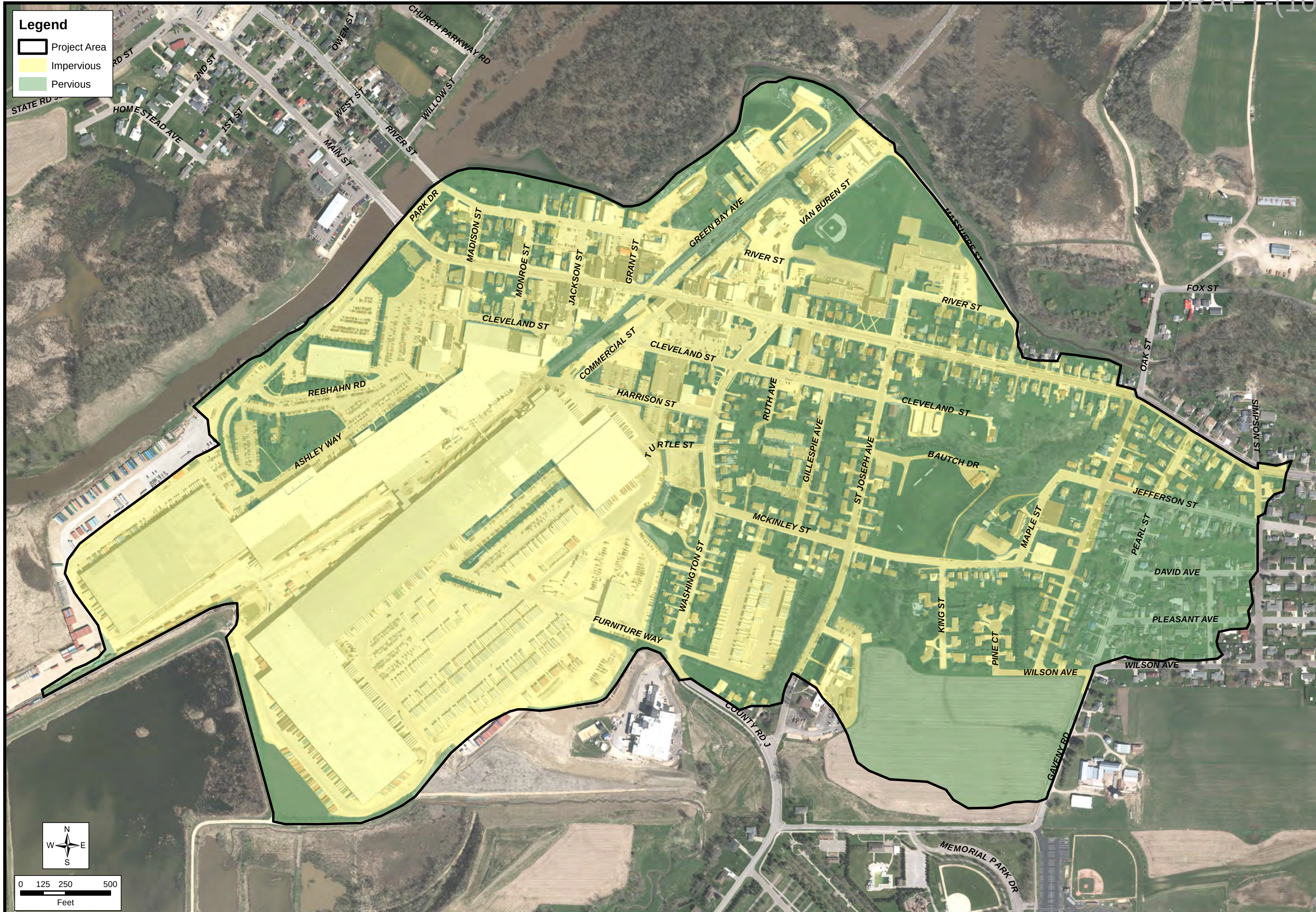


DRAINAGE MAP

CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 1
3832.003



IMPERVIOUS AREA MAP

INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 2
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Figures\Fig 2 Impervious 11x17.mxd User: Danc Date: 8/6/2019 Time: 2:48:44 PM event, floodwaters from Turton Creek caused a levee failure near the Oak Street bridge that overflowed and inundated the City's downtown area.

C. USACE Project

USACE is currently conducting a feasibility study to develop a plan for protecting flood prone areas in the City by constructing a levee and floodwall along the south side of the Trempealeau River and Turton Creek. As part of this flood protection project, the City is required to implement improvements to the interior drainage network to mitigate flooding and protect homes and local businesses. Stormwater lift station improvements are also required as part of the interior drainage system evaluation to meet minimum USACE levee accreditation standards. Proposed improvements to lift stations include installation of trash racks, piping modifications, redundant power, redundant backflow protection, and controls.

D. Vertical Datum

All elevations referenced in this analysis are in the North American Vertical Datum of 1988 (NAVD 88).

E. Methodology

An existing conditions dynamic hydrologic and hydraulic model of the interior drainage system was provided to Strand by USACE. The model input data were verified using available record drawings and storm sewer atlas data provided by the City. Additional data were added to refine the model including runoff curve numbers (RCN), times of concentration (Tc), junction losses, and expected rainfall depths.

Computed existing flooding conditions of the interior drainage system were first compared with observed flood extents provided by the City to validate the reliability of the modelled results. Following completion of the existing conditions modeling, potential modifications and improvements to the interior drainage network were then evaluated with a goal of conveying both a 10 percent and 4 percent probability design storm event and result in flood relief to the extent defined in the Economic Development Administration (EDA) Preliminary Engineering Report (PER).

Note that when the PER was developed, it was anticipated that implementation of interior drainage system flood mitigation improvements with a 10 percent probability design capacity would provide an adequate level of flood protection and resiliency for larger rainfall events (for example, a 1 percent probability storm event). However, based on the results of refined proposed conditions modeling, it was determined that designing interior drainage flood mitigation improvements to a 4 percent probability design storm was more appropriate given the flooding extents that would result from a 1 percent probability design storm.

A summary of storm sewer junction and link data used in the existing conditions model is described in the following section and included in a tabular format within Appendix A and B, respectively. The EDA PER is included in Appendix C.

DESCRIPTION OF INTERIOR DRAINAGE SYSTEM

A. Existing Pumping Stations

Stormwater pumping stations currently exist along Ashley Way, Massuere Street, within Deer Park, and at the southwest portion of the Ashley Furniture complex (Main Pumping Station).

The Ashley Way Pumping Station services approximately 1.7 acres, of which 69 percent of the watershed is impervious and 31 percent is pervious. The existing Massuere Street Pumping Station is fed by approximately 7.3 acres. Pervious area comprises 69 percent of this drainage area and impervious area the remaining 31 percent. The total drainage area served by the Deer Park Pumping Station is approximately 10.3 acres. Of this, 61 percent of the sub-catchment is impervious cover and 39 percent is pervious. The Main Pumping Station services approximately 354.0 acres, which comprises 95 percent of the total interior drainage area. Within this sub-catchment, 60 percent of the area is impervious cover and 40 percent is pervious. Data for the pumping stations provided by the City is summarized in Table 1 below.

Pumping Station	Service Area (acres)	Pump Start Elevation (feet)	Pump Stop Elevation (feet)	Maximum Pump Capacity (cfs)
Massuere Street Pumping Station	7.3	726.5	725.6	0.9
Deer Park Pumping Station	10.3	723.0	718.5	9.1
Ashley Way Pumping Station	1.7	723.0	720.1	1.8
Main Pumping Station	354.0	721.5	715.5	348.0

Note: cfs=cubic feet per second

Table 1 Existing Condition Pumping Station Parameters

Because the Main Pumping Station operates at a substantially higher flow rate in comparison to the other pumping stations and serves a vast majority of the interior drainage areas, the contributions from the existing Massuere Street, Deer Creek, and Ashley Way Pumping Stations have a limited impact for conveying floodwaters out of the interior drainage system.

B. Existing Storm Sewer Systems

As stated previously, the majority of the interior drainage area is drained via an extensive network of storm sewers. The storm sewers draining the Main Pumping Station watershed generally flow in a southwesterly direction through the City's central downtown business district and directly through the Ashley Furniture facility. All of the storm sewer systems draining the Main Pumping Station watershed are directed to a relatively small wet detention basin located at the far west end of the Ashley Furniture facility. This detention basin essentially serves as the Main Pumping Station's wet well.

There are several storm sewer outfalls that discharge into this wet detention basin of varying sizes including one 30-inch, one 36-inch, one 29-inch by 45-inch, one 42-inch, and one 60-inch pipe outfall. The drainage ditch that serves the Plant 6 detention basin also drains into the southwest corner of the Main Pumping Station pond via twin 42-inch diameter cross culverts. Based on available data, the water level in this pond is maintained near elevation 718, which is hydraulically connected to groundwater in the area.

Given that the normal Trempealeau River level is near elevation 719 and the river levels tend to fluctuate rapidly, manual operated sluice gates at the Main Pumping Station are kept closed, even during dry weather periods. Consequently, the tailwater conditions of the storm sewer systems draining to the wet pond are entirely dependent on the hydraulic performance of the existing Main Pumping Station, which has a maximum pumping capacity of approximately 348 cfs.

The storm sewer system that is associated with the Deer Park Pumping Station drains to an 18-inch diameter storm sewer system that discharges directly into the Trempealeau River immediately downstream (southwest) of the River Street bridge. This storm sewer line is equipped with a flap gate.

The Ashley Way Pumping Station provides drainage for a street low point and does not have a gravity discharge outlet. Available data indicates an 18-inch diameter storm sewer that drains to the existing pumping station, which is located approximately 400 feet downstream (southwest) of the State Trunk Highway (STH) 92 bridge over the Trempealeau River.

The area that drains to the Massuere Street Pumping Station includes a large portion of the Arcadia Elementary School site, which consists of mostly open ditch conveyance. Drainage is routed directly into the pumping station which is located near the corner of Massuere Street and Van Buren Street. No gravity outlet from this area can be realized to Turton Creek and must rely entirely on the pumping station to achieve positive drainage.

C. Ponding Areas

There are very few areas within the interior drainage watershed that are specifically reserved or intended for ponding. There is a small 0.8-acre existing stormwater collection area that is located within an existing industrial site at the north end of Green Bay Avenue. The existing Ashley Furniture site includes three wet detention basins that have a total surface area of approximately 3.3 acres. While not specifically designated as a ponding area, the existing open ditches and athletic fields located adjacent to the Massuere Street Pumping Station along Massuere Street and Van Buren Street do provide some flood storage volume for ponding. Because the majority of the interior drainage area has very flat topography, when the capacity of storm sewer systems is exceeded, stormwater runoff ponds within the streets. Specific areas of existing street flooding are further discussed in the following section.

INTERIOR DRAINAGE ASSESSMENT

A. Interior Drainage Hydrologic and Hydraulic Model

To assess the function and performance of the existing and proposed interior drainage storm sewer network, a two-dimensional hydrologic and hydraulic model was developed using the XP-SWMM software package. The initial base model was developed and provided by USACE. Storm sewer system sizes, elevations, and locations were verified by reviewing available record drawings and storm sewer atlases provided by the City and Davy Engineering.

B. Hydrologic Characteristics

Watershed sub-basins were delineated according to available Trempealeau County LiDAR data. A detailed sub-basin map is included as Figure 3. Soil types and extents were obtained from the National resource Conservation Service (NRCS). Much of the soil within the lowest portion the interior drainage area belongs to Hydrologic Soils Groups (HSG) B/D, and HSG A and C/D compose approximately equal portions of the remaining area. HSG A and B are the most common groups in the eastern portion of the drainage area, which generally has higher elevations. A map of the interior drainage area with HSG extents is attached as Figure 4.

Calculations for Tc for sub-basins and storm drain catchments were computed in accordance with the Soil Conservation Service (SCS) procedures. Composite runoff curve numbers and Tcs were computed from methods described in Urban Hydrology for Small Watersheds TR-55 for each sub-basin. The assumed minimum possible Tc was five minutes. A summary of catchment land use, composite curve number, and Tc is shown within the tables provided in Appendix A.

C. Rainfall Data

Rainfall amounts and distributions were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation frequency estimation tool. The City is located within the midwestern and southeastern states (MSE) rainfall distribution region 3. A 24-hour storm duration was assumed for all recurrence intervals analyzed. Expected rainfall depths and associated recurrence intervals are shown in Table 2.

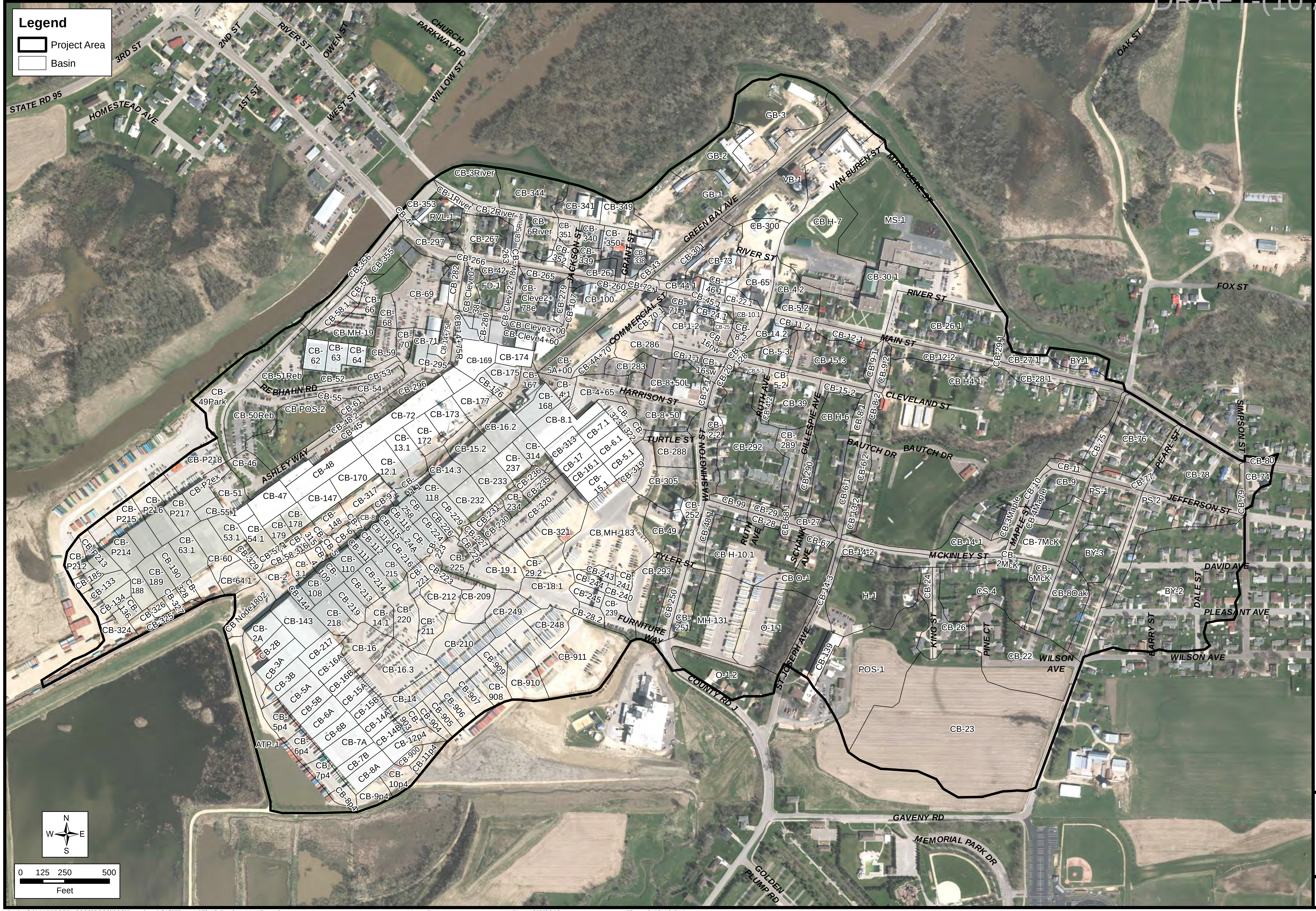
Percent Chance of Occurrence in Any Given Year (%)	24-Hour Rainfall Depth (inches)
50	2.89
20	3.61
10	4.27
4	5.31
2	6.19
1	7.15

Table 2 NOAA Atlas 14 Rainfall Depths

D. Gravity Condition

It is assumed there is no gravity driven condition available for any of the storm sewer system outfalls. For the purposes of this analysis, it was assumed the Trempealeau River and Turton Creek is at a sufficiently high stage that flood gates at storm sewer outfalls are in the closed position and do not enable gravity flow conditions at each outfall.

DRAFT-(10.22.19)



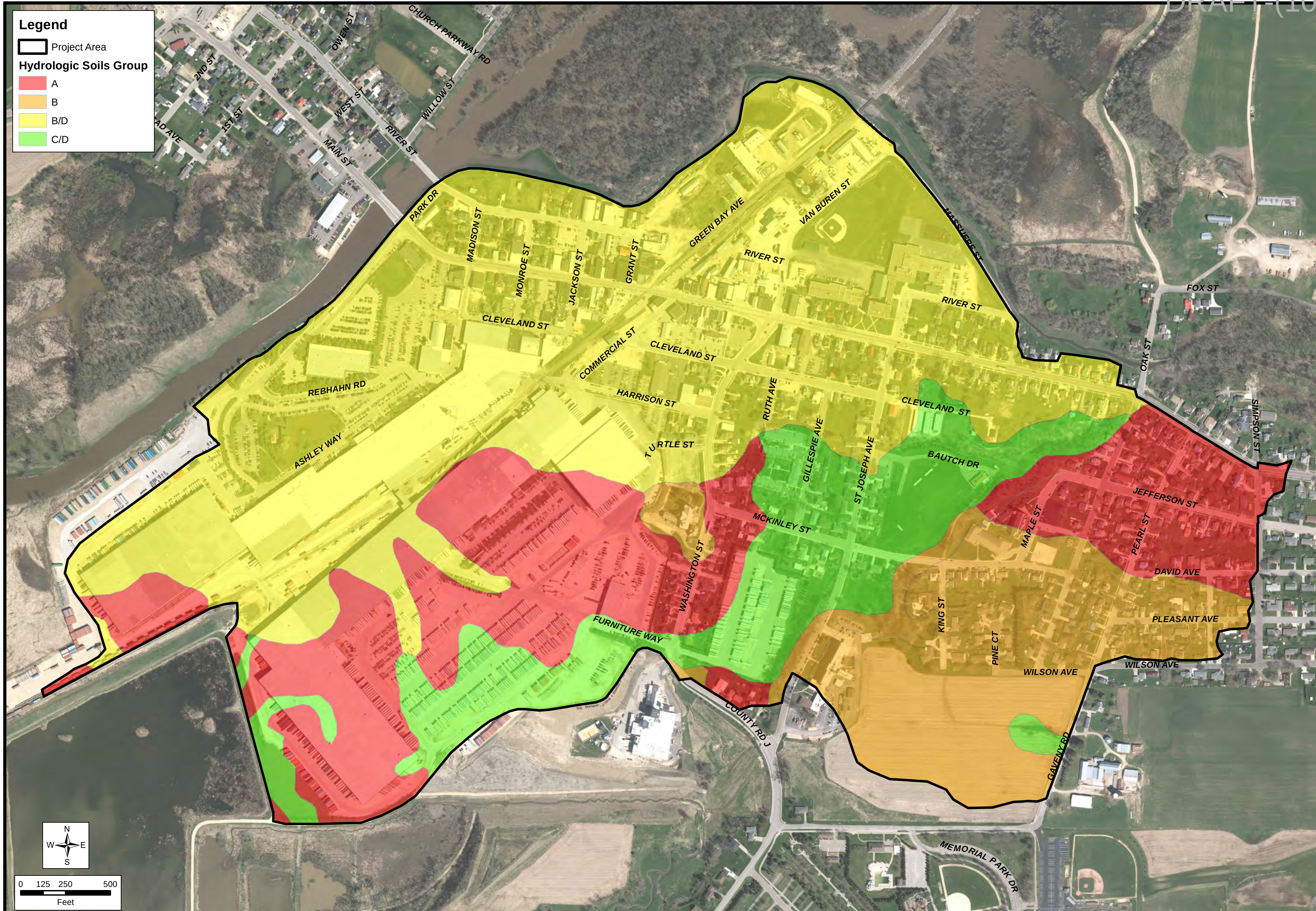
BASIN MAP

INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 3
3832.003

DRAFT (10.22.19)



SOILS MAP

INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 4
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Figures\Fig 4 Soils 11x17.mxd User: Danc Date: 8/6/2019 Time: 2:49:35 PM

E. Blocked Gravity Condition

The downstream boundary conditions used assumed receiving levels of the Trempealeau River and Turton Creek are high and that flood gates are closed so that water can only be evacuated from the interior drainage system via pumping. This is in accordance with information provided by the City. Assumed tailwater elevations for the pumping stations within the interior drainage network used in this evaluation are summarized in Table 3.

Outfall Location	Tailwater Elevation (feet)
Massuere Street Pumping Station	728.0
Deer Park Pumping Station	722.0
Ashley Way Pumping Station	722.0
Main Pumping Station	720.4

Table 3 Assumed Outfall Conditions

F. Interior Runoff/Exterior Stage Correlation

For existing conditions, the Main Pumping Station operates at a substantially higher flow rate in comparison to the other pumping stations and serves a vast majority of the interior drainage areas. The Main Pumping Station does have a gravity gate; however, the gate is never operated and is always left in the closed position. Because of the non-gravity option, a high river stage boundary elevation was selected. Please note that the outfalls for the Main Pumping Station are above the 1 percent probability high water elevation of the Trempealeau River not affecting pump capacities.

For proposed conditions, the Main Pumping Station and Massuere Street Pumping Station will be the two primary pumping stations serving a vast majority of the interior drainage areas. As stated above, the Main Pumping Station gravity gate is always closed and the Massuere Street Pumping Station is too low, eliminating the possibility for a gravity outfall. Because of the non-gravity option, a high river stage boundary elevation was selected. Please note that the outfalls for the Main Pumping Station and Massuere Street Pumping Station are above the 1 percent probability highwater elevation of the Trempealeau River and Turton Creek not affecting pump capacities.

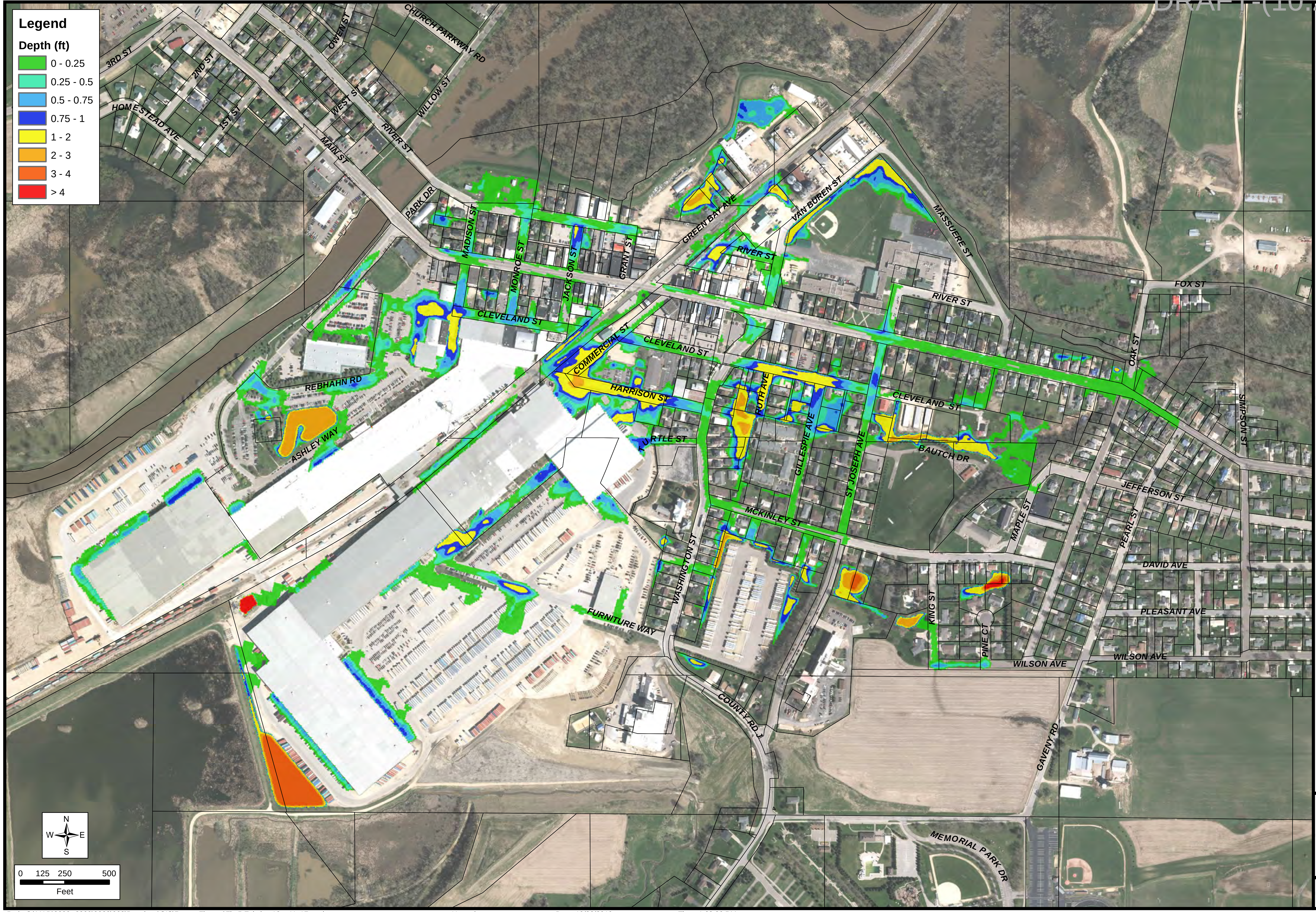
G. Minimum Interior Drainage Facility

Because of the lack of a gravity flow for both the existing and proposed conditions, it was determined that the minimum interior drainage facility is the pumping stations along the levee system. These pumping stations were previously discussed, and the peak flows are listed in Table 1 of this report. With the existing and proposed condition minimum interior drainage facilities in place, there is significant interior flooding that occurs in a 10 percent probability event. Figures 5 and 9 show the 10 percent probability interior flood depths.

H. Existing Conditions Modeling Results

Based on the results of the XPSWMM 2d modeling evaluation, the extents of flooding for the 1 percent joint probability storm event are quite extensive. Recall that because it is assumed that no gravity flow is available, and that evacuation of interior floodwaters is solely based on the need for pumping, the 1 percent probability 24-hour design storm was used. Figures 5,6, and 7 show both the lateral extents and estimated flood depths of interior flooding for a 4 percent probability, 24-hour storm event and

DRAFT (10.22.19)



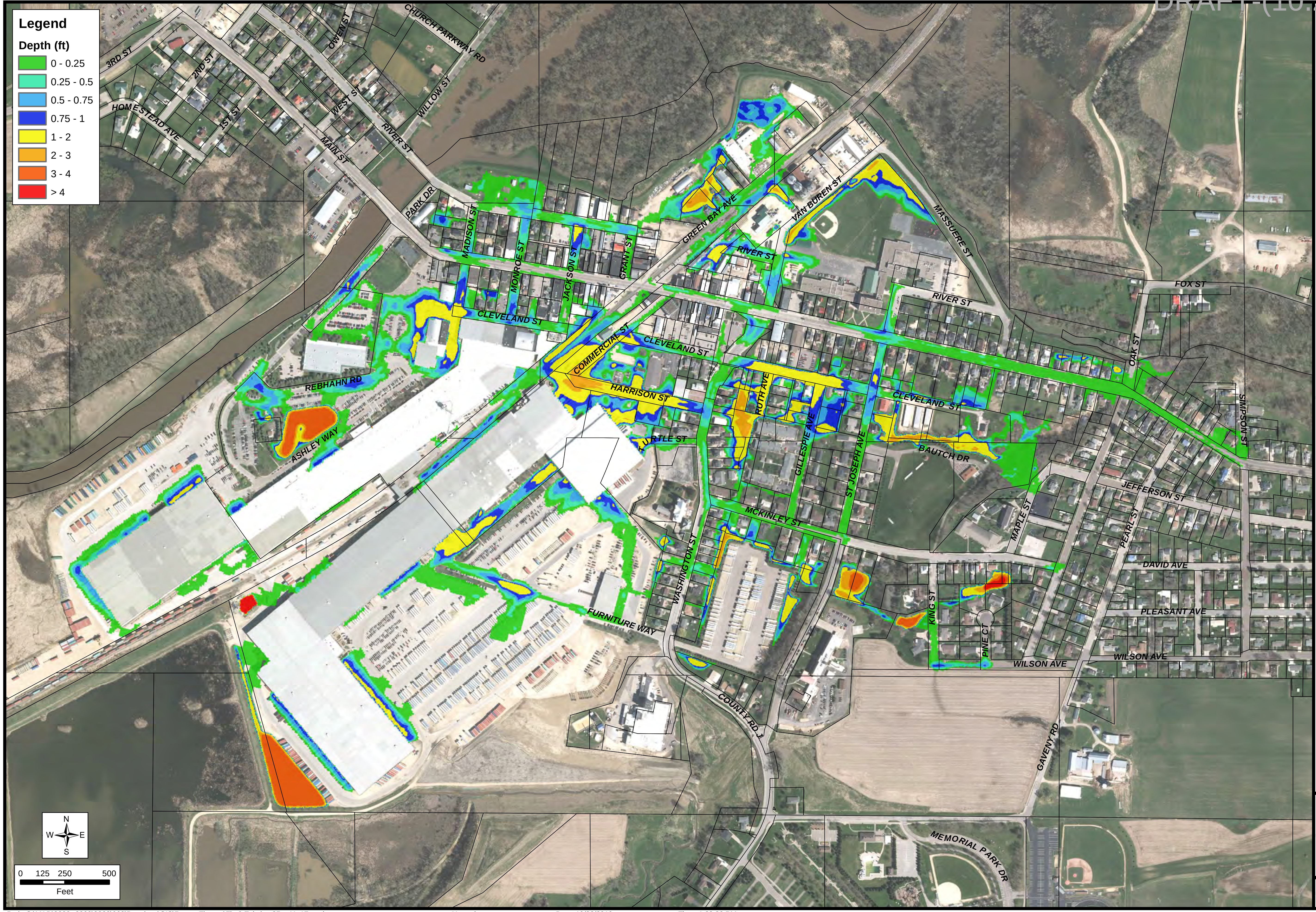
10-YEAR FLOOD EVENT
10% PROBABILITY FLOOD EVENT
EXISTING CONDITIONS
INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 5
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 5 Existing 10yr 11x17.mxd User: danc Date: 10/22/2019 Time: 1:38:39 PM

DRAFT (10.22.19)

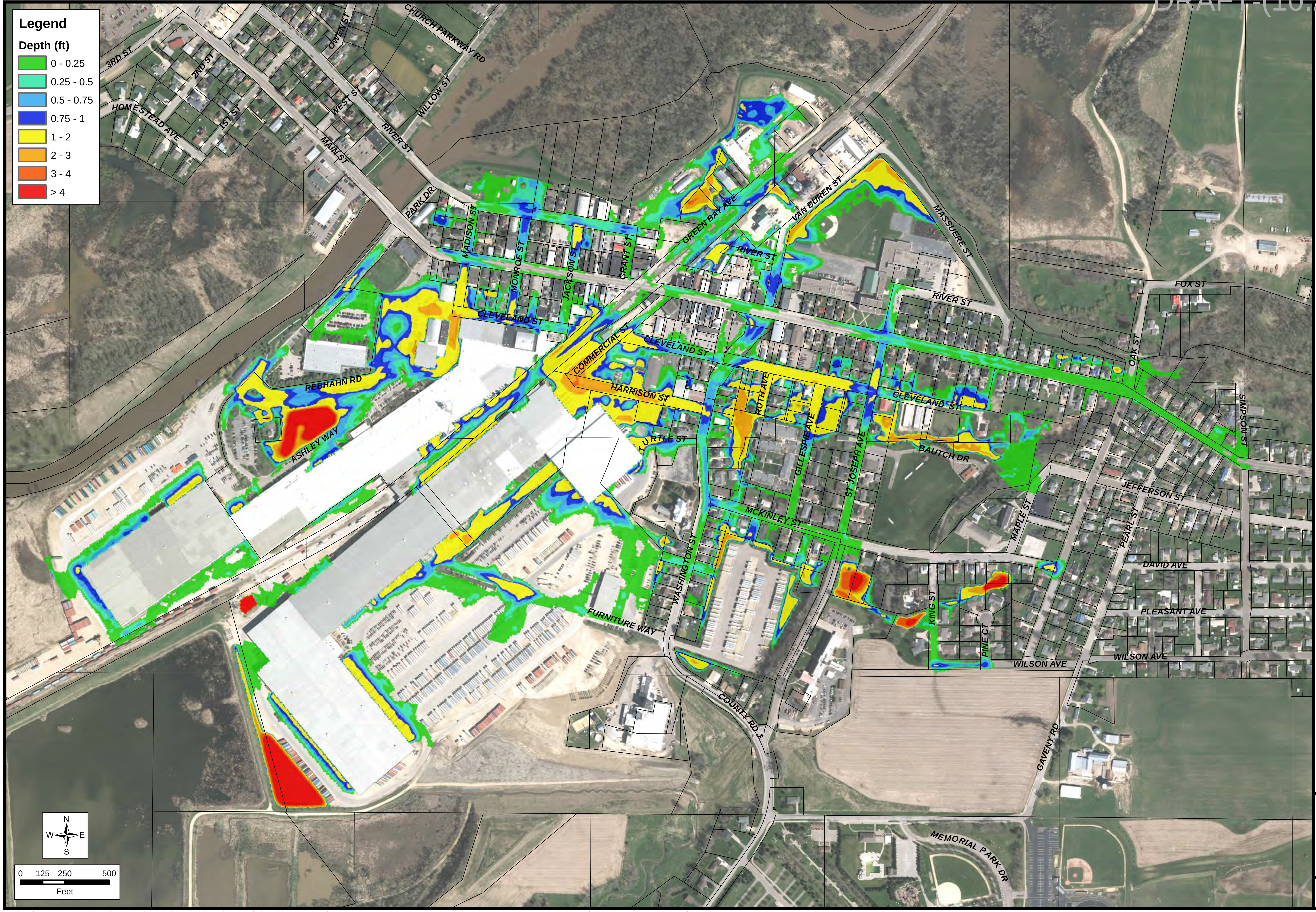


25-YEAR FLOOD EVENT
4 **PERCENT** PROBABILITY FLOOD EVENT
EXISTING CONDITIONS
INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 6
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 6 Existing 25yr 11x17.mxd User: danc Date: 10/22/2019 Time: 1:38:33 PM



100-YEAR FLOOD EVENT
1 **PERCENT** PROBABILITY FLOOD EVENT
EXISTING CONDITIONS
INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 7
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 7 Existing 100yr 11x17.mxd User: danc Date: 10/22/2019 Time: 1:38:45 PM

1 percent probability, 24-hour storm event, respectively. Review of this flood mapping indicates the greatest flood depths at the following locations:

- Near the intersection of Commercial Street and Harrison Street–This area is immediately adjacent to the northeast portion of the Ashley Furniture facility. Estimated flood depths in this area are as deep as 2 to 3 feet.

- Near the intersection of Madison Street and Cleveland Street–This area of flooding extends onto the Ashley Furniture site, inundating significant portions of parking lot and driveway areas.

- Extensive flooding is evident between the north side of the Ashley Furniture site and the Trempealeau River along Ashley Way.

- Flood depths exceeding 1 foot is evident along Cleveland Street between Washington Street and St. Joseph Avenue. This flooding extends south from Cleveland Street along Gillespie Avenue and Ruth Avenue. Some moderate flooding greater than 1 foot is evident along St. Joseph Avenue near the intersection of Cleveland Avenue. Some areas of flooding greater than 1 foot are also present along Cleveland Street east of St. Joseph Avenue.

- Moderate flooding is evident along River Street between Madison Street and Grant Street, particularly at the intersection of Jackson Street.

- A large area of flooding is evident within the athletic fields located at the northwest portion of the Arcadia Elementary School property near the intersection of Van Buren Street and Massuere Street.

- Some overland flooding is present within an existing drainageway that is located immediately north of Bautch Drive east of St. Joseph Avenue.

In most cases, excessive interior area flood depths are the result of very flat topography, insufficient hydraulic capacity of the storm sewer systems, and a lack of positive overland flood routes when the storm sewer systems reach their capacity. When comparing the capacity of the Main Pumping Station to the available capacity of the tributary trunk storm sewers, it is evident that limited storm sewer system capacity is the weakest link and that simply providing greater capacity to the Main Pumping Station would have minimal flood relief benefit.

Increasing storm sewer capacity of the trunk storm sewer lines that drain to the Main Pumping Station is likely not practical and cost prohibitive, given that many of these storm sewers pass through the Ashley Furniture Industries site either under or in very close proximity to existing buildings. A more effective strategy to provide interior flooding relief is to “off-load” drainage that is currently tributary to the Main Pumping Station by directing it to a newly constructed upsized pumping station at Massuere Street. Further discussion regarding potential interior drainage flood mitigation improvements is provided in the following section.

INTERIOR DRAINAGE IMPROVEMENTS

A. Interior Storm Sewer Upgrades

Proposed drainage improvements to the existing storm sewer system are generally concentrated in the vicinity of Main Street between Commercial Street and Massuere Street and along Washington Street between Harrison Street and Massuere Street to reduce the volume of stormwater runoff that is directed to the Main Pumping Station (refer to Figure 8). New storm sewer systems draining these areas will generally direct drainage to the north to a newly reconstructed and improved Massuere Street Pumping station to help relieve flooding as defined within the EDA PER. The existing storm sewer connection between Washington Street and Harrison Street is proposed to be plugged, thus redirecting flows to the upgraded Massuere Street Pumping Station. Existing pipe on Washington Street is proposed to be replaced as follows.

Between Harrison Street and Cleveland Street, the existing 24- by 38-inch horizontal elliptical pipe is proposed to be replaced with 48-inch diameter circular pipe. The 24-inch diameter circular pipe between Cleveland Street and Main Street is proposed to be replaced with 60-inch diameter circular pipe. Existing 15-inch diameter circular pipe on Van Buren Street is proposed to be replaced with 4- by 8-foot precast box culvert that will run along the length of the street to the reconstructed Massuere Street Pumping Station.

Along Main Street, proposed storm sewer improvements include the installation of 48-inch diameter pipe from Washington Street to St. Joseph Avenue and 18-inch diameter pipe from Washington Street to just immediately west of the railroad crossing. The existing 12-inch diameter storm sewer pipe between St. Joseph Street and Massuere Street would be replaced with 24-inch diameter circular pipe. Along Cleveland Street between Washington Street and St. Joseph Avenue, 48-inch diameter storm sewer pipe is proposed.

As previously stated, the sizing for these storm sewer improvements was initially evaluated to convey a 10 percent probability design storm. However, it was determined that 1 percent probability flooding limits for a 10 percent probability design storm sizing condition did not provide adequate flood relief. For this reason, 4 percent probability design storm event sizing for new storm sewer improvements was chosen. It should be noted that the cost to upsize from the 10 percent probability storm sewer to the 4 percent probability storm sewer sizing is under evaluation and subject to City review.

Based on this evaluation, the hydraulic capacity of the reconstructed Massuere Street Pumping Station will need to be increased from 0.9 cfs to 195 cfs. It is anticipated that the proposed storm sewer system draining to the Massuere Street Pumping Station will not operate under a gravity flow condition to Turton Creek and that pumping will be needed for all situations.

B. Proposed Conditions Modeling Results

As a result of the proposed storm sewer improvements, the following areas are expected to see substantial reductions in maximum flooding depth that result from both the 4 percent and 1 percent probability design storm:

DRAFT (10.22.19)

PROPOSED DRAINAGE IMPROVEMENTS

INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 8
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 8 Proposed Future Improvements 11x17.mxd User: danc Date: 10/22/2019 Time: 11:20:49 AM

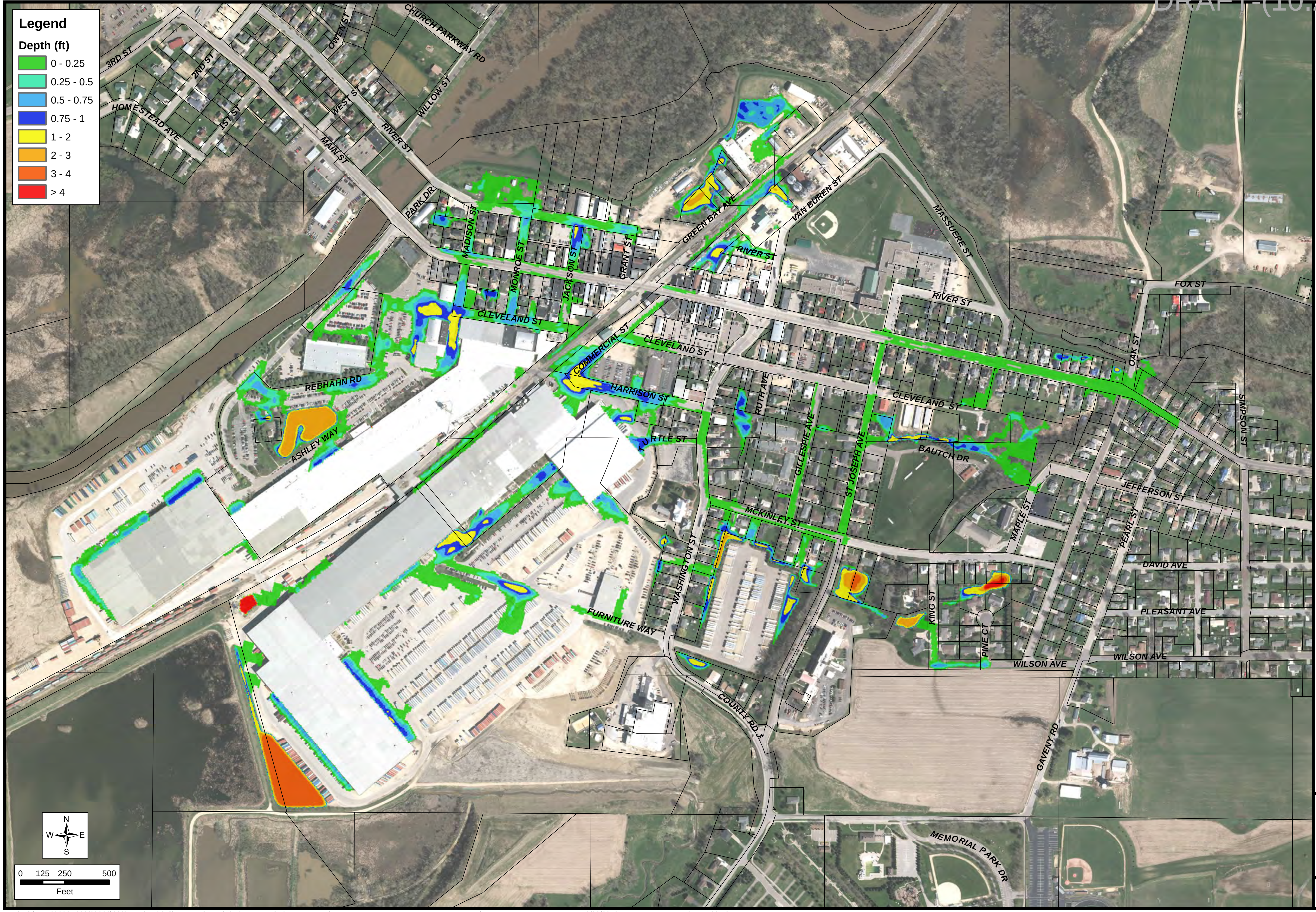
- Van Buren Street between Massuere Street and Harrison Street.
- Main Street between St. Joseph Avenue and Massuere Street.
- Cleveland Street between Washington Street and St. Joseph Avenue. Reductions in flooding extents and depth is also realized along Cleveland Street east of St. Joseph Avenue.
- St. Joseph Avenue near the intersection of Cleveland Street.

Additional areas that would be expected to see a reduction in maximum ponding depth associated with the 4 percent and 1 percent probability design storm are:

- Residential properties located between Washington Street and Ruth Avenue south of Cleveland Street.
- Residential properties located between Gillespie Avenue and St. Joseph Avenue south of Cleveland Street.
- Residential properties located between Ruth Avenue and Gillespie Avenue south of Cleveland Street.
- Area near the intersection of Commercial Street and Harrison Street located adjacent to the northeast end of the Ashley Furniture site.
- Existing drainageway that is located immediately north of Bautch Drive and east of St. Joseph Avenue.

Estimated proposed conditions flooding extents and depths for a 4 percent probability, 24-hour storm and a 1 percent probability, 24-hour storm are depicted on Figures 9, 10, and 11, respectively. Figure 12 depicts proposed conditions 1 percent probability storm event flooding extents where ponding depths will be 1 foot or greater.

Note that the proposed interior drainage improvements that are evaluated and discussed in this analysis do not address all areas of interior drainage flooding that have been identified. The projects evaluated as part of this analysis are considered of highest initial priority and implementation of the improvements will likely be phased in over the next five years or so. It is understood that additional interior drainage improvement projects will need to be studied and implemented following implementation of the initial improvement projects discussed in this analysis.

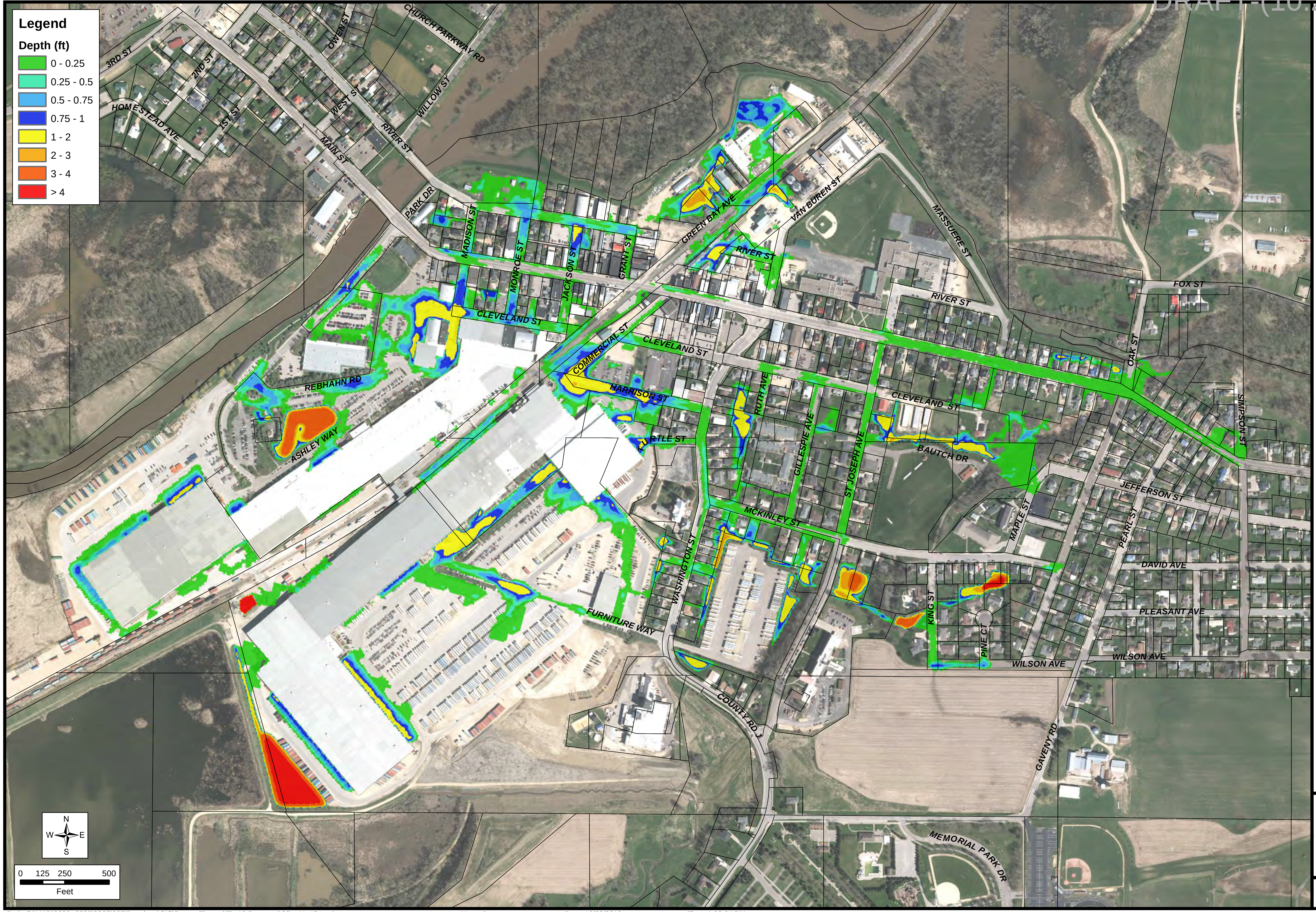


10-YEAR FLOOD EVENT
10 **PERCENT** PROBABILITY FLOOD EVENT
PROPOSED CONDITIONS
INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 9
3832.003

DRAFT (10.22.19)



25-YEAR FLOOD EVENT

4 **PERCENT** PROBABILITY FLOOD EVENT

PROPOSED CONDITIONS

INTERNAL DRAINAGE ANALYSIS

CITY OF ARCADIA

TREMPEALEAU COUNTY, WISCONSIN

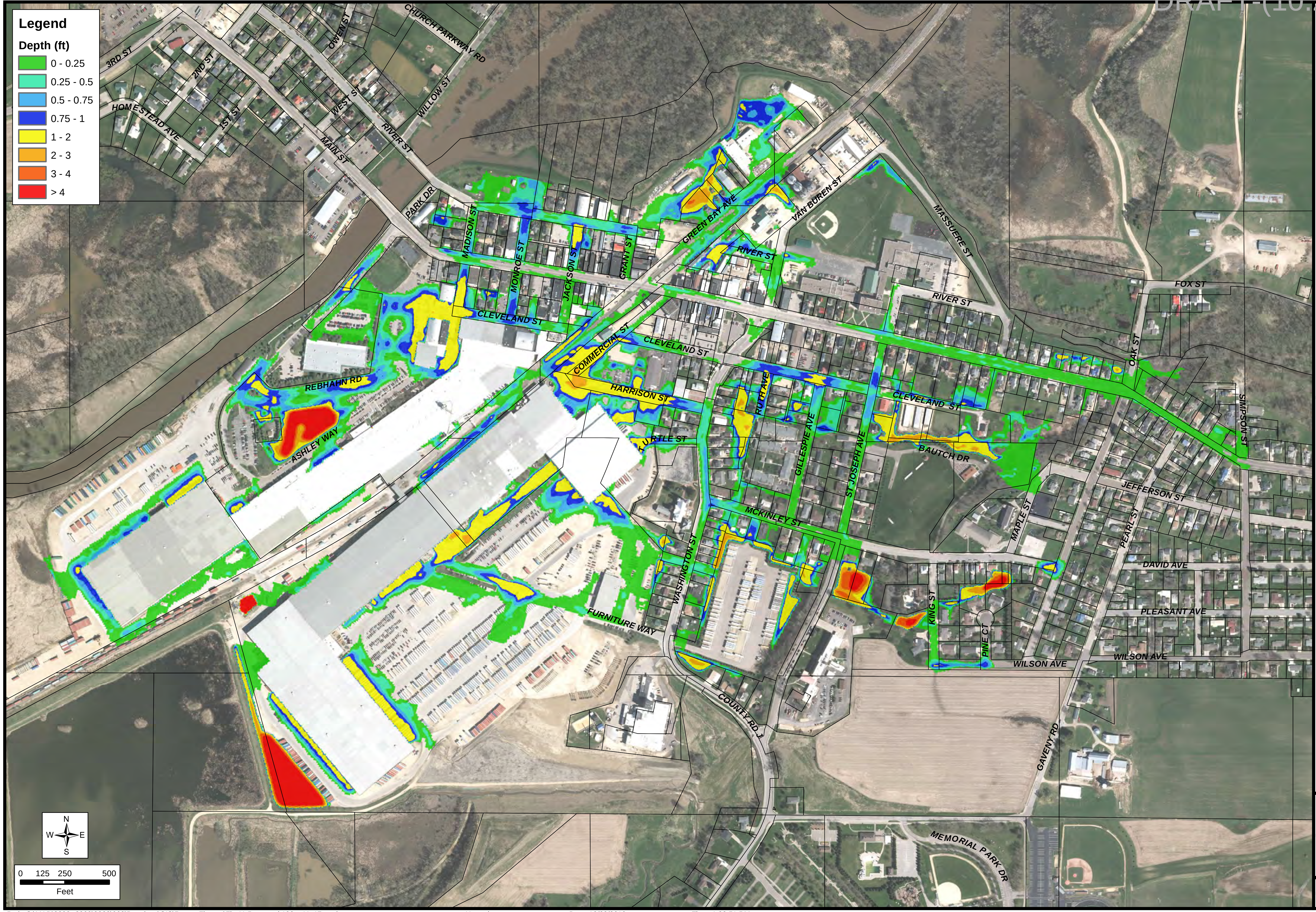
STRAND ASSOCIATES®

FIGURE 10

3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 10 Proposed 25yr 11x17.mxd User: danc Date: 10/22/2019 Time: 1:39:04 PM

DRAFT (10.22.19)



100-YEAR FLOOD EVENT

1 **PERCENT** PROBABILITY FLOOD EVENT

PROPOSED CONDITIONS

INTERNAL DRAINAGE ANALYSIS

CITY OF ARCADIA

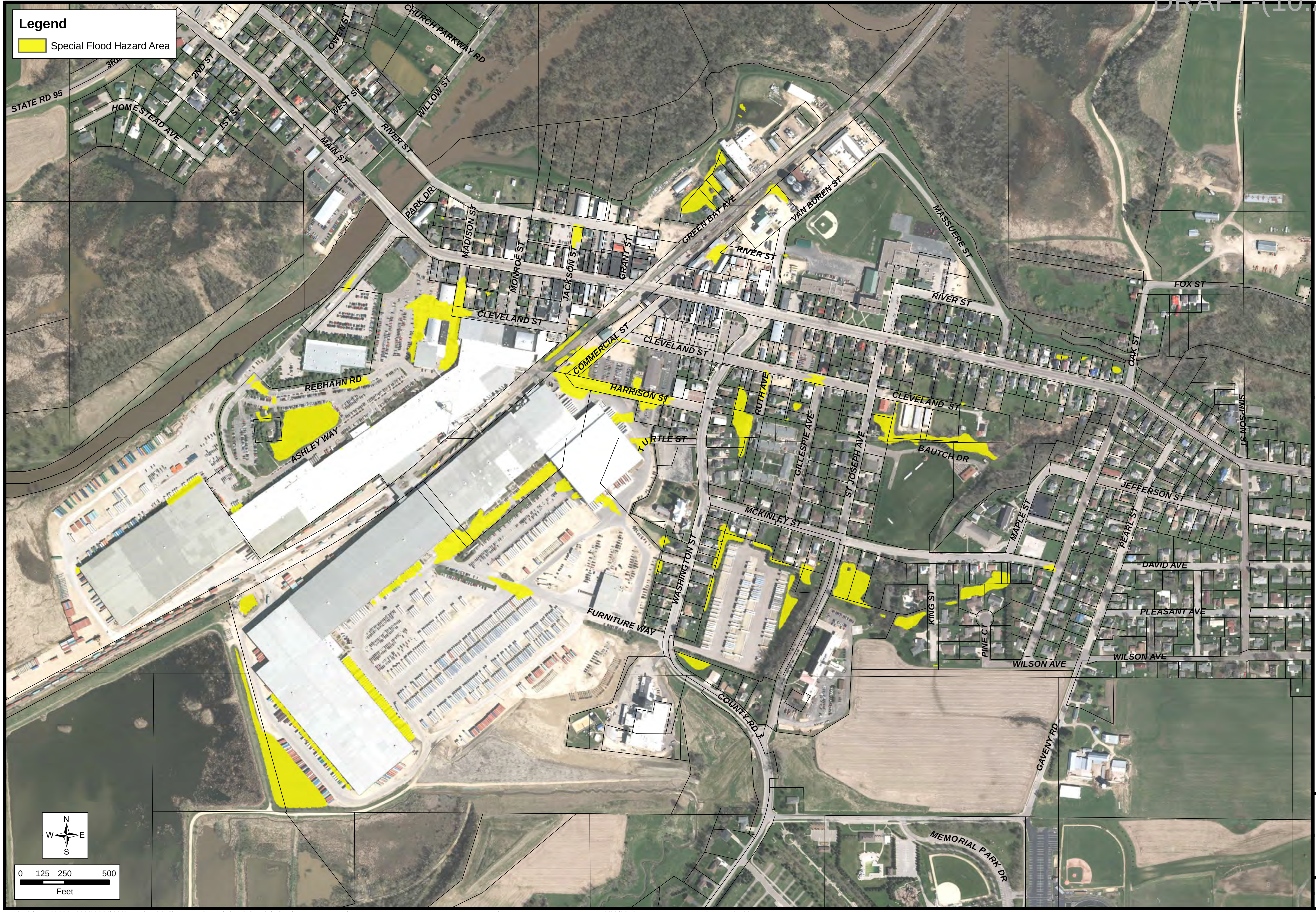
TREMPEALEAU COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 11

3832.003

DRAFT (10.22.19)



100-YEAR SPECIAL FLOOD HAZARD AREA
(> 1-FOOT PONDING)

INTERNAL DRAINAGE ANALYSIS
CITY OF ARCADIA
TREMPEALEAU COUNTY, WISCONSIN

STRAND
ASSOCIATES®

FIGURE 12
3832.003

Path: S:\MAD\3800--3899\3832\003\Drawings\GIS\Report Figures\Fig 12 Special Flood Area 11x17.mxd User: danc Date: 10/22/2019 Time: 11:21:23 AM

APPENDIX A
MODELED STORM SEWER MAPPING

DRAFT-(10.22.19)

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
ATP-1	715.00	714.99	3.91	70	5
BY-1	731.56	731.55	0.72	71	10.1
CB-1	726.76	718.70			
CB-10	772.24	768.54	0.22	85	5
CB-10.1	726.83	723.71	0.56	92	5
CB-100	726.68	723.10	1.94	84	5
CB-100.1	727.58	724.97			
CB-107	726.30	723.10	0.16	91	5
CB-108	726.03	724.90	0.43	98	5
CB-109	725.89	719.00	0.39	98	5
CB-10p4	728.09	717.41	0.55	82	5
CB-11	772.35	768.90	0.34	79	5
CB-1-1	726.31	721.31	0.33	87	5
CB-11.1	727.46	716.70	0.33	98	5
CB-11.2	727.95	724.88	0.33	92	5
CB-110	727.09	722.00	0.43	98	5
CB-111	727.31	722.00	0.27	98	5
CB-112	727.27	722.00	0.24	98	5
CB-114	727.27	719.00	0.21	98	5
CB-115	727.59	719.00	0.23	98	5
CB-116	727.52	719.00	0.24	98	5
CB-118	726.33	721.30	0.49	98	5
CB-11p4	727.96	718.02	0.38	82	5
CB-12	727.48	724.32			
CB-1-2	726.52	721.25	1.21	98	5
CB-12.1	726.71	716.70	0.89	98	5
CB-12-1	727.52	723.14	0.61	86	5
CB-12-2	727.58	723.04	1.14	84	5
CB-128	727.05	723.84	0.08	94	5
CB-12p4	726.56	716.78	0.69	98	5
CB-13	726.84	723.73			
CB-13.1	725.27	716.70	0.80	98	5
CB-13-1	730.85	725.24			
CB-13-2	730.43	725.24	0.40	88	5
CB-133	725.10	721.00	0.62	98	5
CB-134	725.25	720.60	0.52	98	5
CB-135	725.39	720.95			
CB-136	725.38	721.40	0.24	98	5
CB-139	762.99	755.00	0.50	92	5
CB-14	726.45	719.30	0.97	98	5
CB-14.1	726.88	719.00	0.59	98	5
CB-14.2	726.86	723.66	0.74	87	5
CB-14.3	725.04	716.70	0.86	98	5
CB-14+75L	724.26	721.69	0.58	98	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-14+75R	724.44	721.47	0.32	97	5
CB-14-1	732.94	727.80	1.46	84	6.2
CB-14-2	733.84	728.10	2.72	79	6
CB-143	728.11	725.50	1.13	98	5
CB-14-3	733.04	728.31	0.38	96	5
CB-144	726.87	725.40	0.24	98	5
CB-147	725.12	719.50	0.68	98	5
CB-148	725.53	719.40	0.48	98	5
CB-14A	725.23	721.30	0.43	98	5
CB-14B	725.39	721.30	0.38	98	5
CB-15	727.61	724.31	0.04	86	5
CB-15.1	727.96	721.00	0.56	42	5
CB-15.2	725.25	716.70	1.19	98	5
CB-15-2	725.91	722.52	0.54	84	5
CB-15-3	726.21	722.52	2.29	80	13.4
CB-15A	725.31	721.80	0.51	98	5
CB-15B	725.27	721.80	0.38	98	5
CB-16	726.46	721.90	1.18	98	5
CB-16.1	727.70	721.20	0.34	48	5
CB-16.2	725.03	716.70	1.06	98	5
CB-16.3	726.54	720.90	1.75	98	5
CB-167	725.61	719.30	0.72	98	5
CB-168	725.45	719.50	0.66	98	5
CB-169	724.61	720.62	0.99	97	5
CB-16A	726.40	722.30	0.56	98	5
CB-16B	725.46	722.30	0.38	98	5
CB-16NE	727.08	722.25			
CB-16NW	727.31	722.31	0.23	93	5
CB-16SW	726.95	723.64	0.17	92	5
CB-16SW.1	726.66	722.45			
CB-17	728.09	721.20	0.47	54	5
CB-170	725.14	719.60	0.74	98	5
CB-172	724.92	719.60	0.71	98	5
CB-173	725.11	719.70	0.77	98	5
CB-174	725.88	720.20	0.49	98	5
CB-175	725.15	720.00	0.47	98	5
CB-176	725.13	719.90	0.32	98	5
CB-177	724.99	719.72	0.80	98	5
CB-178	725.28	719.40	0.40	98	5
CB-179	725.81	719.30	0.36	98	5
CB-18	726.81	723.91	0.07	89	5
CB-18.1	726.59	717.35	1.25	98	5
CB-185	725.15	721.50	0.30	98	5
CB-188	725.25	722.00	0.50	98	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-189	725.21	720.75	0.65	98	5
CB-19	726.81	724.39			
CB-19.1	726.59	717.35	1.20	94	5
CB-190	725.19	722.00	0.57	98	5
CB-1River	726.75	722.80	0.31	84	5
CB-2	727.27	716.70	0.62	98	5
CB-20	726.71	724.08	0.09	85	5
CB-209	728.72	723.50	0.84	97	5
CB-21	726.86	723.74	0.16	87	5
CB-2-1	726.09	720.70	0.20	91	5
CB-210	730.11	723.00	1.62	98	5
CB-211	729.07	722.00	0.85	98	5
CB-212	727.73	722.20	0.69	98	5
CB-213	725.61	720.05	0.45	98	5
CB-214	725.51	720.05	0.47	98	5
CB-215	725.49	720.05	0.49	98	5
CB-216	725.44	720.06	0.44	98	5
CB-217	728.99	719.40	0.55	98	5
CB-218	725.41	719.40	0.74	98	5
CB-219	725.52	719.60	0.56	98	5
CB-22	761.37	757.00	4.64	73	5.8
CB-2-2	726.14	720.35	1.21	84	5
CB-22.1	727.69	724.57	0.31	98	5
CB-220	726.81	717.07	1.07	98	5
CB-221	726.25	717.10	0.40	98	5
CB-223	726.04	717.13	0.57	90	5
CB-224	725.33	721.33	0.43	98	5
CB-225	725.29	719.13	0.74	89	5
CB-226	725.14	721.77	0.24	98	5
CB-227	725.04	719.23	0.30	81	5
CB-228	725.07	719.73	0.14	76	5
CB-229	726.55	720.20	0.46	91	5
CB-23	760.12	756.00	14.67	62	34.6
CB-230	725.64	722.40	0.45	76	5
CB-231	725.47	720.20	0.26	89	5
CB-232	725.65	720.40	0.78	91	5
CB-233	728.83	722.60	0.76	95	5
CB-234	726.26	722.50	0.37	75	5
CB-235	725.58	722.32	0.31	70	5
CB-236	725.46	720.60	0.27	74	5
CB-237	728.63	721.50	0.57	93	5
CB-239	731.47	721.90	0.73	94	5
CB-24	757.90	755.00	0.64	82	5
CB-24.1	727.85	722.90	0.29	94	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-240	731.36	721.80	0.22	98	5
CB-241	731.35	721.70	0.18	98	5
CB-242	731.38	721.60			
CB-243	731.57	721.50	0.25	98	5
CB-244	731.24	721.40	0.31	98	5
CB-245	731.20	721.30	0.39	98	5
CB-246	731.21	723.50			
CB-247	730.62	723.00			
CB-248	729.38	722.00	0.88	98	5
CB-249	727.36	721.00	1.10	98	5
CB-24A	728.48	721.20	0.47	98	5
CB-25	727.41	722.48	0.23	95	5
CB-250	729.26	725.70	0.82	77	5
CB-251	729.05	725.90	0.89	74	5
CB-252	729.10	725.85	1.39	84	5
CB-258	727.25	719.00	0.32	98	5
CB-26	758.29	755.50	1.12	77	5
CB-26.1	727.79	725.00	4.02	78	18
CB-260	727.34	723.80	0.43	98	5
CB-261	727.26	723.70	0.90	95	5
CB-262	727.24	723.70			
CB-263	726.50	723.50	0.07	98	5
CB-264	726.62	723.50			
CB-265	726.66	723.60	0.34	95	5
CB-266	725.77	722.00	0.09	98	5
CB-267	725.63	723.30	1.74	83	5
CB-268	727.93	723.90	0.05	92	5
CB-27	730.48	727.00	0.44	88	5
CB-27.1	729.85	726.60	1.11	88	5
CB-279	726.32	723.10	0.34	98	5
CB-28	728.73	724.60	0.28	89	5
CB-28.1	729.74	727.00	1.03	87	5
CB-28.2	729.89	721.26	0.33	94	5
CB-280	725.62	721.70	0.28	95	5
CB-282	724.64	721.60	0.57	91	5
CB-283	726.25	721.30	0.61	87	5
CB-286	725.44	721.58	1.15	95	5
CB-287	725.87	721.73			
CB-288	725.79	722.40	1.08	91	5
CB-289	726.57	723.10	1.18	90	5
CB-29	728.86	724.80	0.31	87	5
CB-29.1	729.65	727.00	0.09	85	5
CB-29.2	730.30	717.42	0.82	98	5
CB-290	726.53	723.40	0.84	85	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-292	725.63	722.50	4.67	72	14.2
CB-293	728.10	722.40	1.90	72	5
CB-295	724.91	721.20	0.23	98	5
CB-296	725.23	721.00	0.85	86	5
CB-297	725.46	724.00	1.04	86	5
CB-2A	727.72	721.30	0.69	98	5
CB-2B	728.29	721.30	0.65	98	5
CB-2Mck	764.51	755.70	0.03	72	5
CB-2River	726.43	723.00	0.24	87	5
CB-3	727.34	724.56			
CB-3.1	727.17	716.70	0.35	98	5
CB-30	730.99	717.46			
CB-30.1	727.35	724.60	4.80	84	10.1
CB-300	727.53	724.30	1.30	98	5
CB-301	727.32	724.30	1.10	78	5
CB-305	725.50	722.50	1.79	83	5
CB-31	730.62	717.50			
CB-313	725.63	722.39	0.62	69	5
CB-314	725.92	722.39	0.59	91	5
CB-315	725.42	719.30	0.30	98	5
CB-316	725.32	719.20	0.35	98	5
CB-317	725.44	719.50	0.81	98	5
CB-318	726.49	719.35			
CB-319	729.67	722.00	0.32	87	5
CB-32	730.04	717.54			
CB-320	727.79	721.00	1.16	94	5
CB-321	728.06	720.80	2.09	97	5
CB-322	727.23	722.20	0.30	98	5
CB-323	725.44	722.00	0.43	94	5
CB-324	724.54	720.39	1.13	71	5
CB-325	724.65	719.82	0.59	96	5
CB-326	725.15	719.50	0.20	98	5
CB-327	725.02	719.70	0.21	98	5
CB-328	725.05	718.80	0.24	98	5
CB-329	725.77	719.50	0.35	98	5
CB-33	729.45	717.58			
CB-338	727.10	723.00	0.51	97	5
CB-339	726.71	723.50	0.33	97	5
CB-34	728.77	717.61			
CB-340	726.36	722.95	0.44	93	5
CB-341	726.93	722.85	1.01	87	5
CB-344	726.09	722.75	1.79	68	14.7
CB-349	726.75	722.85	0.88	88	5
CB-350	726.62	722.75	0.79	98	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-351	726.00	722.75	0.36	98	5
CB-352	726.38	723.30	0.37	92	5
CB-353	729.58	722.20	0.44	91	5
CB-355	726.21	722.33	1.18	83	5
CB-356	726.44	721.90	0.67	92	5
CB-39	725.61	722.52	1.54	80	5
CB-3A	726.98	721.30	0.82	98	5
CB-3B	725.21	721.30	0.73	98	5
CB-3Maple	766.53	761.60	0.54	85	5
CB-3River	726.46	722.40	1.39	67	13.3
CB-4	727.02	716.70	0.24	98	5
CB-4.1	724.05	719.40	0.48	98	5
CB-4.2	727.13	724.50	1.03	84	11.9
CB-4+65	724.15	720.32	1.21	95	5
CB-4-1	725.63	721.44			
CB-42	725.86	722.50	0.35	87	5
CB-4-2	726.35	721.44	0.23	78	5
CB-43	728.24	724.00	0.18	82	5
CB-43.1	728.18	724.80	0.05	97	5
CB-44	730.73	722.50	0.10	95	5
CB-44.1	727.88	724.60	0.47	96	5
CB-45	726.01	722.50	1.16	89	5
CB-45.1	727.74	723.70	0.25	95	5
CB-46	725.82	721.50	1.46	84	5
CB-46.1	727.88	723.60	0.29	98	5
CB-47	726.00	721.00	0.84	97	5
CB-48	726.33	723.00	1.15	97	5
CB-48.1	727.39	725.00	0.93	78	5
CB-48.2	725.80	725.79	0.43	98	5
CB-49	727.03	722.20	1.23	74	5
CB-49Park	724.94	720.70	2.45	82	5
CB-4A+70	724.34	720.62	0.52	90	5
CB-4Maple	766.82	762.62	0.43	93	5
CB-5	727.23	716.70	0.19	98	5
CB-5.1	725.73	722.60	0.44	62	5
CB-5.2	728.16	725.12	0.49	90	5
CB-50Reb	725.22	721.75	2.10	86	5
CB-51	725.88	721.20	0.73	94	5
CB-5-1	725.87	721.63	0.56	83	5
CB-51Reb	725.10	722.12	1.36	82	5
CB-52	725.08	722.00	0.90	82	5
CB-5-2	725.85	721.61	0.30	95	5
CB-53	724.73	721.63	0.29	98	5
CB-5-3	726.04	721.72	0.87	89	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-53.1	725.75	720.50	0.55	98	5
CB-54	724.84	721.50	0.89	98	5
CB-54.1	725.47	719.85	0.59	98	5
CB-55	724.89	721.20	0.11	98	5
CB-55.1	726.20	721.00	0.49	98	5
CB-57	726.93	723.00	0.28	86	5
CB-57.1	726.08	719.60	0.09	98	5
CB-58	726.21	719.50	0.21	98	5
CB-58.1	726.47	722.80	0.52	96	5
CB-59	725.65	722.00	0.66	93	5
CB-5A	725.23	721.30	0.64	98	5
CB-5A+00	724.78	720.91	2.25	86	10.1
CB-5B	725.25	721.30	0.48	98	5
CB-5Mck	765.25	756.00	0.03	81	5
CB-5p4	726.67	716.20	0.62	98	5
CB-5River	726.14	722.75	0.45	93	5
CB-6	727.23	716.70	0.25	98	5
CB-6.1	727.35	722.30	0.52	62	5
CB-6.2	727.07	724.07			
CB-60	725.13	719.20	0.94	98	5
CB-61	725.09	721.20	0.30	98	5
CB-6-1	728.10	723.36	0.90	87	5
CB-62	728.77	723.50	0.50	97	5
CB-6-2	727.92	723.71	0.55	89	5
CB-63	728.73	723.00	0.43	97	5
CB-63.1	724.99	718.40	1.24	97	5
CB-64	727.70	722.60	0.30	97	5
CB-64.1	725.23	718.73	0.69	97	5
CB-65	727.02	724.00	0.99	98	5
CB-66	725.66	722.50	0.96	77	5
CB-67	730.00	726.00	0.47	88	5
CB-68	725.63	722.20	0.39	95	5
CB-68.1	730.00	726.00	0.05	92	5
CB-69	724.27	722.30	2.49	97	5
CB-6A	725.23	721.30	0.68	98	5
CB-6B	725.29	721.30	0.56	98	5
CB-6Mck	761.31	756.90	1.00	79	5
CB-6p4	726.75	720.30	0.53	98	5
CB-6River	726.13	722.95	0.99	84	5
CB-7	727.39	716.70	0.13	98	5
CB-7.1	725.40	722.20	0.55	62	5
CB-7.2	726.67	723.92			
CB-70	725.17	721.90	0.36	96	5
CB-70.1	725.85	721.80	0.47	98	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-71	724.23	722.00	0.83	97	5
CB-71.1	727.56	723.00	0.38	98	5
CB-72	728.77	724.00	1.64	97	5
CB-72.1	728.26	724.70	0.09	95	5
CB-73	727.12	724.00	1.41	96	5
CB-74	772.54	768.98	0.57	74	5
CB-75	740.32	737.50	0.53	79	5
CB-76	742.75	738.50	2.85	64	14.2
CB-77	765.51	761.78	0.75	84	5
CB-78	766.78	763.31	3.80	58	5.8
CB-79	771.97	768.00	0.22	74	5
CB-7A	725.29	721.30	0.78	98	5
CB-7B	725.19	721.30	0.45	98	5
CB-7Mck	761.96	757.30	1.79	71	5
CB-7p4	726.80	720.30	0.56	98	5
CB-8	727.39	716.70	0.22	98	5
CB-8.1	726.46	722.00	1.07	91	5
CB-8.2	727.47	723.83	0.08	94	5
CB-8+50	724.72	721.15	1.41	88	15.7
CB-8+50L	725.22	722.00	1.77	91	5
CB-80	771.92	768.00	0.16	90	6.8
CB-8-1	726.92	722.67	0.39	82	5
CB-8-2	726.79	722.59	0.30	81	5
CB-899	726.76	715.59			
CB-8A	725.77	721.30	0.69	98	5
CB-8Oak	762.68	758.00	2.38	71	18.6
CB-8p4	726.65	715.55	0.32	92	5
CB-9	772.57	769.59	1.26	66	5
CB-9.1	727.42	716.70	0.20	98	5
CB-900	727.98	716.37	0.21	98	5
CB-901	727.01	718.44			
CB-902	725.78	719.43			
CB-903	726.54	719.80	0.33	98	5
CB-904	727.31	720.44	0.37	96	5
CB-905	729.05	720.82	0.49	98	5
CB-906	731.47	721.22	0.59	98	5
CB-907	733.15	721.61	0.71	98	5
CB-908	732.56	722.05	0.85	98	5
CB-909	731.68	722.42	0.45	98	5
CB-9-1	726.67	722.80	0.34	88	5
CB-910	730.60	722.73	1.42	97	5
CB-911	730.10	726.08	4.13	95	5
CB-9-2	726.71	722.70	0.40	85	5
CB-99	727.57	724.50	0.31	74	5

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
CB-9p4	727.94	714.47	0.52	82	5
CB-Cleve0+38L	724.77	722.29	0.72	90	5
CB-Cleve0+38R	724.91	722.29	0.10	91	5
CB-Cleve2+78E	725.63	722.72	1.40	94	5
CB-Cleve2+78W	725.48	722.49	0.44	89	5
CB-Cleve3+00	725.36	722.44	0.73	96	5
CB-Cleve4+60	725.71	722.80	0.48	96	5
CB-P212	724.96	721.70	0.50	97	5
CB-P213	725.60	721.80	0.60	98	5
CB-P214	725.54	721.70	1.04	98	5
CB-P215	725.63	721.60	1.12	98	5
CB-P216	729.04	721.55	1.00	98	5
CB-P217	725.37	721.50	0.89	98	5
CB-P218	725.36	721.38	1.19	98	5
CB-P2ex	725.95	721.26	0.65	98	5
CS-4	757.68	754.42	3.34	67	9
FD-1	725.11	725.10	0.51	75	5
GB-1	724.51	724.50	6.10	79	28.9
GB-2	725.79	725.78	1.58	73	5
GB-3	727.62	727.61	4.13	76	5
H-1	744.13	732.50	3.97	72	9.8
H-10	726.00	721.00			
H-10.1	735.00	726.23	3.59	78	5
H-11	736.00	725.60			
H-11.1	727.01	724.51			
H-12	762.00	752.67			
H-13	727.84	726.00			
H-2	762.00	759.80			
H-3	752.44	736.50			
H-4	770.00	747.73			
H-4.1	728.00	724.10	23.28	72	25
H-5	725.71	724.00			
H-6	725.85	724.00	2.69	73	13.9
H-7	728.00	725.68	6.12	86	11
H-8	726.00	721.00			
H-8.1	728.00	723.02			
H-9	726.00	721.28			
H-9.1	728.00	723.01			
MH-1	726.54	721.16			
MH-101	727.17	723.87			
MH-101.1	729.65	726.50			
MH-102	727.73	723.56			
MH-103	726.98	722.95			
MH-103.1	727.17	724.27			

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
MH-104	727.45	722.19			
MH-105	726.84	722.00			
MH-106	726.04	721.81			
MH-107	727.56	723.98			
MH-11	727.20	722.90			
MH-12	727.66	722.94			
MH-123	727.69	723.45			
MH-124	728.08	723.60			
MH-125	728.49	724.45			
MH-127	730.21	725.50			
MH-128	728.76	724.20			
MH-129	728.22	724.00			
MH-13	730.40	725.85			
MH-13.1	726.60	719.10			
MH-130	727.62	724.40			
MH-131	727.88	725.88	3.39	86	5.5
MH-131.1	729.09	721.41			
MH-135	728.17	722.10			
MH-14	733.18	727.50			
MH-15	725.65	722.52			
MH-153	726.22	718.75			
MH-16	727.08	720.80			
MH-17	726.35	723.50			
MH-17.1	725.53	718.82			
MH-18	726.43	722.06			
MH-183	727.78	719.63	4.09	96	5
MH-185	725.07	721.00			
MH-186	725.57	721.31			
MH-187	725.70	721.70			
MH-19	726.18	722.20	1.00	84	5
MH-190	726.21	723.20			
MH-191	727.38	723.40			
MH-192	727.73	723.60			
MH-197	728.35	723.80			
MH-1A	731.47	721.50			
MH-1River	726.88	722.40			
MH-2	726.70	720.50			
MH-20	725.24	721.90			
MH-21	725.31	721.80			
MH-21.1	725.82	721.70			
MH-215	726.53	723.00			
MH-22	725.84	721.40			
MH-22.1	724.89	720.73			
MH-227	726.95	719.06			

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
MH-23	725.11	722.10			
MH-238	726.71	724.20			
MH-24	724.15	722.40			
MH-240	725.83	720.23			
MH-245	726.08	719.20			
MH-246	726.60	719.10			
MH-247	726.33	719.40			
MH-25	724.47	722.20			
MH-255	725.98	722.10			
MH-256	725.36	720.10			
MH-257	725.73	721.30			
MH-26	724.68	722.10			
MH-260	726.77	722.40			
MH-266	730.23	722.00			
MH-269	729.45	722.50			
MH-27	725.03	722.00			
MH-28	724.58	722.10			
MH-29	725.13	722.00			
MH-2River	729.26	721.75			
MH-3	726.77	718.88			
MH-3.1	726.30	721.20			
MH-30	725.61	721.60			
MH-300Wash	727.93	725.10			
MH-31	726.83	722.40			
MH-35	772.19	768.05			
MH-36	766.07	726.02			
MH-37	740.18	737.00			
MH-4	725.68	721.39			
MH-4.1	726.77	717.23			
MH-4A+68	724.13	720.52			
MH-5	725.83	721.56			
MH-55	727.92	721.10			
MH-58	728.76	720.70			
MH-5River	726.33	722.40			
MH-6	727.80	722.17			
MH-61	729.00	721.50			
MH-62	727.97	721.00			
MH-7	725.57	722.41			
MH-7River	726.76	722.65			
MH-8	726.79	722.46			
MH-8A	727.14	723.84			
MH-9	726.54	722.57			
MH-99	727.77	724.50			
MH-Cleve0+09	724.58	720.95			

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
MH-Cleve1+50	725.76	721.61			
MH-Cleve2+90	725.65	721.78			
MH-Cleve4+60	726.07	722.63			
MH-Ex	727.08	718.85			
MH-Madison12+90	725.22	720.50			
MH-Madison14+75	724.16	720.87			
MH-Madison18+27	725.36	721.74			
MH-StructureA	729.01	717.59			
MH-StructureB	726.85	716.18			
MH-Tyler1	729.47	721.04			
MH-Tyler2	729.09	721.24			
MH-Tyler3	729.26	721.28			
MS-1	725.58	725.57	7.27	72	11.7
Node1790	726.00	715.00			
Node1796	726.60	715.00			
Node1802	715.00	714.90	1.14	98	5
Node1803	726.00	718.00			
Node1815	726.00	715.00			
Node1830	735.00	728.90			
Node1831	735.00	728.71			
Node1832	735.00	729.67			
Node1833	735.00	727.78			
Node1834	735.00	727.64			
O-1	744.13	729.60	1.37	80	5
O-1.1	729.77	729.76	3.38	85	5
O-1.2	729.11	729.10	2.11	59	5
O-10	733.22	732.00			
O-10.1	728.59	715.00			
O-15	728.00	722.78			
O-16	728.00	722.70			
O-18	726.00	715.00			
O-22	732.00	721.00			
O-23	728.00	724.00			
O-5	758.39	750.22			
O-5C	726.70	715.40			
O-6C	726.70	719.50			
O-7	726.00	718.80			
O-7C	726.67	719.50			
O-8	726.00	718.70			
O-9	736.00	728.00			
POS-1	752.44	749.00	5.93	69	28.5
POS-2	726.50	721.60	2.61	67	5
RVL-1	726.99	726.98	0.80	76	5
VB-1	725.47	725.46	3.30	83	6.9

Node	Rim Elev. (ft)	Invert Elev. (ft)	Runoff Area (ac)	**RCN**	Tc (min)
W-1	728.06	720.00			
W-2	729.65	718.00			

APPENDIX B
LINK DATA TABLES

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-1	100	2.5	0.024	732.5	729.6	Circular	0.5
CO-100	71.8	1	0.013	722.2	722.1	Circular	0.7
CO-101	140.7	1	0.013	722.1	722	Circular	0.5
CO-102	87	1.5	0.013	716.2	715.4	Circular	1
CO-102.1	19.4	1	0.013	722	721.9	Circular	0.8
CO-103	108	1	0.013	721.3	720.3	Circular	0.5
CO-103.1	209.8	1	0.013	724	723	Circular	0.5
CO-104	68	1	0.013	720.3	719.5	Circular	0.8
CO-105	107.5	1	0.013	721.3	720.3	Circular	0.5
CO-106	107	1	0.013	721.3	720.3	Circular	0.5
CO-107.1	60	1	0.013	720.3	719.5	Circular	0.5
CO-108.1	107	1	0.013	721.3	720.3	Circular	0.5
CO-109	84	1	0.013	721.3	715.591	Circular	0.5
CO-110	110	2.5	0.013	715.55	715	Circular	0.8
CO-118	192	2.5	0.013	716.47	715.55	Circular	0.6
CO-120	42	1	0.013	725	724.5	Circular	0.5
CO-122	16.2	1	0.013	726.6	726.5	Circular	0.5
CO-124	42	1.25	0.013	724.5	724.37	Circular	1
CO-124.1	40	1	0.013	768.984	768.049	Circular	0.5
CO-125	404.6	1	0.013	768.049	762.023	Circular	0.9
CO-126	377.7	1	0.013	762.023	737	Circular	1
CO-127	142.8	1	0.013	737	732	Circular	1
CO-128	40.2	1	0.013	737.5	737	Circular	0.5
CO-129	46.5	1	0.013	738.5	737	Circular	0.5
CO-130	37.9	1	0.013	761.779	762.023	Circular	0.5
CO-131	44.2	1	0.013	763.308	762.023	Circular	0.5
CO-132	44.5	1	0.013	727	726.5	Circular	0.5
CO-132.1	30.4	1	0.013	767.998	768.049	Circular	0.5
CO-133	40.8	1	0.013	727	726.5	Circular	0.5
CO-133.1	14.6	1	0.013	767.995	768.049	Circular	0.5
CO-134	31.3	1	0.013	724.6	724.5	Circular	0.5
CO-135	39	1	0.013	724.64	724.37	Circular	0.5
CO-136	9	1	0.013	724.54	724.37	Circular	0.5
CO-137	9	2.5	0.013	723.71	723.67	Circular	0.5
CO-138	29	2.5	0.013	723.36	723.67	Circular	1
CO-139	254.4	2.5	0.013	723.5	723.5	Circular	0.6
CO-141	261	3.16	0.013	722.9	722.7	Special	0.8
CO-145	45	0.833	0.01	723.22	723.13	Circular	0.5
CO-146	46	0.833	0.01	723.13	723.06	Circular	0.8
CO-149	19	1	0.013	723.11	723.06	Circular	0.5
CO-150	42	1	0.013	724.02	724.02	Circular	0.5
CO-151	12	1	0.013	724.02	724.02	Circular	0.5

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-152	76.6	1	0.013	725.68	725.18	Circular	0.5
CO-153	173	1.25	0.013	725.1	724.56	Circular	0.6
CO-154	134	2	0.013	723.87	723.61	Circular	1
CO-155	64	1	0.013	725.12	724.92	Circular	0.5
CO-157	40	1	0.013	722.81	722.71	Circular	0.5
CO-160	119.5	1	0.013	723.45	723.6	Circular	0.7
CO-161	287.8	1	0.013	724.45	723.6	Circular	0.9
CO-164	47.4	1	0.013	724.6	724.45	Circular	0.5
CO-165	57.3	1	0.013	723.7	723.45	Circular	0.5
CO-166	27.7	1	0.013	723.6	723.45	Circular	0.5
CO-169	202.9	1.25	0.013	725.5	724.2	Circular	0.9
CO-170	109.4	1.25	0.013	724.2	724	Circular	1
CO-171	118.5	1.25	0.013	724	724.4	Circular	0.9
CO-172	26	1	0.013	724.4	725	Circular	0.5
CO-174	43	3.16	0.013	721.28	721.24	Special	0.7
CO-176	78	1	0.013	722.46	722	Circular	0.5
CO-177	26.9	1	0.013	722.2	722.1	Circular	0.5
CO-196	34	1	0.013	720.5	720.3	Circular	0.5
CO-198	107.1	1	0.013	721	721.2	Circular	0.5
CO-199	190.2	1.5	0.013	721	720	Circular	0.7
CO-20	114.822	1.5	0.013	720.6	720.95	Circular	0.5
CO-20.1	60	2	0.013	720.95	720.89	Circular	0.5
CO-202	119.1	5	0.024	719	718.8	Circular	0.8
CO-21	50	2.5	0.013	720.32	720.21	Circular	0.5
CO-215	108.2	3	0.013	718.8	718.4	Circular	0.5
CO-216	92.3	3	0.013	719.7	718.8	Circular	0.7
CO-217	116.1	3	0.013	719.76	719.7	Circular	0.5
CO-218	100	3	0.013	719.82	719.76	Circular	0.7
CO-219	116.2	2.5	0.013	720.39	720.32	Circular	0.8
CO-22	236.5	1.5	0.013	721.26	721	Circular	0.8
CO-22.1	42.3	1	0.013	722.6	722.5	Circular	0.5
CO-220	41	1.5	0.013	721.4	721.32	Circular	0.5
CO-23	111	1.5	0.013	721.5	721.55	Circular	0.7
CO-23.1	116.5	1.25	0.013	722.5	722.2	Circular	0.8
CO-231	59.4	3	0.013	719.2	718.73	Circular	0.7
CO-232	124	5	0.024	718.73	718.7	Circular	0.5
CO-24	123.9	1.5	0.013	721.55	721.6	Circular	0.5
CO-24.1	119.1	1.5	0.013	722.2	722	Circular	1
CO-25	140.2	1.5	0.013	721.5	721.38	Circular	0.5
CO-25.1	129.9	1.5	0.013	722	721.7	Circular	0.7
CO-250	390	3	0.013	721.04	720.13	Circular	1
CO-251	15.3	1	0.013	724	723.87	Circular	0.5

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-252	39	1	0.013	724.5	724.07	Circular	0.8
CO-253	97.3	1	0.013	722.4	722.2	Circular	0.5
CO-254	27.1	1	0.013	726	725.5	Circular	0.5
CO-255	19.5	1	0.013	726	725.5	Circular	0.6
CO-256	8	1	0.013	722.75	722.71	Circular	0.5
CO-258	98	1	0.013	721.8	721.56	Circular	0.8
CO-259	15.3	1	0.013	722	721.7	Circular	0.5
CO-26	84.7	1.5	0.013	721.38	721.26	Circular	0.5
CO-260	229	0.5	0.01	723	722	Circular	0.5
CO-262	36.4	1	0.013	724.7	724.45	Circular	0.8
CO-263	61.3	1	0.013	724.8	724.7	Circular	0.5
CO-264	178.1	1	0.013	724	723.6	Circular	0.5
CO-265	20	1	0.013	724.97	724.56	Circular	0.5
CO-266	17.1	1	0.013	722.31	722.3	Circular	0.5
CO-267	35	1.5	0.013	722.25	722.3	Circular	1
CO-268	42	1	0.013	723.64	723.25	Circular	0.5
CO-268.1	27.553	1	0.013	722.45	722.3	Circular	0.8
CO-269	87.5	1	0.013	721.3	721	Circular	0.5
CO-27	50.2	1	0.013	769.594	768.536	Circular	0.5
CO-274	75	1.5	0.013	720.52	720.21	Circular	1
CO-275	35	1	0.013	720.91	720.52	Circular	0.5
CO-276	12	1	0.013	720.52	720.62	Circular	0.5
CO-277	39	1	0.013	722	721.75	Circular	0.5
CO-278	45	1	0.013	722.2	722	Circular	0.5
CO-28	64	1.5	0.013	721.7	721.5	Circular	0.7
CO-28.1	173.6	1	0.013	768.536	768.899	Circular	0.8
CO-281	50	0.833	0.01	724.02	724.02	Circular	0.5
CO-282	27	1	0.013	722.94	722.89	Circular	0.5
CO-283	8	1	0.013	722.94	722.89	Circular	0.5
CO-284	30	1	0.013	724.3	724.07	Circular	0.5
CO-285	8	1	0.013	724.2	724.07	Circular	0.5
CO-286	27	1	0.013	724.17	723.96	Circular	0.5
CO-287	11	1	0.013	724.09	723.96	Circular	0.5
CO-288	84.5	1	0.013	721.3	720.5	Circular	0.5
CO-289	88.5	1	0.013	721.3	720.5	Circular	0.5
CO-29	40.8	1	0.013	722.3	722.2	Circular	0.5
CO-29.1	73.8	1	0.013	768.899	747.731	Circular	0.8
CO-290	110	1	0.013	721.3	720.5	Circular	0.5
CO-291	31	1	0.013	721.3	720.5	Circular	0.5
CO-295	9	1	0.013	726.74	726.35	Circular	0.5
CO-296	30	1	0.013	726.74	726.35	Circular	0.5
CO-297	22.7	1	0.013	724.5	724.4	Circular	0.5

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-298	282.7	1	0.013	723.4	723.2	Circular	1
CO-299	302.7	1	0.013	723.6	723.4	Circular	1
CO-30	44.6	1	0.013	722.2	722	Circular	0.5
CO-30.1	51.4	1	0.013	758	757.59	Circular	0.5
CO-301	32	1	0.013	721.69	721.2	Circular	0.5
CO-302	10	1	0.013	720.87	721.47	Circular	0.5
CO-307	318.4	1	0.013	723.8	723.6	Circular	0.6
CO-31	49	2	0.013	757.3	756.95	Circular	0.6
CO-31.1	177.9	1	0.013	722	721.7	Circular	0.5
CO-311	42.5	1	0.013	722.29	721.44	Circular	0.5
CO-312	36.3	1	0.013	722.29	721.44	Circular	0.5
CO-313	20	1	0.013	722.44	722.23	Circular	0.5
CO-314	35	1.25	0.013	722.23	722.49	Circular	0.8
CO-315	41	1	0.013	722.6	722.72	Circular	0.5
CO-32	190	2	0.013	756.9	756.14	Circular	0.6
CO-323	641.2	5	0.013	717.6	716.3	Circular	0.9
CO-331	38	1	0.013	722.8	722.75	Circular	0.5
CO-332	18.9	1	0.013	723.1	723	Circular	0.5
CO-334	27.2	1	0.013	723.1	723	Circular	0.5
CO-34	42	1	0.013	762.52	762.1	Circular	0.5
CO-346	46	1	0.013	724.07	723.92	Circular	0.5
CO-347	60	1	0.013	723.92	723.83	Circular	0.5
CO-348	31	1.25	0.013	723.83	723.71	Circular	0.8
CO-349	30	1.25	0.013	723.71	723.5	Circular	0.6
CO-35	56	1.5	0.013	761.6	760	Circular	0.6
CO-350	35	1.25	0.013	723.5	723.66	Circular	0.6
CO-351	83.8	1.25	0.013	722.48	722.3	Circular	0.5
CO-353	98.8	1.25	0.013	722.9	722.48	Circular	0.5
CO-356	45	1.5	0.013	722.25	722.19	Circular	0.5
CO-357	184	2	0.013	722.95	722.23	Circular	1
CO-358	53	1	0.013	723.91	723.75	Circular	0.5
CO-359	60	1	0.013	723.84	723.66	Circular	0.5
CO-36	87	2	0.013	755.7	754.42	Circular	0.8
CO-360	24	1	0.013	723.74	723.67	Circular	0.5
CO-361	22	1	0.013	724.08	723.99	Circular	0.6
CO-362	24	1	0.013	724.39	724.14	Circular	0.5
CO-367	159	2	0.013	722.95	723.56	Circular	0.7
CO-37	108	1	0.013	721.3	720.25	Circular	0.5
CO-37.1	286	1	0.013	757	756	Circular	0.5
CO-378	52	1	0.013	729.6	729.35	Circular	0.6
CO-379	9	1	0.013	729.3	729.25	Circular	0.8
CO-38	107	1.5	0.013	716.2	717.23	Circular	0.5

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-38.1	233.3	2	0.013	756	755	Circular	0.8
CO-380	49	1	0.013	729.81	729.65	Circular	0.5
CO-381	98.4	1	0.013	725.5	725.4	Circular	0.5
CO-382	145.6	1	0.013	725.4	724.9	Circular	0.5
CO-387	130	5	0.024	719.4	719.3	Circular	0.6
CO-389	61.6	1.5	0.013	719.5	719.4	Circular	0.5
CO-39	166	1.5	0.013	717.23	718.88	Circular	1
CO-39.1	63.9	1	0.013	755	753.5	Circular	0.8
CO-395	99	3.5	0.013	718.7	718.7	Circular	0.5
CO-396	101	3.5	0.013	718.7	718.7	Circular	0.7
CO-397	99	3.5	0.013	718.7	718.7	Circular	0.7
CO-398	92	3.5	0.013	718.7	718.7	Circular	0.7
CO-399	61	3.5	0.013	718.7	718.7	Circular	0.7
CO-40	166	1.5	0.013	718.88	720.5	Circular	0.8
CO-40.1	35.5	1	0.013	755.5	755	Circular	0.5
CO-400	100	3.5	0.013	718.7	718.7	Circular	0.9
CO-401	124	3.5	0.013	718.7	718.7	Circular	0.7
CO-404	125.5	3.5	0.013	718.7	718.7	Circular	0.7
CO-405	199	3.5	0.013	718.7	718.7	Circular	0.5
CO-406	197.5	3.5	0.013	718.7	718.7	Circular	0.5
CO-407	129.5	3.5	0.013	718.7	718.7	Circular	0.5
CO-41	56.3	1	0.013	727	726	Circular	0.5
CO-411	60	1	0.013	722	721.5	Circular	0.5
CO-412	104	1	0.013	719.5	719.4	Circular	0.5
CO-416	125	5	0.024	719.7	719.6	Circular	0.5
CO-419	62.8	2	0.013	720	719.9	Circular	0.8
CO-42	26.7	1	0.013	724.6	724.2	Circular	0.5
CO-420	100.8	2	0.013	719.9	719.72	Circular	0.5
CO-421	247.2	5	0.024	719.72	719.7	Circular	0.5
CO-423	50	1.5	0.013	719.4	719.3	Circular	0.5
CO-425	121.3	5	0.024	719.3	719.2	Circular	0.6
CO-426	44.2	2	0.013	719.3	719.2	Circular	0.5
CO-43	111	1	0.013	721.3	720.25	Circular	0.5
CO-43.1	20.1	1	0.013	724.8	724.2	Circular	0.5
CO-432	79.9	1.333	0.013	721.7	721.5	Circular	0.8
CO-433	111.6	1.5	0.013	721.5	721	Circular	0.5
CO-434	114.2	1.333	0.013	721.8	721.7	Circular	0.5
CO-435	119.6	1.5	0.013	721.8	721.7	Circular	0.5
CO-436	180.6	1.5	0.013	721.7	721.6	Circular	0.5
CO-439	99.7	1	0.013	722	721.75	Circular	0.5
CO-44	26.6	2	0.013	719.9	719.8	Circular	1
CO-440	100.3	1	0.013	722	721.75	Circular	0.5

DRAFT-(10.22.19)

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-441	47	2	0.013	720.75	720.7	Circular	0.7
CO-444	104	1.5	0.013	723.08	722.77	Circular	0.5
CO-445	104	2	0.013	722.73	722.47	Circular	0.5
CO-446	104	2	0.013	722.42	722.11	Circular	0.5
CO-447	104	2	0.013	722.05	721.69	Circular	0.5
CO-448	104	2.5	0.013	721.61	721.3	Circular	0.5
CO-449	104	2.5	0.013	721.22	720.9	Circular	0.5
CO-450	104	3	0.013	720.82	720.53	Circular	0.5
CO-452	199	2	0.013	720.9	719.9	Circular	1
CO-453	199.5	1.75	0.013	720.9	721.9	Circular	0.8
CO-454	103	1	0.013	721.9	722.3	Circular	0.5
CO-455	107	1	0.013	722.3	721.9	Circular	0.5
CO-456	105	1	0.013	721.8	720.9	Circular	0.5
CO-457	107	1	0.013	721.8	720.9	Circular	0.5
CO-458	108	1	0.013	721.3	719.9	Circular	0.5
CO-463	213.2	1.25	0.013	723.5	723	Circular	0.5
CO-464	191.1	2	0.013	723	722	Circular	0.8
CO-465	310.5	2	0.013	722	719	Circular	0.9
CO-466	217.6	1.25	0.013	722.2	722	Circular	0.5
CO-467	48	1.5	0.013	720.05	720	Circular	0.5
CO-47	50	3	0.013	720.44	720.29	Circular	0.5
CO-472	97.7	1.5	0.013	719.6	719.4	Circular	0.5
CO-473	56.5	1.5	0.013	719.4	719.06	Circular	0.5
CO-474	38.2	1.5	0.013	719.4	719.2	Circular	0.5
CO-475	56.6	1.5	0.013	719.06	718.95	Circular	0.9
CO-476	158	3.5	0.013	718.85	718.8	Circular	0.7
CO-477	226.2	3.5	0.013	719	718.85	Circular	1
CO-478	68	1.5	0.013	720.05	720	Circular	0.5
CO-479	131.5	3.5	0.013	719.07	719.02	Circular	1
CO-48	214	2	0.013	719.8	719.1	Circular	0.8
CO-480	69	1.5	0.013	720.05	720	Circular	0.5
CO-481	55	1.5	0.013	720.06	720	Circular	0.5
CO-482	153	3.5	0.013	719.1	719.07	Circular	0.7
CO-483	70	1.5	0.013	721.2	721.13	Circular	0.5
CO-484	128	3.5	0.013	719.13	719.1	Circular	1
CO-485	479.6	3.5	0.013	719.345	719.13	Circular	0.5
CO-486	64	1.5	0.013	721.33	721.27	Circular	0.5
CO-487	128	3.5	0.013	719.13	719.1	Circular	0.7
CO-488	62	1.5	0.013	721.77	721.71	Circular	0.5
CO-489	95.5	2	0.013	719.23	719.13	Circular	1
CO-490	31.5	1	0.013	719.73	719.415	Circular	0.5
CO-491	59.7	1	0.013	720.2	720	Circular	0.5

DRAFT-(10.22.19)

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-492	30.3	1	0.013	722.4	722.1	Circular	0.5
CO-493	154.5	1.25	0.013	720.2	720	Circular	1
CO-494	53	1	0.013	720.4	720.2	Circular	0.5
CO-495	60.5	1	0.013	722.6	722.5	Circular	0.5
CO-496	191.1	1.25	0.013	722.5	721.86	Circular	0.6
CO-497	32	1	0.013	722.32	720.85	Circular	0.5
CO-498	207.4	1.25	0.013	722.5	720.6	Circular	1
CO-499	61.1	1	0.013	721.5	720.85	Circular	0.5
CO-500	33.3	1	0.013	725.7	725.7	Circular	0.5
CO-501	45.8	1	0.013	725.9	725.9	Circular	0.5
CO-502	15.6	1	0.013	725.85	725.7	Circular	0.5
CO-503	16	2.5	0.024	726.23	721.41	Circular	0.5
CO-505	69.5	1.5	0.013	719	718.75	Circular	0.8
CO-506	50	1	0.013	722	721.5	Circular	0.5
CO-507	43.5	1	0.013	719	718.82	Circular	0.5
CO-508	88.1	1	0.013	719	718.82	Circular	0.5
CO-509	115	3.5	0.013	718.7	718.7	Circular	0.7
CO-510	79	3.5	0.013	718.7	718.7	Circular	0.5
CO-511	47.6	1	0.013	719	718.86	Circular	0.5
CO-513	57	1	0.013	723.8	723.6	Circular	0.5
CO-514	37.1	1	0.013	723.7	723.6	Circular	0.5
CO-515	23	1	0.013	723.7	723.6	Circular	0.5
CO-516	25	1	0.013	723.5	723.4	Circular	0.5
CO-517	42.2	1	0.013	723.5	723.4	Circular	0.5
CO-518	57.1	1	0.013	723.6	723.4	Circular	0.5
CO-52	73.6	2	0.024	749	736.5	Circular	0.5
CO-521	28.6	1	0.013	721.74	722	Circular	0.5
CO-522	25.4	1	0.013	723.3	723.2	Circular	0.5
CO-523	21.6	1	0.013	723.9	723.8	Circular	0.5
CO-53	113.2	1	0.013	759.8	752.669	Circular	0.5
CO-536	35.3	1	0.013	723.1	723	Circular	0.5
CO-539	19.1	1	0.013	721.7	721.61	Circular	0.5
CO-540	38.7	1	0.013	721.6	721.44	Circular	0.5
CO-541	6	1	0.013	721.58	721.56	Circular	0.5
CO-542	125.8	2.5	0.013	724.1	723.71	Circular	0.5
CO-543	32.4	2.5	0.013	723.1	722.9	Circular	0.5
CO-544	40	2.5	0.013	723.4	723.1	Circular	0.8
CO-545	17	2.5	0.013	723.5	723.4	Circular	0.8
CO-547	12.7	1	0.013	722.5	722.41	Circular	0.5
CO-548	34	1	0.013	722.4	722	Circular	0.5
CO-55	62	2	0.013	756	755.74	Circular	0.5
CO-552	81.8	1.5	0.013	719.6	719.5	Circular	0.5

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-553	37.6	1	0.013	721.2	721	Circular	0.5
CO-554	53.3	1	0.013	721	720.5	Circular	0.8
CO-555	122.5	1	0.013	724	723.2	Circular	0.5
CO-557	88	1	0.013	724.3	724.2	Circular	0.5
CO-558	77.7	1	0.013	724.2	724.3	Circular	0.5
CO-559	99.4	1	0.013	724.2	724	Circular	0.9
CO-56	90.8	0.833	0.013	722.5	722.1	Circular	0.5
CO-560	46.4	1	0.013	724	723.5	Circular	0.5
CO-561	44.5	1	0.013	724	723.5	Circular	0.5
CO-562	531.8	5	0.024	719.6	719.5	Circular	0.5
CO-563	224.4	5	0.024	719.5	719.4	Circular	0.6
CO-564	100	3.5	0.013	719.46	719.42	Circular	0.5
CO-565	100	3.5	0.013	719.5	719.46	Circular	0.5
CO-566	101	3.5	0.013	719.54	719.5	Circular	0.5
CO-567	99	3.5	0.013	719.58	719.54	Circular	0.5
CO-57	43	1	0.013	724	723.9	Circular	0.5
CO-571	170	3.5	0.013	719.42	719.35	Circular	0.5
CO-572	81.5	2	0.013	720.7	720.61	Circular	0.9
CO-573	65	3.5	0.013	719.61	719.58	Circular	0.9
CO-574	10	1	0.013	722.39	722	Circular	0.5
CO-575	30	1	0.013	720.5	722.39	Circular	0.5
CO-576	413.1	2.5	0.013	720.23	719.1	Circular	0.8
CO-577	216.4	3.5	0.013	719.35	719.3	Circular	0.6
CO-578	138	3	0.013	720.21	719.9	Circular	1
CO-579	104.2	1.5	0.013	721	720.6	Circular	0.5
CO-58	204.8	1	0.013	722.5	722.2	Circular	0.5
CO-584	19.2	1	0.013	719.6	719.5	Circular	0.5
CO-586	96.2	1.5	0.013	720	719.5	Circular	0.7
CO-589	101.7	5	0.024	719.1	719	Circular	0.7
CO-590	259.2	5	0.024	719.2	719.1	Circular	0.6
CO-591	17.7	3.5	0.013	719.2	719.1	Circular	0.8
CO-592	38.6	1	0.013	719.5	719.4	Circular	0.8
CO-593	48.9	1.5	0.013	719.5	719.4	Circular	0.5
CO-594	59.4	3.5	0.013	719.4	719.2	Circular	0.6
CO-595	158	3.5	0.013	718.7	718.7	Circular	0.5
CO-596	81.9	1	0.013	724.9	719	Circular	0.5
CO-597	107.7	1	0.013	721.3	718.9	Circular	0.6
CO-598	28	3.5	0.013	718.82	718.7	Circular	0.9
CO-600	71	3.5	0.024	718.7	715	Circular	0.7
CO-601	180.5	2.5	0.013	717.41	716.47	Circular	0.5
CO-603	112	2.5	0.013	718.02	717.41	Circular	0.8
CO-604	153	2.5	0.013	718.78	718.02	Circular	0.6

DRAFT-(10.22.19)

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-605	65	2.5	0.013	719.1	718.78	Circular	0.5
CO-608	28.42	1	0.013	721.3	719.9	Circular	0.5
CO-609	29	3.5	0.013	716.18	715	Circular	0.5
CO-610	62	1	0.013	724.31	724.08	Circular	0.5
CO-611	33	1	0.013	724.88	724.63	Circular	0.5
CO-612	62	1	0.013	724.32	723.84	Circular	0.6
CO-613	22	1.25	0.013	723.73	723.67	Circular	0.5
CO-614	20	1	0.013	724.56	724.5	Circular	0.5
CO-615	63.4	1.25	0.013	723.98	723.45	Circular	0.5
CO-617	7	1	0.013	724.48	724.57	Circular	0.5
CO-62	479.6	1	0.013	721.5	720.2	Circular	0.7
CO-624	176.7	3.5	0.024	723.01	722.7	Circular	0.5
CO-625	175.5	3.5	0.024	723.02	722.78	Circular	0.5
CO-627	71.9	2.5	0.024	718.7	715	Circular	0.7
CO-628	34	1	0.013	723.2	722.1	Circular	1
CO-629	46.2	1.5	0.013	722.1	721.74	Circular	0.7
CO-63	24.7	2	0.013	721.5	721	Circular	0.8
CO-630	53.3	1	0.013	720.2	720.1	Circular	0.5
CO-631	55.7	1	0.013	720.1	720	Circular	0.5
CO-633	389	2	0.013	721.26	720.85	Circular	0.8
CO-634	133.3	3	0.013	718.4	719.2	Circular	0.5
CO-635	362.7	2	0.013	720.5	720	Circular	0.6
CO-636	49	1	0.013	722	721.5	Circular	0.5
CO-637	43.9	1	0.013	719	718.84	Circular	0.5
CO-638	67.2	3.5	0.013	719.1	719.3	Circular	0.5
CO-639	63.4	1.5	0.013	721.3	721.1	Circular	0.8
CO-64	304.8	2	0.013	721	719.3	Circular	0.5
CO-640	66.2	1.25	0.013	721.3	721.4	Circular	0.8
CO-641	112.9	1.5	0.013	721.5	721	Circular	0.5
CO-642	99	3.5	0.013	719.63	719.61	Circular	0.8
CO-643	158.1	1.5	0.013	724.51	724	Circular	0.5
CO-644	493.4	3	0.013	724	722.41	Circular	1
CO-65	117.3	1	0.013	723	722.5	Circular	0.6
CO-66	71.2	1	0.013	722.2	722	Circular	0.5
CO-660	340.2	1	0.013	726	722.8	Circular	0.5
CO-661	285	1	0.013	722.65	722.65	Circular	1
CO-662	297	1.25	0.013	722.4	722.4	Circular	0.9
CO-663	295	1.25	0.013	722.4	722.4	Circular	0.7
CO-664	75	1.25	0.013	722.65	722.4	Circular	0.9
CO-665	62	1	0.013	723	722.65	Circular	0.5
CO-666	46.4	1	0.013	723.5	723.3	Circular	0.5
CO-667	113.7	1	0.013	723.3	722.9	Circular	0.8

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-668	20	1	0.013	722.75	722.65	Circular	0.7
CO-669	43	1	0.013	722.95	722.85	Circular	0.5
CO-67	43.5	1	0.013	722	722.12	Circular	0.5
CO-670	30	1	0.013	722.85	722.65	Circular	0.5
CO-671	43	1	0.013	722.95	722.85	Circular	0.5
CO-672	23	1	0.013	722.75	722.65	Circular	0.8
CO-673	245	1	0.013	722.75	722.4	Circular	0.5
CO-674	35	1	0.013	722.4	722.4	Circular	0.6
CO-675	38	1	0.013	723	722.8	Circular	0.5
CO-676	18	1	0.013	722.8	722.65	Circular	0.8
CO-678	30	1	0.013	722.85	722.65	Circular	0.5
CO-679	12	1	0.013	722.75	722.65	Circular	0.5
CO-68	98.4	1.5	0.013	721.1	721	Circular	0.7
CO-68.1	43	1	0.013	722	721.88	Circular	0.5
CO-680	250	1.5	0.013	722.4	722.25	Circular	1
CO-681	48.9	1.5	0.013	722	721.5	Circular	0.8
CO-682	39.3	1.5	0.013	721.5	721	Circular	0.8
CO-683	23.5	1	0.013	722.2	722	Circular	0.6
CO-684	15.1	1	0.013	721.75	718	Circular	0.8
CO-686	293.4	0.833	0.01	722.5	721.5	Circular	0.5
CO-687	35.3	1	0.013	722.33	722.15	Circular	0.5
CO-69	98.1	2	0.013	721	720.8	Circular	0.7
CO-69.1	8.7	1	0.013	721.7	721.5	Circular	0.5
CO-690	10.3	1.5	0.013	721.9	720	Circular	0.5
CO-70	172.8	1	0.013	721.5	721.2	Circular	0.5
CO-70.1	71.6	2	0.013	720.8	720.7	Circular	0.7
CO-71	25.4	1	0.013	721.2	721	Circular	0.5
CO-72	240.7	1.25	0.013	721.75	721.28	Circular	0.7
CO-72.1	101.1	1.25	0.013	722	721.5	Circular	0.5
CO-73	292.9	1	0.013	722.5	722.06	Circular	0.8
CO-74	167.1	2	0.013	722.06	721.5	Circular	0.6
CO-74.1	73.4	1.5	0.013	721	720.7	Circular	0.5
CO-75	122.7	2	0.013	723	722.06	Circular	0.5
CO-75.1	38.1	1	0.013	721	720.8	Circular	0.5
CO-76	38.2	1	0.013	721.2	721	Circular	0.5
CO-76.1	136.5	1	0.013	723	722.8	Circular	0.5
CO-77	29.8	1	0.013	721.2	721.1	Circular	0.5
CO-77.1	283.3	1	0.013	722.8	722.2	Circular	0.6
CO-78	20.1	1	0.013	722.2	722	Circular	0.8
CO-79	67.9	1	0.013	722	721.9	Circular	0.5
CO-80	68	1	0.013	721.9	721.8	Circular	0.5
CO-81	175.8	1.5	0.013	721.8	721.6	Circular	1

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-82	143.7	1.75	0.013	721.6	721.4	Circular	0.5
CO-83	234.9	2	0.013	721.4	721.2	Circular	0.5
CO-84	24.9	2	0.013	721.2	721	Circular	0.5
CO-85	71.8	1	0.013	723.5	723	Circular	0.5
CO-85.1	165.1	1	0.013	723.5	723	Circular	0.5
CO-86	184.4	1.25	0.013	723	722	Circular	0.8
CO-86.1	148.6	1	0.013	723	722.6	Circular	0.5
CO-87	194.1	1.5	0.013	722	721	Circular	0.5
CO-87.1	23.8	1	0.013	722.6	722.4	Circular	0.6
CO-88	42.3	1.5	0.013	721	720	Circular	0.8
CO-88.1	49.4	1	0.013	722.4	722.2	Circular	0.8
CO-89	10.1	3.5	0.013	719.35	719.345	Circular	1
CO-89.1	59.7	1	0.013	722.5	722.1	Circular	0.5
CO-90	123.8	1	0.013	722.1	722	Circular	0.8
CO-91	71	1	0.013	721.9	721.8	Circular	0.5
CO-91.1	214.3	1.25	0.013	722	721.8	Circular	0.7
CO-92	15.8	1	0.013	722.2	722.1	Circular	0.5
CO-92.1	98.8	1	0.013	721.8	721.7	Circular	0.5
CO-93	45.1	1	0.013	722.3	722.4	Circular	0.5
CO-93.1	40.2	1.25	0.013	721.7	721.6	Circular	0.8
CO-94	140.3	1.25	0.013	721.6	721.5	Circular	0.5
CO-94.1	80.4	1	0.013	722.4	722.2	Circular	0.8
CO-95	62.6	1.5	0.013	721.5	721.4	Circular	0.8
CO-95.1	13	1	0.013	722.2	722.1	Circular	0.7
CO-96	91.5	1.5	0.013	721.4	721.3	Circular	0.5
CO-96.1	57.1	1	0.013	722.1	722	Circular	0.7
CO-97	100	1.5	0.013	721.3	721.26	Circular	0.5
CO-97.1	72.4	1	0.013	722.1	722	Circular	0.7
CO-98	140.4	1	0.013	722	721.9	Circular	0.5
CO-99	57.9	1	0.013	721.9	721.8	Circular	0.7
CO-Cleve	141	1.5	0.013	721.61	721.44	Circular	0.6
CO-Cleve1	140	1.5	0.013	721.78	721.61	Circular	1
CO-Cleve3	170	1	0.013	722.63	722.23	Circular	0.6
CO-Cleve4	151.5	1	0.013	723	722.75	Circular	1
CO-Cleveland1	208.333	1.25	0.013	721.95	721.7	Circular	0.7
CO-Cleveland16	240	1.25	0.013	722.66	722.3	Circular	0.6
CO-Commercial	177.2	1	0.013	721	720.52	Circular	0.7
CO-Commercial1	131.2	1	0.013	721.31	721	Circular	0.7
CO-Gillespie	251.3	1.25	0.013	724.02	722.9	Circular	1
CO-Harrison1	24	2.5	0.013	721.85	721.81	Circular	0.5
CO-Harrison1.1	53	3.75	0.013	722.7	722.41	Special	0.9
CO-Harrison2	28.8	2.5	0.013	721.81	721.73	Circular	0.9

Name	Length (ft)	Diameter (ft)	Manning's n	US Invert Elevation (ft)	DS Invert Elevation (ft)	Shape	Upstream Junction Entrance Loss
CO-Harrison3	342.9	2.5	0.013	721.9	721.15	Circular	0.7
CO-Harrison4	185.55	2.5	0.013	721.15	720.73	Circular	0.7
CO-Harrison5	185.55	2.5	0.013	720.73	720.32	Circular	0.9
CO-HarrisonExt	255.2	2.5	0.013	722.41	721.85	Circular	1
CO-Hospital	514	0.5	0.01	755	729.6	Circular	0.5
CO-Madison	250.9	1.5	0.013	721.74	721.44	Circular	0.8
CO-Madison.1	185	2	0.013	720.87	720.72	Circular	1
CO-Madison1	102	2	0.013	720.95	720.87	Circular	1
CO-Madison5	25	2	0.013	720.62	720.5	Circular	0.6
CO-Main	672.5	1	0.013	726.5	724.5	Circular	1
CO-Ruth4-3	125	1.25	0.013	722.89	722.7	Circular	1
CO-Ruth5-4	123	1.25	0.013	723.06	722.89	Circular	0.9
CO-StJoAve	240	1	0.013	729	726.45	Circular	0.8
CO-StJoAve1	339.1	1.25	0.013	726.35	723.67	Circular	1
CO-StJoAve2	109.9	1.25	0.013	723.84	723.67	Circular	0.5
CO-StJoAve3	105	1.25	0.013	723.96	723.84	Circular	1
CO-StJoAve4	88	0.917	0.013	724.07	723.96	Special	1
CO-StJoAve5	140.5	1.25	0.013	724.27	724.07	Circular	0.5
CO-StJoAve6	103.4	1.25	0.013	724.37	724.27	Circular	1
CO-Tyler	146	2.5	0.013	721.24	721.1	Circular	1
CO-Tyler.1	133	2.5	0.013	721.41	721.28	Circular	0.8
CO-Wash	132.5	1.25	0.013	722.9	723.45	Circular	1
CO-Washington	177.2	3.16	0.013	722	721.81	Special	1
CO-Washington2	175	3.16	0.013	722.19	722	Special	1
Link1340	71.63	3	0.013	719.8	719.43	Circular	0.5
Link1341	192.94	3	0.013	719.43	718.44	Circular	0.8
Link1342	405.38	3	0.013	718.44	716.37	Circular	0.8
Link1343	154.48	3	0.013	716.37	715.59	Circular	0.6
Link1344	115.78	3	0.013	715.59	715	Circular	0.8
Link1345	59	1	0.013	725.88	724.88	Circular	0.5
Link1346	75	2.5	0.013	728.93	728.71	Circular	0.5
Link1347	41	1	0.013	729.67	728.71	Circular	0.5
Link1348	71	2.5	0.013	727.78	727.64	Circular	0.5