



City of Waupun

201 E. Main Street
WAUPUN, WISCONSIN 53963
Phone: 920-324-7900
Fax: 920-324-7939

"Wild Goose Center of Wisconsin"

July 6, 2016

A meeting of the Board of Public Works is scheduled for **Monday, July 11th, 2016**, at 4:30 p.m. in the Waupun City Hall, **Administrative Conference Room**.

AGENDA

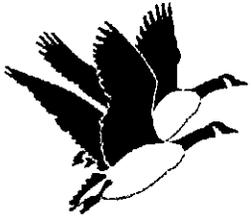
- 1) Call to Order
- 2) Roll Call
- 3) Approve minutes of the May 10, 2016 regular meeting.
- 4) Discuss / Approve N. State St. land purchase.
- 5) Discuss / Approve Handicapped parking ordinance for Pine St.
- 6) Discuss / Approve Storm Water Plan
- 7) Discuss / Approve No Parking ordinance for Jackson St.
- 8) Discuss / Approve Tire changer and Bulk oil installation (Perkins Oil) from maintenance & repair budget to capital budget.
- 9) Update on E. Main St. DOT Project 2022.
- 10) ADA Updates
- 11) Public Comments
- 12) Adjournment

Richard Flynn
Public Works Director

cc: Mayor & Common Council
City Attorney
Department Heads
Media
Mike and Deb Leu

It is possible that members of and possibly a quorum of other governmental bodies of the municipality may be in attendance at the above stated meeting to gather information. No action will be taken by any other governmental body at the above stated meeting other than the governmental body specifically referred to above in this Notice.

Please note that, upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and service. For additional information or to request this service, contact Angela Hull, City Clerk, at 324-7900.



"Wild Goose Center of Wisconsin"



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Waupun Board of Public Works DRAFT Minutes of Regular Meeting – May 10, 2016

The Waupun Board of Public Works met in regular session on Tuesday, May 10, 2016 at the Waupun City Hall located at 201 E Main Street, Waupun.

Mayor Kyle Clark and Alderman Julie Nickel are present.

Audience present is James and Victoria Svitavsky, Joe and Alice Kowalski, Steve Buchholz, Jerry Medema, Gary Rogers, Mike Butler, and Donna Bitner.

Chairman Johnson called the meeting to order at 4:30pm.

Members present at roll call are Alderman Mike Matoushek Jr., Alderman Mike Johnson, Alderman Pete Kaczmarek, Public Works Director Dick Flynn, City Clerk Angie Hull, and Police Deputy Scott Loudon. No members are absent.

Motion Loudon, second Flynn to approve the minutes from the March 8, 2016 meeting of the Board of Public Works. Motion carried 6-0.

Hull and Loudon request clarification of the motion made at the January 19, 2016 Board of Public Works meeting as it was understood that the City Building Inspector would be requested to view the easements, not contracting with any engineers. This was found to not be the case as during the Public Comment section of the March 8, 2016 meeting of the Board of Public Works, this was questioned. Flynn stated he was going to locate the property pins himself and spoke with the Building inspector who stated the structures can be placed there as they are not a permanent structure. If Flynn cannot find the pins, then he will need to contract with an engineering firm. Hull and Loudon state they understood that the Building Inspector would be providing this service only and no engineering survey would be necessary.

Rogers appears before the Board stating he was not provided with the option to hook up years ago. He feels the City is confusing surface stormwater with sump pump discharge and doesn't believe the issues will be resolved by the owners connecting. Blotzer stated he was not provided with the option to hook up and believes the grade of the houses is causing the issues. Alderman Nickel states she received two phone calls of complaints from residents on Robin Road regarding the water issues.

Motion Flynn, second Johnson for homeowners on Sunrise Avenue to hook up to sump pump lateral as stated in Ordinance 7.12(2) within 1 year from this date. Motion carried 5-1 on roll call with Kaczmarek voting nay.

James and Victoria Svitavsky of 546 W Franklin St., Waupun, appear to request temporary one-way traffic on W. Franklin Street. Svitavsky states that re-routed traffic, due to the construction on Main Street, has become a safety hazard on W. Franklin Street.

There is currently parking only on the south side to aid in traffic issues. Louden recommends increasing signage and police patrol. Matoushek inquires if the signage could be flagged for more visibility. Johnson inquires if a 15 mph zone would benefit. Louden and Flynn will review the area for signage needs.

Forest Mound Cemetery road maintenance was discussed. This road is use for Harris Mill Park access as well as the Forest Mound Cemetery. Flynn states the City does apply cold patch this area. Louden viewed the road for usage and finds that there is a large amount of public usage outside of cemetery usage. Kaczmarski states other City roads/streets are in need of repair/maintenance and states to look at this road for possible future budgets. The Recreational Trail may aid this concern in the future.

DOT reconstruction project in 2022 is located between Gateway and Plum. The DOT has a small portion listed as mill and overlay, not concrete. Flynn has made attempts to inquire with the DOT of why this is and no response. Flynn would like the Council to send a letter of support contesting the mill and overlay and request concrete.

Motion Louden, second Matoushek to duly call the meeting adjourned at 5:55pm. Motion carried 6-0.

Angie Hull, City Clerk

ORDINANCE NUMBER 16-_____

AN ORDINANCE TO AMEND CHAPTER SIX OF THE MUNICIPAL CODE OF THE CITY OF WAUPUN ENTITLED "TRAFFIC CODE."

THE COMMON COUNCIL OF THE CITY OF WAUPUN, DO ORDAIN:

SECTION 1: Section 6.05 (3) (c) of the Waupun Municipal Code entitled "Handicapped Parking Stalls" is amended to add the following subsection:

5. On the west side of Pine St. commencing 224 feet north of the north curblineline of Tulip Ln. going north for 20 feet.

SECTION 2: This Ordinance shall be in full force and effect upon its passage and publication as provided by law.

Enacted this _____ day of _____, 2016

Kyle Clark,
Mayor

ATTEST:

Angela Hull
City Clerk



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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Eric Thompson, PE, CFM / Uriah Monday, PE, CFM, MSA Professional Services
Subject: Citywide Stormwater Improvements Recommendations Summary
Date: May 23, 2016

The City of Waupun contracted with MSA Professional Services to study six separate project areas within the City that are areas of concern for stormwater management. Individual study documents were prepared for each area of concern, and were presented at City Council meetings; copies of these study documents are attached at the end of this memo. This memo summarizes the recommended improvement and estimated cost for each of the study areas.

Harris Creek Flood Improvements (MSA Project #00212078) – Priority #1

- Study recommended the widening of the creek channel from Main Street to approximately 400' north of Newton Avenue, and the reconstruction of box culverts along the channel at Newton Avenue, Rock Avenue, and the driveway near Maple Avenue.
- Total estimated construction and design costs are \$750,000; this does not include possible property acquisition or utility relocation. WDNR does offer a biannual grant program which can cover some property acquisition costs.
- Project is given a priority ranking of #1 due to the potential for alleviating food risk and flood insurance requirements for approximately 20 homeowners .

Hazel/Pattee/Lincoln/Rens Neighborhood (MSA Project #00212077) – Priority #2

- Study recommended the construction of a detention pond at the south end of Pattee Drive, new storm sewer within Lincoln Street between Rens Way and Pattee Drive, and a bypass storm sewer from the Rensway Apartments pond westward toward Harris Creek.
- Total estimated construction and design costs are \$843,000.
- Project is given a priority ranking of #2 due to the potential for greatly reducing flood risk at the Hazel/Pattee intersection area and adjacent homes, as well as at the Rensway Apartments – both areas suffer from chronic flooding affecting buildings. This recommendation also has the potential for introducing water-quality improvements.

Watertown Street/Bronson Street (MSA Project #00212072) – Priority #3

- Study recommended the reconstruction of approximately 800 LF of relief storm sewer in Sawyer Street from Watertown Street to the baseball complex, and the expansion of detention basins north of the ball fields.
- Total estimated construction and design costs are \$205,000.

Offices in Illinois, Iowa, Minnesota, and Wisconsin

2901 International Lane, Suite 300, Madison, WI 53704-3133

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Waupun Stormwater Recommendations Summary 052316.docx

MEMO

May 23, 2016

- Project is given a priority ranking of #3 due to the potential for reducing chronic street flooding along a main arterial roadway. This recommendation also has the potential for introducing water-quality improvements.

Gateway Drive Flood Protection (MSA Project #00212075) – Priority #4

- Study recommended the construction of a floodwall, configured to protect the north-south leg of Gateway Drive and the car dealership from frequent high water.
- Total estimated construction and design costs are \$575,000.
- Project is given a priority ranking of #4 due to the somewhat high cost of the project vs. the limited benefit; although the project will provide additional protection to local businesses it will not protect the entire length of Gateway Drive.

West Hawthorne Drive (MSA Project #00212079) – Priority #5

- Study recommended the reconstruction of the pipe draining the yard area north of 434 West Hawthorne Avenue, along with related limited grading.
- Total estimated construction and design costs are \$10,000.
- Project is given a priority ranking of #5 due to its limited benefit to the general public.

Rock River Flood Study (MSA Project #00212076) – NOT RECOMMENDED

- Scope of study was to determine feasibility of constructing a large-scale floodwater storage to mitigate flood hazard at Gateway Drive. Study determined that such a strategy was economically infeasible.

MSA is currently in the beginning stages of a WDNR-grant-funded revision to the City's Stormwater Quality Master Plan. In 2010 when the study was last revised, the City was found to be falling short of its NPDES permit required water quality treatment goal. The 2010 plan identified a capital improvement plan of approximately \$890,000 to achieve the goal.

Recently, the WDNR and USEPA approved the Rock River Total Maximum Daily Load Study. This study increased the estimated water quality treatment measures required of the City of Waupun necessary to protect the Rock River and its tributaries. The City's new NPDES permit requires that the City achieve this increased water quality treatment goals. While it is too early to tell what the study will find, the goals are substantially higher than those previously required and so considerable additional stormwater quality improvement projects will be required of the City in the future.

MEMO

May 23, 2016

**Attachment A:
Harris Creek Flood Improvements Memo
(3 pages)**



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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Eric Thompson, PE, CFM, MSA Professional Services
Subject: Flood Improvements for Harris Creek
Date: August 20, 2015

The newly-released FEMA floodplain map for Harris Creek shows extensive flooding along Rock Avenue and Newton Avenue. This flooding is due primarily to the inadequate size of the existing culvert under Newton Avenue (approximately 11' wide by 5' high) but also is due in some part to tailwater effects of the Rock River and to the size of other culverts (at Rock Avenue and a private driveway) and the size of the existing creek channel. Mapped flood elevations range from 887.2 at Newton Avenue to 888.7 at Main Street. Approximately 12 acres is covered by FEMA Flood Zone AE, affecting up to three dozen homes. This mapping has flood insurance and zoning implications for home owners. A project which would improve the conveyance capacity of the creek would reduce the mapped flood extents and as a result alleviate insurance requirements and zoning restrictions.

MSA investigated the topography of the area and determined that flood elevations of approximately 887 or less would significantly reduce the mapped flooding area, and would likely remove all homes in the area from mapped floodplain. Using this elevation as a target, MSA utilized the FEMA hydraulic model to determine the size of culverts under the two roadways and private drive that would achieve this elevation. Model results indicated the following:

- Twin parallel 10' wide by 6' high box culverts at Newton and Rock Avenues would reduce flood elevations to the greatest extent possible in the area upstream of Newton Avenue. Because of the tailwater effect of the Rock River, larger culverts would have virtually no additional beneficial effect.
- To accommodate the size of these culverts and to provide adequate conveyance, the creek channel would be widened from its existing width of roughly 30 feet to approximately 50' at the top of bank from So. Branch of the Rock River to approximately 300 feet upstream from Rock Avenue.
- Between Rock Avenue and W. Main Street, there is a private driveway which is somewhat more limited in space than the road crossings. At this location, a 14' wide by 6' high box culvert within a 40' wide channel would serve to reduce flood elevation to satisfactory levels. As this configuration has somewhat smaller conveyance, a bypass channel may need to be constructed easterly of and parallel to Harris Creek in order to make up for the difference.

The result of the improvements described above is that the flood elevation is reduced to 885.3 at Newton Avenue and 886.9 at Main Street. This represents an overall 1.8' reduction in flood elevation, and is expected to contain floodwaters within the channel and in low points along roadways, limiting floodplain extents to about 2 acres and alleviating effects on home structures.

Offices in Illinois, Iowa, Minnesota, and Wisconsin

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MEMO

August 20, 2015

Construction costs for the above improvements are expected to be in the range of \$750,000. This estimate includes engineering, permitting, culvert installation, and channel grading, plus some contingency for incidentals such as site restoration, roadway paving, etc. It does not include property acquisition or major utility relocation.

The impacts to properties adjacent to the creek are expected to be limited to open space, but may require work close to existing homes. While some acquisition of private property (either permanent or via easement) is likely required, acquisition and removal of homes is not anticipated.

MEMO

May 23, 2016

**Attachment B:
Hazel/Pattee/Lincoln/Rens Neighborhood Memo
(10 pages)**



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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Uriah Monday, PE, CFM, MSA Professional Services
Subject: Storm Sewer Capacity Improvements
Hazel/Pattee Neighborhood and West Lincoln Street
Date: March 29, 2016

Existing System Description

West Lincoln Street contains a main storm sewer trunk line that conveys storm flow from the Hazel Street/Pattee Drive neighborhood westerly to Harris Creek (approximately 750 feet west of Mulder Street). Along this corridor, the street grade drops a total of 5 feet over about 2,300 feet of distance – a net gradient of about 0.2%. There are several sag points along the corridor as the street grade rises and falls. Along the corridor there is also a storm sewer trunk line, which varies somewhat in slope but generally follows the net street gradient of 0.2%. A map of the area entitled “Existing Storm Sewer System” is attached as **Exhibit A** to this memo. The map demonstrates aerial contours (2’ vertical interval), the alignment of the storm sewer, and estimated surcharged capacity of several representative segments of the system. At the downstream end (in the vicinity of Pleasant Avenue and Mulder Street, and westerly to the creek) the system has a capacity of approximately 20 cubic feet per second (CFS). For the majority of the system’s length, it has a capacity of approximately 5 CFS.

Watershed Hydrology and Problem Statement

This storm sewer system services approximately 75.1 acres of developed and undeveloped lands. Along Lincoln Street and within one block north and south, there is mostly single-family home development, with an area of apartments southeast of the Lincoln/Rens intersection and a school parking lot northwest of the Pleasant/West intersection. The total amount of developed area is about 33.8 acres. South of the dead end of Pattee Drive, there is mainly agricultural land with sparse development, totaling 41.3 acres. A hydrologic analysis to determine flow rates from this watershed to each of eleven (11) separate inlet points was conducted with HydroCAD software for 1-year, 2-year, 5-year, and 10-year 24-hour rainfall events using the most up-to-date NOAA Atlas 14 Volume 2 rainfall data. **Note the 10-year storm event is commonly used as the design storm for storm sewers, and hereinafter all quoted runoff rates are for the 10-year rainfall event.** Several areas with flooding concerns were noted, either as reported by City staff or as inferred from model results:

- Excessive runoff from the agricultural lands causing flooding at the end of Pattee Drive (City has constructed a large breaker-run stone check dam to slow and detain flow)
- Street flooding at low points on Hazel Street and Lincoln Street
- Parking lot flooding at apartments south of Lincoln Street at Rens Way
- Parking lot flooding in the Central Wisconsin Christian School parking lot near Pleasant Avenue

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MEMO

March 29, 2016

- Flooding in a low area on the interior of the block bounded by West/Pleasant/Mulder/Lincoln Streets

A map of the area entitled "Contributing Watersheds & Runoff Rates" is attached as **Exhibit B** to this memo. The map lists runoff rates from the various land use areas, and lists cumulative peak flow rates at several points along the system. Note that the cumulative flow rates in the storm sewer are lower than the generated runoff amounts; this is due to the storage effect of ponding in existing roadway sag points and natural low areas. It can be seen that the contributing runoff rates are greatly in excess of existing storm sewer's capacity. For example:

- The contributing runoff from the agricultural land south of Pattee Drive, even when considering the effect of ponding behind the check dam in the low area of the field, is **three times greater** than the receiving pipe's capacity.
- At a rate of 2.8 CFS per acre of developed area, the storm sewer in Lincoln Street would be at capacity with only two acres of contributing area; by comparison, the block bounded by Hazel/Pattee/Lincoln/Beaver Dam Streets is 5 acres.

Stormwater System Improvement Strategies

The watershed runoff model demonstrates that multiple system conditions are causing the majority of the system's problems. Therefore the overall system improvement must be made up of several strategies addressing multiple contributing areas. These improvements are presented in an incremental step-by-step approach below, with the goal of achieving a condition where the ponding of water in streets is eliminated in a 10-year storm event.

- **Improvement Concept #1: Detention Basin at Pattee Drive**
 - The existing storm sewer capacity in Pattee Drive is approximately 5 CFS as shown on Exhibit A. To limit the impact of runoff from the existing agricultural lands south of Pattee Drive a detention basin should be constructed, replacing the stone check dam that exists at this location now, and designed to limit peak discharge to 5 CFS. This would avoid the need for replacing the storm sewer in Pattee Drive itself. Such a basin would be approximately 1 acre in size and would be excavated to approximately 4 feet below the existing ground level. Estimated cost for land acquisition and construction of this basin is \$80,000. Engineering design fees (from plan production through bidding) are preliminarily estimated to be \$8,000.
 - This improvement, while reducing rates to a tolerable level at the Pattee/Hazel intersection, does not by itself alleviate excessive flows to Lincoln Street. Its impact on flow rates to Lincoln Street is as follows (note that all flow rates remain considerably higher than the existing system capacity of 5 CFS):
 - At Lincoln and Pattee, flow rates will be cut to 15 CFS vs. 29 CFS in the existing condition.
 - At Lincoln and Rens, flow rates will be cut to 26 CFS vs. 43 CFS in the existing condition.
 - Mid-block between Mulder and West Streets, flow rates will be cut to 41 CFS vs. 59 CFS in the existing condition.

- **Improvement Concept #2: Disconnection of Rensway Apartments Storm Sewer**
 - The existing Rensway Apartments and the agricultural areas to the south collectively generate about 15 CFS of runoff. There is a detention basin on the westerly perimeter of the site that reduces rates to approximately 6 CFS before discharging to the Lincoln Street storm sewer. To reduce the impact of runoff from the apartments and adjacent agricultural lands, the pipe discharging from the basin could be disconnected and re-routed westerly. To accommodate this, a new storm sewer would need to be constructed, running parallel to Lincoln Street but south of the existing residential lots, then turning northward to end at the dead-end of Lincoln. Estimated cost for land acquisition and construction of the storm sewer is \$135,000. Engineering design fees (from plan production through bidding) are preliminarily estimated to be \$12,000.
 - This improvement, while somewhat reducing stormwater contributions to Lincoln Street, does not alleviate excessive flows to Lincoln Street even when combined with Concept #1, above. The cumulative impact on flow rates to Lincoln Street if both concepts are implemented is as follows (note that all flow rates remain considerably higher than the existing system capacity of 5 CFS):
 - At Lincoln and Pattee, flow rates will be cut to 15 CFS vs. 29 CFS in the existing condition.
 - At Lincoln and Rens, flow rates will be cut to 23 CFS vs. 43 CFS in the existing condition.
 - Mid-block between Mulder and West Streets, flow rates will be cut to 39 CFS vs. 59 CFS in the existing condition.

- **Improvement Concept #3: Upsize of Storm Sewer between Lincoln St. and Pleasant Ave.**
 - Where there are storm sewer capacity limits throughout a system, there are occasionally cases where relieving a particular constriction would have a benefit to the system as a whole – a “weakest link” scenario. MSA explored a concept of upsizing the existing storm sewer that runs northerly from Lincoln and Pleasant at the location mid-block between West Street and Mulder Street. The aim of this concept was to check whether relieving this segment would have enough effect on the remainder of the system in Lincoln to alleviate street flooding. It was determined that while an upsize to this segment would sufficiently relieve street flooding in the area of Lincoln between West Street and Mulder Street, the relieved hydraulic grade line would not extend sufficiently far upstream (easterly) in the system to have any benefit to the Rens/Lincoln intersection or the low area on Lincoln between Rens and Pattee. Therefore this concept was not pursued further.

- **Improvement Concept #4: Reconstruction of Lincoln Street Storm Sewer**
 - Because the previous three concepts presented cannot reduce the contribution of stormwater to Lincoln Street to an acceptable level, an alternative which also increases the capacity of the storm sewer must be introduced. Referencing the stormwater contribution rates reported in Concept #2, above:
 - the capacity east of Rens must be increased to about 15 CFS,
 - the capacity immediately west of Rens must be increased to about 23 CFS, and
 - the capacity from the low point between West Street and Mulder Street and westerly must be increased to about 39 CFS.

This would require storm sewer sized in the range of 30" diameter RCP on the easterly end and 42" RCP on the westerly end. In this stretch of Lincoln Street, however, high bedrock exists. When the sanitary sewer and water main utility in this area were constructed, the bedrock was avoided and therefore the service laterals are higher than normal. Reconstructing storm sewer in this vicinity to diameters as indicated above would require excavation to elevations 18" to 24" lower than the existing storm sewer; this excavation would incur excessive costs due somewhat to rock excavation but more so due to the potential for replacing (lowering) sewer and water lines as well – particularly between Rens Way and Mulder Street. Therefore, the concept of replacing the entire storm sewer in Lincoln Street was not pursued further, but was refined in an alternative concept presented below.

- **Improvement Concept #5: Construction of Lincoln Street Storm Sewer Bypass**
 - To avoid the issue of high sewer and water lateral interference discussed in Concept #4, the concept of creating a bypass route for an upsized storm sewer line was investigated. This bypass would follow a similar route as was presented in Concept #2 – following the rear of the existing residential lots southerly of Lincoln Street from Rens Way westerly. To fully utilize the capacity of this bypass, system upsizes east of Rens and west of Mulder would also be required. The system improvements would consist of:
 - An additional storm sewer parallel to the existing sewer west of Mulder Street (770 LF), sized at 29"x45" elliptical RCP (equivalent to a 36" round)
 - Construct the storm sewer bypass southerly of and parallel to Lincoln Street from Mulder Street easterly to Rens Way (1,490 LF), sized as a 29"x34" elliptical RCP
 - Abandon the storm sewer from the Rensway Apartments to Lincoln Street, replacing it with a 30" RCP running from Lincoln southerly in Rens Way (300 LF) and reconnecting the existing pond outlet to a new manhole near the apartment driveway entrance
 - Reconstruct the storm sewer in Lincoln Street from Rens Way easterly to Pattee Drive (710 LF), sized as a 30" round RCP. Note that this block has only three service laterals which are anticipated to be lower than the laterals on the blocks further west; therefore the additional deeper excavation is not anticipated to incur additional cost due to utility interference. If, prior to development of more comprehensive plans, it is determined that utility laterals would cause some interference, two alternatives appear feasible. One alternative would be to construct the storm sewer line in the northerly half of the street (or even in the terrace area) adjacent to the ball fields, which have no service laterals. A second alternative is to use a pair of parallel 19"x30" elliptical pipes instead of a single 30" pipe; the twin parallel pipes would be laid at the same depth as the existing storm sewer and would not require deeper excavation.
 - Estimated cost for land acquisition and construction of the storm sewer is \$643,000. Engineering design fees (from plan production through bidding) are preliminarily estimated to be \$53,000.
 - This improvement, in combination with construction of the pond discussed in Concept #1, alleviates the system in Lincoln Street to the point where street flooding should not occur in the 10-year event.

MEMO

March 29, 2016

A map entitled "Storm Sewer System Improvements", attached as Exhibit C to this memo, shows the conceptual locations/layout of all the alternatives. It is **recommended** that:

- Concept #1 (detention pond at the south end of Pattee) be constructed, alleviating overload of the storm sewer system in Pattee Drive
- Concept #5 (new storm sewer within Lincoln Street east of Rens, and bypassing Lincoln Street west of Rens) be constructed, increasing system capacity within Lincoln Street and alleviating stormwater contributions to the problem area mid-block between West Street and Mulder Street
- Concept #2 (re-routing of Rensway Apartments pond outlet) should be implemented as a part of Concept #5.

The preliminary estimated construction cost for this recommendation is \$778,000 and engineering design fees (from plan production through bidding) are preliminarily estimated to be \$65,000.

Future Development Considerations

It can be anticipated that future development may occur in several areas, and there should be a strategy to address these future conditions. Each area is discussed briefly below along with a strategy to address the storm water impacts of development. Note that no immediate capital improvement or expenditure is necessary, and it is anticipated that the cost for implementing these strategies will be either borne solely by the development or by some future cost-sharing arrangement between the City and the development. A demonstration of the particular potential development areas is shown on the map entitled "Future Development Stormwater Management Limitations", attached as Exhibit D to this memo.

- The agricultural lands south of Pattee Drive, west of Beaver Dam Street, and east of Rens Way are likely to be developed at some point in time, as a mix of single-family, multi-family, and/or apartment residential development. Current City ordinance will require any development to limit peak flow rates to existing runoff conditions and detention ponds will be required within the development (conceptual locations are shown on the exhibit; actual future locations, sizes, and number of ponds may vary).
- The Central Wisconsin Christian School parking lot storm sewer appears to be slightly undersized, and appears to cause some ponding within the parking lot. This ponding limits the contribution to the City storm sewer to about 6 CFS in a 10-year event. In the case that the school reconstructs the lot in the future, some control should be implemented to prevent a greater runoff rate than 6 CFS from entering the City system.
- Similarly, the apartment complex south of Rens Way and Lincoln Street appears to have some ponding within the parking lot in the 10-year event, limiting the contribution to the City storm sewer to about 6 CFS. In the case that parking lot reconstruction occurs in the future, some control should be implemented to prevent a greater runoff rate than 6 CFS from entering the City system.

Citywide Stormwater Management Goals

Two final remarks should be made regarding the relationship of the storm water system improvements discussed in this memo to other Citywide storm water management goals:

MEMO

March 29, 2016

- While it would have little to no impact on the size or cost of Lincoln Street storm sewer improvements, a detention basin could be constructed westerly of the end of Lincoln Street in order to reduce pollutant contributions to the Rock River watershed and help the City meet TDML requirements.
- Any detention basins constructed within the watershed could help to reduce peak runoff rates to the Harris Creek waterway. This may have some positive (albeit limited) impact on flooding concerns near Harris Avenue and Main Street.

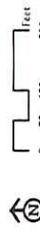
EXHIBIT A: EXISTING STORM SEWER SYSTEM

HAZEL/PATTEE/ LINCOLN/PLEASANT STUDY AREA

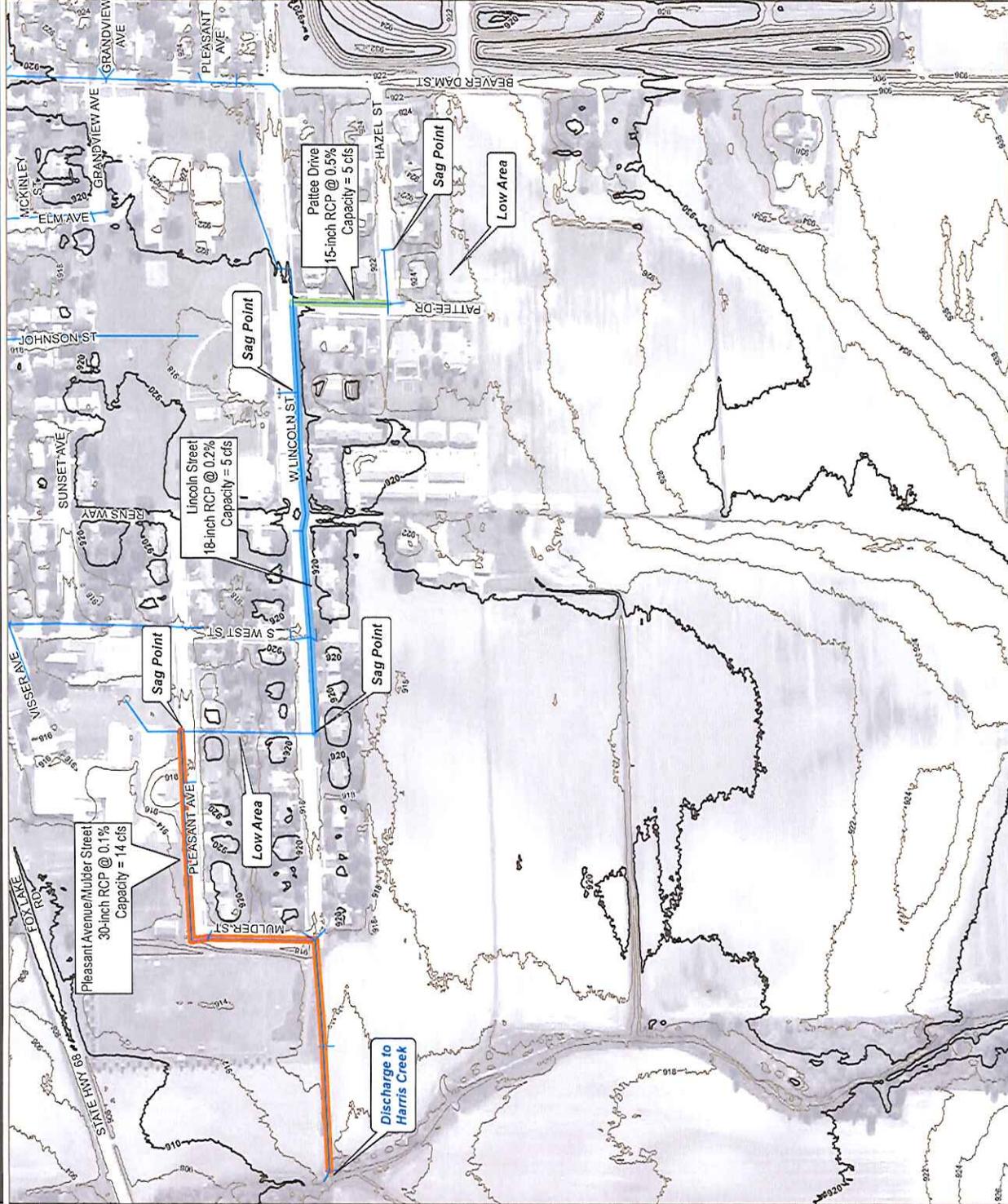
- Existing Storm Lines
- Trunk Line
- Lincoln Street
- Pattee Drive
- Pleasant Avenue/Mulder Street

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
AERIAL IMAGERY AND CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
DODGE COUNTY, WI



Plan Date: 10/15/2015



Project: swwer, MAP: 15-01-001207, DS: 08/12/15, Title: Existing Storm and

EXHIBIT B: CONTRIBUTING WATERSHEDS AND RUNOFF RATES

HAZEL/PATTEE/ LINCOLN/PLEASANT STUDY AREA

-  Contributing Watershed to Storm Sewer at Hazel/Pattee
-  Subwatershed
-  Existing Storm Lines
-  Trunk Line
-  Lincoln Street
-  Pattee Drive
-  Pleasant Avenue/Mulder Street

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
AERIAL IMAGERY AND CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
DODGE COUNTY, WI



Print Date: 12/15/2015

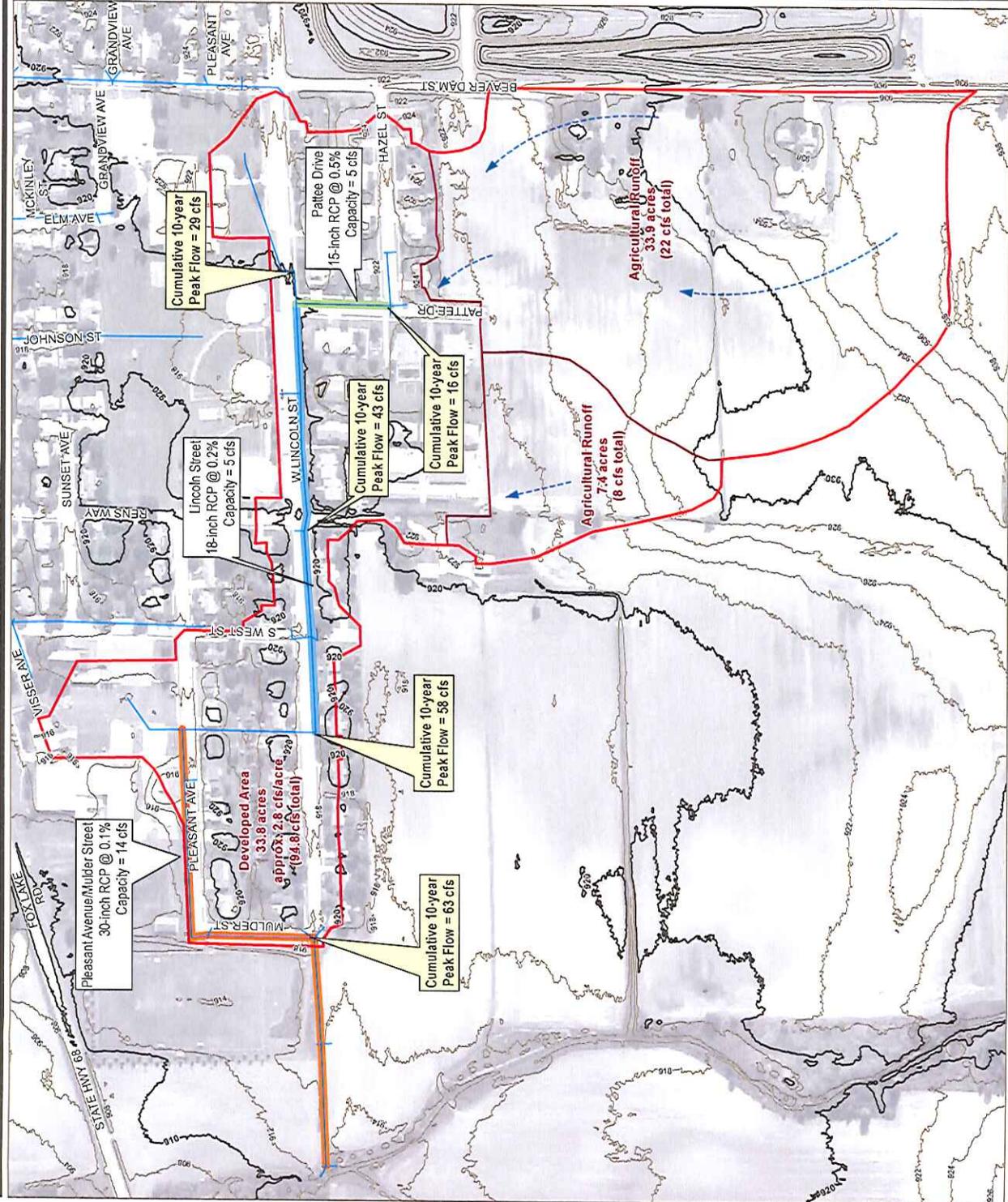


EXHIBIT C: STORM SEWER SYSTEM IMPROVEMENTS

HAZEL/PATTEE/ LINCOLN/PLEASANT STUDY AREA

-  Contributing Watershed to Storm Sewer at Hazel/Pattee
-  Existing Storm Lines
-  Proposed Improvements
-  Concept #1
-  Concept #2
-  Concept #3
-  Concept #4
-  Concept #5

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
AERIAL IMAGERY AND CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
DODGE COUNTY, WI

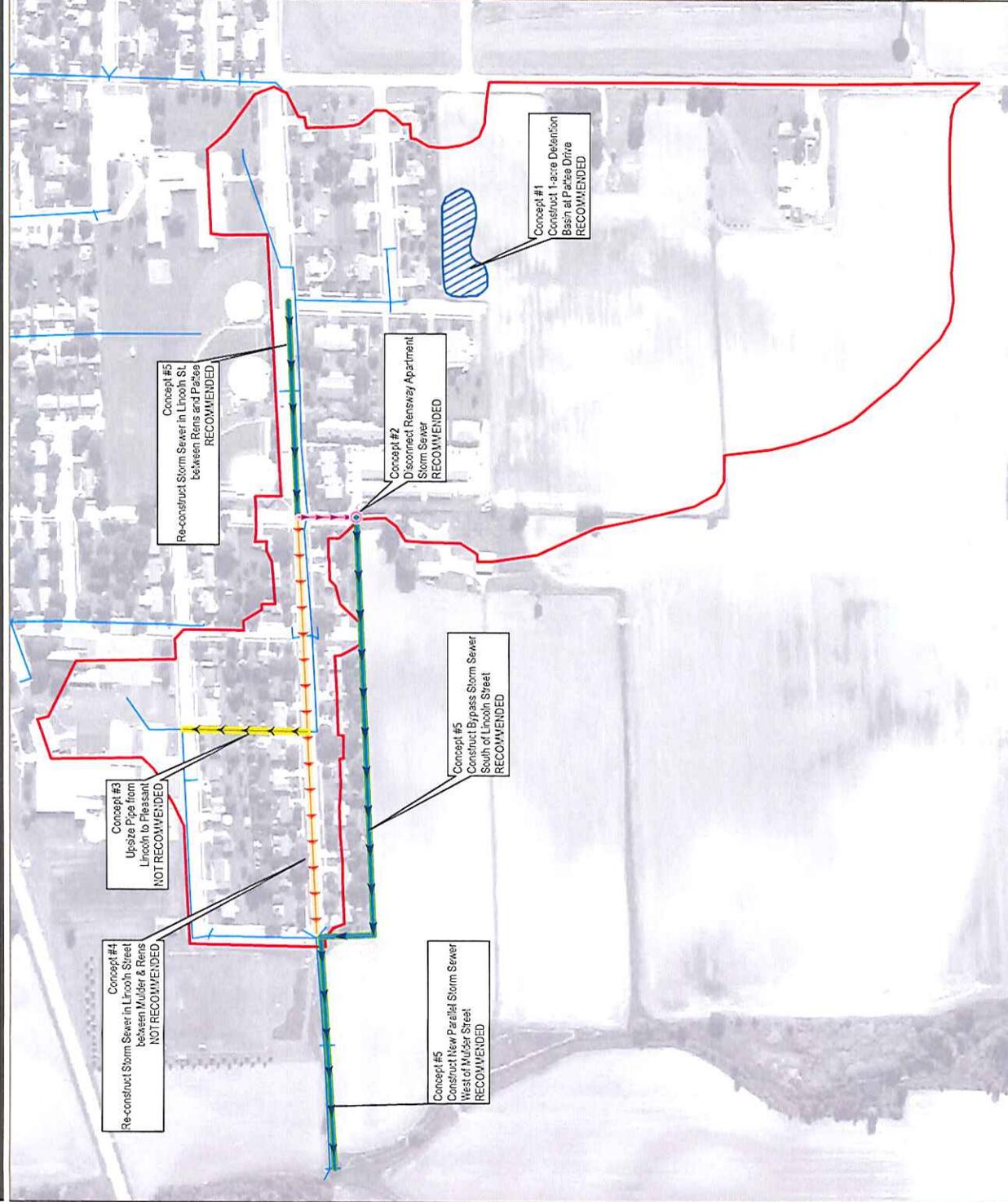
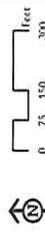


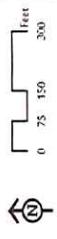
EXHIBIT D: FUTURE DEVELOPMENT STORMWATER MANAGEMENT LIMITATIONS

HAZEL/PATTEE/ LINCOLN/PLEASANT STUDY AREA

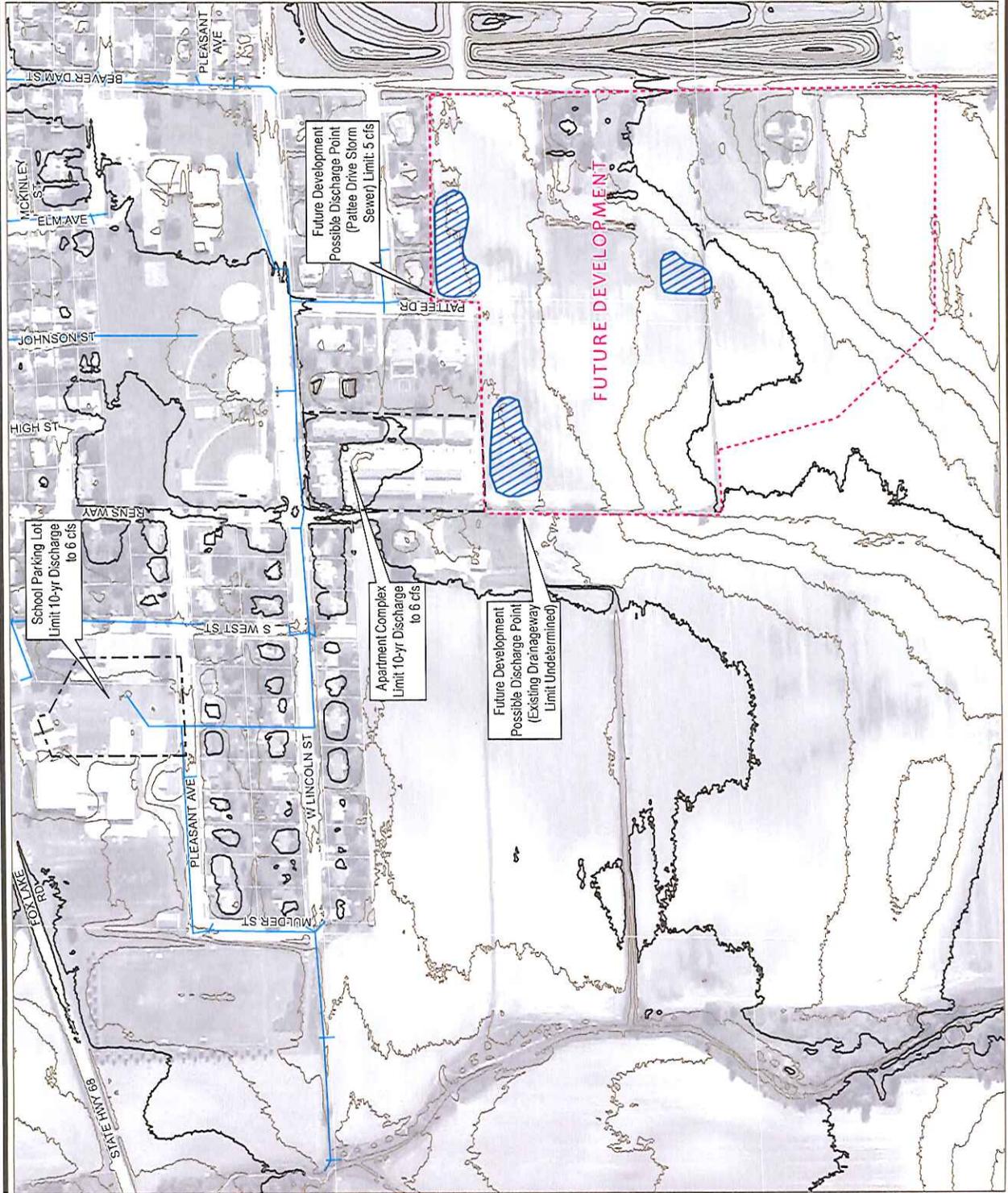
-  Existing Storm Lines
-  Future Detention Basin by Developer (for concept only)

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
AERIAL MAPPING AND CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
DODGE COUNTY, WI



Print Date: 02/15/2015



MEMO

May 23, 2016

**Attachment C:
Watertown St/Bronson St Area Memo
(4 pages)**



PROFESSIONAL SERVICES

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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Uriah Monday, PE, CFM, MSA Professional Services
Subject: Storm Sewer Capacity – Watertown Street at Bronson Street
Date: October 22, 2015

Watertown Street contains a main storm sewer trunk line that conveys storm flow from near Reids Drive northward all the way to the South Branch of the Rock River, a distance of nearly a mile. Along this corridor, the street grade is nearly continuously downhill; the exception is at the Bronson Street intersection. At this location, there is a low point and the street grade rises about four feet going northerly to Wilcox Street, where it begins to fall again. At this low area, street flooding has been reported during heavy rains.

A map of the area entitled “Existing Storm Sewer” is attached to this memo. The map demonstrates the extents of the 23.8-acre watershed contributing runoff to the storm sewer between Argonne Street and Wilcox Street, which encompasses all of the runoff that would affect flooding at Bronson Street. A hydrologic analysis to determine flow rates from this watershed to each of the storm sewer segments was conducted for 1-year, 2-year, 5-year, and 10-year rainfall events using HydroCAD software. Additionally, a determination of the storm sewer system capacity in Watertown Street was included in the analysis.

The existing storm sewer map includes comparative information regarding storm sewer capacity vs. the contributing 10-year runoff (note the 10-year storm event is commonly used as the design storm for storm sewers). It can be seen that south of Lincoln Street, the system has 10-year capacity. However, on the block between Lincoln and Bronson, the 10-year runoff is nearly twice the available capacity of the sewer, and between Bronson and Wilcox the runoff is about two-and-a-half times the available capacity – placing the service level at about a 1-year storm event. Northerly of Wilcox, the storm sewer is steeper and therefore has higher available capacity; however additional lateral storm sewer inflows meet the mainline system at both the Brown Street and Jefferson Street intersections.

Three observations can be made from these findings:

- Flooding at the Bronson Street intersection is caused by low capacity in the pipe going northward from that location – the street must flood to temporarily hold the excess water volume until storm intensity subsides.
- The apparent low-capacity part of the system between Lincoln and Bronson may manifest itself as excess flow in the street gutters – any flow not able to be carried in the pipe simply stays (or backs up into) the curblin and runs to the Bronson Street intersection – and may or may not be noted as a problem.

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Page 1 of 2 00212072 Watertown Bronson Storm Sewer Commentary Memo to Dick Flynn 10/22/15.docx

MEMO

October 22, 2015

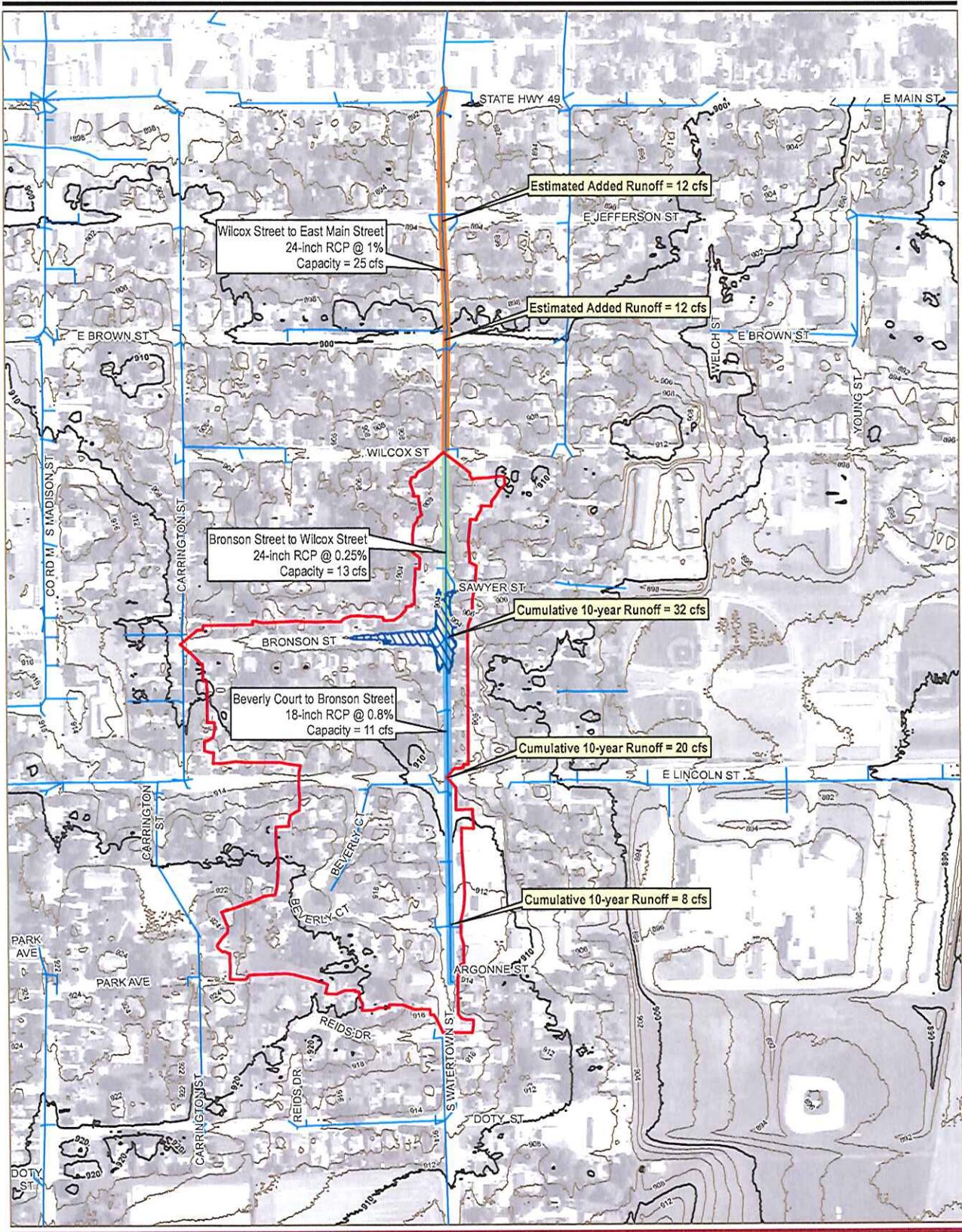
- It appears that the amount of runoff entering the system north of Wilcox would utilize the entire pipe capacity, which may also be contributing to back-ups at Bronson Street.

A solution is proposed on the second attached map entitled "Storm Sewer Improvements" which conceptually lays out the construction of a relief sewer within Sawyer Street and the improvement of several existing stormwater management ponds near the northwesterly corner of the baseball complex. This concept achieves the following:

- The storm sewer reroute would be sized to convey the computed 10-year runoff of 32 CFS (a great improvement from the existing capacity), eliminating the flooding issue at the Bronson Street intersection
- The disconnection from the downstream system at Wilcox Street eliminates the "restriction" that inflows from Brown Street and Jefferson Street may have on the flooding problem, and will reduce flows to the remainder of the system effectively increasing its service capacity
- The stormwater ponds would be increased in size to accommodate the additional runoff. Runoff routed through this area would ultimately be directed to the Shaler Drive pond, providing additional water quality benefit that would help the City meet TMDL requirements

The preliminary estimated construction cost for this improvement is \$175,000 which generally encompasses the construction of 800 LF of 24" RCP storm sewer, approximately 1 acre of pond grading/reconfiguration, and associated street/curb/manhole/inlet reconstruction. Engineering design fees (from plan production through bidding) are preliminarily estimated to be \$30,000.

A conceptual layout for additional improvements for consideration is also shown on the map entitled "Storm Sewer Improvements" – this consists of the reconstruction of the storm sewer in Watertown Street between Lincoln and Bronson and/or the construction of a small stormwater pond within the adjacent City park. These improvements are NOT an alternative substitute for the relief sewer in Sawyer Street but rather are intended to address the apparent shortage of storm sewer capacity along this block. Construction of these improvements would minimize potential for excess flow in the street gutters; however, since this has not been specifically reported as a problem, the need for this should be further assessed by City public works personnel based on field observation during heavy storms.



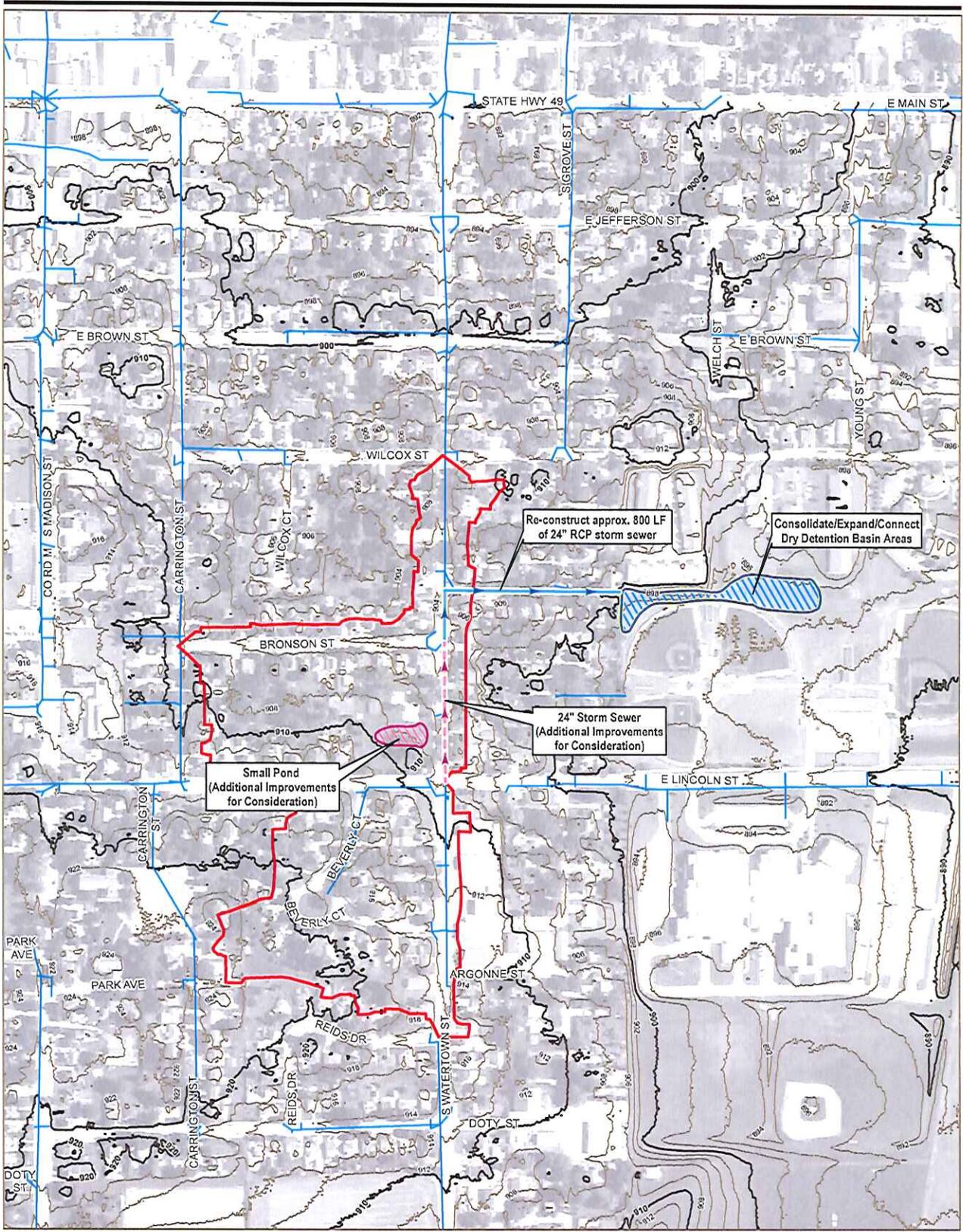
EXISTING STORM SEWER - WATERTOWN ST. AT BRONSON ST.

CITY OF WAUPUN
DODGE COUNTY, WI

- Contributing Watershed to Storm Sewer at Watertown/Bronson – 23.8 acres
- General Area of Street Flooding
- Existing Storm Lines
- Trunk Line
- Beverly Court to Bronson Street
- Bronson Street to Wilcox Street
- Wilcox Street to East Main Street

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
AERIAL IMAGERY AND CONTOURS PROVIDED BY THE COUNTY.

MSA
PROFESSIONAL ENGINEER



STORM SEWER IMPROVEMENTS - WATERTOWN ST. AT BRONSON ST. CITY OF WAUPUN DODGE COUNTY, WI

Contributing Watershed to Storm Sewer at Watertown/Bronson – 23.8 acres Existing Storm Lines	Proposed Detention Basin Detention Basin for Consideration Proposed Stormline Stormline for Consideration	<p>DATA SOURCES: EXISTING STORM SEWER PROVIDED BY THE CITY, AERIAL IMAGERY AND CONTOURS PROVIDED BY THE COUNTY.</p>
		<p>0 75 150 300 Feet</p>

MEMO

May 23, 2016

**Attachment D:
Gateway Drive Flood Protection Memo
(4 pages)**



PROFESSIONAL SERVICES

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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Uriah Monday, PE, CFM, MSA Professional Services
Subject: Flood Protection along Gateway Drive
Date: August 20, 2015

The South Branch of the Rock River flows through the City of Waupun. In some locations, frequent flooding is a problem – in particular the easternmost area of the City along Gateway Drive experiences almost annual flooding resulting in road closures.

Based on observation both by City staff and MSA personnel, the issue at Gateway is primarily attributable to high water in the river backing up over the road and/or through the storm sewer system. It is not attributable to inadequate storm sewer conveyance. For many of the frequent flooding occurrences, there is standing water on Gateway Drive both westerly between the car dealership and Fond du Lac Street, and southeasterly between the car dealership and US Highway 151. A small 'island' of roadway at the bend on Gateway Drive is higher, and is not frequently flooded.

Two options below are discussed. Both are intended to protect the roadway, the car dealership, and undeveloped properties in the area to varying degrees, with rough cost estimates for each.

One option is to construct a floodwall (or levee, if space permits) along the bank of the river as shown in Figure 1. This floodwall would have a top elevation of approximately 873, and several closure devices would need to be installed on the various storm sewer outfalls to prevent backups to the landward side. This configuration would protect all of Gateway Drive, the car dealership property, the undeveloped property north of the bend in Gateway Drive, and the undeveloped area west of the dealership, from flood events even as great as the 2008 event, at an estimated cost of \$1,140,000. However, construction of this wall would encroach into the regulatory floodway and would cause a rise in floodplain elevations of up to 4-inches between Gateway Drive and the dam. Under FEMA and State floodplain management rules, this is not permissible if it affects buildings within the floodplain. Based on available mapping, there do appear to be buildings that would be affected. It should be noted that even a wall or levee with a top elevation of 871 (i.e. lower level of protection – see next option below) would likely be 10% to 15% less costly, but not avoid causing this rise in floodplain elevation.

A second, more limited option is to construct a floodwall outside of the floodway area as shown in Figure 2, to avoid regulatory issues related to increasing flood elevations. This wall would be built to an elevation of 871, which matches the high point of the 'island' in the Gateway Drive roadway. This strategy utilizes this high point as a means of protecting the southerly leg of Gateway Drive from flooding. A closure device would need to be installed at the end of the ditch along Highway 151. Also, the westerly driveway entrance to the car dealership would need to be reconstructed to go over the

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Page 1 of 2

5-00212075 Flood Protection Memo to Dick Flynn 082015

MEMO

August 20, 2015

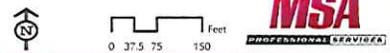
wall (only approximately 12" higher than the existing drive) and a drain and closure device would need to be constructed at the northwest corner of the lot. As noted above, this configuration would protect the portion of Gateway Drive from the curve going south during flood events approximately equal to or less than the 10-year event (similar to the 2004 flood), and would also protect the car dealership and the undeveloped property to the north. It would, however, not protect the westerly portion of Gateway Drive nor the undeveloped area west of the dealership. This option has an estimated cost of \$575,000.

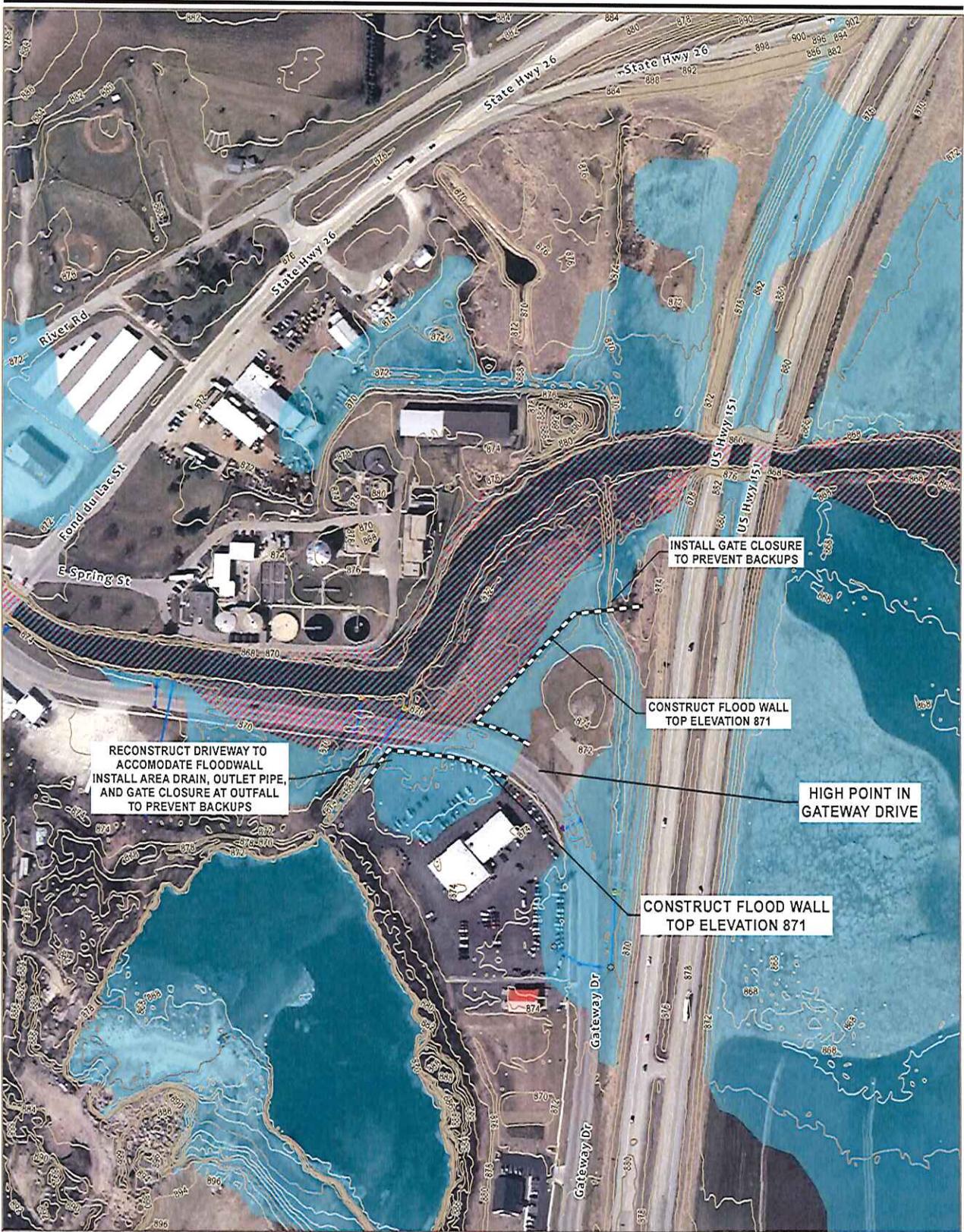


GATEWAY DR. - FLOODWALL OPTION #1

CITY OF WAUPUN
DODGE AND FOND DU LAC CO., WI

<ul style="list-style-type: none"> Floodwall Alignments Contours Index (10'Interval) Intermediate (2'Interval) 	<ul style="list-style-type: none"> Flood Zone Designations AE: 1% Annual Chance of Flooding, no BFE AE: 1% Annual Chance of Flooding, with BFE AE: Regulatory Floodway 	<ul style="list-style-type: none"> Storm Sewer Structures Discharge Point Inlet Manhole Stormline 	<p><small>DATA SOURCES: ROAD NAMES AND COUNTY BOUNDARY PROVIDED BY THE US CENSUS (2013); FLOOD ZONE DESIGNATIONS PROVIDED BY FEMA; AERIAL IMAGERY PROVIDED BY ESRI.</small></p>
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GATEWAY DR. - FLOODWALL OPTION #2

CITY OF WAUPUN
DODGE AND FOND DU LAC CO., WI

<ul style="list-style-type: none"> Floodwall Alignments Contours Index (10' Interval) Intermediate (2' Interval) 	<ul style="list-style-type: none"> Flood Zone Designations A: 1% Annual Chance of Flooding, no BFE AE: 1% Annual Chance of Flooding, with BFE AE: Regulatory Floodway 	<ul style="list-style-type: none"> Storm Sewer Structures Discharge Point Inlet Manhole Stormline 	<p>DATA SOURCES: ROAD NAMES AND COUNTY BOUNDARY PROVIDED BY THE US CENSUS (2013). FLOOD ZONE DESIGNATIONS PROVIDED BY FEMA. AERIAL IMAGERY PROVIDED BY ESRI.</p>
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MEMO

May 23, 2016

**Attachment E:
West Hawthorne Drive Neighborhood Memo
(4 pages)**



PROFESSIONAL SERVICES

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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Uriah Monday, PE, CFM, MSA Professional Services
Subject: Storm Sewer Capacity – Area North of Hawthorne Drive
Date: October 22, 2015

This memorandum documents the findings of a study of the drainage area tributary to the trunk storm sewer flowing down Autumn Avenue. The 50.2-acre study area is generally bounded by Hawthorne Drive on the north, Winter Avenue on the east, Summer Avenue on the west, and Bittersweet Lane on the south. The storm sewer system also collects runoff from agricultural lands behind the residential lots on the north side of Hawthorne Drive. A map of the area entitled "Storm System Overview" is attached to this memo which demonstrates the extents of the watershed boundary. It can be seen that while much of the agricultural area is able to drain either along side lot lines or is directed toward dead-end streets at Winter Avenue and Summer Avenue, some of the runoff area (about 2.2 acres) is directed to a low area behind 434 West Hawthorne Drive. At this location, there are two small drains that capture runoff; however, some flooding has been reported during heavy rains.

A hydrologic analysis to determine flow rates and runoff volumes from this watershed to each of the storm sewer segments was conducted using HydroCAD software. Additionally, a determination of the storm sewer system capacity from the location behind 434 West Hawthorne, within Hawthorne Drive itself, and down Autumn Avenue was included in the analysis. The analysis determined that system has 10-year capacity within most of Autumn Avenue and within all of Hawthorne Avenue including the inlets behind 434 Hawthorne, and 5-year capacity from Edgewood Drive down to the system outlet.

These findings indicate that the flooding at 434 Hawthorne is likely not the result of pipe backups; rather, it is more likely a case of insufficient inlet capacity. The inlet appears to consist of a grate set in the "bell" end of an upturned 18" storm sewer pipe, with a rim elevation of 892.5. Calculations based on a similar Neenah Foundry inlet grate (Type R-4370-5) determined that:

- Ponding depth over the grate is approximately 1.5-inches for a 1-year storm event
- Ponding depth over the grate is approximately 4-inches for a 10-year storm event
- During a 100-year storm event or during frozen ground conditions, ponding depth over the grate would need to reach a foot or more (in this case, before ponding became this deep, runoff would flood the backyard and run between homes out to the street)

It is noted that a low area exists in the farm field northwesterly of the reported problem location. While the ground in this area appears to be lower than the backyard at the location of the drain, the outlet/overflow point from the low area is not well defined or readily apparent. It is possible that

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MEMO

October 22, 2015

overflow from this area may contribute to the backyard location during very heavy rains or snowmelt conditions.

The second attached map entitled "Storm System Problem Location" shows the area in more detail, and outlines both a short-term solution and a long-term solution as follows:

- The short-term solution would be to eliminate the need for water to pond over a grate, by extending the pipe toward the field line and allowing water to enter the open end of the pipe (similar to a culvert). If the invert of the pipe was set to elevation 891.0, with a low area excavated along with grading to redirect flow to its location, a 10-year runoff event would be limited to an elevation of approximately 892. This elevation is half a foot lower than the existing grate elevation, and is at least a foot lower than the ground elevation at the home. A precise cost estimate has not been determined here, due to some uncertainty with regard to pipe length, grading extents, etc.; however it is likely that the required effort could be conducted by City crews or a privately-hired general contractor for less than \$10,000.
- The long-term (future) solution would be triggered if/when the land to the north is developed. As a condition of development, the development grading plan could be required to construct a ditch or swale parallel with the rear lot line that would convey runoff toward the end of Summer Avenue which could then be directed into an extension of the sewer on Summer Avenue. A precise cost estimate has not been determined as costs would be borne by any party developing the property.

STORM SYSTEM OVERVIEW

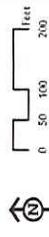
HAWTHORNE AVENUE SYSTEM

LEGEND

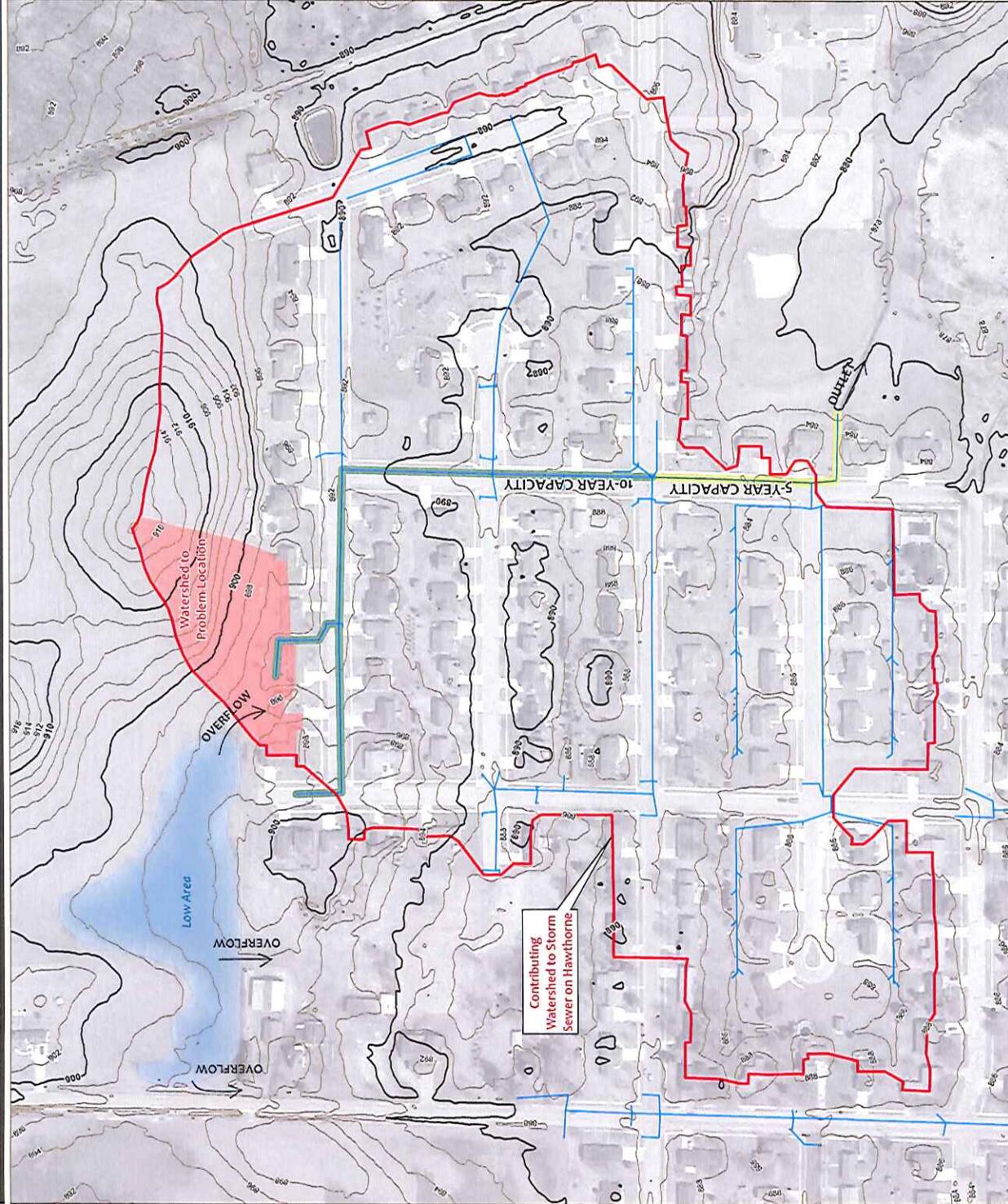
-  Contributing Watershed to Storm Sewer on Hawthorne 50.2 acres
-  Watershed to Problem Location 2.2 acres
-  Low Area
-  Existing Storm Lines
-  Trunk Line Capacity 10-year
-  5-year

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
FOND DU LAC COUNTY, WI



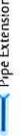
Print Date: 02/27/2015



Project: s:\municipal\146\146135\146135.dwg (02/27/2015) [146135.dwg] Storm_Sewer_Overview.mxd

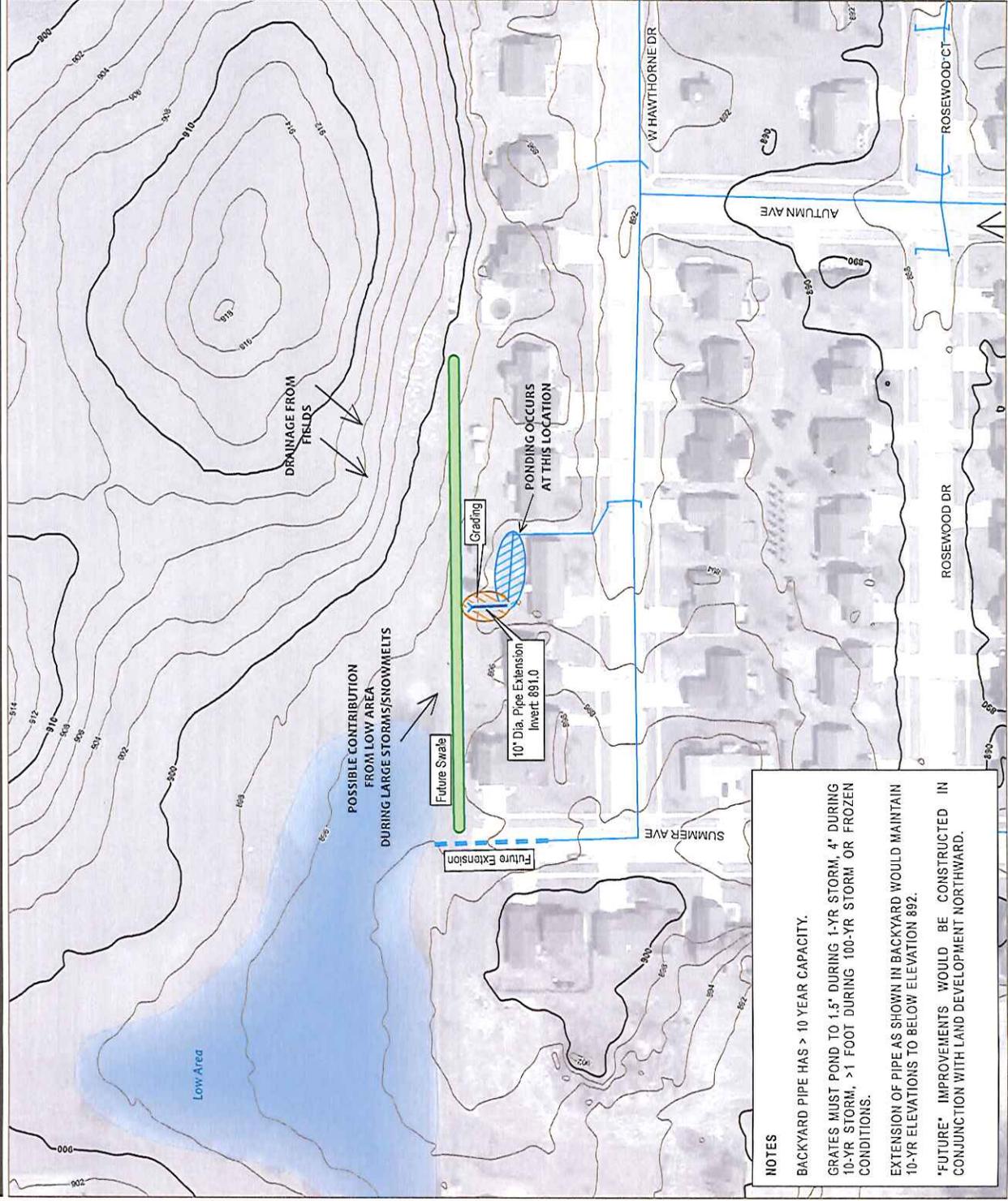
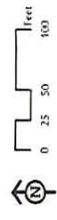
STORM SYSTEM PROBLEM LOCATION

HAWTHORNE AVENUE SYSTEM

- LEGEND**
-  Low Area
 -  Ponding Location
 -  Existing Storm Lines
 -  Future Extension
 -  Future Swale
 -  Pipe Extension
 -  Proposed Grading Location

DATA SOURCES:
EXISTING STORM SEWER PROVIDED BY THE CITY.
CONTOURS PROVIDED BY THE COUNTY.

CITY OF WAUPUN
FOND DU LAC COUNTY, WI



NOTES

BACKYARD PIPE HAS > 10 YEAR CAPACITY.

GRATES MUST POND TO 1.5' DURING 1-YR STORM, 4" DURING 10-YR STORM, > 1 FOOT DURING 100-YR STORM OR FROZEN CONDITIONS.

EXTENSION OF PIPE AS SHOWN IN BACKYARD WOULD MAINTAIN 10-YR ELEVATIONS TO BELOW ELEVATION 892.

FUTURE IMPROVEMENTS WOULD BE CONSTRUCTED IN CONJUNCTION WITH LAND DEVELOPMENT NORTHWARD.

MEMO

May 23, 2016

**Attachment F:
Rock River Flood Study Memo
(11 pages)**



PROFESSIONAL SERVICES

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MEMO

To: Dick Flynn, Director of Public Works, City of Waupun
From: Uriah Monday, PE, CFM, MSA Professional Services
Subject: Flood Reduction on the South Branch of the Rock River
Date: August 20, 2015

Introduction and Summary of Findings

The South Branch of the Rock River flows through the City of Waupun. In some locations, frequent flooding is a problem – in particular the easternmost area of the City along Gateway Drive experiences almost annual flooding resulting in road closures.

The South Branch of the Rock River is gaged by the USGS at a location just west of Fond du Lac Street (USGS Gage 05423500). It records, among other measurements, annual peak flow rates and average daily flow rates. These records were used to determine typical flood characteristics of the River through the City.

The purpose of this memo is to document the analysis of Rock River flow rates, determine elevations produced by these flow rates at the Gateway Drive location, and a discussion on the effectiveness of a potential floodwater storage area located near the golf course on the westward end of the City.

The analysis found that even a very large floodwater storage area (100 acres, 6' deep, with an estimated cost of nearly \$5 million) would reduce flow rates to a degree only sufficient enough to lower flood elevations at Gateway Drive by approximately 1.5 inches.

Hydrologic Analysis

The gage records of annual maximum flow on the South Branch of the Rock River were used by FEMA in order to determine flood elevations and mapping as published in the Flood Insurance Study. However, FEMA's study only used flow data from 1949 through 1981. In order to obtain a more statistically accurate picture of recurrence interval flow rates, the gaged annual peak flow rate data set from 1949 through 2014 was analyzed using a Log-Pearson Type III statistical procedure (a widely accepted method of determining t-year flood events used by DNR and FEMA). A summary of recurrence interval flow rates is presented in the table below. A full presentation of the calculation is attached to the end of this memo. It can be seen that the rates based on data through 2014 are significantly lower than the FEMA-published rates. Since

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Page 1 of 5 P:\2105\212\00212076\Documents\00212076 Flood Reduction Memo to Dick Flynn 082015.docx

MEMO

August 20, 2015

the flooding at Gateway Drive is relatively frequent, the updated 10-year flood event ($Q_{peak} = 1,050$ CFS) was chosen as an event of reasonable scale for a conceptual flood control project as discussed later in this memo.

Table 1. Recurrence Interval Flow Rate Summary.

Description of Analysis	10-yr Peak Discharge (CFS)	25-yr Peak Discharge (CFS)	50-yr Peak Discharge (CFS)	100-yr Peak Discharge (CFS)	500-yr Peak Discharge (CFS)
Values Used in Fond du Lac County Flood Insurance Study	1,300	-----	2,350	2,850	4,125
Values Computed by MSA Using Flow Records from 1959-2014	1,050	1,410	1,680	1,970	2,640

The table above establishes peak flow rate values associated with a likely recurrence interval; however, an important component in flood control is also the total volume of water experienced in a flood and the duration of the flood. A type of flow record that indicates a time-series of flow values is termed a *hydrograph*. The daily average gage records were used to obtain hydrographs from actual flood events of an approximate 10-year recurrence interval. From the record of annual peak flows, the following actual floods had recorded peaks close to the 10-year flood value of 1,050 CFS:

- Flood of 1952 – 1,000 CFS
- Flood of 1960 – 1,150 CFS
- Flood of 1993 – 920 CFS
- Flood of 2004 – 1,120 CFS

The daily data for these flood events was downloaded from the USGS website, and plotted to a graph. These plots are attached to the end of the memo. It can be seen that the average flow on the day of the flood peak is anywhere from approximately 5% to 20% lower than the peak value; this is because some flood events are more ‘flashy’ than others. Prior to using this data some adjustments were made which will be discussed in the “Flood Reduction Facility Concept” section below.

Hydraulic Analysis

A hydraulic computer model of the South Branch of the Rock River was constructed by FEMA in order to determine flood elevations and mapping as published in the Flood Insurance Study. This model was obtained from the WDNR and was updated from the older HEC2 format to a more updated HEC-RAS 4.1.0 format model (available from the US Army Corps of Engineers).

MEMO

August 20, 2015

The model was run using the FEMA Flood Insurance Study flows and it was determined that the converted model produced similar results as the published FIS profiles. The model was then executed using a range of flow rates from 200 CFS to 2000 CFS to determine an elevation-discharge relationship at a location on the upstream end of the City. This relationship (termed a *rating curve*) was used in the design of the “Flood Reduction Facility Concept” discussed below, and is presented in Table 2.

Table 2. River Stage-Discharge Summary.

Depth of River (feet)	Discharge (CFS)
0 feet	Zero
4.0 feet	200 CFS
5.0 feet	400 CFS
5.6 feet	600 CFS
6.0 feet	800 CFS
6.4 feet	1000 CFS
6.7 feet	1200 CFS
7.0 feet	1400 CFS
7.2 feet	1600 CFS
7.4 feet	1800 CFS
7.6 feet	2000 CFS

Note that these depth-discharge values in Table 2 are for the upstream end of the City. The hydraulic model indicates that in the vicinity of Gateway Drive an approximate 0.5’ difference in flood elevation occurs for every 200 CFS in flow rate change.

Flood Reduction Facility Concept

Flood risk can be reduced in a variety of ways, including but not limited to:

- watershed-wide land use controls that reduce the volume of runoff from rainfall or snowmelt
- creation of flood storage areas such as ponds or wetlands that hold and slowly release floodwaters over a period of time
- increasing conveyance within the waterway by re-channelization, increasing bridge openings, or eliminating obstructions
- constructing floodwalls or levees to protect low-lying areas from high water elevations

MEMO

August 20, 2015

The flood reduction concept that will be discussed here is the creation of a large flood storage area in the vicinity of the Rock River Country Club near State Highway 49 just westerly of the City.

This type of flood reduction requires flow-routing computational routine – that is, for a given rate of flow into a low-lying area, how much flow continues downstream and how much is stored in the area. A flow routing computer model called HydroCAD was used to execute these routing computations. The model used the following input parameters:

- Five separate flow hydrographs were inserted into the model. Four of them were based on the actual flood event hydrographs (roughly equal to 10-year floods) discussed above and another was based on the flood of record in 2008 with a peak recorded flow of 2,350 CFS (roughly a 250-year flood event). The average daily flow on the peak day was transformed to a triangular hydrograph with the peak equal to the value of the recorded instantaneous peak while maintaining the correct average flow for the day. Additionally all hydrograph values were multiplied by a factor of 0.88, representing the ratio of the watershed size at the west end of the City (55.8 square miles) to that at the gage (63.6 square miles).
- The rating curve for the river channel discussed in the “Hydraulic Analysis” section above was inserted into the model as the outlet for the flood control area.
- The flood control area was modeled as a 100-acre wetland area – this is about the size of the golf course. The area would have a two-foot-deep low-flow channel for the river and an additional six feet above the channel for flood storage. Flows in excess of two feet deep would flood into the wetland, which would temporarily store floodwater and diminish peak rates. If the cost of construction of such a basin is estimated as \$5 per cubic yard of excavation, six feet of excavation over a 100-acre area is 968,000 CY, for a total estimated cost of \$4.84 million.

Each of the historical flood hydrographs was run through this conceptualized flood control basin, which simulates what might have happened in these floods had the control been in place. Table 3, below, summarizes the results.

Table 3. Flood Peak Reduction Summary.

Flood Event	Peak Flow into Control Facility (CFS)	Peak Flow out of Control Facility (CFS)	Reduction in Peak Discharge
March 1952	880 CFS	832 CFS	48 CFS (5.5%)
March 1960	1012 CFS	972 CFS	40 CFS (4.0%)
July 1993	810 CFS	788 CFS	22 CFS (2.7%)
June 2004	986 CFS	976 CFS	10 CFS (1.0%)
June 2008	2350 CFS	2346 CFS	4 CFS (0.2%)

The model showed that peak flows were reduced in magnitude by varying degrees, but all within a range of no effect to a reduction of 50 CFS.

Discussion and Recommendation

The reductions summarized in Table 3 are on the order of 50 CFS or less, and represent a 5.5% reduction or less in flow rates for these events. While a 100-acre control area might appear to be large, there is a much larger watershed – by way of comparison, a 100-acre flood control area is approximately 0.3% of the 55.8 square mile watershed. A map of the watershed showing the to-scale area for this concept for flood control is attached to this memo.

As noted below Table 2 in the “Hydraulic Analysis” section, flow rates would need to be reduced by 200 CFS to obtain a 0.5’ reduction in flood elevation at Gateway Drive. Table 3 shows reduction for floods of a 10-year magnitude might achieve a reduction of up to 50 CFS – or about a 1.5-inch lowering of flood elevations at Gateway Drive. At an estimated cost of \$4.84 million to achieve this level of flood reduction, the economics do not appear to be justified.

Therefore, our recommendation is to abandon the concept of a flood storage facility as a means to improve flood protection at Gateway Drive. Instead, a more economical concept could be pursued, such as the construction of a levee to protect Gateway Drive or reconstruction of Gateway Drive to a higher elevation.

South Branch Rock River at Waupun
USGS Gage No. 05423500

Water Year	Date	Flow (CFS)	log Q	diff from msquared	cubed	
1949	3-27-1949	398	2.599883	-0.00958	9.18E-05	-8.8E-07
1950	3-27-1950	818	2.912753	0.303288	0.091984	0.027898
1951	3-29-1951	584	2.766413	0.156948	0.024633	0.003866
1952	3-21-1952	1,000	3	0.390535	0.152517	0.059563
1953	2-21-1953	507	2.705008	0.095543	0.009128	0.000872
1954	7-7-1954	168	2.225309	-0.38416	0.147576	-0.05669
1955	10-4-1954	570	2.755875	0.14641	0.021436	0.003138
1956	4-2-1956	753	2.876795	0.26733	0.071465	0.019105
1957	6-11-1957	170	2.230449	-0.37902	0.143653	-0.05445
1958	8-12-1958	51	1.70757	-0.90189	0.813415	-0.73361
1959	4-3-1959	1,500	3.176091	0.566626	0.321065	0.181924
1960	3-30-1960	1,150	3.060698	0.451233	0.203611	0.091876
1961	11-16-1960	369	2.567026	-0.04244	0.001801	-7.6E-05
1962	3-28-1962	990	2.995635	0.38617	0.149127	0.057589
1963	3-25-1963	253	2.403121	-0.20634	0.042578	-0.00879
1964	5-15-1964	57	1.755875	-0.85359	0.728616	-0.62194
1965	3-2-1965	371	2.569374	-0.04009	0.001607	-6.4E-05
1966	2-10-1966	1,280	3.10721	0.497745	0.24775	0.123316
1967	3-27-1967	189	2.276462	-0.333	0.110891	-0.03693
1968	6-27-1968	170	2.230449	-0.37902	0.143653	-0.05445
1969	6-27-1969	510	2.70757	0.098105	0.009625	0.000944
1988	3-8-1988	218	2.338456	-0.27101	0.073446	-0.0199
1989	3-26-1989	376	2.575188	-0.03428	0.001175	-4E-05
1990	3-14-1990	379	2.578639	-0.03083	0.00095	-2.9E-05
1991	3-2-1991	444	2.647383	0.037918	0.001438	5.45E-05
1992	10-25-1991	395	2.596597	-0.01287	0.000166	-2.1E-06
1993	7-6-1993	920	2.963788	0.354323	0.125545	0.044483
1994	2-20-1994	453	2.656098	0.046633	0.002175	0.000101
1995	8-9-1995	386	2.586587	-0.02288	0.000523	-1.2E-05
1996	6-19-1996	530	2.724276	0.114811	0.013182	0.001513
1997	3-22-1997	349	2.542825	-0.06664	0.004441	-0.0003
1998	3-31-1998	387	2.587711	-0.02175	0.000473	-1E-05
1999	7-21-1999	809	2.907949	0.298483	0.089092	0.026593
2000	6-2-2000	264	2.421604	-0.18786	0.035292	-0.00663
2001	6-12-2001	287	2.457882	-0.15158	0.022977	-0.00348
2002	3-9-2002	160	2.20412	-0.40535	0.164305	-0.0666
2003	5-11-2003	150	2.176091	-0.43337	0.187813	-0.08139
2004	6-11-2004	1,120	3.049218	0.439753	0.193383	0.085041
2005	3-31-2005	410	2.612784	0.003319	1.1E-05	3.66E-08
2006	3-13-2006	190	2.278754	-0.33071	0.10937	-0.03617
2007	3-13-2007	301	2.478566	-0.1309	0.017134	-0.00224
2008	6-13-2008	2,350	3.371068	0.761603	0.580039	0.441759
2009	3-25-2009	495	2.694605	0.08514	0.007249	0.000617
2010	7-23-2010	739	2.868644	0.259179	0.067174	0.01741
2011	3-21-2011	412	2.614897	0.005432	2.95E-05	1.6E-07
2012	3-8-2012	210	2.322219	-0.28725	0.08251	-0.0237
2013	4-10-2013	447	2.650308	0.040842	0.001668	6.81E-05
2014	6/19/2014	523	2.718502	0.109037	0.011889	0.001296

M= 2.609465
N= 48 Kn= 2.744
s= 0.333571 High Outlier Test 3.524784
g= -0.36995 Low Outlier Test 1.694146

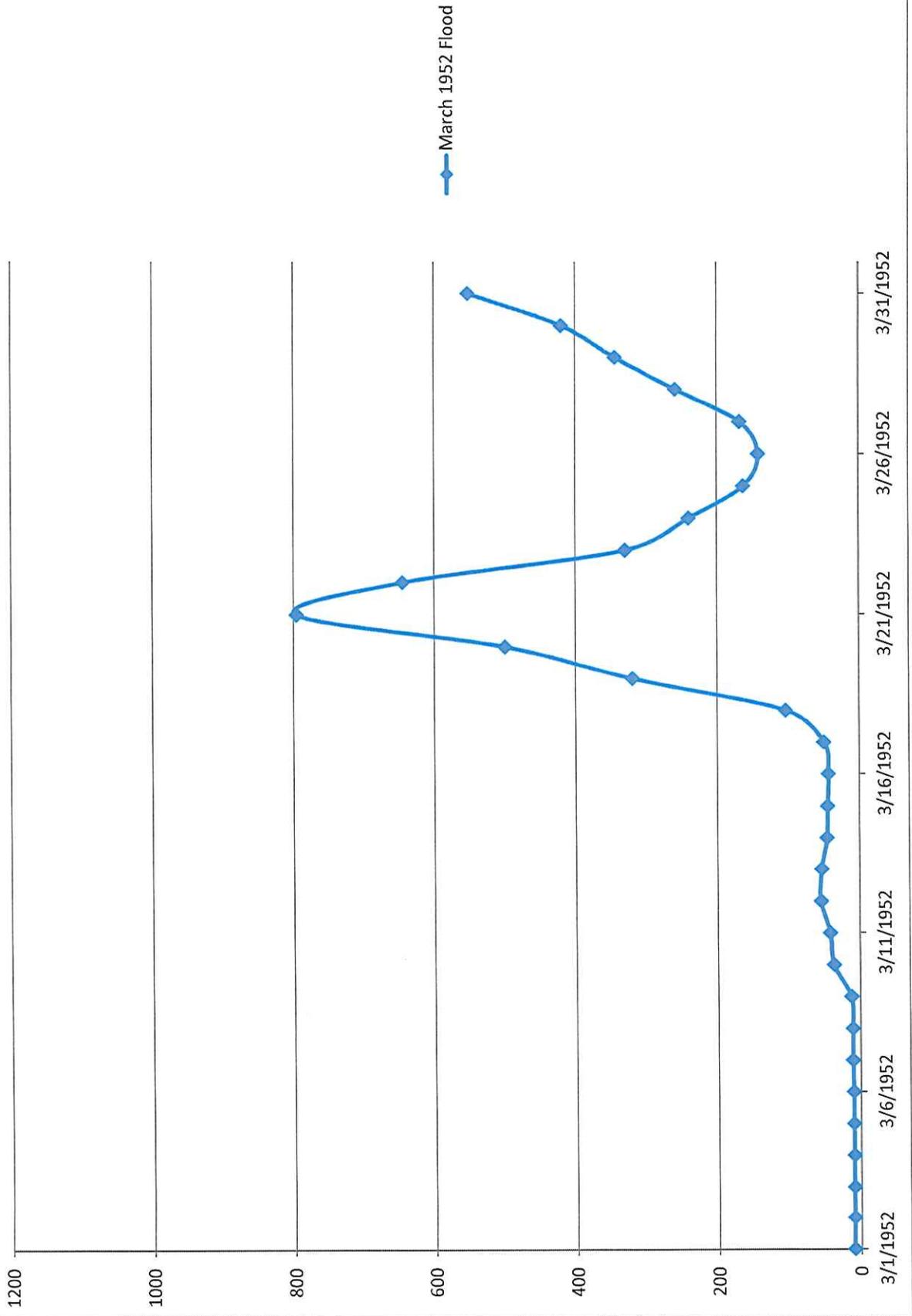
Return Period	K (see note)	log Q	Q
10-year	1.235	3.021425	1050
50-year	1.85	3.226571	1680
100-year	2.052	3.293953	1970
500-year	2.435	3.421711	2640

Skew value used: -0.36995
-0.4
1.23114 1.83361 2.02933 2.39942
1.235352526 1.85043006 2.051748 2.434872
1.24516 1.88959 2.10394 2.51741

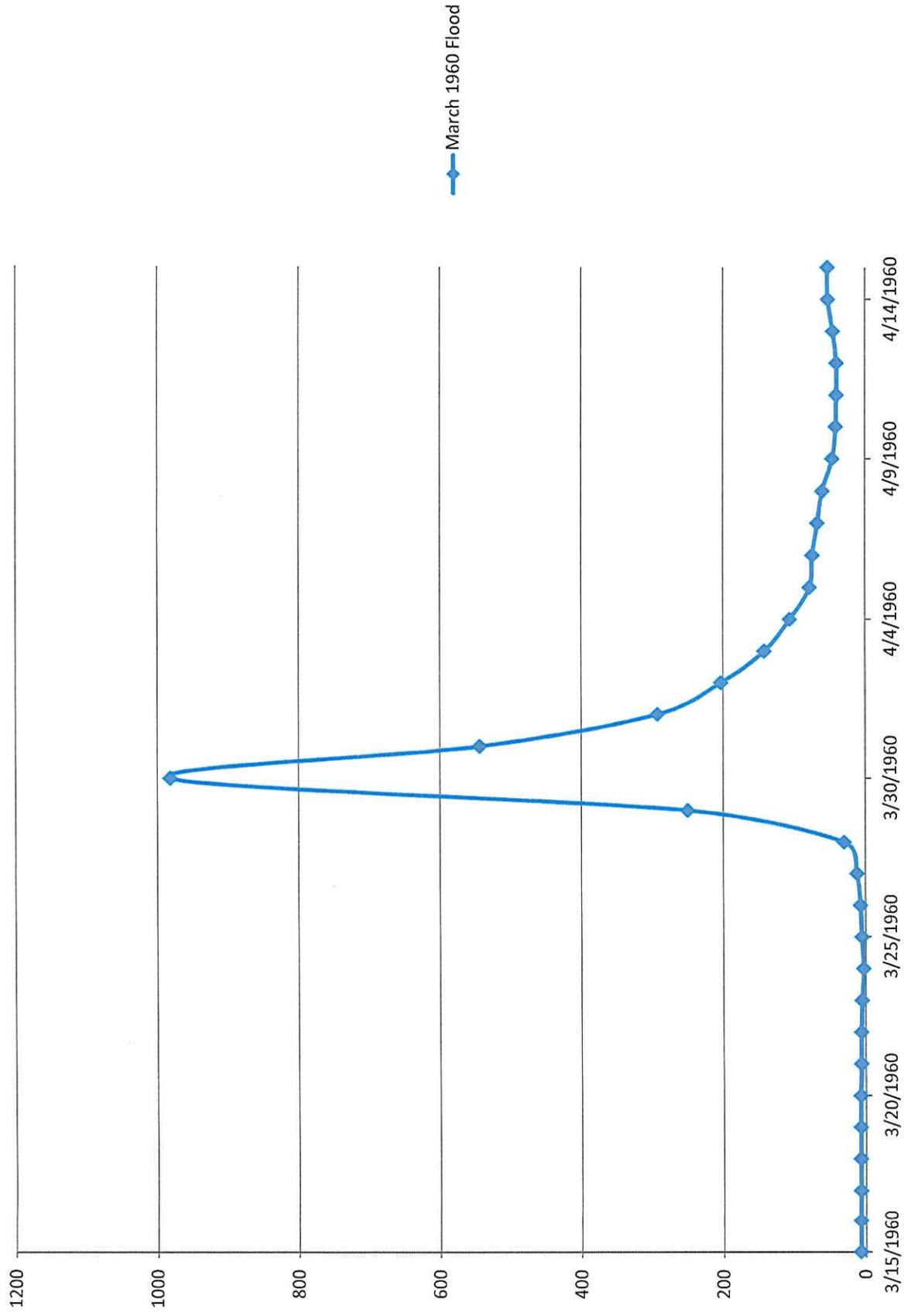
Note: K value is lookup from Table In Appendix 3 of Bulletin 17B as a function of skewness g (computed above).
Log Q = M + KS.

Notes: Several calendar years noted to contain two peaks in separate water years.
No outliers.

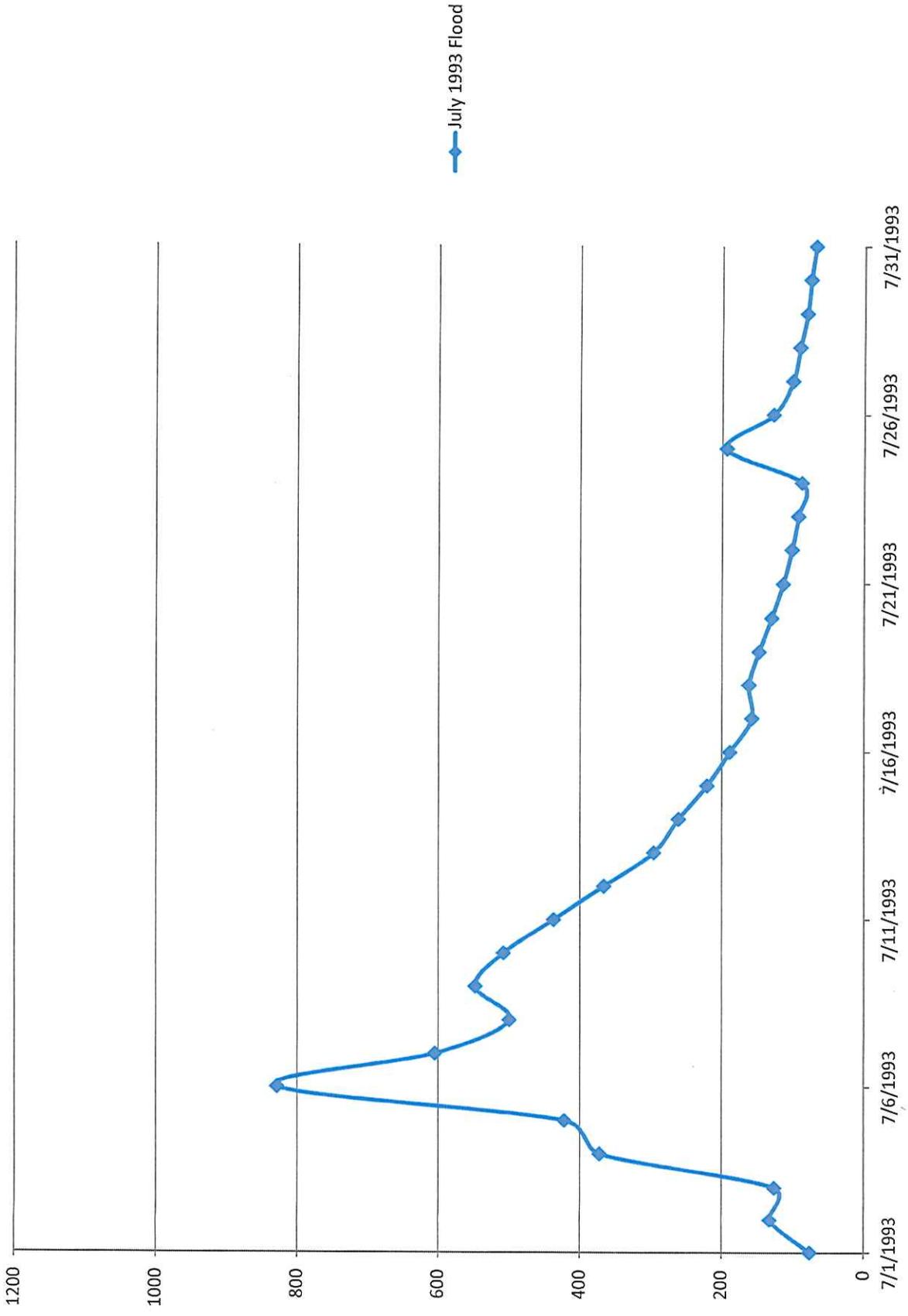
Daily Average Flow Data



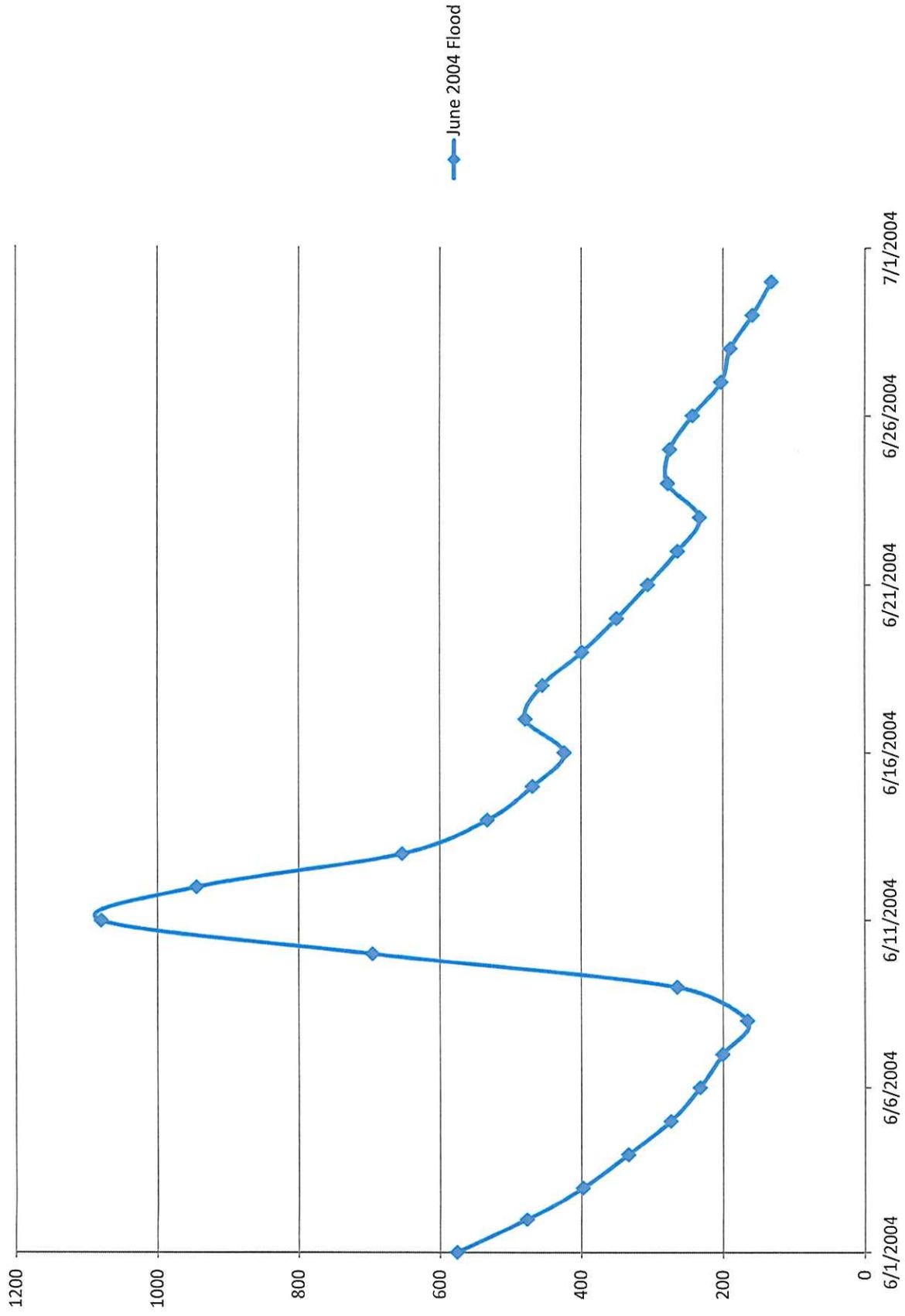
Daily Average Flow Data



Daily Average Flow Data



Daily Average Flow Data



South Branch Rock River

*City of Waupun
Dodge/Fond du Lac Co.*

Flood Flow Reduction Concept

Legend

-  Flood Storage Area
-  Municipalities
-  Watershed

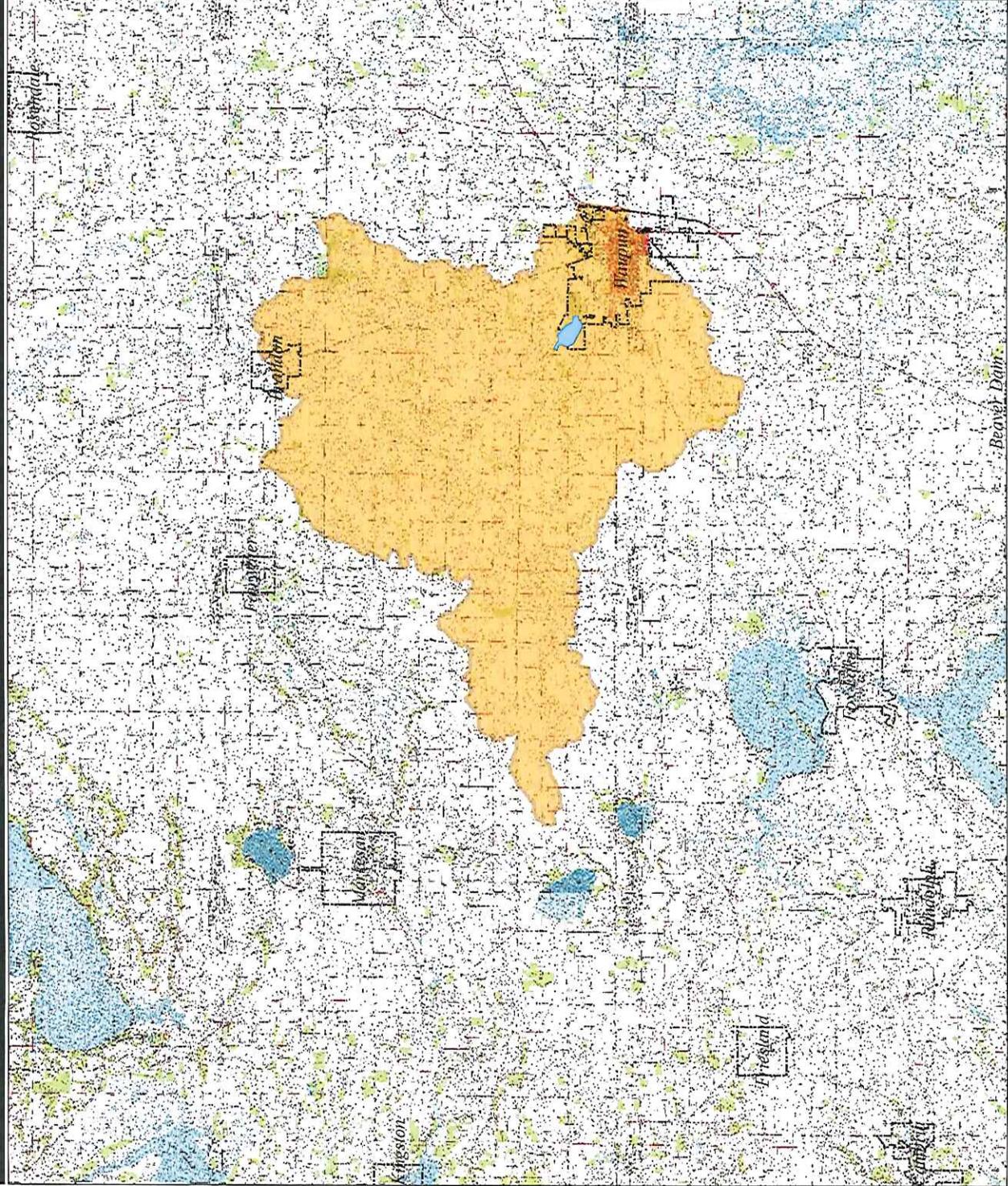


Miles



Sources:
• 1' contours generated from Lidar provided by
• 2010 NAD Ortho provided by USDA

MSA
PROFESSIONAL SERVICES



Franklin St - No Parking Ordinance - Survey

PROPERTY ADDRESS	Need Ordinance	No Ordinance	Comments
124 FOND DU LAC ST	X		If possible need a no parking by driveway. Had too many cars parking too close to driveway.
450 E FRANKLIN ST	X		If allowed to park on both sides of street there would be no clearance for cars to pass on the road. Also there are numerous driveway entrances to the old school.
421 JACKSON ST		X	
415 JACKSON ST	X		The road is way too narrow to have parking on both sides of the street, especially during football games
411 JACKSON ST	X		Still needed during Union dances or football games. If able to park on both sides of street traffic will not flow efficiently
129 N MADISON ST			Would suggest leaving No Parking for the first 100 feet or so from the corners otherwise removing sign. Would it be possible to get a handicap parking spot on Madison St. in front of cement slab in terrace. People across street park in front of our office making it hard for patient access
201 N MADISON ST	X		No trucks on N. Madison St.
420 JACKSON ST	X		
422 JACKSON ST			
424 JACKSON ST	X		
426 JACKSON ST		X	
434 JACKSON ST	X		This will be an extremely tight road during school events. Do not allow parking on the south side of the road
438 JACKSON ST	X		
448 JACKSON ST	X		Please have apartment building across street have ample parking for guests also, sick of cleaning up oil spills out in front of my house. No parking on either side of street - Franklin to Fond du Lac - very dangerous 100% of time.
462 JACKSON ST			
202 FOND DU LAC ST			

ORDINANCE NUMBER 16-_____

AN ORDINANCE TO AMEND CHAPTER SIX OF THE MUNICIPAL CODE OF THE
CITY OF WAUPUN ENTITLED "TRAFFIC CODE."

THE COMMON COUNCIL OF THE CITY OF WAUPUN, DO ORDAIN:

SECTION 1: Section 6.05 (3) (e) of the Waupun Municipal Code entitled "No
Parking" is amended to add the following subsection:

99. On the south side of Jackson St. from the East curb line of N. Madison St.
to the West curb line of Fond du Lac St.

SECTION 2: This Ordinance shall be in full force and effect upon its passage
and publication as provided by law.

Enacted this _____ day of _____, 2016

Kyle Clark,
Mayor

ATTEST:

Angela Hull
City Clerk