STORMWATER MANAGEMENT PLAN

THE VILLAGE OF METTAWA
26225 RIVERWOODS BOULEVARD
METTAWA, ILLINOIS 60045

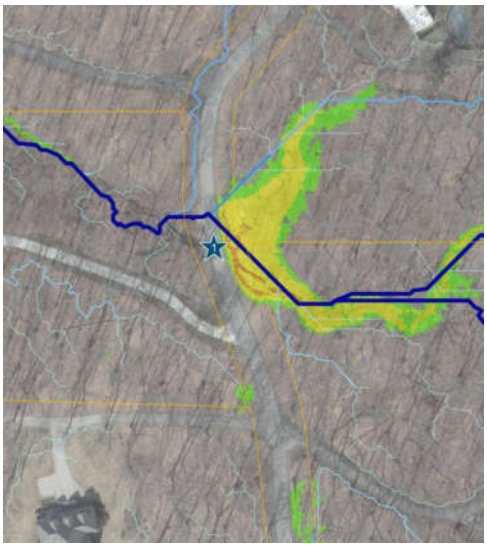
Hey and Associates, Inc.

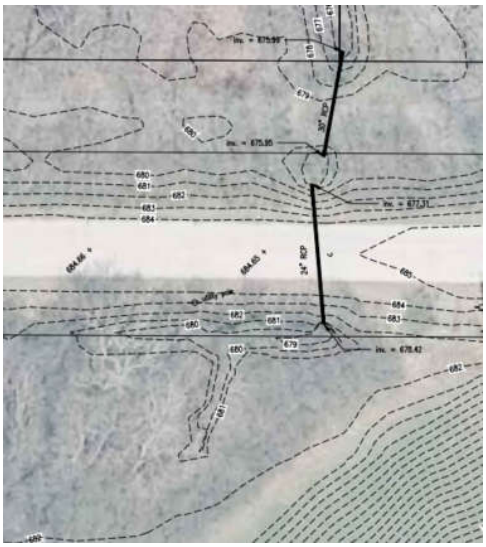
26575 W. Commerce Drive, Suite 601
Volo, Illinois 60073
847-740-0888

Project Number: 20-0216

May 7, 2021

Table of Contents





EXECUTIVE SUMMARY 1

DATA REVIEW AND ASSESSMENT 2

VILLAGE-WIDE GIS-BASED ASSESSMENT 3

PUBLIC REPORTING 4

FINDINGS AND CONCEPTUAL SOLUTIONS 5

- **15390 W LITTLE SAINT MARYS ROAD** 5
- **27115 MEADOWOODS DRIVE** 6
- **BRADLEY OASIS PARK AREA AND METTAWA LANE** 6
- **15141 W LITTLE SAINT MARYS ROAD** 10
- **METTAWA WOODS DRIVE CUL-DE-SAC** 10

ADDITIONAL DRAINAGE CONCERNS 12

CONCLUSION 17

EXHIBITS

- **EXHIBIT 1: CONTRIBUTING DRAINAGE AREAS**
- **EXHIBIT 2: DEPRESSIONAL ANALYSIS**
- **EXHIBIT 3: FLOWPATH ANALYSIS**
- **EXHIBIT 4: ANALYSES EXAMPLE**
- **EXHIBIT 5: OASIS PARK OVERALL DRAINAGE CONCEPTUAL PLAN**
- **EXHIBIT 6: OASIS PARK CONCEPTUAL PLAN**
- **EXHIBIT 7: METTAWA LANE DRAINAGE CONCEPTUAL PLAN**
- **EXHIBIT 8: 15390 W LITTLE SAINT MARYS ROAD AND METTAWA LANE DRAINAGE CHANNEL RESTORATION**

SCHEMATIC DESIGN PLANS

C1.0: 15390 W LITTLE SAINT MARYS ROAD

C2.0: 27115 MEADOWOODS DRIVE

C3.0 15141 W LITTLE SAINT MARYS ROAD

C4.0: METTAWA WOODS DRIVE CUL-DE-SAC

C5.0 OLD SCHOOL ROAD AND BRADLEY ROAD

APPENDIX A - VILLAGE PROVIDED FILES (DIGITAL)

APPENDIX B - GIS-BASED ASSESSMENT SPATIAL RESULTS FILES (DIGITAL)

APPENDIX C - DRAINAGE CONCERNS REPORTING

DRAINAGE CONCERNS APPLICATION - PUBLIC

DRAINAGE CONCERNS APPLICATION - ADMINISTRATIVE

DRAINAGE CONCERNS REPORTING FORM

EXHIBIT 1: DRAINAGE CONCERNS REPORTED

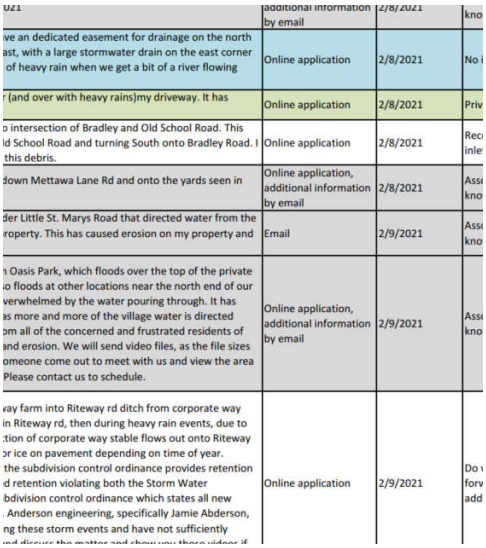
TABLE 1: DRAINAGE CONCERNS REPORTED

PUBLIC WORKS COMMITTEE MEETING RECORDING (DIGITAL)

DRAINAGE CONCERNS REPORTED AND ASSOCIATED ATTACHMENTS (DIGITAL)

APPENDIX D - CALCULATIONS AND MODEL RESULTS

APPENDIX E - HYDROLOGIC AND HYDRAULIC MODEL FILES (DIGITAL)



ve an dedicated easement for drainage on the north ast, with a large stormwater drain on the east corner of heavy rain when we get a bit of a river flowing	Online application	2/8/2021	No
(and over with heavy rains)my driveway. It has	Online application	2/8/2021	Priv
intersection of Bradley and Old School Road. This ld School Road and turning South onto Bradley Road. I this debris.	Online application	2/8/2021	Rec inle
down Mettawa Lane Rd and onto the yards seen in	Online application, additional information by email	2/8/2021	Ass kno
der Little St. Marys Road that directed water from the roperty. This has caused erosion on my property and	Email	2/9/2021	Ass kno
Oasis Park, which floods over the top of the private o floods at other locations near the north end of our verwhelmed by the water pouring through. It has s more and more of the village water is directed om all of the concerned and frustrated residents of nd erosion. We will send video files, as the file sizes omeone come out to meet with us and view the area Please contact us to schedule.	Online application, additional information by email	2/9/2021	Ass kno
way farm into Riteway rd ditch from corporate way in Riteway rd, then during heavy rain events, due to tion of corporate way stable flows out onto Riteway or ice on pavement depending on time of year. the subdivision control ordinance provides retention d retention violating both the Storm Water bdivision control ordinance which states all new . Anderson engineering, specifically Jamie Abderson, ng these storm events and have not sufficiently	Online application	2/9/2021	Do forv add

Hey and Associates, Inc. (Hey) was retained by the Village of Mettawa (Village) to explore known drainage issues and identify potential additional drainage areas of concern within the municipality. Incorporated in 1959, Mettawa is primarily characterized by large residential properties, horse stables, and open spaces, including several Lake County Forest Preserves. The Village's eastern boundary is home to a business corridor along Interstate 94, while a system of meandering trails leads to the western extent at the Des Plaines River.

Six initial project locations were identified by the Village during the commencement of this study: 15390 W Little Saint Marys Road, 27115 Meadowoods Drive, the Bradley Oasis Park Area, 15141 W Little Saint Marys Road, Mettawa Lane, and Mettawa Woods Drive cul-de-sac. These areas are shown on Exhibit 1. The Village also provided pertinent reference record data for analysis of these locations and for other areas throughout the Village.

In addition to data provided by the Village, a Village-wide GIS-based assessment was performed, including delineation of contributing tributary areas, topographic analysis of depressional storage areas, and calculation of flowpaths to better understand drainage in the project locations and to identify additional areas of concern.

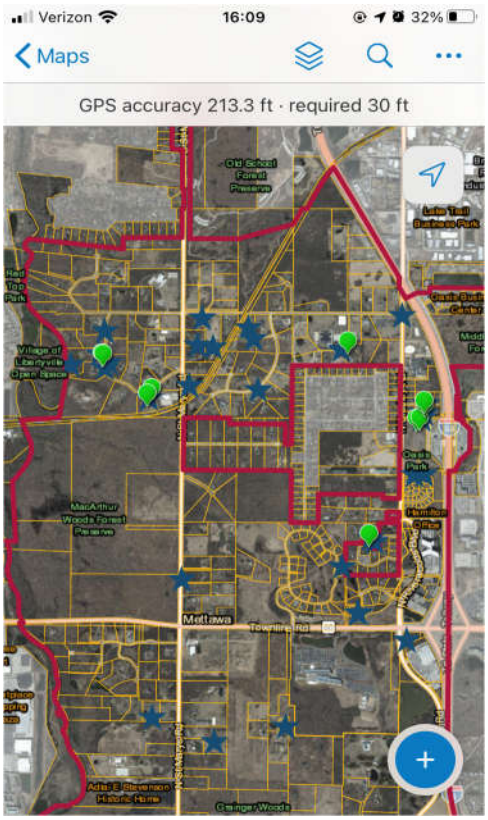
Village residents were encouraged to submit their drainage concerns as part of this project, resulting in the collection of additional information about the six locations, and the identification of other areas that have been investigated as part of tis report. Of the thirty-one (31) drainage concerns received, three (3) submissions noted no concerns, twelve (12) submissions were associated with the six initial project locations, twelve (12) submissions were identified as likely private drainage issues, two (2) submissions were associated with Little Melody Lane, one (1) was associated with a Village-owned open space, and one (1) was associated with the intersection of Old School Road and Bradley Road. The Old School and Bradley Road intersection was added to the initial project locations to review in detail.

Recommendations have been developed for the Village at these seven project locations. Schematic design plans have been developed for the 15390 W Little Saint Marys Road, 27115 Meadowoods Drive, 15141 W Little Saint Marys Road, and Mettawa Woods Drive cul-de-sac locations. The Bradley Road, Oasis Park area, and Mettawa Lane area was further assessed using a hydrologic and hydraulic model to develop detailed concept-level recommendations, and are provided as attached exhibits. The remaining concerns provided by the residents have been reviewed and preliminary recommendations have been developed for consideration.

Historical data in the form of various engineering design plans, topographic surveys, drainage atlases, preliminary design sketches, Autodesk's Auto Computer Aided Design (AutoCAD) files, and a variety of past correspondence was provided by the Village. As part of this effort, Hey reviewed this information to assess conditions and develop a thorough understanding of the identified project areas, detention ponds, and overall Village drainage. All data provided by the Village is included as Appendix A.

Additional spatial data was collected to build a base file utilizing the Environmental Systems Research Institute's (ESRI) ArcMap software, including:

- Lake County Municipal Boundaries
- Lake County Parcels
- Lake County Subdivision Boundaries
- Lake County 2017 Light Detection and Ranging (LiDAR)-derived Topographic Contours
- Lake County 2017 LiDAR-derived Digital Elevation Models (DEM)
- Lake County 2017 Hydro Breaklines
- Lake County 2018 Leaf-off Aerial Imagery
- Unites States Department of Agriculture, Farm Services Agency, National Agriculture Imagery Program 2020 growing season aerial imagery
- Lake County Forest Preserve Boundaries
- Federal Emergency Response Agency's National Flood Hazard Layer
- Lake County Forest Preserve District's Drain Tile Inventory for Grainger Woods Conservation Preserve



Field Data Collection Interface

Provided digital files with geographic components (engineering design plans, topographic surveys, drainage atlases, and preliminary design sketches) were geo-referenced using Lake County parcel information and Lake County 2018 high-resolution aerial imagery, projected using NAD 1983 (2011) State Plane Illinois East FIPS 1201 (US Feet). A minimum of three control points were selected for each digital file based upon visual clarity on the exhibit, visual clarity on the reference geographic data, type of object selected (preference was given to stationary objects, such as sidewalk or roadway edges of pavement), and distribution extent.

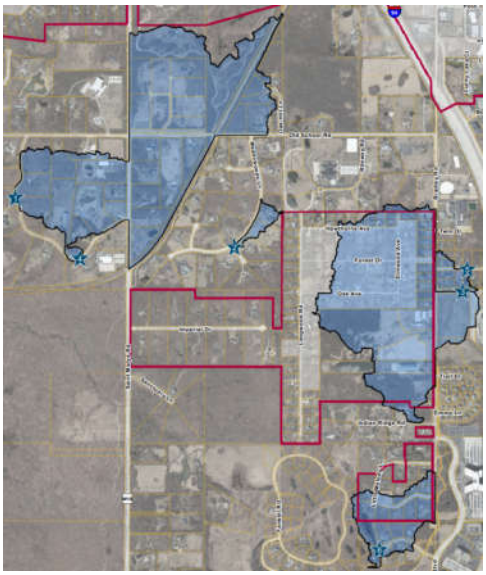
Following data collection and review, detailed field reconnaissance of the Village was performed to assess known or suspected problem areas in detail on November 3, 2020 and on March 3, 2021. Additional spatial data was collected and created during the March field visit, including geo-tagged photo documentation, in which Hey was accompanied by Village representatives.

200216 DAK/KNJ Field Notes - Field Notes (Points) (Features: 11, Selected: 0)

Category	Comments	Receiver Name	Latitude	Longitude	CreationDate	Creator	Photos and Files
Engineer's Field Note	Test	iPhone 7	42.32215657	-88.15036191	3/3/2021, 11:17 AM	HeyAdmin01	(0) Add
Engineer's Field Note	Flow takes turn and dishes out onto road	iPhone 7	42.25984077	-87.91033605	3/3/2021, 1:14 PM	HeyAdmin01	(5) Show
Engineer's Field Note		iPhone 7	42.25901687	-87.93219555	3/3/2021, 1:26 PM	HeyAdmin01	(8) Show
Engineer's Field Note		iPhone 7	42.25897555	-87.93208424	3/3/2021, 1:30 PM	HeyAdmin01	(3) Show
Engineer's Field Note		iPhone 7	42.25660150	-87.92773621	3/3/2021, 1:35 PM	HeyAdmin01	(2) Show
Engineer's Field Note		iPhone 7	42.25621828	-87.92816981	3/3/2021, 1:37 PM	HeyAdmin01	(5) Show
Engineer's Field Note	To be open swale improved in 2022	iPhone 7	42.24649150	-87.90843504	3/3/2021, 1:54 PM	HeyAdmin01	(4) Show
Engineer's Field Note		iPhone 7	42.25450632	-87.90419840	3/3/2021, 2:04 PM	HeyAdmin01	(15) Show
Engineer's Field Note	Culvert on south side bringing a lot of water	iPhone 7	42.25453938	-87.90393965	3/3/2021, 2:07 PM	HeyAdmin01	(1) Show

Spatial Data Collected on March 3, 2021

In addition to collecting Village and property owner information on known drainage issues, a Village-wide GIS-based assessment was performed utilizing ESRI ArcMap software and Lake County 2017 LiDAR data to better understand drainage pathways.



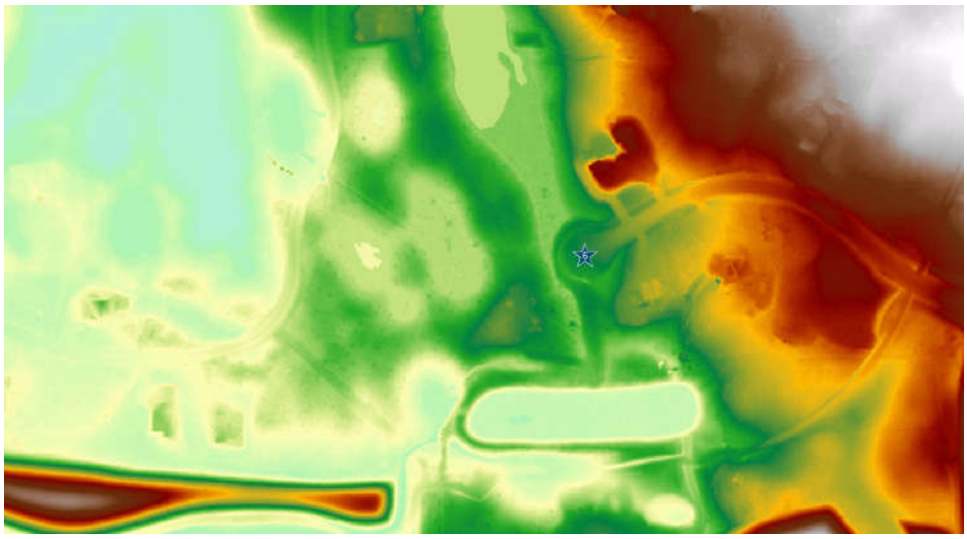
Delineated Contributing Drainage Areas for the Six Initial Project Locations

First, contributing drainage areas to the six initial project locations were delineated from 2-foot pixel resolution DEMs using ArcHydro tools, as shown on the image to the left. Understanding the size and composition of the areas that drain to the project locations were instrumental in further understanding problems and developing solutions. The contributing drainage area to Oasis Park was further subdivided to better define drainage conditions and to calculate hydrologic and hydraulic modeling parameters. These results are included as Exhibit 1.

Topographic depressional areas within the Village were also identified utilizing these DEMs. First, DEMs were "filled" to mathematically eliminate areas of internal drainage or areas that may be served by storm sewer or culverts. The resulting "filled DEM" represents the elevation conditions if all storage areas were filled to their overflow elevations. Next, the original DEM cell values are subtracted from the filled DEM values, producing a raster (coded pixel grid) layer containing cell values representative to the approximate available storage depth. Analysis results were segmented and displayed using graduated colors symbology to show depth of depressional storage areas. This analysis was utilized both to identify locations and extents of potential drainage issues in the Village. Results are classified as 0 - 0.5-foot, 0.5 - 1-foot, 1 - 2-feet, 2 - 3-feet, 3 - 4-feet, and greater than 4-feet depth ranges of depressional areas on Exhibit 2.

Further processing derived linear features to delineate drainageways as part of the flowpath mapping. This process involves calculating flow direction by analyzing raster cell elevation values to create a "flow direction" raster, and calculating flow accumulation by analyzing the output of the flow direction analysis. The resulting series of calculations provides a raster layer in which each cell is coded with the number of cells "flowing" to it, and resulting contributing areas can be calculated using the cell size. Similar to the depressional storage area analysis, thorough evaluation of this product aided in understanding sources and extents of drainage issues and informed concept solution development. Results are classified as 0.5 - 1-acre, 1 - 5-acres, 5 - 10-acres, 10 - 50-acres, 50 - 100-acres, and greater than 100-acres contributing area ranges as shown on Exhibit 3.

Exhibit 4 shows a close-up view of how these two analyses reveal crucial drainage information. These findings have been documented as digital shapefiles (geospatial vector data) and rasters included in Appendix B.



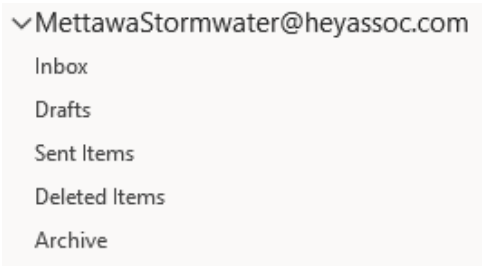
LiDAR DEM Data for Mettawa Woods Drive cul-de-sac

Beyond discussion with Village staff and assessment and evaluation of Village records, residents were engaged in the data collection process. The active reporting period was from February 8, 2021 through March 1, 2021, although submissions were accepted up until March 15, 2021. Anecdotal drainage concerns were solicited from residents by the Village through a hyperlink to a web-based form, posted to the Village website and distributed by the Village to residents via email.

Report Submission Confirmation

Two separate digital interfaces were created by Hey. The first was designed to provide a method of data collection for residents, the second was designed to provide the Village staff with an interface to monitor submissions. Concerns reported in the public application populated a database, which was then displayed on the administrative application. Screen captures provided in Appendix C (Drainage Concerns Application - Public and Drainage Concerns Application - Administrative sections) show the interfaces for both map interfaces. A fillable PDF form was also created and provided in the public-facing application, included in Appendix C.

A project-specific email, MettawaStormwater@heyassoc.com, was created to take any questions regarding the digital application use and to receive PDF forms. The email address was active for the months of February and March, 2021. Hey also provided a mailing address to our Volo office to receive any paper copies mailed by residents. The database was periodically updated by Hey during the reporting period to capture any information received via email or mail.



Project-Specific Email Account

In addition to the reporting period, a Public Works Committee Meeting was hosted on April 8, 2021 at 6:00pm via Zoom to present the project to the residents and to solicit and additional concerns or feedback. A digital recording of this meeting is provided in Appendix C.

All public drainage concern forms reported as PDF or paper documents, and any associated attachments included in the digital form or provided to Hey otherwise by residents have been compiled provided as a digital file in Appendix C. Exhibit 1 maps the locations of the drainage concerns received, while Table 1 includes the database attribute table, corresponding to the numbers on the maps; both are also included in Appendix C.

Of the thirty-one (31) drainage concerns received, three (3) submissions noted no concerns, twelve (12) submissions were associated with the six initial project locations, twelve (12) submissions were identified as potential private drainage issues, two (2) submissions were associated with Little Melody Lane drainage - a project the Village intends to pursue in the near future as part of a roadway improvement project, one (1) was associated with a Village-owned open space, and one (1) was associated with a Village drainage structure at Bradley Road and Old School Road. Summaries of the concerns reported and preliminary recommendations are included in the following section.

Based upon the data review and condition assessment described in the previous sections, findings have been compiled and are included below. Recommended solutions have also been developed to address these drainage issues. Beginning with the six initial projects, each location is described in detail, a concept solution is proposed, any maintenance is identified, and a concept-level estimate of probable cost is provided. Exhibits or schematic design plans are also referenced as they been prepared. The following section provides similar information for the three Village drainage issues identified in the public reporting effort. The final section follows with preliminary recommendations for those drainage issues identified as likely to be private in the public reporting effort.

Six Initial Project Locations

1. 15390 W Little Saint Marys Road (Reported Concerns 6 and 26)

A 30-inch by 19-inch elliptical reinforced concrete pipe conveys flow under W Little Saint Marys Road, just south of W Old School Road. As shown on Schematic Design Plan C1.0, this area is impacted by the floodplain from the Des Plaines River, likely further inhibiting drainage in high water level conditions. Proximity to the Des Plaines, recent regional trends of increased rainfall depths and frequency, and topography suggest the increase in standing water in this area, predominantly east of the road, is influenced by the current high water tables. Additional investigation shows hydric and hydric inclusion soils, further suggesting this area is prone to periodic inundation.

15390 W Little Saint Marys Road Upstream Drainage

Without an extensive analysis of stormwater storage volume in the approximately 193-acre upper watershed, preliminary drainage area delineation and reports of roadway overtopping in Reported Concern 26 suggest the existing pipe may be undersized. Preliminary model results, that excludes detailed modeling of watershed storage, suggest that the existing pipe has between 6-month and 9-month capacity (Appendix D).

Roadway elevations and associated cover available over the pipe indicate that the most practical way to increase conveyance would be to install a secondary 30-inch by 19-inch elliptical culvert, effectively doubling the current capacity. Other capacity-driven solutions may include replacement of this crossing with a bridge or box culvert, although a more costly option.

Schematic Design C1.0 depicts the recommended solution, which is to install a secondary pipe to increase capacity and accommodate larger flow events. Considering the downstream channel is experiencing erosion (Reported Concern 6), it is recommended that the downstream length of the channel, located on private property, be assessed, stabilized, and restored in conjunction with any pipe replacement to protect against future erosion. A conceptual plan of this restoration and stabilization is shown as Exhibit 8. Both floodplain and floodway affect the channel, necessitating additional permitting needs. This strategy would require private property owner engagement, construction and maintenance easements, and may prompt replacement of the private driveway culvert as well.

Anticipated Regulatory Needs:

- Wetland Delineation and a Jurisdictional Wetland Determination (JD)
- United States Army Corps of Engineers (USACE) permit for wetland impacts
- Lake County Watershed Development Ordinance (WDO) permit, as administered by the Village of Mettawa as a Certified Community
- Floodway Delegation from the Illinois Department of Natural Resources (IDNR) Office of Water Resources (OWR) to the Lake County Stormwater Management Commission (SMC)
- WDO Floodplain and Floodway review and approval, as administered by SMC

- Soil Erosion and Sediment Control Plan review and approval, Lake County SMC
- IDNR-OWR Part 3708 permit for construction in the floodway or documentation that the project can meet the requirements of IDNR-OWR Regional Permit 3
- Village of Mettawa Building Permit

Concept-level estimate of probable cost (to include final design, permitting, and construction): $95,000

2. 27115 Meadowoods Drive (Reported Concern 18)

Open ditch flow from along N Meadowoods Drive is conveyed under Southwoods Lane in a 15-inch reinforced concrete pipe. The flared end section on the upstream pipe terminus has pulled away from the pipe connection and is limiting capacity and rendering the pipe prone to clogging and creating a situation where water can drain around the outside of the pipe, causing potential settlement issues. Rational method and culvert capacity calculations included in Appendix D were performed to determine if the existing pipe has capacity to convey peak discharge from the approximately 4.4-acre contributing area, which was confirmed for the 7.5-year recurrence interval event. Replacement of this upstream flared end section is recommended to ensure the design conveyance is achieved, as depicted in schematic design plan C2.0.

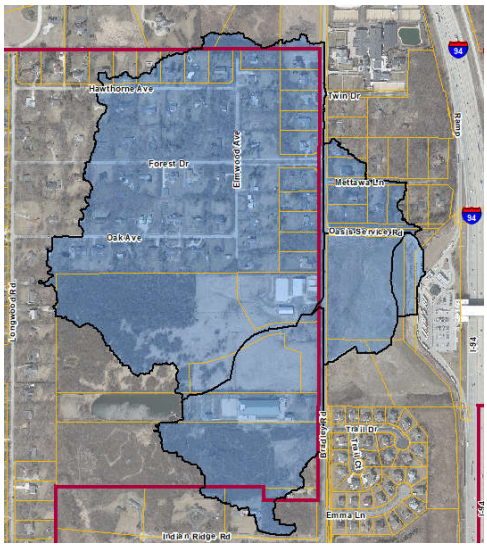
Anticipated Regulatory Needs: None, likely considered maintenance

Concept-level estimate of probable cost (construction): $3,000

3. Bradley Oasis Park Area (Reported Concerns 7 and 15 and
5. Mettawa Lane (Reported Concern 5)

More than 250-acres drains to the conveyance route under Mettawa Lane. Drainage concerns along this flow path include the overtopping of Oasis Service Road, structure flooding at 707 W Bradley Road (Reported Concern 15), and Mettawa Lane roadway flooding (Reported Concern 5). The Village-owned Oasis Park has been identified as an opportunity to provide some level of stormwater storage in the upper watershed.

Drainage from west of Bradley Road and north of the Lake Forest Equestrian Center is collected in a north-south ditch system and is conveyed through a 30-inch roadway culvert to the northwest corner of Oasis Park, and through a 12-inch pipe system to the road ditch along the southern expanse of Mettawa Lane. Drainage from west of Bradley Road and south of the Lake Forest Equestrian Center is conveyed through a 36-inch roadway culvert to the southwest corner of Oasis Park.



Approximately 250-acres Drain to Mettawa Lane

Existing conditions modeling, described in detail and included in Appendices D and E, and summarized in Table 1, shows Oasis Service Road and Bradley Road overtop in the 25-year event from west to east, both at the northwestern corner of Oasis Park and at Mettawa Lane. Model results show that roadway overtopping does not occur at either location in the 10-year critical duration event.

Options were explored to increase storage in Oasis Park to alleviate flood concerns to the extent practicable, primarily focused on roadway overtopping at the three locations identified. A land use plan consistent with the concept shown on Exhibits 5 and 6, comprised of a restored channel and floodplain while maintaining the recently constructed pathway could provide sufficient storage to alleviate the Oasis Service Road flooding in the 25-year event.

Additional modeling was performed to explore the feasibility of limiting the overtopping of Bradley Road in this location. Preliminary results show that

upsizing the 30-inch culvert to re-direct greater flows to Oasis Park would require creating an additional 165-acre-feet of flood storage at Oasis Park. Given the total site is 19.2-acres, this strategy is impractical.

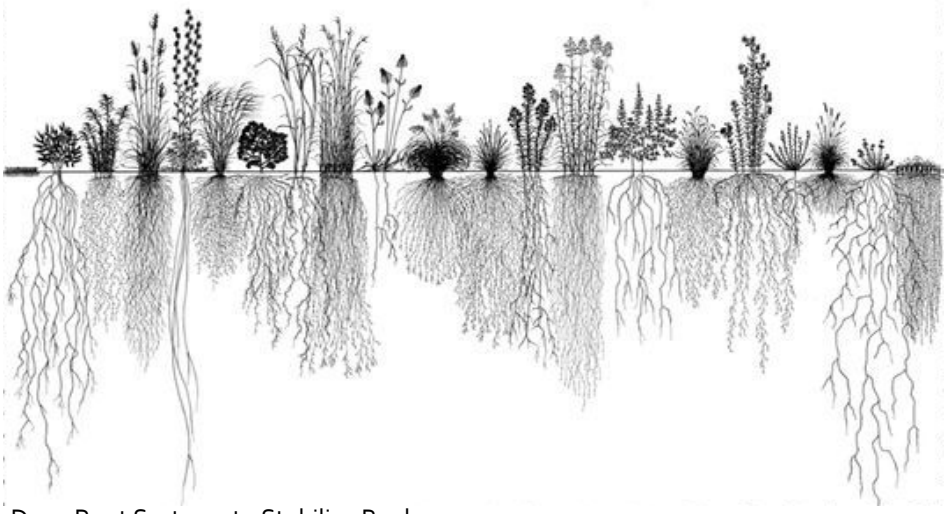
However, two additional preliminary scenarios were prepared for the Oasis Park and Mettawa Lane. Results summarizing roadway overtop frequency and magnitude in the modeled design storms are shown in Table 1 and include the following scenarios:

1. Base Scenario, representing the existing conditions
2. Pr1: adding 10-acre-feet of stormwater storage below an elevation of 685.0
3. Pr2: adding of 10-acre-feet of stormwater storage below an elevation of 685.0 and upsizing the 30-inch pipe from Bradley Road to Oasis Park to a 36-inch pipe
4. Pr3: adding of 10-acre-feet of stormwater storage below an elevation of 685.0, upsizing the 30-inch pipe from Bradley Road to Oasis Park to a 36-inch pipe, and upsizing the Bradley Road to Mettawa Lane culvert system to a 24 -inch system

Table 1. Roadway Overflow Peak Discharges (cfs) for Critical Duration Events

Location	10-year				25-year				50-year				100-year			
	Ex	Pr1	Pr2	Pr3	Ex	Pr1	Pr2	Pr3	Ex	Pr1	Pr2	Pr3	Ex	Pr1	Pr2	Pr3
Bradley Road at Oasis Park	0.0	0.0	0.0	0.0	2.6	2.6	1.2	1.0	4.9	4.8	3.1	2.9	7.8	7.6	5.6	5.2
Bradley Road at Mettawa Lane	0.0	0.0	0.0	0.0	148.3	148.3	92.9	81.4	232.6	228.6	172.0	160.9	318.2	311.8	254.2	243.1
Oasis Service Road	0.0	0.0	0.0	0.0	45.6	0.0	50.0	44.2	97.5	3.0	91.1	73.7	145.6	48.1	141.2	103.3

In the concept for Oasis Park, creation of approximately 10-acre-feet of storage could be provided at an elevation below 685 (the approximate lowest elevation of the Oasis Service Road) in a functional manner to preserve the integrity of the park site and this reach of the Mettawa Trail. A low flow channel is proposed to convey the drainage through this site in most conditions and low flow storm events, likely represented by the 2-year event. Natural riffle structures would function to restore and protect grade, while the alignment would restore the natural meanders of a small stream. A terrace would be constructed to convey events in the 5-year to 10-year recurrence interval range. Capacity would be designed for flows to access this terrace, supporting a unique native plant community and restoring a facet of ecosystem function. The third terrace, identified as the high water level area, would provide stormwater storage in the 10-year to 25-year event range, increasing infiltration and providing for another diverse habitat.

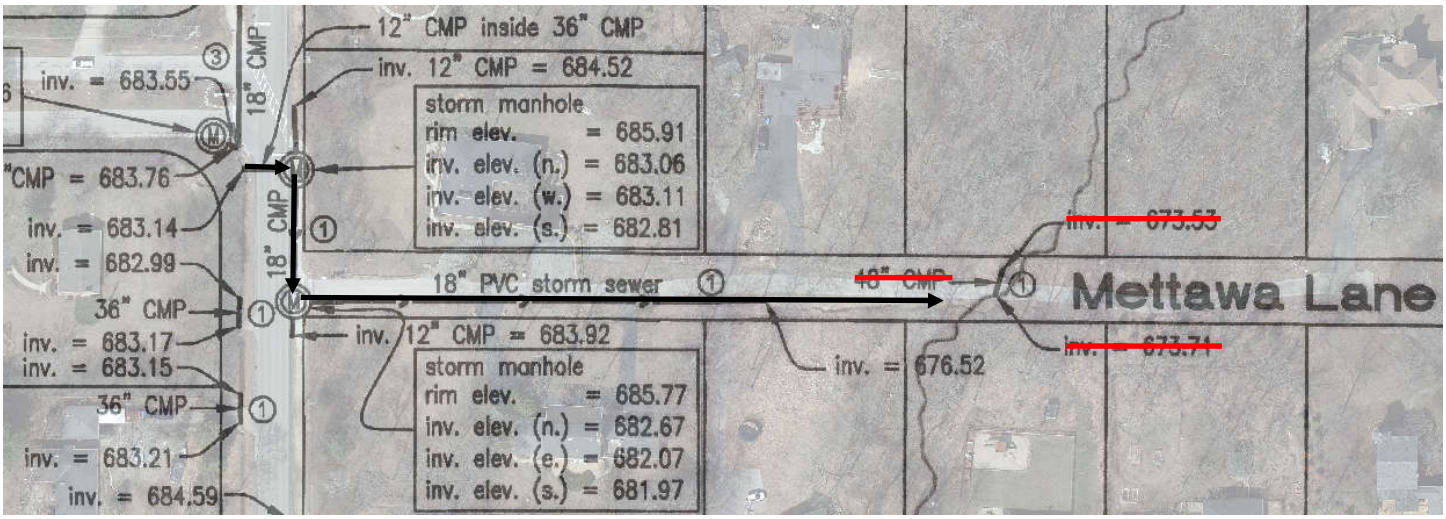


Deep Root Systems to Stabilize Banks
Lake County SMC's Riparian Area Management: A Citizen's Guide

As shown on Exhibits 5 and 7, stabilization of the reach from the Oasis Service Road crossing to Mettawa Lane and from Mettawa Lane to Interstate 94 is also recommended. Construction of engineered scour pools, riffles, additional bank protection measures, and removal of woody underbrush could be implemented to protect

against erosion and restore bank areas. Large trees in this area would remain, but dense underbrush would be cleared to encourage the establishment of a herbaceous native vegetative understory to utilize the complex root systems to stabilize soils and overbank areas further. A conceptual rendering of this restoration is shown as Exhibit 8.

To address the remaining overflow of Bradley Road at Oasis Park and at Mettawa Lane (depicted in Reported Concern 5), it is recommended that the 12-inch to 18-inch pipe system conveying flows from the ditch system along the western side of Bradley Road to the ditch system along Mettawa Lane be upsized. To accommodate this flow, and considering the limitations in increasing ditch capacity, it is recommended that new storm sewer be installed to convey flows.



Ditch west of Bradley Drainage System to Mettawa Lane

The Village has been involved in ongoing discussions about the reconstruction of Mettawa Lane to comprehensively address stormwater and improve the roadway. It is recommended that any stormwater improvements, including upsizing the identified 12-inch to 18-inch piped system along Mettawa Lane be implemented in conjunction with roadway improvements for infrastructure maintenance access. Additionally, increasing capacity through this system would require the stabilization of the drainageway from Mettawa Lane downstream to the Interstate 94 culvert.

The two corrugated plastic pipes along the drainageway under Mettawa Lane, may be prone to clogging and thus impacting the conveyance system from both Oasis Park and down Mettawa Lane. It is feasible that these be replaced by a box culvert or bridge structure, though this would have substantial cost implications for construction. As described above, it is recommended that this replacement to increase capacity and limit clogging potential and scour be implemented in conjunction with roadway improvements for infrastructure maintenance access and the stabilization of the drainageway from Mettawa Lane downstream to the Interstate 94 culvert.

To protect against erosion and stabilize the existing scour pool forming on the downstream end of the two existing corrugated plastic pipes, and to accommodate the recommended storm sewer system's more consolidated flows, it is recommended that both the upstream and downstream extents of the Mettawa Lane crossing be treated with rock riprap scour protection. In addition, further downstream clearing and stabilization treatments to protect grade and prevent against erosion similar to those recommended for the reach extending from Oasis Service Road to Mettawa Lane are recommended to protect against additional flow.

Access and maintenance easements along drainageway on private property, for both the Oasis Service Road to Mettawa Lane reach and the Mettawa Lane to Interstate 94 reach would be required to accomplish these improvements and facilitate construction of the potential Mettawa Lane stormwater improvements.

Ditches west along Bradley Road in the Village right-of-way are primarily turf grass. Exploration of providing additional capacity could be pursued by the Village as part of ongoing ditch maintenance, although adjacent grades and widths of right-of-way will be limiting and prove additional storage creation in this area infeasible. The drainageway on the 690 N Bradley Road parcel, directly adjacent to the 30-inch culvert leading to Oasis Park has already been cleared of woody understory vegetation, minimizing the potential clogging of the culvert. Additional understory clearing on the 696 N Bradley Road parcel or the feasibility of utilizing this parcel for added stormwater storage could be explored in cooperation with the property owner. Similar to Oasis Park, creating sufficient storage volume to have a measurable impact on flooding relief is impractical on this parcel.

In summary, the stormwater concerns related to overtopping of Oasis Service Road, structure flooding, and Mettawa Lane roadway flooding are all part of a comprehensive drainage system and could realize substantial benefit, both in functionality and in cost, if addressed in both design and construction as an integrated solution. The Village-owned Oasis Park has been identified as an opportunity to provide some level of stormwater storage in the upper watershed, but construction of improvements in this location will only mitigate a portion of the overall flooding issue. Flood elevations can be reduced by providing additional capacity in the Mettawa Lane system, but are not recommended without addressing the reach from Mettawa Lane to Interstate 94.

Anticipated Regulatory Needs:

- Wetland Delineation and a JD
- USACE permit for wetland impacts
- Lake County WDO permit, as administered by the Village of Mettawa as a Certified Community
- WDO Floodplain and Floodway review and approval, as administered by Lake County SMC
- Soil Erosion and Sediment Control Plan review and approval, Lake County SMC
- IDNR OWR Part 3700 permit for construction in the floodway/floodplain
- National Pollutant Discharge Elimination System (NPDES) permit through the Illinois Environmental Protection Agency (IEPA)
- Village of Mettawa Building Permit

Concept-level estimate of probable cost for Oasis Park Improvements (to include model refinement, final design, permitting, and construction): $450,000

Concept-level estimate of probable cost for Mettawa Lane and Oasis Park Drainage Improvements (to include model refinement, final design, permitting, and construction): $220,000

Oasis Park, August 2018

Lake County SMC has received funding through the Department of Commerce and Economic Opportunity (DCEO) for regional stormwater capital improvements, intended to fund "in-the-ground improvements ("bondable" projects) and will support the countywide implementation of regional stormwater infrastructure that is identified as having significant flood damage reduction value." The last grant cycle (applications due January, 2021) considered funding for projects in the $250,000 to $2,500,000 range. This program may be a funding mechanism to pursue as part of the improvements at Oasis Park.

4. 15141 W Little Saint Marys Road (Reported Concern 17)

Across from Sapphire Riding Academy, a 12-inch corrugated metal pipe under W Little Saint Marys Road has collapsed. In the interim, a 4-inch PVC pipe was inserted into the upstream side of the culvert in an effort to maintain some level of drainage. The existing PVC pipe limits capacity, causing water to overtop W Little Saint Marys Road, impacting the road surface condition and leading to seasonal ice sheet formation. In an effort to protect public safety and Village infrastructure, it is recommended that this culvert be replaced.

Rational method and culvert capacity calculations were performed to determine if the pipe should be replaced in-kind or upsized to convey peak discharge from the approximately 1.4-acre contributing area. Results show the pipe size is limited, prompting recommendation to upsize the pipe to a 15-inch pipe. Replacement would include the installation of two new flared end sections, minor grading to improve upstream drainage, and the installation of stone outlet scour protection at the downstream flared end section and is shown in schematic design plan C3.0. A design-stage planning information request is recommended to confirm feasibility of upsizing the culvert, as field reconnaissance recovered gas pipeline utility flags in the area.

15141 W Little Saint Marys
Field Utility Flag

Anticipated Regulatory Needs: None, likely considered maintenance

Concept-level estimate of probable cost (construction): $11,000

6. Mettawa Woods Drive cul-de-sac (Reported Concerns 1, 11, 12, and 14)

The depressional area located northwest of the Mettawa Woods Drive cul-de-sac utilizes an overland conveyance route to outlet to the Mettawa Woods Pond, located south of the cul-de-sac. As-built plans provided as part of the document review effort and historical aerial imagery reviewed indicate that the natural drainage was somewhat impeded by the development. In the current conditions, there is also a 24-inch reinforced concrete pipe in this area, installed to drain ditch flow from the cul-de-sac to the detention pond.

The review of this site and associated documents yielded a solution that generally concurs with the James Anderson Company's assessment. To restore some level of a stabilized overland drainage route to the wetland, it is recommended that a swale be graded from the southern extent of the wetlands into the Mettawa Woods Pond. Further exploration of the location of the sanitary system and other utilities in the area should be confirmed prior to finalizing this approach.

The design high water level of this pond is 671.8, and the designed overflow is at an elevation of 672.0. Existing survey provided indicates the current overflow of the wetland area into the pond is approximately 672.7. Topographic review in conjunction with aerial imagery suggest that the nominal normal water level is approximately 672.0. Upon providing a swale connection between these two areas, the elevation of 671.8 may project back into the wetland area in high flow events, as shown in schematic design plan C4.0.

Another document prepared by Manhard Consulting, Ltd., suggests an alternate option that would include grading to direct cul-de-sac flows into the improved swale, removing a portion of the 24-inch storm sewer, and relocating the flared end section to convey proposed swale flows to the detention pond by storm sewer. The recommended option was selected in favor of storm sewer modifications as it provides greater capacity and will likely be more cost effective. If the full swale option is deemed prohibitive by sanitary sewer or other utility elevation conflicts, this option should be explored further. Discussion of storm sewer modifications could also be prompted by any future development plans of lots 4 and 5.

Maintenance considerations to support the functionality of this solution shall include periodic vegetative maintenance of the swale and outlet to the detention pond. If not already implemented, regular inspection of the pond outlet structure should be performed to ensure the restrictor structure and flared end section is not obstructed.

Anticipated Regulatory Needs:

- Wetland Delineation and JD
- USACE/LCSMC Letter of No Objection/Impact or permit for wetland impacts
- Lake County WDO permit, as administered by the Village of Mettawa as a Certified Community
- Soil Erosion and Sediment Control Plan review and approval, Lake County SMC
- Village of Mettawa Building Permit

Concept-level estimate of probable cost (to include final design, permitting, and construction): $35,000

Although these additional reported drainage concerns are predominately located on private property, identification of contributing problems and recommendations have been included in this section.

Although not explicitly discussed for each reported concern below, it should be noted that most work to address the concerns and implement solutions below, beyond regular maintenance activities, will require some level of permitting, either through the Village, County, IDNR, USACE, or other agencies, and engagement of a professional engineer may be either recommended or required.

Through this study, the Village has attempted to identify and review a comprehensive list of drainage concerns within the community. Detailed solutions provided above have focused on those areas occurring on Village owned properties, easements, and rights-of-way or those areas where natural drainage from these Village properties may be tributary to areas of concern. While it is not generally feasible for the Village to participate in resolution of private drainage issues, the summaries below provide preliminary guidance on issues provided. As part of this report, the following strategy has been developed for the Village to adapt as needed in supporting resolution to these problems:

- Village will be available to consult private residents on individual drainage concerns and shall provide direction towards qualified professionals to help address and resolve
- Village will consider assisting in resolving drainage issues on private property on a case-by-case basis when said issue impacts public facilities such as publicly owned drainage infrastructure, publicly owned roadway infrastructure, a public way, or a special service area with special revenue identified explicitly for drainage infrastructure
- Village will coordinate with private property owners when private drainage improvements necessitate impact to public property or a right-of-way

14695 W Westwoods Lane (Reported Concern 3)

The submission provided indicates that the drainageway under the private drive at 14695 W Westwoods Lane may be eroding. Furthermore, the driveway culvert may not have capacity to convey peak discharges in heavy rain events. It is recommended that the owner explore stabilizing the driveway embankment and upsizing this culvert. Stabilization and culvert replacement may lessen regular or post-storm maintenance needs and decrease the number and frequency of events in which the driveway overtops, although it would be associated with costs of design, potential permitting, and construction. If maintenance or pipe condition would prompt replacement, it is recommended that upsizing be explored at that time in lieu of an in-kind replacement. This culvert may be partially located in the Village right-of-way. Westwoods Lane is under Village jurisdiction, per Chapter 14 of the Village Ordinance, in which coordination with and approval by the Village would be necessary.

W Old School Road and Bradley Road (Reported Concern 4)

Three storm sewer inlets located on the southwest corner of the W Old School Road and Bradley Road intersection are slightly elevated relative to the surrounding ground surface. This minor elevation discrepancy impedes capture of overland flow from the adjacent road and trail, likely resulting in concentrated overland flow at the intersection. This could be the cause of the accumulation of the roadway debris referenced in the submitted concern. In addition, the capacity of the 15-inch outlet pipe to the south limits drainage from both the 15-inch and 12-inch pipes entering the structure, potentially causing surcharge conditions in some events.

One of Three Inlets to be Modified

To lower the inlet rim elevations by approximately 6-inches to match the adjacent ground elevations, the concrete grade rings should be removed, and the Type 8 grates be reset on the inlet structure. It is also recommended that the 8 -foot 15-inch outlet section be removed and the inlet structure be sawcut to provide sufficient capacity to convey flows. The recommended plan also includes regrading the roadside ditch per plans by the James Anderson Company, dated July 25, 2016. Additional ditch grading is shown on the schematic design plan C5.0 to accommodate the proposed sawcut. These adjustment would likely be considered maintenance, will help preserve the integrity of the roadway and trail, and will help to keep the area free of debris resulting from ponding.

Anticipated Regulatory Needs: None, likely considered maintenance

Concept-level estimate of probable cost (construction): $6,500

14341 W Old School Road (Reported Concern 8)

The roadway ditch along the northwestern portion of W Riteway Road overflows onto the roadway, causing standing water and ice cover on the right-of-way.

A partial development grading plan for the improvements completed in 2017 was provided for review. Preliminary aerial imagery, topographic assessment, and site assessment indicates the detention basin west of the road may overtop W Riteway Road in certain storm events. It is our understanding that the Village and the owner of the parcel, Shadowbrook Farm First Resubdivision, Lot 1, agreed to a solution including vegetative maintenance and minor upland grading improvements in 2019.

In order to protect the infrastructure and safety of W Riteway Rd, identified as a private road in Chapter 14 of the Village Ordinance, which appears to be jointly owned by Shadowbrook Farm First Resubdivision and Shadowbrook Farm, it is recommended that the solution previously identified (vegetative maintenance and minor upland grading improvements) be implemented. Periodic vegetative maintenance of this area, in conjunction with regular sediment accumulation clean out may be needed to support the functionality of this area. If the drainage issue persists after a regular maintenance schedule is implemented and executed, it is recommended that concepts be developed to limit overtopping events by providing additional storage capacity.

14935 W Old School Road (Reported Concern 9)

This concern identifies an overtopping swale on the south side of Old School Road. It is recommended that the woody understory vegetation be cleared and debris be removed in the right-of way to maximize the existing ditch capacity. Regular ditch maintenance is also recommended, to include periodic shrub-layer and debris removal. Chapter 5, Article III, Section 5.311 of the Village Ordinance identifies the property owner served by the driveway approach as the responsible party to maintain this portion of the public parkway in the vicinity of their driveway approach.

Grading improvements to the roadside ditch would likely decrease the number and frequency of events in which the ditch overtops, but would require costs of design, potential permitting, and construction. This portion of W Old School Road is identified as Village-owned in Chapter 14 of the Village Ordinance, and therefore coordination with and approval by the Village would be necessary.

Riverwoods Road and Townline Road Village Open Space (Reported Concern 10)

This Village-owned open space located at the southeast corner of Riverwoods Road and Townline Road is directly adjacent to the Costco Wholesale complex. The reported concern notes that vegetative changes have occurred in this area, likely due to water level fluctuations. Currently, the area is dominated by a wetland-type community comprised of phragmites, reed canary grass, cattails, and oaks. As aerial imagery, topographic data, and field review preliminarily suggest, infrastructure, most notably Riverwoods Road, is impacted by changes to water levels. It is recommended that the Village periodically monitor drainage at this parcel and contact the Lake County Division of Transportation (LCDOT)

if roadside ditch maintenance concerns develop. Furthermore, its recommended the Village consider developing a use plan for this parcel, potentially in partnership with the Costco Wholesale Corporation, as there may be opportunity for natural area restoration.

Little Melody Lane (Reported Concerns 13 and 16)

Roadway ditches and culverts along Little Melody Lane appear to be in need of maintenance or replacement. The Village intends to address this roadway comprehensively, including resurfacing, reconstruction, stormwater, and maintenance needs in coordination with the County as part of the FY 2022-23 Capital Improvement Program.

25439 N Saint Marys Road (Reported Concern 20)

Preliminary review of historical drain tile investigations indicates that this is most likely a failed drain tile. It is very likely this tile extends further north onto the property. Serving as a mutual drain, as defined in the Illinois Drainage Code, this drain tile can be repaired and maintained by the property owner to restore full functionality.

Grainger Woods Conservation Preserve

26245 N Saint Marys Road (Reported Concern 21)

This concern identifies the drainage ditch along the east side of Saint Marys Road is not well defined. This roadway is under jurisdiction of the Lake County Highway Department, as noted in Chapter 14 of the Village Ordinance.

Village provided documents show that the LCDOT intends to reconstruct Saint Marys Road from the intersection with IL Route 176 to IL Route 60. Pre-final level plans have been reviewed as part of this effort, which include improved roadside ditches and a transition to curb and gutter, and will likely resolve this concern.

15469 W Saint Marys Road (Reported Concern 22)

The submission provided indicates that the driveway culvert at this location is in disrepair, impacting the condition of the private drive. Chapter 5, Article III, Section 5.311 of the Village Ordinance identifies the property owner served by the driveway approach as the responsible party to maintain this portion of the public parkway in the vicinity of their driveway approach. It is recommended that the approach road be slightly raised to accommodate a pipe. Upon design, this pipe should be installed with sufficient compacted base material to minimize sinking or lift. This portion of W Saint Marys Road is identified as Village-owned road in Chapter 14 of the Village Ordinance, in which coordination with and approval by the Village would be necessary.

25783 N Saint Marys Road (Reported Concern 23)

This location, a shared private road experiences regular flooding. Preliminary analysis shows there is drain tile that serves as a mutual drain in the area, which could facilitate extension or repair if investigation shows it is in disrepair. Other options may include channel grading from the affected area to the adjacent existing culvert. Installation of a new culvert would likely include grading and roadway improvements, and would require costs of design, potential permitting, and construction. Coordination with property owners, including the Lake County Forest Preserve District is needed to explore possible solutions further.

15375 W Little Saint Marys Road (Reported Concern 24)

Although no substantial additional information was provided in conjunction with this report aside from the indication of standing water in an unpaved area and flooding from a river, stream or creek, the address provided is located

directly adjacent to the Des Plaines River. Portions of the residence are located within the planimetric floodway limits, indicating that this area is impacted by the base flood event. The floodplain elevation in this area is 653.9. County topography indicates that nearly the entire property is impacted by flooding from the Des Plaines River. The structure is listed on the U.S. National Register of Historic Places, and combined with its location, likely render modification to the structure impractical.

13908 W Trail Drive (Reported Concern 25)

Although located just south of Oasis Park, this concern is not related to the Bradley Road and Oasis Park drainage system discussed in a prior section, as indicated by contributing drainage area delineation. Topographic evidence from this location and information provided as part of Reported Concern 2 suggests a swale on a dedicated drainage easement is designed to convey flow from west to east, along the northside of the properties along the north side of W Trail Drive. This drainage system is part of the Hamilton Estates Subdivision, and outlets to a detention pond located directly adjacent to Interstate 94, jointly owned by the Enclave at Hamilton Estates Homeowners Association and Abbvie, Inc. The Abbvie property is also part of the Hamilton Office 2nd Resubdivision.

Review of design grading and utility plans confirm information provided in Reported Concern 2, and also show that a manhole at the northeast corner of the 13908 W Trail Drive property directs flow to a sedimentation pond, which drains to the detention basin via a 6-inch PVC pipe. Overflow from this manhole is conveyed by overland flow directly to the detention basin. Ultimate discharge of this system is through a restrictor placed on the eastern side of the detention basin. These plans also indicate that both the sedimentation pond and the detention basin have a bottom elevation of 682.0, a design normal water level of 682.5, and a designed highwater level of 685.0. Historical aerial imagery shows extensive vegetative cover throughout the detention basin, which appears to be holding water at an elevation consistence with the design normal water level. In storm events, evidence provided as part of this report suggests the detention basin system is functioning at design maximum capacity.

It is recommended that regular inspections be performed to ensure that the drainage swale and manhole at the northeastern corner of the property remain free and clear of debris to maintain the drainage per plan. To ensure the detention basin system is also functioning per design, regular inspection should be performed of structures to remove any obstructions. The 6-inch PVC pipe and the manhole with the restrictor plate may be prone to clogging due to size, function, and vegetation. Periodic vegetative maintenance in the basin is recommended to retain design capacity in the stormwater system and limit obstructions. It is recommended that the plan for the ongoing maintenance of all stormwater management components for the Hamilton Estates Subdivision, as referenced in the recorded deed or plat restriction document , be followed per plan or revised as needed to maintain the design function of the system.

27387 N Saint Marys Road (Reported Concern 27)

A preliminary contributing drainage area investigation indicates that as much as approximately 30-acres of surrounding land use drains to the site, concurrent with anecdotal evidence of conveyance and inundation provided in the concern report. To maintain drainage and lessen saturation of mowed areas, options may exist to consolidate and improve definition of drainage and stormwater storage on the property.

14697 W Old School Road (Reported Concern 28)

A preliminary contributing drainage area investigation indicates that as much as approximately 30-acres of surrounding land use drains to the site, concurrent with anecdotal evidence of conveyance and inundation provided in the concern report. To maintain drainage and lessen saturation of mowed areas, options may exist to consolidate and improve definition of drainage and stormwater storage on the property. In addition, the driveway culvert may not have capacity to convey peak discharges in heavy rain events. It is recommended that the owner explore upsizing this culvert. Culvert replacement may decrease the number and frequency of events in which the driveway overtops, but would require costs of design, potential permitting, and construction.

27157 N Saint Marys Road (Reported Concern 29)

This concern identifies front yard flooding, occasionally overtopping Saint Marys Road. Village provided documents show that the LCDOT intends to reconstruct Saint Marys Road from the intersection with IL Route 176 to IL Route 60. Pre-final level plans have been reviewed as part of this effort, which include improved roadside ditches and a transition to curb and gutter in some locations, likely mitigating the overtopping of Saint Marys Road here. To maintain drainage and lessen saturation of mowed areas, options may exist to consolidate and improve definition of drainage and stormwater storage on the property and would require costs of design, potential permitting, and construction.

25620 N Saint Marys Road (Reported Concern 30)

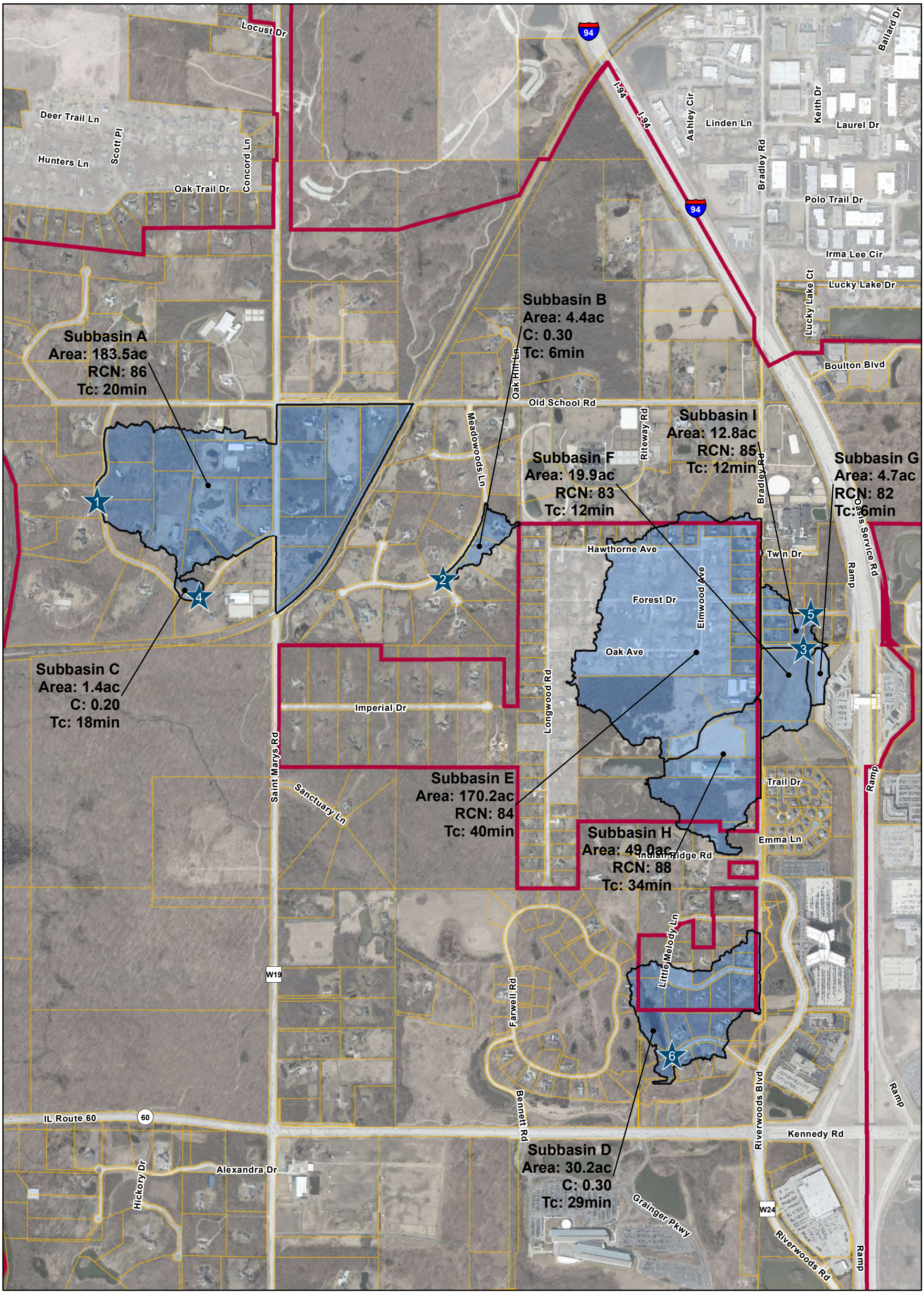
Anecdotal and photographic evidence shows the detention pond is impacting the private drive and an adjacent residence in storm events. It is recommended that the outlet in the southwestern corner of the pond be periodically cleared of any obstructions. Further investigation of the outlet structure and downstream conveyance could be explored to determine if the outlet structure is in need of repair or could be modified to reduce flooding impact to infrastructure. Additionally, the culvert inlet under the private drive and the outlet structure could be modified to reduce overtopping events. Improvements associated with this solution may include stabilization of downstream conveyance routes and would require costs of design, potential permitting, and construction.

Recommendations, including likely permitting needs and costs, have been provided for seven Village project locations for consideration. Schematic design plans have been developed for five of these locations. The projects at 27115 Meadowoods Drive, 15141 W Little Saint Marys Road, and the Old School and Bradley Road intersection are entirely in Village-owned rights-of-way and can be considered and addressed by the Village. The 15390 W Little Saint Marys Road and Mettawa Woods Drive cul-de-sac projects will require further coordination with adjacent private property owners and additional design and permitting tasks.

The Bradley Road, Oasis Park Area, and Mettawa Lane may require additional long-term planning efforts to assist in development of a potential phased approach to implementation. Concepts presented for this area have been included as exhibits for planning purposes. The hydrologic and hydraulic XP-SWMM model included as a digital attachment can be utilized during final design. A comprehensive approach to projects in this area will be key to mitigating stormwater impacts.

Remaining concerns provided by the residents have been reviewed and preliminary recommendations have been developed for consideration. Many of these projects will require some level of design and permitting, both through the Village and with other agencies, in which the Village can provide preliminary support and direction towards qualified professionals to help address and resolve these problems.

EXHIBITS



Scale: 0 — 1,000 Feet

Orientation:

Project Number: 20-0216

Date: 5/6/2021

Legend:

- Initial Project Locations
- Contributing Drainage Area
- Village Boundary
- Village and Adjacent Parcel Boundaries

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture

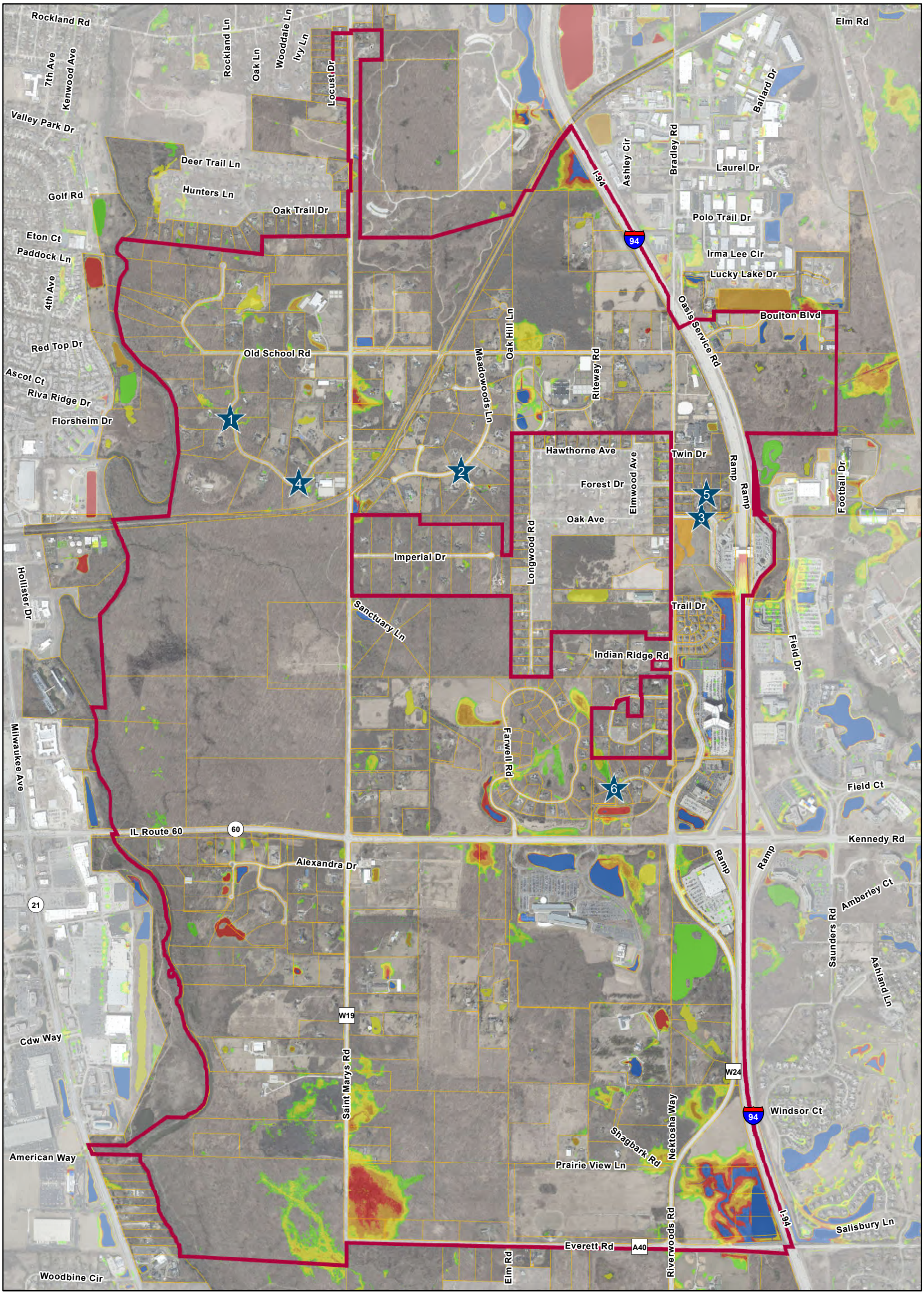
Project Name:
Drainage Study

Prepared for:
Village of Mettawa

Information about exhibit:
Delineated using County LiDAR DEM

Exhibit Title: **Contributing Drainage Areas**

Exhibit: **1**



Scale: 0 1,500 Feet

Orientation:

Project Number: 20-0216

Date: 4/1/2021

Legend:

- Initial Project Locations
- Village Boundary
- Village and Adjacent Parcel Boundaries

Depressional Area (Depth)

- 0 - 0.5ft
- 0.5 - 1ft
- 1 - 2ft
- 2 - 3ft
- 3 - 4ft
- > 4ft

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

Project Name:

Drainage Study

Prepared for:

Village of Mettawa

Information about exhibit:

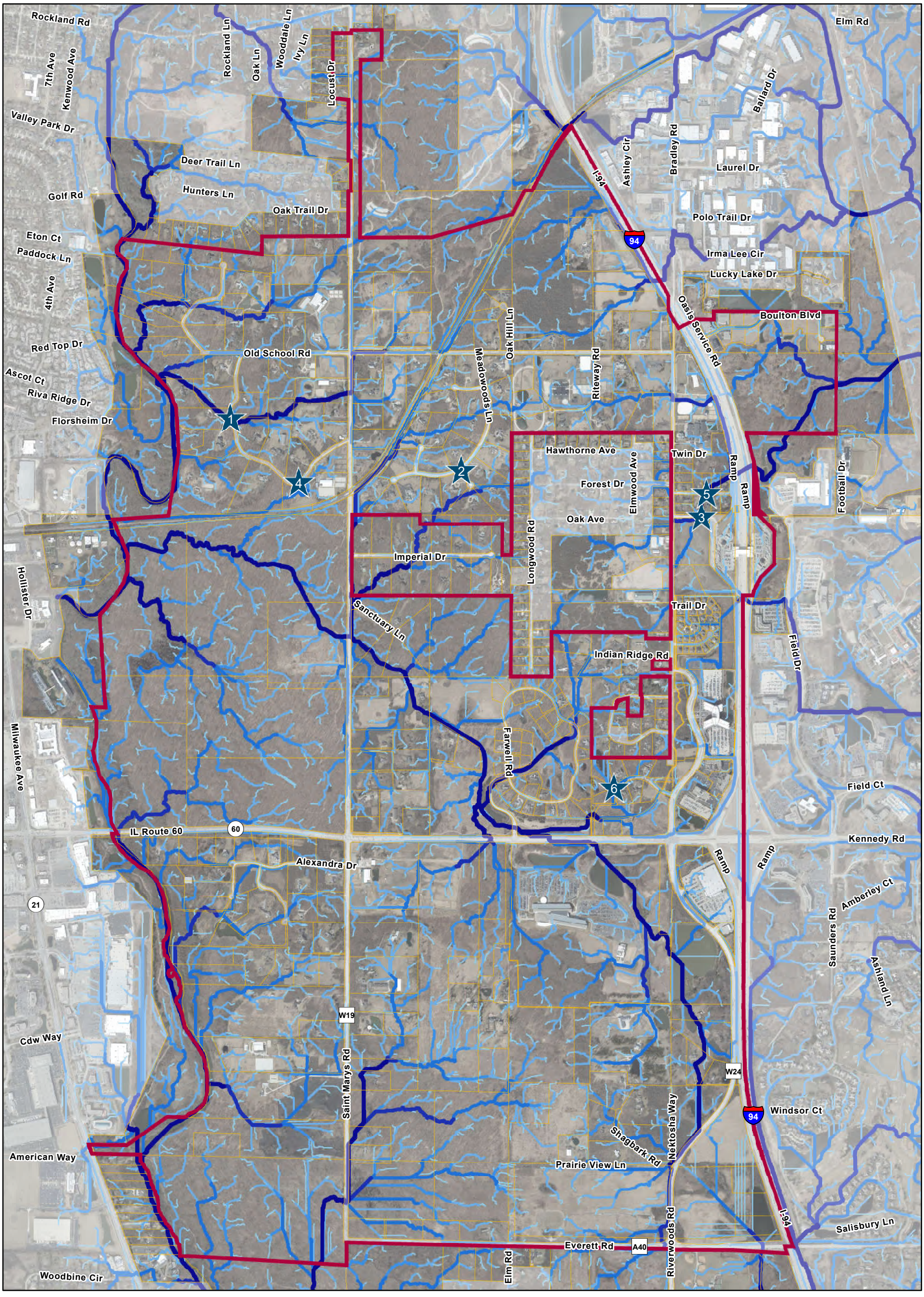
Derived using County LiDAR DEM

Exhibit Title:

Depressional Analysis

Exhibit:

2



Scale: 0 1,500 Feet

Orientation:

Project Number: 20-0216

Date: 4/1/2021

Legend:

- Initial Project Locations
- Village Boundary
- Village and Adjacent Parcel Boundaries

Flowpaths (Contributing Area)

- 0.5 - 1ac
- 1 - 5ac
- 5 - 10ac
- 10 - 50ac
- 50 - 100ac
- > 100ac

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

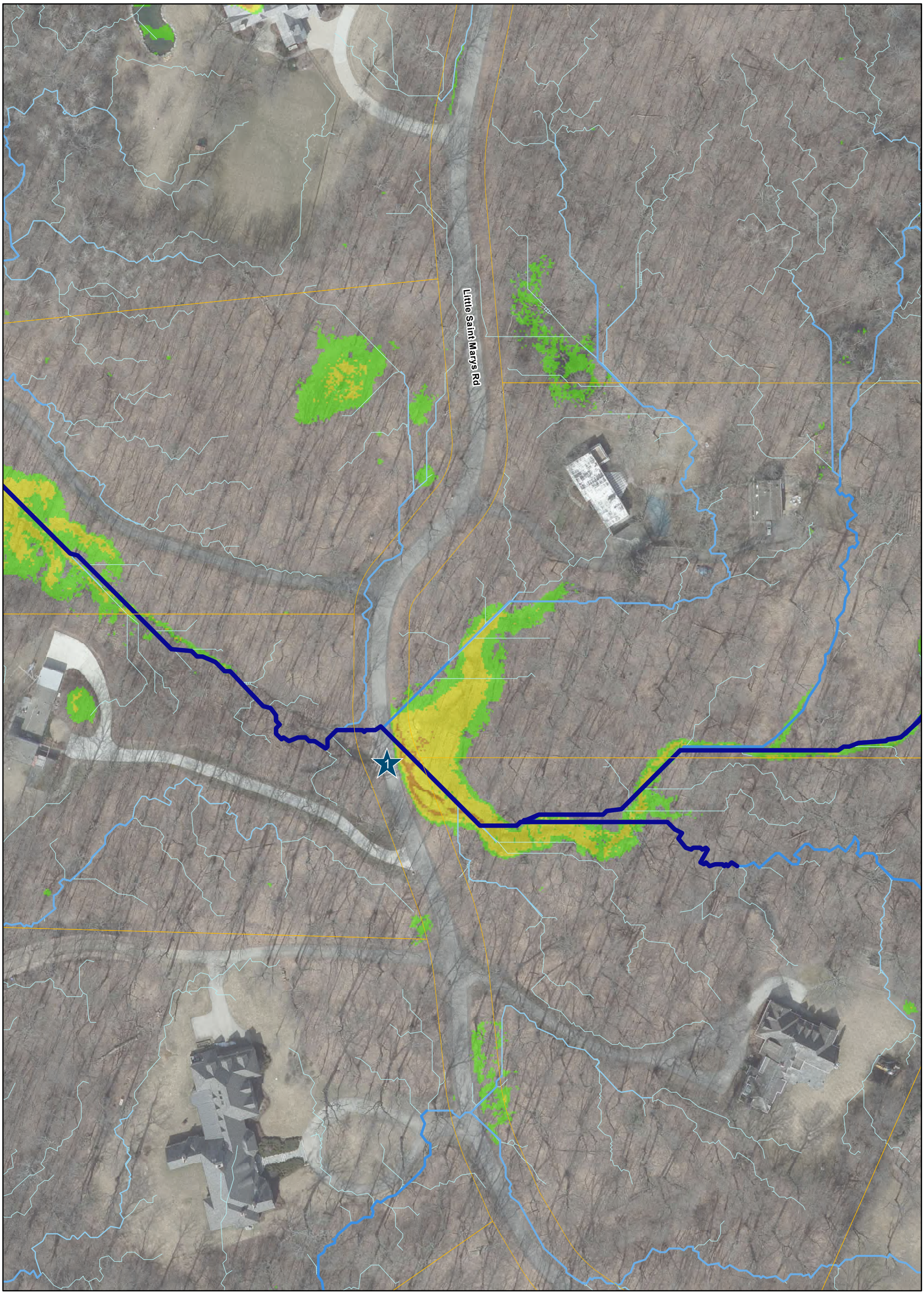
Project Name: Drainage Study

Prepared for: Village of Mettawa

Information about exhibit: Delineated using County LiDAR DEM

Exhibit Title: **Flowpath Analysis**

Exhibit: **3**



Scale:

0 100 Feet

Project Number: 20-0216

Orientation:

Date: 4/1/2021

Legend:

- Initial Project Locations
- Village Boundary
- Village and Adjacent Parcel Boundaries

Flowpaths (Contributing Area)

- 0 - 0.05ac
- 0.5 - 1ac
- 1 - 5ac
- 5 - 10ac
- 10 - 50ac
- 50 - 100ac
- > 100ac

Depressional Area (Depth)

- 0 - 0.5ft
- 0.5 - 1ft
- 1 - 2ft
- 2 - 3ft
- 3 - 4ft
- > 4ft

Project Name:

Drainage Study

Prepared for:

Village of Mettawa

Information about exhibit:

Flowpaths & Depressional Areas

Exhibit Title:

Analyses Example

Exhibit:

4

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

Riffle Installation

Corridor Restoration
See Exhibit 8

Enhance Natural Riffle

Engineered Scour Pool

Potential Storm
Sewer Improvments

Potential Culvert Replacement

Bank Stabilization
and Scour Protection

Corridor Restoration
See Exhibit 8

Riffle Installation

Bank Stabilization
and Scour Protection

Engineered Scour Pool

Potential Culvert
Improvement

Engineered Scour Pool

Modify Outlet Structure
per Final Design

Exhibit 7

Low Flow Channel

Preliminary
Grading

Foodplain Terrace

High Water Level

Stabilize
Berm Drainage

Enhance Culvert
Stabilization

Riffle Installation

Exhibit 6

Forest Dr

Mettawa Ln

Oasis Service Rd

Bradley Rd

Ramp

Interstate 94

Overall Drainage

Conceptual Plan

Exhibit 5

Parcel Boundaries

Contributing Drainage Area

Index Contours (5ft)

Intermediate Contours (1ft)

0 100 Feet

4/25/2021

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture

Bank Stabilization
and Scour Protection

Engineered Scour Pool

Oasis Service Rd

Modify Outlet Structure
per Final Design

Potential Culvert
Improvement

Low Flow Channel

Preliminary
Grading

Foodplain Terrace

Enhance Culvert
Stabilization

High Water Level
Addition of ±10ac-ft of Storage
Below an Elevation of ±685
±3.2ac Footprint

Bradley Rd

Stabilize
Berm Drainage

Riffle Installation

Oasis Park

Conceptual Plan

Exhibit 6

Parcel Boundaries

Index Contours (5ft)

Intermediate Contours (1ft)

0 60 Feet

4/25/2021

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture

Corridor Restoration
See Exhibit 8

Riffle Installation

Enhance Natural Riffle

Potential Storm
Sewer Improvements

Engineered Scour Pool

Mettawa Ln

Potential Culvert Replacement

Bank Stabilization
and Scour Protection

Corridor Restoration
See Exhibit 8

Riffle Installation

Bank Stabilization
and Scour Protection

Engineered Scour Pool

Oasis Service Rd

Modify Outlet Structure

interstate 96

Mettawa Lane Drainage

Conceptual Plan

Exhibit 7

Parcel Boundaries

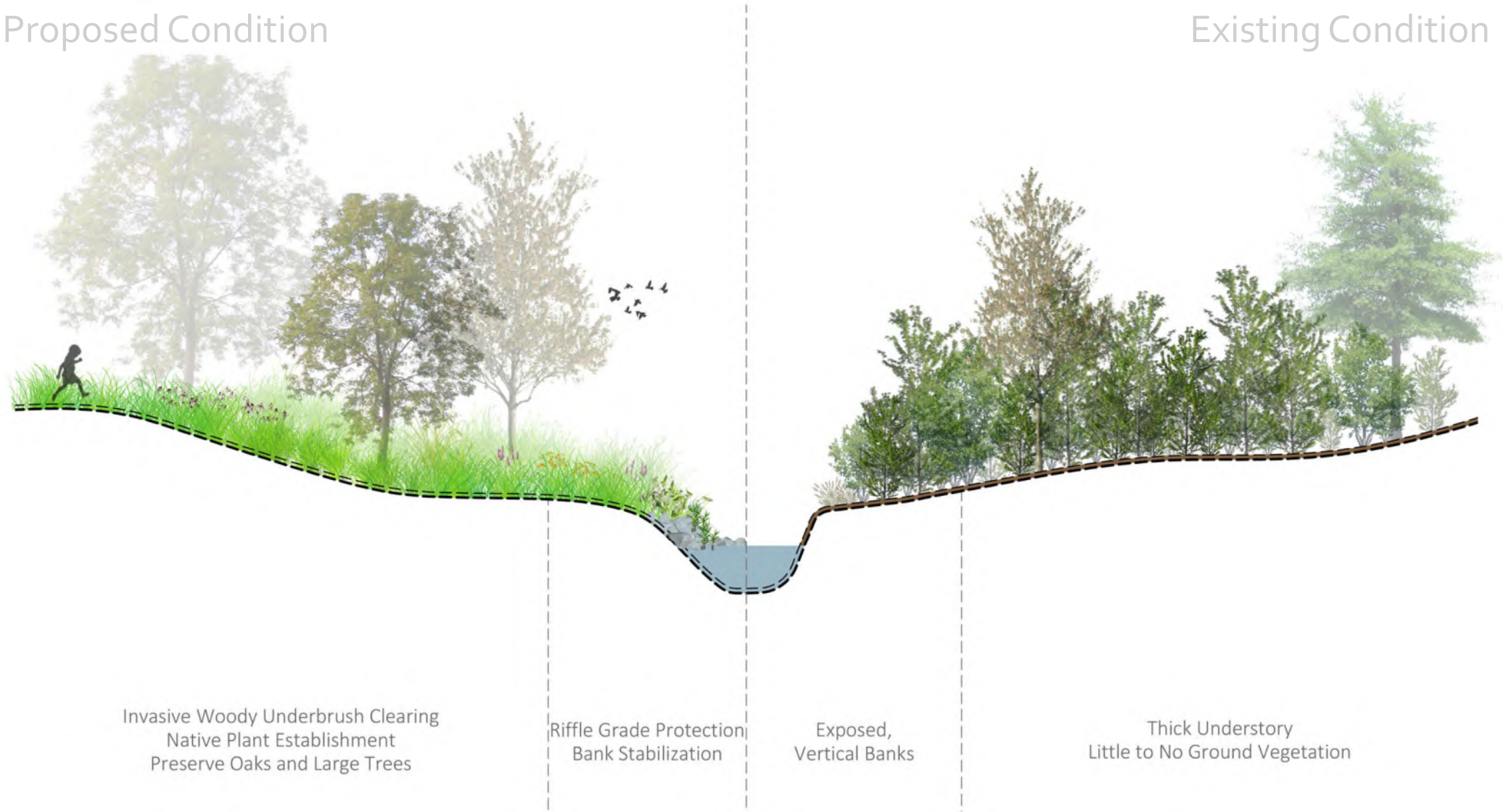
Index Contours (5ft)

Intermediate Contours (1ft)

0 60 Feet

4/25/2021

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture



Channel Restoration Conceptual Plan

at 15390 W Little Saint Marys Road and Mettawa Lane Drainage

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture

Exhibit 8

Schematic Design Plans

0 30 60

Scale in Feet

N

LEGEND

- Property Line
- Existing Contours
- Proposed Contours
- FEMA Floodway Line
- FEMA Floodplain Line by Elevation = 654.0
- Existing Storm Sewer
- Proposed Storm Sewer
- Limits of Clearing (LIM)
- Ex. Catch Basin (CB)
- Ex. Flared End Section (FES)
- Proposed Flared End Section (FES)
- Drainage Arrow

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@Heyassoc.com

Professional Design Firm
License No. 184-002429

Drainage Improvements
Village of Mettawa

Overall Plan
Initial Project Location 1
15390 W Little St Marys Road

PROJECT NO: 20-0216		DRAWING NO:
DESIGNED BY	KNJ	C1.0
DRAWN BY	KNJ	
CHECKED BY	DAK	
APPROVED BY	DAK	SHEET NO:
ISSUE DATE	04/22/2021	1

Preliminary

File: P:\20000\20-0216 Mettawa - Stormwater Management Services\05 CAD\20-0216 Mettawa Drainage Improvements-Prelim.dwg Plot Date: April 23, 2021 Plotted by: Kirsten James

0 5 10

Scale in Feet

N

LEGEND

- Property Line
- Existing Contours
- Proposed Contours
- FEMA Floodway Line
- FEMA Floodplain Line by Elevation = 654.0
- Existing Storm Sewer
- Proposed Storm Sewer
- Limits of Clearing (LIM)
- Ex. Catch Basin (CB)
- Ex. Flared End Section (FES)
- Proposed Flared End Section (FES)
- Drainage Arrow

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@Heyassoc.com

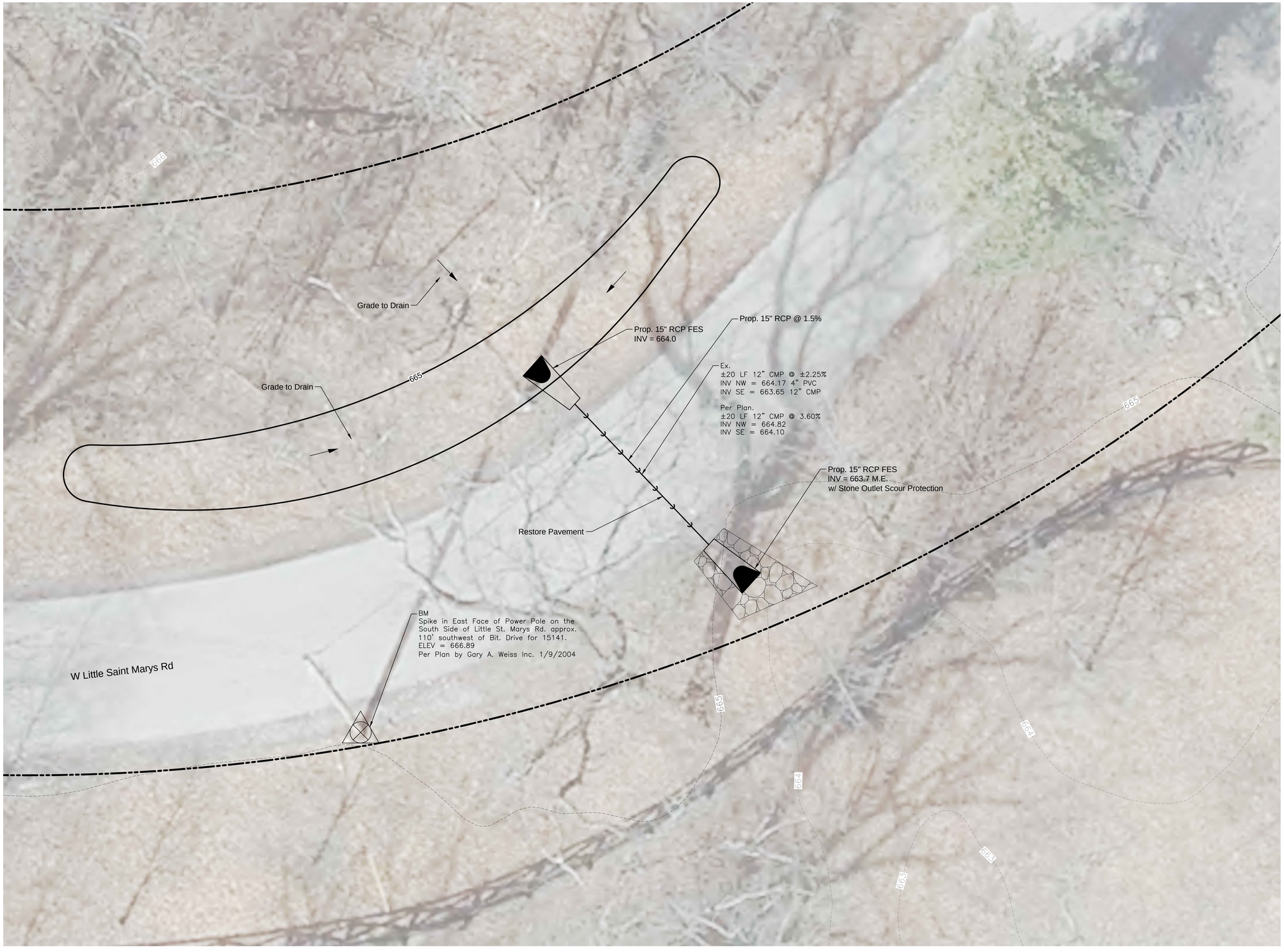
Professional Design Firm
License No. 184-002429

Drainage Improvements
Village of Mettawa

Overall Plan
Initial Project Location 2
27115 Meadowoods Drive

PROJECT NO:	20-0216	DRAWING NO:
DESIGNED BY	KNJ	C2.0
DRAWN BY	KNJ	
CHECKED BY	DAK	
APPROVED BY	DAK	SHEET NO:
ISSUE DATE	04/22/2021	2

Preliminary



0 5 10

Scale in Feet

N

LEGEND

- Property Line
- Existing Contours
- Proposed Contours
- FEMA Floodway Line
- FEMA Floodplain Line by Elevation = 654.0
- Existing Storm Sewer
- Proposed Storm Sewer
- Limits of Clearing (LIM)
- Ex. Catch Basin (CB)
- Ex. Flared End Section (FES)
- Proposed Flared End Section (FES)
- Drainage Arrow

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@heyassoc.com

Professional Design Firm
License No. 184-002429

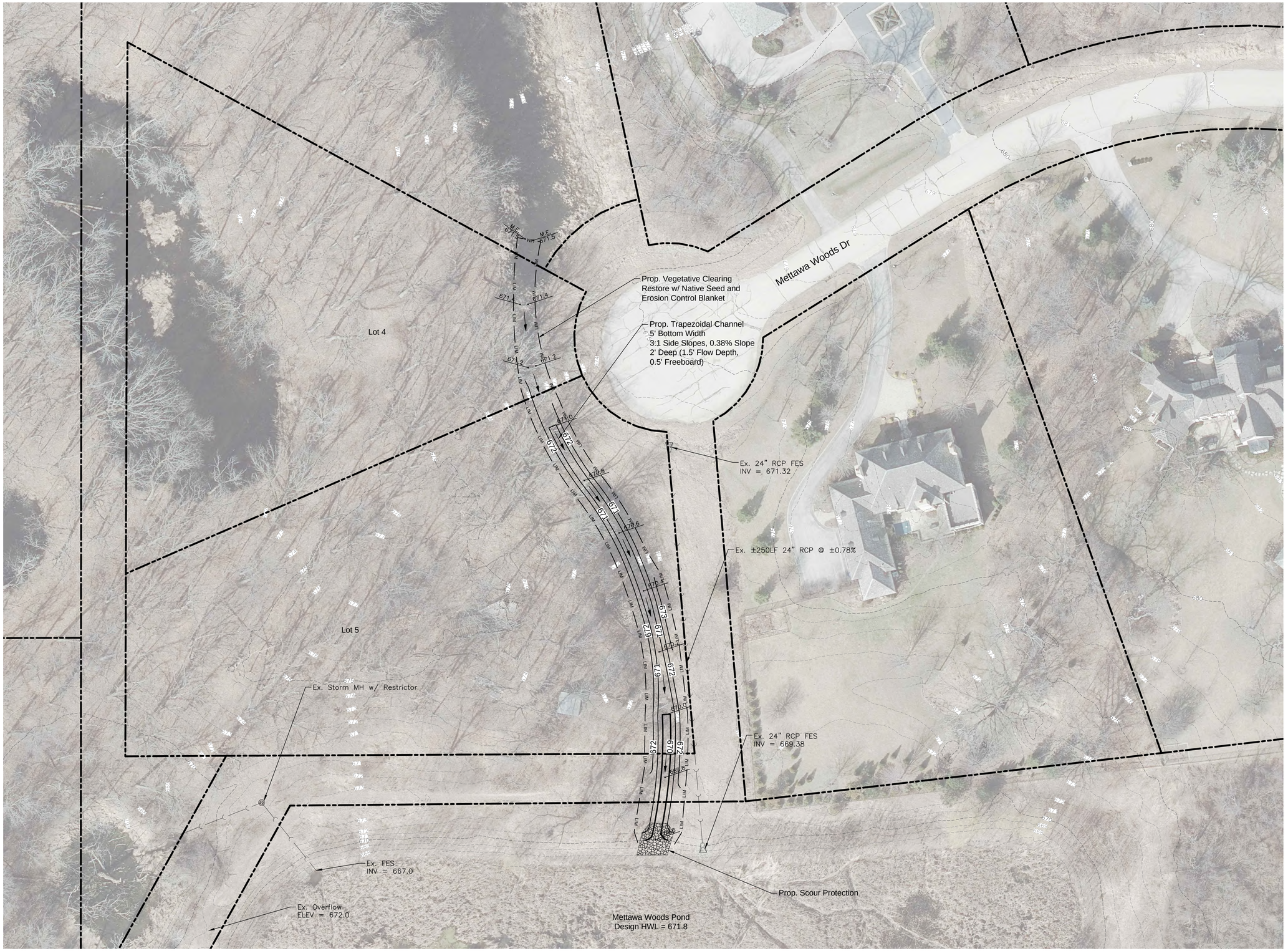
Drainage Improvements
Village of Mettawa

Overall Plan
Initial Project Location 4
15141 W Little St Marys Road

PROJECT NO:	20-0216	DRAWING NO:
DESIGNED BY	KNJ	C3.0
DRAWN BY	KNJ	
CHECKED BY	DAK	
APPROVED BY	DAK	SHEET NO:
ISSUE DATE	04/22/2021	3

Preliminary

File: P:\2020\20-0216 Mettawa - Stormwater Management Services\05.CAD\20-0216 Mettawa Drainage Improvements-Prelim.dwg Plot Date: April 23, 2021 Plotted by: Kirsten James



0 30 60

Scale in Feet

N

LEGEND

- Property Line
- Existing Contours
- Proposed Contours
- FEMA Floodway Line
- FEMA Floodplain Line by Elevation = 654.0
- Existing Storm Sewer
- Proposed Storm Sewer
- Limits of Clearing
- Ex. Catch Basin (CB)
- Ex. Flared End Section (FES)
- Proposed Flared End Section (FES)
- Drainage Arrow

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@Heyassoc.com

Professional Design Firm
License No. 184-002429

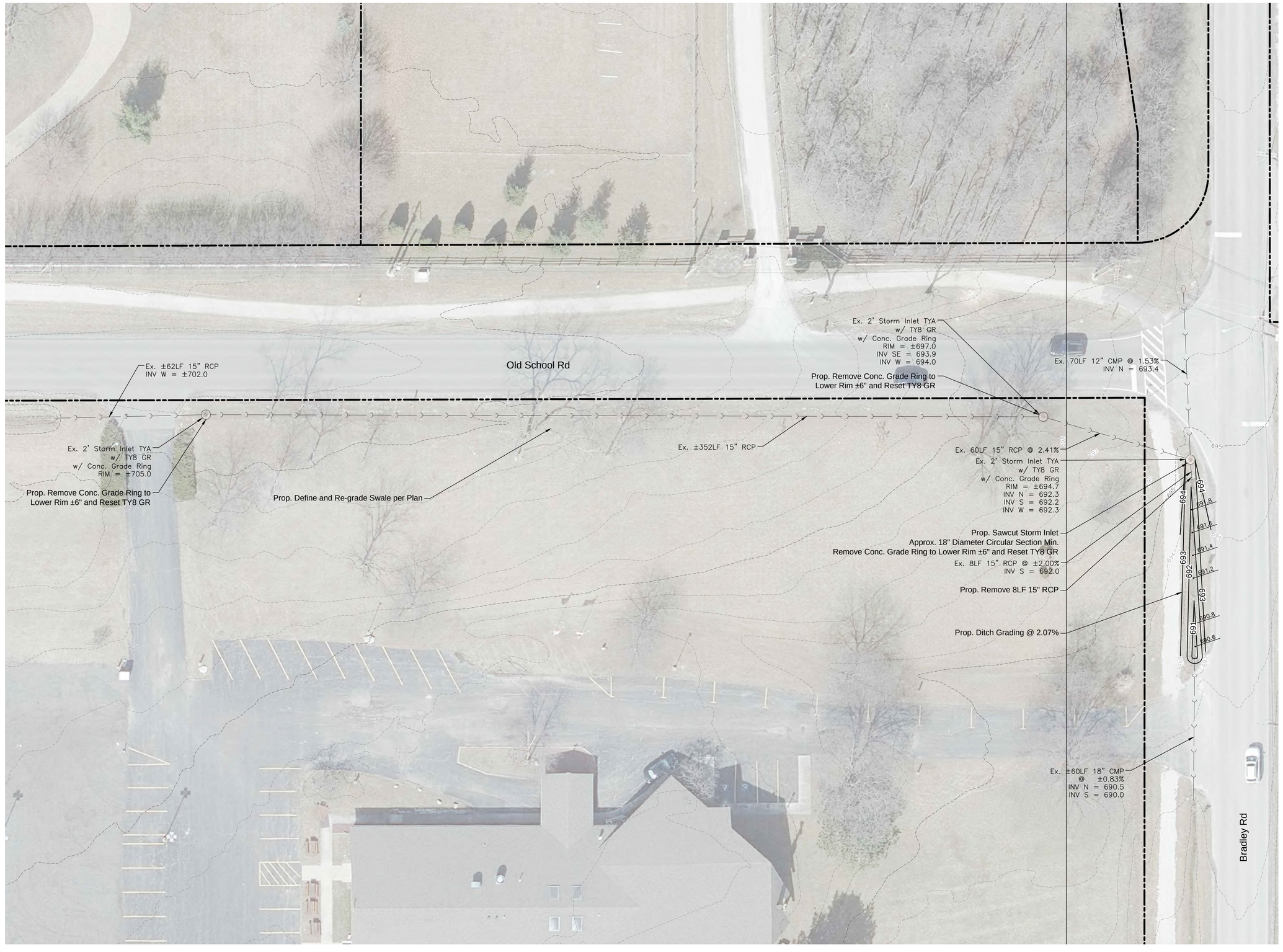
Drainage Improvements
Village of Mettawa

Overall Plan
Initial Project Location 6
Mettawa Woods Drive
cul de sac

PROJECT NO:	20-0216	DRAWING NO:
DESIGNED BY	KNJ	C4.0
DRAWN BY	KNJ	
CHECKED BY	DAK	
APPROVED BY	DAK	SHEET NO:
ISSUE DATE	04/22/2021	4

Preliminary

File: P:\2000\20-0216 Mettawa - Stormwater Management Services\05.CAD\20-0216 Mettawa Drainage Improvements-Prelim.dwg Plot Date: April 23, 2021 Plotted by: Kirsten James



0 20 40

Scale in Feet

N

LEGEND

- Property Line
- Existing Contours
- Proposed Contours
- FEMA Floodway Line
- FEMA Floodplain Line by Elevation = 654.0
- Existing Storm Sewer
- Proposed Storm Sewer
- Limits of Clearing (LIM)
- Ex. Catch Basin (CB)
- Ex. Flared End Section (FES)
- Proposed Flared End Section (FES)
- Drainage Arrow

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@Heyassoc.com

Professional Design Firm
License No. 184-002429

Drainage Improvements
Village of Mettawa

Overall Plan
Old School Road and Bradley Road

PROJECT NO: 20-0216		DRAWING NO:
DESIGNED BY	KNJ	C5.0
DRAWN BY	KNJ	
CHECKED BY	DAK	
APPROVED BY	DAK	SHEET NO:
ISSUE DATE	04/25/2021	5

Preliminary

File: P:\2000\20-0216 Mettawa - Stormwater Management Services\05.CAD\20-0216 Mettawa Drainage Improvements-Prelim.dwg Plot Date: April 25, 2021 Plotted by: Kirsten James

Village Provided Files (Digital)

GIS-Based Assessment Spatial Results Files (Digital)

Drainage Concerns Reporting

Drainage Concerns Application
Public

Village of Mettawa Drainage Concerns Application

The Village of Mettawa is collecting data from residents to inform the 2021 Village-Wide Drainage Assessment. We thank you for your participation, as this data is crucial to determine where the Village may need to investigate infrastructure and take action. If we need to follow up with you, we will contact you using the email or phone number collected as part of the submittal.

If you would like to submit more than one concern, please close out of the "Thank you for your contribution!" pop-up after you hit "Submit" and fill in the form again.

This application is the interface for data collection and will be active from February 8, 2021 through March 1, 2021. If you are facing technical difficulties with this application, please contact Hey and Associates, Inc. at MettawaStormwater@heyassoc.com. A form version of this application is also available and can be accessed here.

1. Enter Information

Name (required)

Please type your name.

Concern Type (required)

Select...

Please use the drop down menu to select the description that best fits your concern.

Comments (required)

Please elaborate on the concern. 1000 characters remaining

Date (required)

April 15, 2021 9:55 AM

Attach Document

Select File

Please attach any pertinent photos, videos, or documents to better show or describe the concern. Please limit 10MB per file.

Drainage Concerns Application
Public - continued

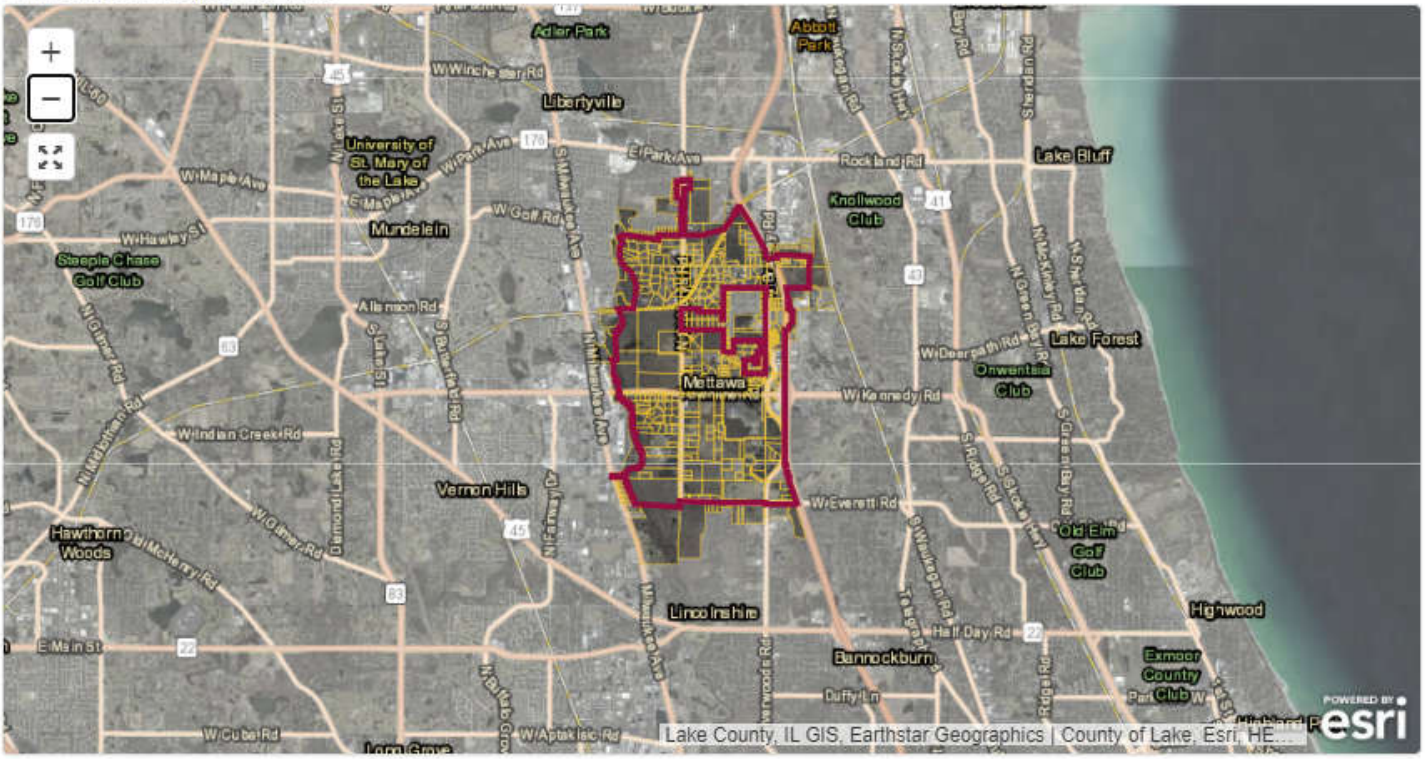
2. Select Location

Specify the location for this entry by clicking/tapping the map or by using one of the following options.

Search

Find address or place | Locate Me

Latitude: 42.22025, Longitude: -87.96492

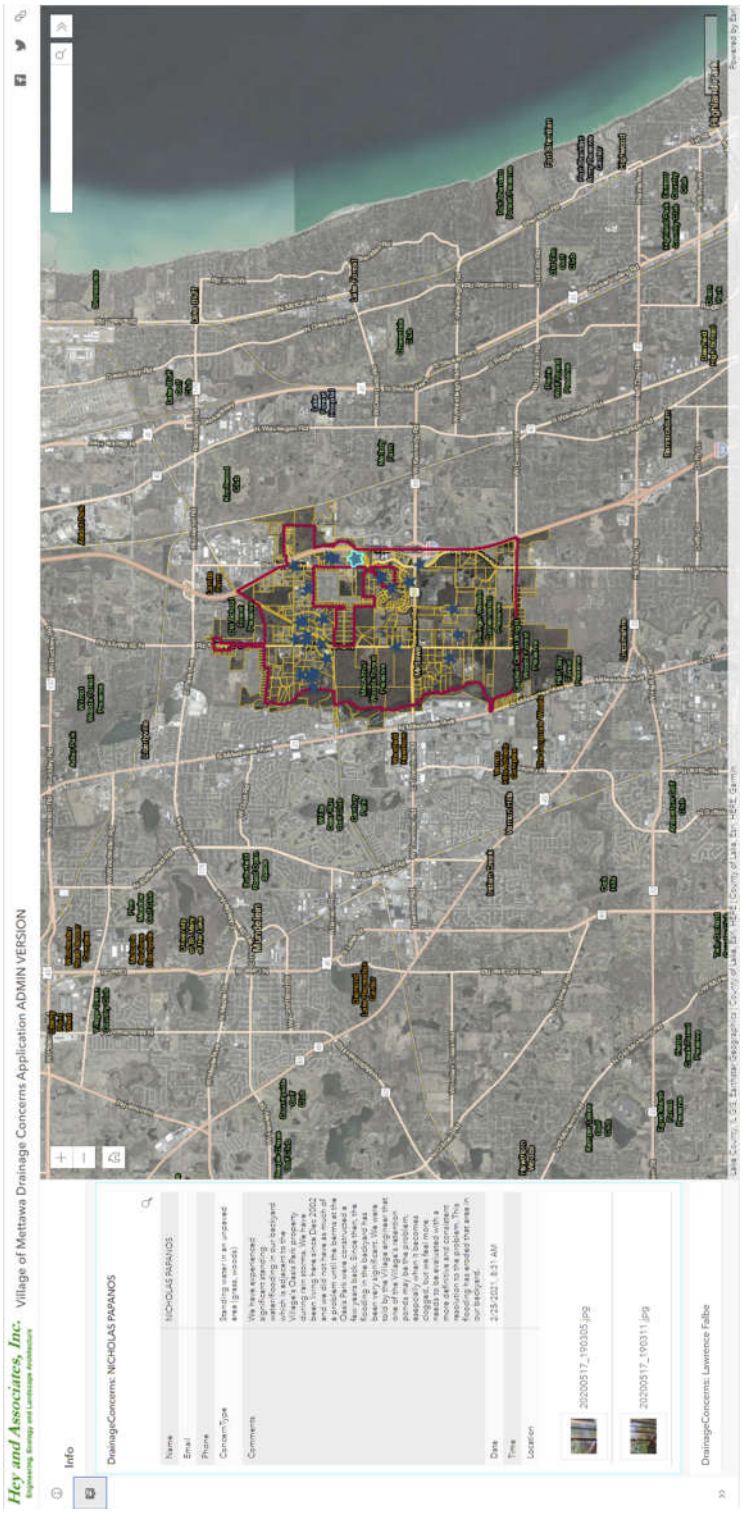


3. Complete Form

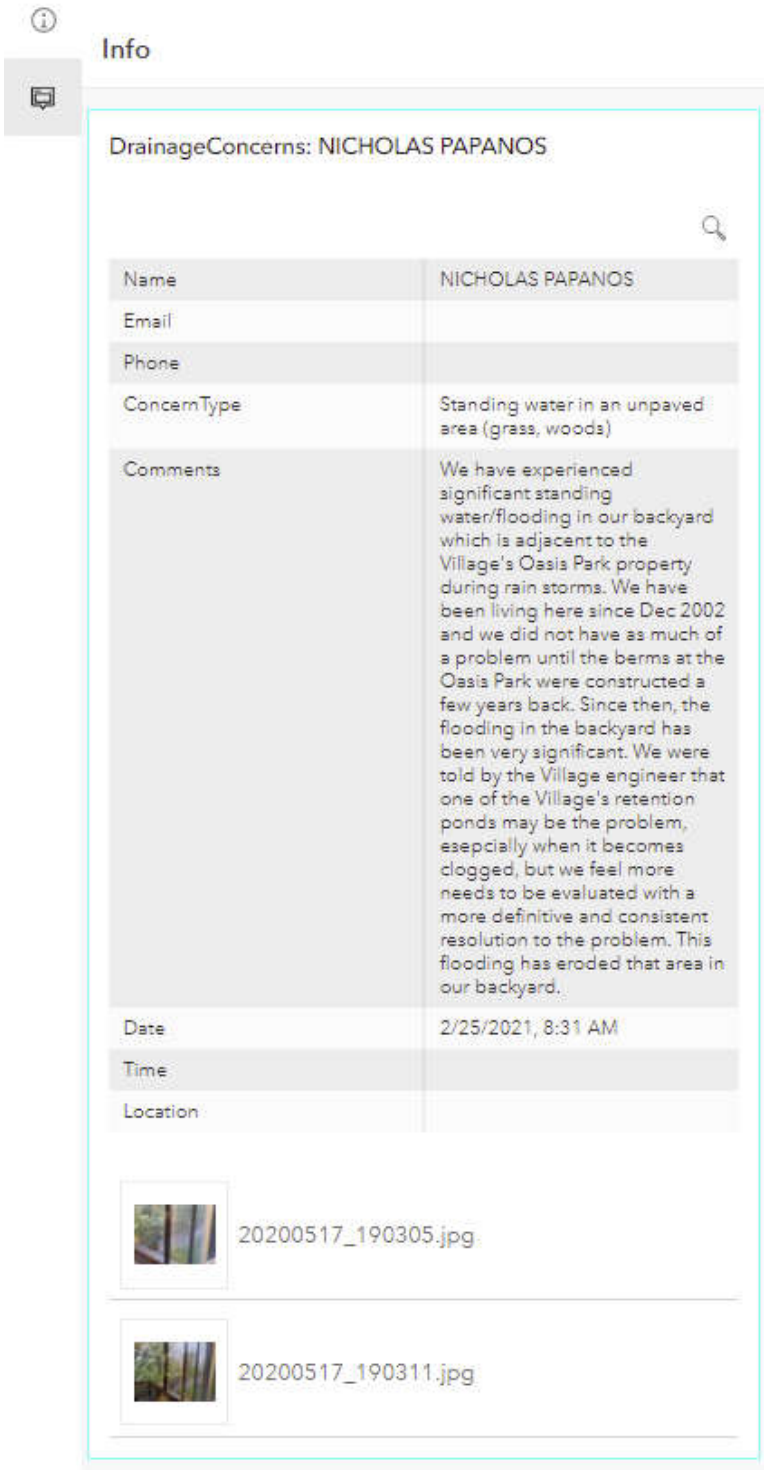
Add this information to the map.

Submit

Drainage Concerns Application Administrative



Drainage Concerns Application Administrative - continued



Info

DrainageConcerns: NICHOLAS PAPANOS

Name	NICHOLAS PAPANOS
Email	
Phone	
ConcernType	Standing water in an unpaved area (grass, woods)
Comments	We have experienced significant standing water/flooding in our backyard which is adjacent to the Village's Oasis Park property during rain storms. We have been living here since Dec 2002 and we did not have as much of a problem until the berms at the Oasis Park were constructed a few years back. Since then, the flooding in the backyard has been very significant. We were told by the Village engineer that one of the Village's retention ponds may be the problem, esepcially when it becomes clogged, but we feel more needs to be evaluated with a more definitive and consistent resolution to the problem. This flooding has eroded that area in our backyard.
Date	2/25/2021, 8:31 AM
Time	
Location	

20200517_190305.jpg

20200517_190311.jpg

VILLAGE OF METTAWA DRAINAGE CONCERNS FORM

The Village of Mettawa is collecting data from residents to inform the 2021 Village-Wide Drainage Assessment. We thank you for your participation, as this data is crucial to determine where the Village may need to investigate infrastructure and take action. If we need to follow up with you, we will contact you using the email, phone number, or mailing address collected as part of the submittal. **If you would like to submit another concern, please fill out a separate form.**

NAME:

EMAIL:

PHONE:

CONCERN TYPE:

- ☐ standing water or ice on a roadway
- ☐ standing water or ice on a driveway
- ☐ standing water in an unpaved area (grass, woods)
- ☐ flooding from a river, stream, or creek
- ☐ a pond or detention basin overflows
- ☐ water is coming out of a manhole or inlet grate
- ☐ structural flooding (water in a house or building)
- ☐ other (describe in section below)

COMMENTS:

please elaborate on the concern

DATE:

today's date

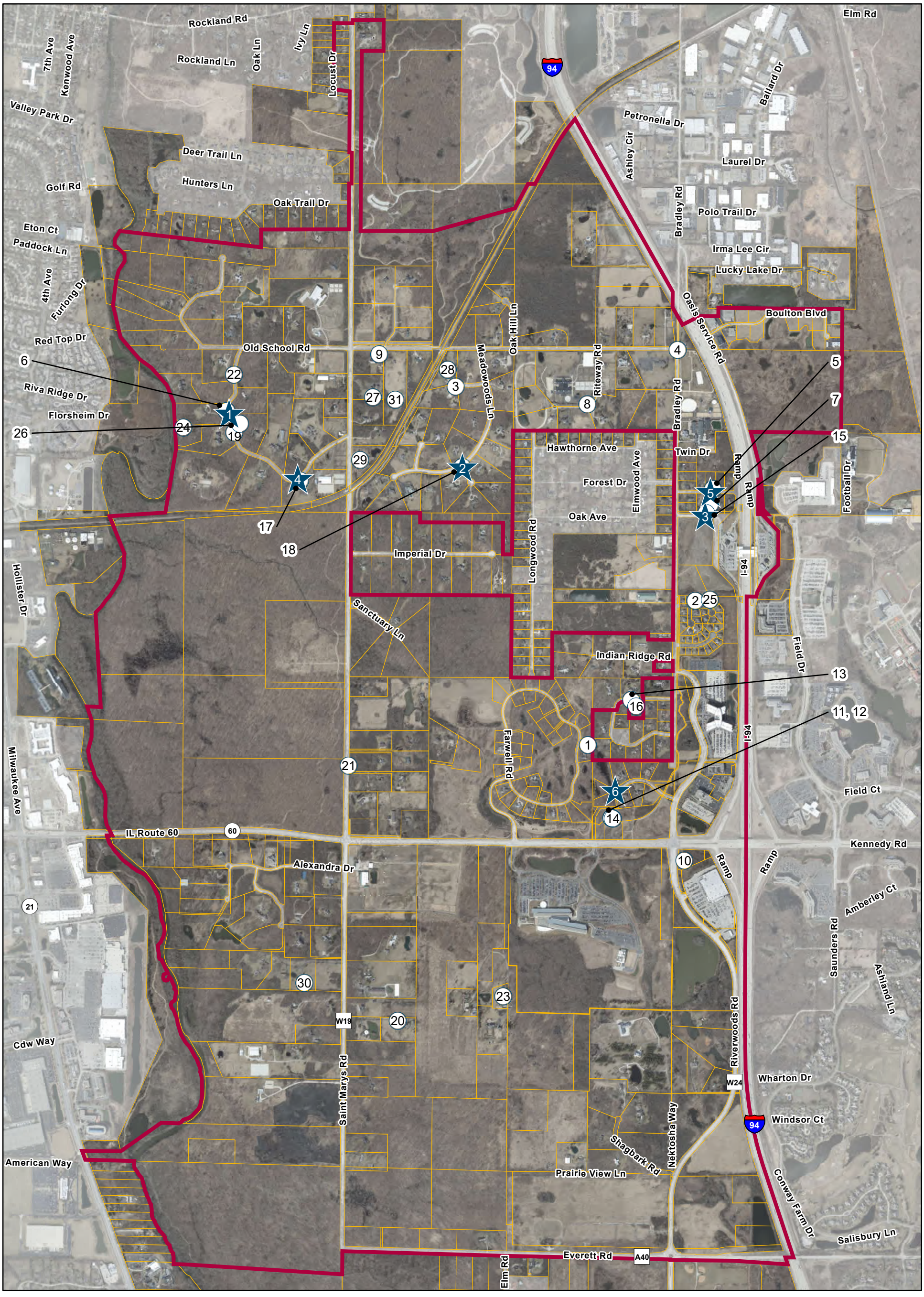
LOCATION:

street address, parcel number, or nearest intersection

Please return this form by March 1, 2021 via email to MettawaStormwater@heyassoc.com or via mail to the following address. We encourage you to include any photos, videos, or documents to better show or describe the concern.

Hey and Associates, Inc.
ATTN: Kirsten James
26575 W. Commerce Dr.
Suite 601
Volo, Illinois 60073

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture



Scale: 0 2,000 Feet

Orientation:

Project Number: 20-0216

Date: 4/1/2021

Legend:

- Initial Project Locations
- Drainage Concern Reports
- Village Boundary
- Village and Adjacent Parcel Boundaries

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture

Project Name:
Drainage Study

Prepared for:
Village of Mettawa

Reporting Period:
February 8, 2021 - March 10, 2021

Exhibit Title: **Drainage Concerns Reported**

Exhibit: **1**

ID	Name	Concern Type	Comments	Submission Method	Date Submitted	Type/Note	Address
1	Joe Krusinski	a pond or detention basin overflows	Concern provided in 5 separate emails on 2/8/2021	Online application, additional information by email	2/8/2021	Associated with known project area	Mettawa Woods Drive cul de sac
2	Lawrence Falbe	other (describe in section below)	We don't have any stormwater concerns; we have an dedicated easement for drainage on the north side of our lot that conveys flow from west to east, with a large stormwater drain on the east corner of our lot. It seems to work well even in periods of heavy rain when we get a bit of a river flowing west to east in the backyard.	Online application	2/8/2021	No issue	13948 W Trail Drive
3	Chris Lane	other (describe in section below)	Rain water runs along Westwoods ln. and under (and over with heavy rains)my driveway. It has started to erode the driveway.	Online application	2/8/2021	Private	14695 W Westwoods Lane
4	Stephen Baez	other (describe in section below)	Water from heavy rainstorm washing debris into intersection of Bradley and Old School Road. This debris is a hazard to Bicyclists traveling down Old School Road and turning South onto Bradley Road. I have personally witnessed a cyclist wipe out on this debris.	Online application	2/8/2021	Recommend minor inlet adjustment	W Old School Road and Bradley Road
5	Angelo Boulieris	other (describe in section below)	Flooding overflow from Bradley Road, draining down Mettawa Lane Rd and onto the yards seen in the attached pictures.	Online application, additional information by email	2/8/2021	Associated with known project area	Mettawa Lane
6	Les Raffel	flooding from a river, stream, or creek	Several years ago, a culvert was constructed under Little St. Marys Road that directed water from the east side of the road to the west side onto my property. This has caused erosion on my property and as formed a breeding area for mosquitos.	Email	2/9/2021	Associated with known project area	15390 W Little Saint Marys Road
7	Matthew Witten	flooding from a river, stream, or creek	There is a massive amount of water run off from Oasis Park, which floods over the top of the private road at south end of our property. The creek also floods at other locations near the north end of our property as the culverts on Mettawa Lane are overwhelmed by the water pouring through. It has increased significantly over the past few years, as more and more of the village water is directed through this area. I am also attaching a letter from all of the concerned and frustrated residents of this area, who continue to experience flooding and erosion. We will send video files, as the file sizes are too large for attachment. We request that someone come out to meet with us and view the area and walk through the issues that are occurring. Please contact us to schedule.	Online application, additional information by email	2/9/2021	Associated with known project area	Bradley Oasis Park Area
8	Tim Towne	standing water or ice on a roadway	Stormwater exits storm sewer from corporate way farm into Riteway rd ditch from corporate way farm then flows easterly along ditch until bend in Riteway rd, then during heavy rain events, due to ditch not being properly graded during construction of corporate way stable flows out onto Riteway rd and floods the road creating standing water or ice on pavement depending on time of year. Corporate way farm was a new subdivision and the subdivision control ordinance provides retention for all new subdivisions, and they never provided retention violating both the Storm Water Management ordinance as well as the village subdivision control ordinance which states all new subdivisions provide their own retention ponds. Anderson engineering, specifically Jamie Abderson, has many videos that were provided by me during these storm events and have not sufficiently solved the problem. I would be happy to meet and discuss the matter and show you those videos if Anderson can’t provide them to you.	Online application	2/9/2021	Private	14341 W Old School Road
9	Brian and Cindy Klassman	standing water in an unpaved area (grass, woods)	On heavy rains or defrost, the swale on south side of old school rd, isn't able to handle the water flow.	Email	2/9/2021	Private	14935 W Old School Road
10	Karen Carruthers	standing water in an unpaved area (grass, woods)	SE corner of Rt 60 & Riverwoods Rd, between Costco & Rt 60 - historical GIS aerial photos (and dead tree remains) indicate that healthy tree cover extended ~100' further west (closer to Riverwoods Rd) than it does now. Cattails & phragmites now dominate the western third of this village-owned parcel, indicating standing water and likely interrupted drainage.	Online application	2/9/2021	Village to decide if and how to proceed with this open space	Riverwoods Road and Townline Road
11	A. H. Gerhardt	a pond or detention basin overflows	Good day, There is a detention basin for the Mettawa Woods Drive subdivision located between the former Korhumel home (north side of Highway 60 and roughly 200 yards west of Riverwoods Road) and our residence at 14155 Mettawa Woods Drive. This is roughly 1.1 acres in surface area, since created it has become overgrown with cattails, and our residence has seen a few instances where heavy rainfall has produced high water levels with standing water in our yard. Is this due to poor maintenance by our subdivision? Or the cattails blocking water flow? Thanks for your consideration, it would be a pleasure to discuss further.	Online application	2/9/2021	Associated with known project area	Mettawa Woods Drive cul de sac
12	A. H. Gerhardt	a pond or detention basin overflows	Good day, There is a detention basin for the Mettawa Woods Drive subdivision located between the former Korhumel home (north side of Highway 60 and roughly 200 yards west of Riverwoods Road) and our residence at 14155 Mettawa Woods Drive. This is roughly 1.1 acres in surface area, since created it has become overgrown with cattails, and our residence has seen a few instances where heavy rainfall has produced high water levels with standing water in our yard. Is this due to poor maintenance by our subdivision? Or the cattails blocking water flow? Thanks for your consideration, it would be a pleasure to discuss further.	Online application	2/9/2021	Associated with known project area	Mettawa Woods Drive cul de sac
13	Sean McCarthy	other (describe in section below)	Lack of upkeep and overgrown vegetation in culverts that no longer work, that are now causing erosion to roads and redirecting rain water towards homes.	Online application	2/9/2021	Village to address Little Melody Ln in 2023	14386 W Little Melody Lane

ID	Name	Concern Type	Comments	Submission Method	Date Submitted	Type/Note	Address
14	A. H. Gerhardt	a pond or detention basin overflows	There is a detention basin for the Mettawa Woods Drive subdivision that is currently overgrown with cattails. Our residence at 14111 Mettawa Woods Drive has had several episodes of standing water following periods of heavy rainfall. Is this due to inadequate maintenance? Or possibly the catttails blocking water flow? It would be a pleasure to discuss further. Thanks for your consideration.	Online application	2/9/2021	Associated with known project area	Mettawa Woods Drive cul de sac
15	Holly Hirsch	other (describe in section below)	I have standing watermon my property driveway and on unpaved area along oasis service road, flooding from ditch, Oasis Park overflows onto Oasis Service Road my property. Damage and erosion is occurring on unpaved area and paved area due to water. Trees are falling down and driveway is ruined. The berm has created more water. The drainage improvements on Bradley have allowed more water to to the ditch increasing flooding. I had a cyber attack lost many pictures and videos sent to the village.	Online application, additional information by email	2/12/2021	Associated with known project area	Bradley Oasis Park Area
16	John Bradley	other (describe in section below)	Storm water failing on many levels. On Riverwoods Rd and Little Melody Rd water either drains into homeowner's yards or floods the street. The ground has built up in the grass swales where it does not allow the water to flow to the retention areas that have been made for it. In some areas the piping under the driveways leading from the streets which is to allow the water to flow as well has fallen apart or been crushed due to the streets sinking. Many homeowners have tried to dig these areas up and fix them themselves to help solve the problems. Due to the snow pictures cannot be taken to show these problems although I have sent pictures a year or two ago for he Village to review and will try and find them and send them again.	Online application	2/12/2021	Village to address Little Melody Ln in 2023	14386 W Little Melody Lane
17	Mary Brennan	standing water or ice on a roadway	Culver of Little St. Marys Road by home #15141... is too small so it overflows on the road	Mail	2/12/2021	Associated with known project area	15141 W Little Saint Marys Road
18	Mona Nicholas	other (describe in section below)	The cement culvert on the corner of my property located near the intersection of Meadowoods + Southwoods is out of place. Now stormwater flows around it under it instead of through it.	Email	2/12/2021	Associated with known project area	27115 Meadowoods Drive
19	Margo and Mike Oberman	standing water or ice on a roadway	We have never experienced a problem. Thank you!	Online application	2/12/2021	No issue	15141 W Little Saint Marys Road
20	Robert Pauls	other (describe in section below)	Hi there. We moved in last September and soon after noted that we had the output of either a breeched municipal pipe or a spring on our property. (We believe it is likely the latter.) the bubbling of water to the surface actually causes significant flooding in our property, and we have wondered if there are any solutions we might be able to employ in order to limit the amount of standing water that this regularly creates.	Online application	2/15/2021	Private - Hey confirmed very likely tile failure	25439 N Saint Marys Road
21	George Ginakakis	other (describe in section below)	I spoke with Dave from Hey & Assoc. over the phone and he advised that I document flooding issues here. Drainage Ditch on the East side of St. Marys Rd. just north of Rt. 60 has lost its definition in a particular area (about 3 driveways north of rt. 60. The water in this drainage ditch it supposed to flow North on St. Marys rd. downhill, however over time the drainage ditch has lost the definition to its swale and now the water floods into the properties East of St. Marys rd.- instead the water should continue down the drainage ditch to the North. I have been following this flooding issue over the past couple of years and trace back the neighbors flooding to this area. I believe this drainage ditch needs to be redefined here so that the water continues North down the drainage ditch as intended. Please contact me with any questions or to discuss. I would be more than happy to meet someone from Hey & Assoc. in the field when you are in the area next. -George (847)340-2111	Online application	2/17/2021	Private	26245 N Saint Marys Road
22	Stevie Schmidt	standing water or ice on a roadway	Village pipe at the end of driveway, on old school rd, has raised up and is causing a large bump while walking on driving out. Situation is getting worse every year.	Email	2/20/2021	Private	15469 W Little Saint Marys Road
23	Bill Kurtis and Donna LaPietra	standing water or ice on a driveway		Email	2/20/2021	Private	25783 N Saint Marys Road
24	Leslie K. Haines	flooding from a river, stream, or creek		Mail	2/24/2021	Private	3
25	Nicholas Papanos	standing water in an unpaved area (grass, woods)	We have experienced significant standing water/flooding in our backyard which is adjacent to the Village's Oasis Park property during rain storms. We have been living here since Dec 2002 and we did not have as much of a problem until the berms at the Oasis Park were constructed a few years back. Since then, the flooding in the backyard has been very significant. We were told by the Village engineer that one of the Village's retention ponds may be the problem, esepcially when it becomes clogged, but we feel more needs to be evaluated with a more definitive and consistent resolution to the problem. This flooding has eroded that area in our backyard.	Online application, additional information by email	2/25/2021	Private, associated with HOA detention maintenance	13908 W Trail Drive

ID	Name	Concern Type	Comments	Submission Method	Date Submitted	Type/Note	Address
26	Mary Swift	standing water in an unpaved area (grass, woods)	The wooded areas of our front and side property are often flooded after storms and heavy melting of snow and ice. Some flooding does reach into the street. All these areas can collect extreme amounts of water, which often sits for prolonged periods of time and can also run onto the street. We have multiple sump pumps in our home and when the ground is wet or saturated (which it most often is -- aside from the freezing winter months) our pumps can run consistently for days to weeks without stopping. Our concern is not only the visible, standing water in our woods and on our street but also the excessive volume of ground water that does not seem to drain properly and keeps our sump pumps running nearly constantly after the winter months.	Online application	2/26/2021	Associated with known project area	15390 W Little Saint Marys Road
27	Joseph Lafita	standing water in an unpaved area (grass, woods)	During heavy (and not so heavy) rain fall, we have a pond/river running through the north and south sides of our property. The entire fields are also very swampy for a long time.	Online application	2/26/2021	Private	27387 N Saint Marys Road
28	Brett Wiegman	standing water or ice on a driveway	During large-scale weather events with lots of rapid rain, we have water that moves from the east of our property to the west where our pond is. In extremely heavy rains, we have had water overflow the culvert and our driveway, washing out the area completely	Email	3/5/2021	Private	14697 W Old School Road
29	Ann and Thomas A. Heinz	Standing water in an unpaved area (grass, woods)	With heavy rains, the front yard, across the entire frontage, floods, across the road, St Marys, it sometimes crosses.	Mail	2/26/2021	Private	27157 N Saint Marys Road
30	Ninette Viglione	A pond or detention basin overflows	This retention pond is on adjacent property (lot to the west) During excessive rainfall, runoff was coming from neighbors property that is north of ours and more elevated than ours.	Email	3/5/2021	Private	25620 N Saint Marys Road
31	R Busscher	other (describe in section below)	We have no water issues at this time.	Mail	2/28/2021	No issue	14895 W Old School Road

Public Works Committee Meeting Minutes (Digital)

Drainage Concerns Reported and Associated Attachments (Digital)

Calculations and Model Results

Discharge Calculation: Rational Method

Q = CIA

- Q = Discharge, cfs
- C = Runoff coefficient
- I = Rainfall intensity, inches per hour
- A = Drainage area, acres

Rational Method Calculation

Project Site	Tributary Area	A	Event (min)	C	I (10yr)	Q (10yr)	I (100yr)	Q (100yr)
27115 Meadowoods Drive	B	4.42	6	0.30	7.00	9.28	11.68	15.5
15141 W Little St Marys Road	C	1.37	18	0.20	3.12	0.86	5.19	1.4
Mettawa Woods Drive cul du sac	D	30.24	29	0.30	2.42	21.95	4.03	36.6

The Rational Method may be used to calculate discharges for areas of less than one hundred (100) acres. The Rational Method shall not be used to determine detention or depressional storage requirements. - Lake County Watershed Development Ordinance, October 12, 2020

The 10-year design storm shall be used as a minimum for the design of storm sewers, swales, and appurtenances - Lake County Watershed Development Ordinance, October 12, 2020

What are the existing capacities of the culverts?

ID	I (2mo)	I (3mo)	I (4mo)	I (6mo)	I (9mo)	I (1yr)	I (2yr)	I (5yr)
B	2.16	2.48	2.68	3.04	3.48	3.76	4.52	5.88
C	0.95	1.08	1.20	1.36	1.54	1.68	2.03	2.60
D	0.74	0.84	0.93	1.05	1.20	1.30	1.57	2.02

ID	Ex Flowing Full Capacity (cfs)	Q (2mo)	Q (3mo)	Q (4mo)	Q (6mo)	Q (9mo)	Q (1yr)	Q (2yr)	Q (5yr)	Ex Approx Storm Capacity
B	8.52	2.86	3.29	3.55	4.03	4.61	4.98	5.99	7.79	7.5 yr
C	0.36	0.26	0.30	0.33	0.37	0.42	0.46	0.56	0.71	5.5 mo
D	19.92	6.71	7.62	8.44	9.52	10.89	11.79	14.24	18.32	7.2 yr

*from Storm Sewer Sizing Calculations sheet

Runoff Curve Number:

Project Site	Tributary Area
15390 W Little St Marys Road	A
Oasis: W of Bradley	E
Oasis: Oasis Park	F
Oasis: E of Berm	G
Oasis: Equestrian Connection	H
Oasis: Mettawa Lane	I

Tributary Area	Area (ac)	Wetlands and Water	Farmstead		Residential, >2ac		Open Space, Good		Paved, Open Ditch		Paved, Gravel	Woods, Good	RCN
			C	D	C	D	C	D	C	D	D	D	
A	183.53	41.29	0.00	39.28	0.00	83.90	0.00	15.81	0.00	3.23	0.01	0.00	86
E	170.20	17.61	0.11	41.78	3.07	82.91	1.35	17.18	0.18	5.70	0.32	0.00	84
F	19.85	2.44	0.00	0.03	0.00	0.00	0.00	16.30	0.00	0.72	0.36	0.00	83
G	4.73	0.00	0.00	0.00	0.00	0.00	0.00	4.08	0.00	0.66	0.00	0.00	82
H	49.02	9.76	0.00	34.92	0.00	2.54	0.00	1.30	0.00	0.50	0.00	0.00	88
I	12.78	1.99	0.00	0.00	0.00	8.32	0.00	1.52	0.00	0.77	0.17	0.00	85
		96	82	86	77	82	74	80	92	93	91	77	

Tributary Areas: Time of Concentration

		Basin ID	A	B	C	D
Sheet Flow		Segment ID	A-1	B-1	C-1	D-1
1. Surface Description (table 3-1)			Smooth Surfaces, concrete	Smooth Surfaces, concrete	Woods, Light Underbrush	Woods, Light Underbrush
2. Manning's Roughness Coefficient, n (table 3-1)			0.011	0.011	0.400	0.400
3. Flow Length, L (total L $\leq$ 100 ft.)		ft	47	100	65	100
4. Two-year, 24-hour rainfall, P_2		in	3.34	3.34	3.34	3.34
5. Land Slope, s		ft/ft	0.021	0.010	0.015	0.020
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5} * s^{0.4}}$	Compute T_t	hr	0.01	0.03	0.28	0.35
Shallow Concentrated Flow		Segment ID	A-2	B-2	C-2	D-2
7. Surface Description (paved or unpaved)			Unpaved	Unpaved	Unpaved	Unpaved
8. Flow Length, L		ft	125	251	319	133
9. Watercourse slope, s		ft/ft	0.008	0.020	0.021	0.015
10. Average Velocity, V (figure 3-1)		ft/s	1.50	2.30	2.35	1.90
11. $T_t = \frac{L}{3600 * V}$		hr	0.02	0.03	0.03	0.02
Channel flow		Segment ID	A-3	B-3		D-3
12. Cross Sectional Flow Area, a		ft^2	7.00	5.00		10.00
13. Wetted Perimeter, P_w		ft	9.00	7.00		12.00
14. Hydraulic Radius, $r=a/P_w$	Compute r	ft	0.78	0.71		0.83
15. Channel Slope, s		ft/ft	0.005	0.020		0.015
16. Manning's roughness coefficient, n			0.035	0.030		0.030
17. $V = (1.49 * r^{2/3} * s^{1/2})/n$	Compute V	ft/s	2.60	5.63		5.43
18. Flow length, L		ft	2837	746		2234
19. $T_t = \frac{L}{3600 * V}$	Compute T_t	hr	0.30	0.04		0.11
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	Compute T_c	hr	0.3	0.1	0.3	0.5
		min	20	6	18	29

Tributary Areas: Time of Concentration

		Basin ID	E	F	G	H
Sheet Flow		Segment ID	E-1	F-1	G-1	H-1
1. Surface Description (table 3-1)			Smooth Surfaces, concrete	Dense grasses	Dense grasses	Woods, Light Underbrush
2. Manning's Roughness Coefficient, n (table 3-1)			0.800	0.240	0.240	0.400
3. Flow Length, L (total L $\leq$ 100 ft.)		ft	100	100	100	100
4. Two-year, 24-hour rainfall, P_2		in	3.34	3.34	3.34	3.34
5. Land Slope, s		ft/ft	0.025	0.095	0.250	0.015
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5} * s^{0.4}}$	Compute T_t	hr	0.56	0.12	0.08	0.39
Shallow Concentrated Flow		Segment ID		F-2		H-2
7. Surface Description (paved or unpaved)				Unpaved		Unpaved
8. Flow Length, L		ft		318		248
9. Watercourse slope, s		ft/ft		0.052		0.002
10. Average Velocity, V (figure 3-1)		ft/s		3.60		1.18
11. $T_t = \frac{L}{3600 * V}$		hr		0.02		0.06
Channel flow		Segment ID	E-2	F-3	G-2	H-3
12. Cross Sectional Flow Area, a		ft^2	12.00	3.00	5.00	7.50
13. Wetted Perimeter, P_w		ft	10.00	5.00	7.00	8.00
14. Hydraulic Radius, $r=a/P_w$	Compute r	ft	1.20	0.60	0.71	0.94
15. Channel Slope, s		ft/ft	0.015	0.014	0.027	0.006
16. Manning's roughness coefficient, n			0.030	0.030	0.030	0.030
17. $V = (1.49 * r^{2/3} * s^{1/2})/n$	Compute V	ft/s	6.86	4.14	6.56	3.56
18. Flow length, L		ft	2711	727	293	1426
19. $T_t = \frac{L}{3600 * V}$	Compute T_t	hr	0.11	0.05	0.01	0.11
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	Compute T_c	hr	0.7	0.2	0.1	0.6
		min	40	12	6	34

Tributary Areas: Time of Concentration

		Basin ID	I
Sheet Flow		Segment ID	I-1
1. Surface Description (table 3-1)			Bermuda-grass
2. Manning's Roughness Coefficient, n (table 3-1)			0.410
3. Flow Length, L (total L $\leq$ 100 ft.)		ft	31
4. Two-year, 24-hour rainfall, P_2		in	3.34
5. Land Slope, s		ft/ft	0.194
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5} * s^{0.4}}$	Compute T_t	hr	0.06
Shallow Concentrated Flow		Segment ID	I-2
7. Surface Description (paved or unpaved)			Unpaved
8. Flow Length, L		ft	422
9. Watercourse slope, s		ft/ft	0.002
10. Average Velocity, V (figure 3-1)		ft/s	1.18
11. $T_t = \frac{L}{3600 * V}$		hr	0.10
Channel flow		Segment ID	I-3
12. Cross Sectional Flow Area, a		ft^2	12.00
13. Wetted Perimeter, P_w		ft	10.00
14. Hydraulic Radius, $r=a/P_w$	Compute r	ft	1.20
15. Channel Slope, s		ft/ft	0.010
16. Manning's roughness coefficient, n			0.035
17. $V = (1.49 * r^{2/3} * s^{1/2})/n$	Compute V	ft/s	4.73
18. Flow length, L		ft	722
19. $T_t = \frac{L}{3600 * V}$	Compute T_t	hr	0.04
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	Compute T_c	hr	0.2
		min	12

Updated Rainfall Depth Duration Frequency Table

Rainfall Depth Duration Frequency Tables for Lake County
Rainfall is in Inches

Storm Duration	2mo	3mo	4mo	6mo	9mo	1yr	2yr	5yr	10yr	25yr	50yr	100yr	500yr
5min	0.19	0.22	0.24	0.27	0.31	0.33	0.40	0.52	0.62	0.77	0.90	1.03	1.35
10min	0.35	0.40	0.43	0.49	0.56	0.61	0.73	0.95	1.13	1.42	1.65	1.89	2.47
15min	0.42	0.49	0.53	0.61	0.69	0.75	0.90	1.16	1.39	1.74	2.03	2.32	3.04
30min	0.58	0.66	0.73	0.83	0.94	1.03	1.24	1.59	1.91	2.39	2.78	3.17	4.16
1hr	0.74	0.84	0.93	1.05	1.20	1.30	1.57	2.02	2.42	3.03	3.53	4.03	5.28
2hr	0.91	1.04	1.14	1.30	1.48	1.61	1.94	2.49	2.99	3.74	4.35	4.97	6.52
3hr	1.00	1.15	1.26	1.44	1.63	1.77	2.14	2.75	3.30	4.13	4.80	5.49	7.20
6hr	1.18	1.35	1.48	1.68	1.91	2.08	2.51	3.23	3.86	4.84	5.63	6.43	8.43
12hr	1.37	1.56	1.71	1.95	2.21	2.41	2.91	3.74	4.48	5.61	6.53	7.46	9.78
18hr	1.48	1.69	1.85	2.11	2.39	2.61	3.14	4.04	4.84	6.06	7.05	8.06	10.57
24hr	1.57	1.80	1.97	2.24	2.55	2.77	3.34	4.30	5.15	6.45	7.50	8.57	11.24
48hr	1.72	1.97	2.16	2.46	2.79	3.04	3.66	4.71	5.62	6.99	8.13	9.28	12.10
72hr	1.87	2.14	2.34	2.67	3.03	3.30	3.97	5.08	6.05	7.49	8.64	9.85	12.81
120hr	2.08	2.38	2.61	2.97	3.37	3.67	4.42	5.63	6.68	8.16	9.39	10.66	13.81
240hr	2.63	3.01	3.30	3.76	4.27	4.65	5.60	7.09	8.25	9.90	11.26	12.65	16.00

References: ISWS Bulletin 75 Precipitation Frequency Study for Illinois
James R. Angel and Momcilo Markus
Illinois State Water Survey, March 2020

Rational Method: C Values for Urban Conditions

			Slope		
			< 0.02	0.02-0.10	> 0.10
Industrial	light	0.50-0.80	0.50	0.70	0.80
	heavy	0.60-0.90	0.60	0.80	0.90
Business	downtown	0.70-0.95	0.80	0.85	0.85
	neighborhood	0.50-0.70			
Residential	single-family	0.30-0.50			
	multi-units, detached	0.40-0.60			
	multi-unis, attached	0.40-0.60			
	suburban	0.25-0.40			
	1-3units/ac		0.35	0.40	0.45
	3-6 units/ac		0.50	0.55	0.60
	6-15 units/ac		0.70	0.75	0.80
	apartments	0.50-0.70	0.50	0.60	0.70
Park & Cemetery		0.10-0.25	0.10	0.15	0.25
Playground		0.20-0.35	0.20	0.25	0.30
Drive & Walk		0.75-0.95	0.75	0.80	0.85
Railroad Yard		0.20-0.35			
Roofs		0.75-0.95			
Water Impoundment		1.00			
Lawn	soil unspecified		0.17	0.22	0.35
	sandy soil		0.05-0.10*	0.10-0.15*	0.15-0.20*
	heavy soil		0.13-0.17*	0.18-0.22*	0.25-0.35*
Roadway	unspecified asphalt	0.70-0.95	0.90	0.90	0.90
	concrete	0.70-0.95			
	brick	0.70-0.85			
	gravel		0.50	0.55	0.60
	earth shoulder		0.50	0.50	0.50
	grass shoulder		0.25	0.25	0.25
	earth sideslope		0.60	0.60	0.60
	turf sideslope		0.30	0.30	0.30
	turf median		0.25	0.30	0.30

* Slope < 0.02, 0.02-0.07, > 0.07

References: Chow, 1964, p.14-7, 21-38; ASCE, 1996, p. 591; ODOT, 1990, p. 11

Storm Sewer Sizing Calculations

Existing Conditions

ID	Size (in)	Type	U/S Invert	D/S Invert	Length (ft)	Slope (ft/ft)	Manning's n	Capacity Flowing Full (cfs)	Velocity Flowing Full (ft/sec)	Min Design Capacity (10-yr Q) (cfs)	Does the pipe have capacity?
B	15	RCP	691.01	690.47	31	0.017	0.013	8.52	6.94	9.3	-0.75
C	4	PVC	664.17	663.65	20	0.026	0.011	0.36	4.15	0.9	-0.50
D	24	RCP	671.32	669.38	250	0.008	0.013	19.92	6.34	22.0	-2.03

Design Conditions (if different than existing)

ID	Size (in)	Type	U/S Invert	D/S Invert	Length (ft)	Slope (ft/ft)	Manning's n	Capacity Flowing Full (cfs)	Velocity Flowing Full (ft/sec)	Min Design Capacity (10-yr Q) (cfs)	Does the pipe have capacity?
C	12	CMP	664.82	664.10	20	0.036	0.024	3.66	4.66	0.9	2.80

Proposed Conditions - single pipe replacement

ID	Size (in)	Type	U/S Invert	D/S Invert	Length (ft)	Slope (ft/ft)	Manning's n	Capacity Flowing Full (cfs)	Velocity Flowing Full (ft/sec)	Min Design Capacity (10-yr Q) (cfs)	Does the pipe have capacity?
B	15	RCP	691.01	690.47	31	0.017	0.013	8.52	6.94	9.3	-0.75
C	15	RCP	663.80	663.65	20	0.007	0.013	5.59	4.56	0.9	4.73

Storm sewers shall have a minimum diameter of twelve (12) inches with the exception that storm sewers servicing a single parcel may be excused from this requirement upon approval of the Enforcement Officer. Storm sewer design analysis shall be calculated under full flow conditions, unless prior approval from the Enforcement Officer is received for an alternate flow condition (e.g., pressure flow). - Lake County Watershed Development Ordinance, October 12, 2020

Tributary Areas: Stage-Storage Relationships (Volume Computed from Average Area End Method)
Existing Conditions

Basin: A

Elevation (ft)	Depth (ft)	Area (sqft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
652.24	0.0	0	0.00001			0.00
653.0	0.8	2726	0.06	0.76	0.02	0.02
654.0	1.8	19997	0.46	1.00	0.26	0.28
655.0	2.8	91268	2.10	1.00	1.28	1.56

Basin: E

Elevation (ft)	Depth (ft)	Area (sqft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
682.73	0.0	0	0.00001			0.00
683.0	0.3	8	0.0002	0.27	0.00	0.00
684.0	1.3	719	0.02	1.00	0.01	0.01
685.0	2.3	6230	0.14	1.00	0.08	0.09
686.0	3.3	30032	0.69	1.00	0.42	0.50
687.0	4.3	70616	1.62	1.00	1.16	1.66
688.0	5.3	138334	3.18	1.00	2.40	4.06
689.0	6.3	227028	5.21	1.00	4.19	8.25
690.0	7.3	351525	8.07	1.00	6.64	14.89

Basin: F

Elevation (ft)	Depth (ft)	Area (sqft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
678.42	0.0	0	0.00001			0.00
679.0	0.6	106	0.002	0.58	0.00	0.00
680.0	1.6	648	0.01	1.00	0.01	0.01
681.0	2.6	2588	0.06	1.00	0.04	0.05
682.0	3.6	20036	0.46	1.00	0.26	0.31
683.0	4.6	43983	1.01	1.00	0.73	1.04
684.0	5.6	69772	1.60	1.00	1.31	2.35
685.0	6.6	96311	2.21	1.00	1.91	4.25
686.0	7.6	118078	2.71	1.00	2.46	6.71
687.0	8.6	138224	3.17	1.00	2.94	9.66
688.0	9.6	155031	3.56	1.00	3.37	13.02
689.0	10.6	176107	4.04	1.00	3.80	16.82

Tributary Areas: Stage-Storage Relationships (Volume Computed from Average Area End Method)
Existing Conditions

Basin: G

Elevation (ft)	Depth (ft)	Area (sqft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
680.38	0.0	0	0.00001			0.00
682.0	1.6	187	0.004	1.62	0.00	0.00
683.0	2.6	1084	0.02	1.00	0.01	0.02
684.0	3.6	5484	0.13	1.00	0.08	0.09
685.0	4.6	8236	0.19	1.00	0.16	0.25
686.0	5.6	10906	0.25	1.00	0.22	0.47
687.0	6.6	14244	0.33	1.00	0.29	0.76
688.0	7.6	19510	0.45	1.00	0.39	1.15
689.0	8.6	27851	0.64	1.00	0.54	1.69

Basin: H

Elevation (ft)	Depth (ft)	Area (sqft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
689.27	0.0	0	0.00001			0.00
691.0	1.7	2960	0.07	1.73	0.06	0.06
692.0	2.7	14034	0.32	1.00	0.20	0.25
693.0	3.7	35199	0.81	1.00	0.57	0.82
694.0	4.7	61843	1.42	1.00	1.11	1.93

Tributary Areas: Stage-Storage Relationships (Volume Computed from Average Area End Method)
Proposed Conditions

Elevation (ft)	Depth (ft)	Area (acres)	ΔH (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
678.42	0.0	0.01			0.00
679.0	0.6	1.00	0.58	0.29	0.29
680.0	1.6	1.50	1.00	1.25	1.54
681.0	2.6	2.00	1.00	1.75	3.29
682.0	3.6	2.50	1.00	2.25	5.54
683.0	4.6	3.00	1.00	2.75	8.29
684.0	5.6	3.10	1.00	3.05	11.34
685.0	6.6	3.20	1.00	3.15	14.49
686.0	7.6	3.30	1.00	3.25	17.74
687.0	8.6	3.40	1.00	3.35	21.09
688.0	9.6	3.56	1.00	3.48	24.57
689.0	10.6	4.04	1.00	3.80	28.37

Tributary Areas: Natural Channel Sections and Overflow Cross Sections

Cross Section: A to Out

X Coord	Y Coord	Distance	Station	Elevation
1092825.22	2037399.43	0.00	0.00	656.00
1092831.99	2037317.15	82.55	82.55	655.00
1092836.45	2037253.47	63.84	146.39	655.00
1092878.90	2037037.95	219.67	366.06	656.00
1092812.36	2036747.60	297.88	663.93	657.00

Manning's N Value
0.016

Cross Section: F to I

X Coord	Y Coord	Distance	Station	Elevation
1100732.35	2035634.59	0.00	0.00	689.00
1100694.71	2035655.15	42.89	42.89	688.00
1100660.69	2035657.08	34.08	76.97	687.00
1100625.31	2035653.04	35.60	112.57	686.00
1100580.31	2035653.74	45.01	157.58	685.00
1100177.63	2035656.15	402.69	560.27	685.00
1100077.45	2035654.28	100.20	660.47	686.00
		0.10	660.57	687.00
		0.10	660.67	688.00
		0.10	660.77	689.00

Manning's N Value
0.016

Cross Section: G to F

X Coord	Y Coord	Distance	Station	Elevation
1100672.56	2035656.40	0.00	0.00	688.00
1100656.06	2035647.59	18.70	18.70	687.00
1100650.35	2035642.35	7.75	26.45	686.00
1100648.64	2035638.20	4.49	30.94	685.00
1100647.41	2035635.04	3.39	34.33	684.00
1100646.33	2035631.98	3.24	37.57	683.00
1100645.44	2035628.99	3.12	40.70	682.00
1100643.58	2035626.29	3.28	43.98	682.00
1100642.70	2035623.48	2.94	46.92	683.00
1100641.35	2035620.67	3.12	50.04	684.00
1100639.96	2035618.02	2.99	53.03	685.00
1100638.52	2035615.42	2.98	56.00	686.00
1100637.19	2035612.64	3.08	59.08	687.00
1100634.76	2035609.92	3.65	62.73	688.00

Manning's N Value
0.03

Cross Section: H to F

X Coord	Y Coord	Distance	Station	Elevation
1100060.65	2034394.52	0.00	0.00	694.00
1100060.51	2034616.54	222.03	222.03	693.00
1100061.94	2035006.92	390.39	612.41	693.00
1100057.13	2035093.53	86.74	699.15	turn
1100028.56	2035108.34	32.18	731.33	694.00

Manning's N Value
0.016

Tributary Areas: Natural Channel Sections and Overflow Cross Sections

Cross Section: E to I

X Coord	Y Coord	Distance	Station	Elevation
1100060.35	2036522.41	0.00	0.00	690.00
1100061.88	2036402.84	119.58	119.58	690.00
1100062.75	2036270.00	132.85	252.42	690.00
1100061.97	2036228.98	41.02	293.45	689.00
1100060.30	2036187.85	41.17	334.61	688.00
1100061.32	2036127.29	60.57	395.18	687.00
1100064.26	2035655.27	472.03	867.21	687.00
		0.10	867.31	687.00
		0.10	867.41	688.00
		0.10	867.51	689.00
		0.10	867.61	690.00
		0.10	867.71	691.00

Manning's N Value
0.016

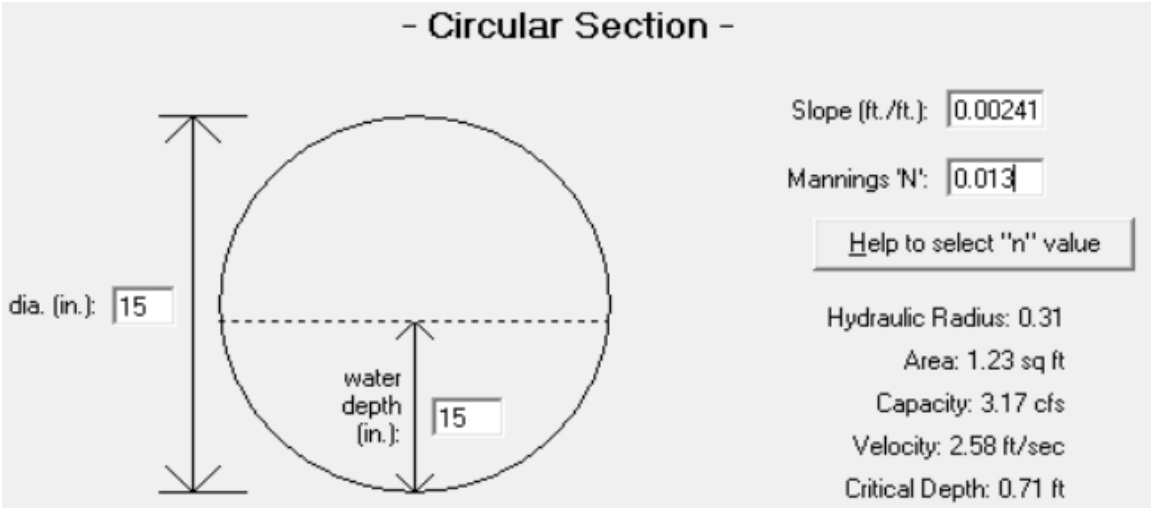
Cross Section: E to F

X Coord	Y Coord	Distance	Station	Elevation
		0.00	0.00	690.00
		0.10	0.10	689.00
		0.10	0.20	688.00
		0.10	0.30	687.00
1100064.26	2035655.27	0.10	0.40	687.00
1100061.36	2035533.16	122.14	122.54	688.00
1100062.31	2035429.67	103.49	226.04	689.00
1100061.85	2035359.73	69.94	295.98	690.00
1100061.46	2035301.35	58.39	354.36	691.00

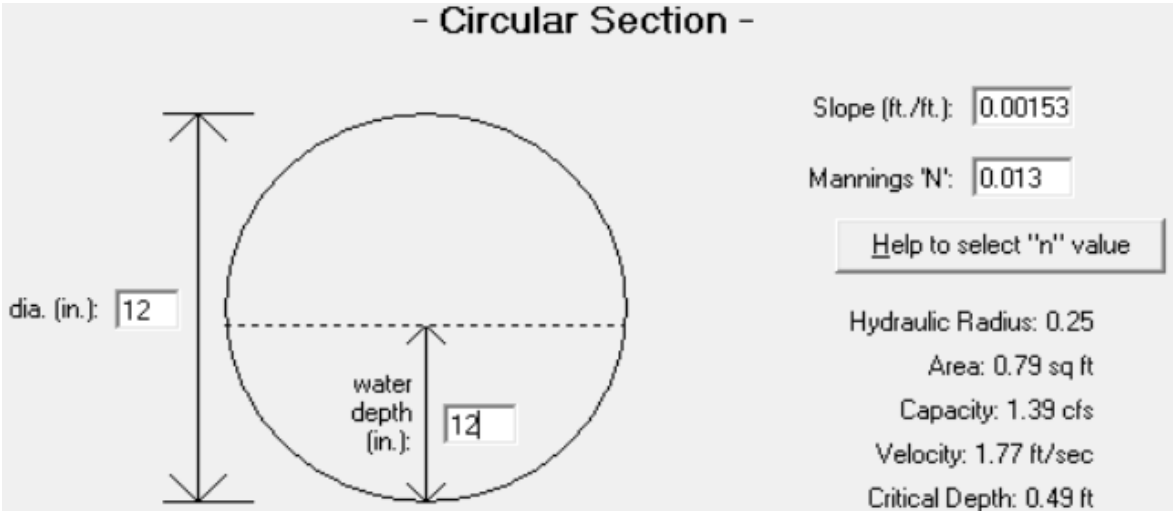
Manning's N Value
0.016

Capacity Calculations for Old School Road and Bradley Road Inlet (NRCS Hydraulics Calculator Tool)

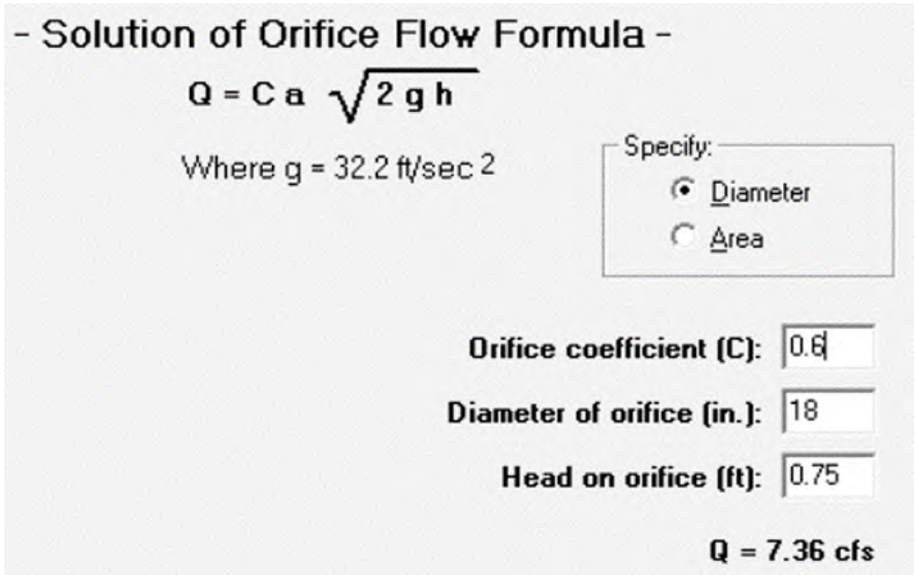
Existing Conditions 15"



Existing Conditions 12"



Proposed Sawcut at Ground Surface Head



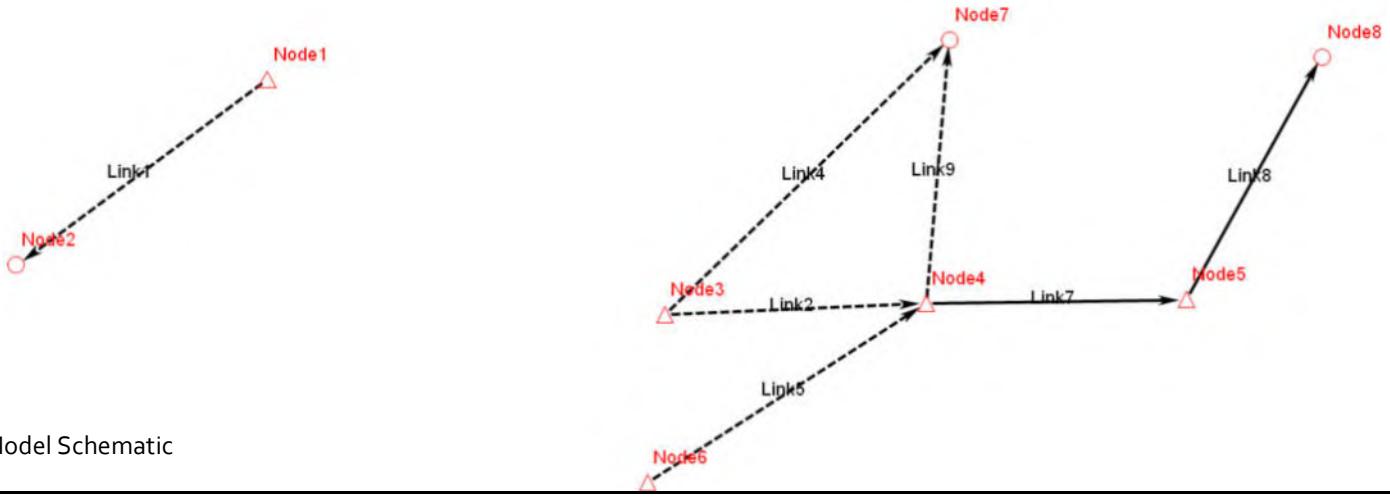
To evaluate existing hydrologic and hydraulic conditions and to develop conceptual solutions, an XP-SWMM hydrologic and hydraulic model was prepared for the Oasis Park and Mettawa Lane drainage with four scenarios:

1. Base Scenario, representing the existing conditions
2. Pr1: adding 10-acre-feet of stormwater storage below an elevation of 685.0
3. Pr2: adding of 10-acre-feet of stormwater storage below an elevation of 685.0 and upsizing the 30-inch from Bradley Road to Oasis Park to a 36-inch
4. Pr3: adding of 10-acre-feet of stormwater storage below an elevation of 685.0, upsizing the 30-inch pipe from Bradley Road to Oasis Park to a 36-inch pipe, and upsizing the Bradley Road to Mettawa Lane culvert system to 24-inch pipe

This modeling effort was used to support design recommendations and shows the proposed conceptual improvements provide a measurable benefit to the drainage and do not adversely impact off-site flooding. Any increases in discharge to the Illinois State Toll Highway Authority property, either from the 30-inch pipe on the northeastern corner of Oasis Park or from the Mettawa Lane Drainage should be addressed in final design.

To assess the existing conditions and the impacts of the proposed concepts, storm events ranging in duration from 5-minutes to 240-hours were simulated for the 10-year and 100-year recurrence intervals. Rainfall depths included in the Lake County Watershed Development Ordinance (WDO) and Huff Quartile Distributions for an area less than 10 square miles were used to define these storm events.

Tributary areas to each key project area were determined using site survey and county topography in the Village-wide GIS-based assessment. Exhibit 1 shows the drainages and hydrologic modeling parameters for each subbasin. Runoff Curve Numbers (RCN) and Times of Concentration (Tc) were calculated for each subbasin using the weighted curve number method outlined in USDA NRCS TR-55. Land cover was derived from the Lake County Wetland Inventory, Lake County's trails layer, Lake County's Edge of Pavement dataset, Chicago Metropolitan Agency for Planning's 2015 Land Use Inventory dataset, and review of field conditions and aerial photography. Hydrologic soil group (HSG) was derived from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) SSURGO database. Soil units with dual HSGs were determined to be in either the drained or undrained condition depending on the likely presence and location of drain tiles. Adjustments to land use and HSG were made using Lake County's 2018 aerial imagery and site photos. Tcs were calculated using a maximum sheet flow length of 100-feet, as revised per Merkel, 2001, and included in the Part 630 of the National Engineering Handbook, Chapter 15. Tcs were assumed to remain unchanged between the existing and proposed conditions. Lake County 1-foot topography (based on 2017 lidar data) was used to derive stage-storage relationships for depressional areas and cross sections to represent overflows on the site. Supporting calculations are included in the sections following.



Model Schematic

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
A	10yr5min	0.00	0.00	0.00	0.00
A	10yr10min	0.00	0.00	0.00	0.00
A	10yr15min	0.00	0.00	0.00	0.00
A	10yr30min	119.19	0.00	0.00	0.00
A	10yr1hr	119.20	119.20	119.20	0.00
A	10yr2hr	119.20	119.20	119.20	0.00
A	10yr3hr	119.19	119.19	119.19	0.00
A	10yr6hr	119.17	119.17	119.17	0.00
A	10yr12hr	0.00	0.00	0.00	0.00
A	10yr18hr	0.00	0.00	0.00	0.00
A	10yr24hr	0.00	0.00	0.00	0.00
A	10yr48hr	0.00	0.00	0.00	0.00
A	10yr72hr	0.00	0.00	0.00	0.00
A	10yr120hr	0.00	0.00	0.00	0.00
A	10yr240hr	0.00	0.00	0.00	0.00
A	25yr5min	0.00	0.00	0.00	0.00
A	25yr10min	0.00	0.00	0.00	0.00
A	25yr15min	0.00	0.00	0.00	0.00
A	25yr30min	0.00	0.00	0.00	0.00
A	25yr1hr	119.23	119.23	119.23	0.00
A	25yr2hr	119.23	119.23	119.23	0.00
A	25yr3hr	119.22	119.22	119.22	0.00
A	25yr6hr	119.19	119.19	119.19	0.00
A	25yr12hr	0.00	0.00	0.00	0.00
A	25yr18hr	0.00	0.00	0.00	0.00
A	25yr24hr	0.00	0.00	0.00	0.00
A	25yr48hr	0.00	0.00	0.00	0.00
A	25yr72hr	0.00	0.00	0.00	0.00
A	25yr120hr	0.00	0.00	0.00	0.00
A	25yr240hr	0.00	0.00	0.00	0.00
A	50yr5min	118.98	118.98	0.00	0.00
A	50yr10min	119.18	119.18	0.00	0.00
A	50yr15min	119.21	119.21	0.00	0.00
A	50yr30min	119.24	119.24	0.00	0.00
A	50yr1hr	119.25	119.25	119.25	119.25
A	50yr2hr	119.25	119.25	119.25	119.25
A	50yr3hr	119.24	119.24	119.24	119.24
A	50yr6hr	119.21	119.21	119.21	119.21
A	50yr12hr	119.17	119.17	0.00	0.00
A	50yr18hr	119.16	119.16	0.00	0.00
A	50yr24hr	119.14	119.14	0.00	0.00
A	50yr48hr	119.12	119.12	0.00	0.00
A	50yr72hr	119.10	119.10	0.00	0.00
A	50yr120hr	118.99	118.99	0.00	0.00
A	50yr240hr	113.68	113.68	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
A	100yr5min	0.00	0.00	0.00	0.00
A	100yr10min	0.00	0.00	0.00	0.00
A	100yr15min	0.00	119.23	0.00	0.00
A	100yr30min	119.26	119.26	0.00	0.00
A	100yr1hr	119.27	119.27	119.27	119.27
A	100yr2hr	119.26	119.26	119.26	119.26
A	100yr3hr	119.25	119.25	119.25	119.25
A	100yr6hr	119.22	119.22	119.22	119.22
A	100yr12hr	0.00	0.00	0.00	0.00
A	100yr18hr	0.00	0.00	0.00	0.00
A	100yr24hr	0.00	0.00	0.00	0.00
A	100yr48hr	0.00	0.00	0.00	0.00
A	100yr72hr	0.00	0.00	0.00	0.00
A	100yr120hr	0.00	0.00	0.00	0.00
A	100yr240hr	0.00	0.00	0.00	0.00
AOver	10yr5min	0.00	0.00	0.00	0.00
AOver	10yr10min	0.00	0.00	0.00	0.00
AOver	10yr15min	0.00	0.00	0.00	0.00
AOver	10yr30min	1494.99	0.00	0.00	0.00
AOver	10yr1hr	1646.86	1646.85	1646.85	0.00
AOver	10yr2hr	1629.73	1629.72	1629.72	0.00
AOver	10yr3hr	1490.87	1490.86	1490.86	0.00
AOver	10yr6hr	1110.24	1110.24	1110.24	0.00
AOver	10yr12hr	0.00	0.00	0.00	0.00
AOver	10yr18hr	0.00	0.00	0.00	0.00
AOver	10yr24hr	0.00	0.00	0.00	0.00
AOver	10yr48hr	0.00	0.00	0.00	0.00
AOver	10yr72hr	0.00	0.00	0.00	0.00
AOver	10yr120hr	0.00	0.00	0.00	0.00
AOver	10yr240hr	0.00	0.00	0.00	0.00
AOver	25yr5min	0.00	0.00	0.00	0.00
AOver	25yr10min	0.00	0.00	0.00	0.00
AOver	25yr15min	0.00	0.00	0.00	0.00
AOver	25yr30min	0.00	0.00	0.00	0.00
AOver	25yr1hr	2289.10	2289.10	2289.10	0.00
AOver	25yr2hr	2232.37	2232.37	2232.37	0.00
AOver	25yr3hr	2029.98	2029.98	2029.98	0.00
AOver	25yr6hr	1507.44	1507.44	1507.44	0.00
AOver	25yr12hr	0.00	0.00	0.00	0.00
AOver	25yr18hr	0.00	0.00	0.00	0.00
AOver	25yr24hr	0.00	0.00	0.00	0.00
AOver	25yr48hr	0.00	0.00	0.00	0.00
AOver	25yr72hr	0.00	0.00	0.00	0.00
AOver	25yr120hr	0.00	0.00	0.00	0.00
AOver	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
AOver	50yr5min	0.00	0.00	0.00	0.00
AOver	50yr10min	1310.97	1310.96	0.00	0.00
AOver	50yr15min	1895.55	1895.54	0.00	0.00
AOver	50yr30min	2636.44	2636.44	0.00	0.00
AOver	50yr1hr	2801.02	2801.01	2801.01	2801.01
AOver	50yr2hr	2707.69	2707.69	2707.69	2707.69
AOver	50yr3hr	2449.65	2449.65	2449.65	2449.65
AOver	50yr6hr	1807.09	1807.10	1807.10	1807.10
AOver	50yr12hr	1149.45	1149.45	0.00	0.00
AOver	50yr18hr	880.85	880.85	0.00	0.00
AOver	50yr24hr	690.89	690.89	0.00	0.00
AOver	50yr48hr	406.35	406.35	0.00	0.00
AOver	50yr72hr	197.24	197.24	0.00	0.00
AOver	50yr120hr	0.00	0.00	0.00	0.00
AOver	50yr240hr	0.00	0.00	0.00	0.00
AOver	100yr5min	0.00	0.00	0.00	0.00
AOver	100yr10min	0.00	0.00	0.00	0.00
AOver	100yr15min	0.00	2334.72	0.00	0.00
AOver	100yr30min	3128.31	3128.31	0.00	0.00
AOver	100yr1hr	3302.85	3302.85	3302.85	3302.85
AOver	100yr2hr	3177.13	3177.13	3177.13	3177.13
AOver	100yr3hr	2868.85	2868.85	2868.85	2868.85
AOver	100yr6hr	2100.69	2100.69	2100.69	2100.70
AOver	100yr12hr	0.00	0.00	0.00	0.00
AOver	100yr18hr	0.00	0.00	0.00	0.00
AOver	100yr24hr	0.00	0.00	0.00	0.00
AOver	100yr48hr	0.00	0.00	0.00	0.00
AOver	100yr72hr	0.00	0.00	0.00	0.00
AOver	100yr120hr	0.00	0.00	0.00	0.00
AOver	100yr240hr	0.00	0.00	0.00	0.00
EF	10yr5min	0.00	0.00	0.00	0.00
EF	10yr10min	0.00	0.00	0.00	0.00
EF	10yr15min	0.00	0.00	0.00	0.00
EF	10yr30min	96.61	0.00	0.00	0.00
EF	10yr1hr	100.54	100.54	137.89	0.00
EF	10yr2hr	100.54	100.54	143.84	0.00
EF	10yr3hr	100.54	100.54	143.76	0.00
EF	10yr6hr	100.54	100.54	140.47	0.00
EF	10yr12hr	0.00	0.00	0.00	0.00
EF	10yr18hr	0.00	0.00	0.00	0.00
EF	10yr24hr	0.00	0.00	0.00	0.00
EF	10yr48hr	0.00	0.00	0.00	0.00
EF	10yr72hr	0.00	0.00	0.00	0.00
EF	10yr120hr	0.00	0.00	0.00	0.00
EF	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
EF	25yr5min	0.00	0.00	0.00	0.00
EF	25yr10min	0.00	0.00	0.00	0.00
EF	25yr15min	0.00	0.00	0.00	0.00
EF	25yr30min	0.00	0.00	0.00	0.00
EF	25yr1hr	100.54	100.54	144.77	0.00
EF	25yr2hr	100.54	100.54	144.77	0.00
EF	25yr3hr	100.54	100.54	144.77	0.00
EF	25yr6hr	100.54	100.54	144.77	0.00
EF	25yr12hr	0.00	0.00	0.00	0.00
EF	25yr18hr	0.00	0.00	0.00	0.00
EF	25yr24hr	0.00	0.00	0.00	0.00
EF	25yr48hr	0.00	0.00	0.00	0.00
EF	25yr72hr	0.00	0.00	0.00	0.00
EF	25yr120hr	0.00	0.00	0.00	0.00
EF	25yr240hr	0.00	0.00	0.00	0.00
EF	50yr5min	27.15	27.15	0.00	0.00
EF	50yr10min	81.18	81.18	0.00	0.00
EF	50yr15min	99.95	99.95	0.00	0.00
EF	50yr30min	100.54	100.54	0.00	0.00
EF	50yr1hr	100.54	100.54	144.77	144.77
EF	50yr2hr	100.52	100.52	144.77	144.77
EF	50yr3hr	100.54	100.54	144.77	144.77
EF	50yr6hr	100.54	100.54	144.77	144.77
EF	50yr12hr	100.91	100.88	0.00	0.00
EF	50yr18hr	100.54	100.54	0.00	0.00
EF	50yr24hr	100.57	100.54	0.00	0.00
EF	50yr48hr	100.02	100.02	0.00	0.00
EF	50yr72hr	87.46	87.46	0.00	0.00
EF	50yr120hr	61.47	61.47	0.00	0.00
EF	50yr240hr	42.54	42.54	0.00	0.00
EF	100yr5min	0.00	0.00	0.00	0.00
EF	100yr10min	0.00	0.00	0.00	0.00
EF	100yr15min	0.00	134.86	0.00	0.00
EF	100yr30min	100.53	100.54	0.00	0.00
EF	100yr1hr	100.53	100.53	144.77	144.77
EF	100yr2hr	100.53	100.53	144.77	144.77
EF	100yr3hr	100.54	100.54	144.77	144.77
EF	100yr6hr	100.54	100.54	144.77	144.77
EF	100yr12hr	0.00	0.00	0.00	0.00
EF	100yr18hr	0.00	0.00	0.00	0.00
EF	100yr24hr	0.00	0.00	0.00	0.00
EF	100yr48hr	0.00	0.00	0.00	0.00
EF	100yr72hr	0.00	0.00	0.00	0.00
EF	100yr120hr	0.00	0.00	0.00	0.00
EF	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
EFOver	10yr5min	0.00	0.00	0.00	0.00
EFOver	10yr10min	0.00	0.00	0.00	0.00
EFOver	10yr15min	0.00	0.00	0.00	0.00
EFOver	10yr30min	0.00	0.00	0.00	0.00
EFOver	10yr1hr	0.00	0.00	0.00	0.00
EFOver	10yr2hr	0.00	0.00	0.00	0.00
EFOver	10yr3hr	0.00	0.00	0.00	0.00
EFOver	10yr6hr	0.00	0.00	0.00	0.00
EFOver	10yr12hr	0.00	0.00	0.00	0.00
EFOver	10yr18hr	0.00	0.00	0.00	0.00
EFOver	10yr24hr	0.00	0.00	0.00	0.00
EFOver	10yr48hr	0.00	0.00	0.00	0.00
EFOver	10yr72hr	0.00	0.00	0.00	0.00
EFOver	10yr120hr	0.00	0.00	0.00	0.00
EFOver	10yr240hr	0.00	0.00	0.00	0.00
EFOver	25yr5min	0.00	0.00	0.00	0.00
EFOver	25yr10min	0.00	0.00	0.00	0.00
EFOver	25yr15min	0.00	0.00	0.00	0.00
EFOver	25yr30min	0.00	0.00	0.00	0.00
EFOver	25yr1hr	0.00	0.00	0.00	0.00
EFOver	25yr2hr	2.09	2.09	0.00	0.00
EFOver	25yr3hr	1.78	1.78	0.00	0.00
EFOver	25yr6hr	0.00	0.00	0.00	0.00
EFOver	25yr12hr	0.00	0.00	0.00	0.00
EFOver	25yr18hr	0.00	0.00	0.00	0.00
EFOver	25yr24hr	0.00	0.00	0.00	0.00
EFOver	25yr48hr	0.00	0.00	0.00	0.00
EFOver	25yr72hr	0.00	0.00	0.00	0.00
EFOver	25yr120hr	0.00	0.00	0.00	0.00
EFOver	25yr240hr	0.00	0.00	0.00	0.00
EFOver	50yr5min	0.00	0.00	0.00	0.00
EFOver	50yr10min	0.00	0.00	0.00	0.00
EFOver	50yr15min	0.00	0.00	0.00	0.00
EFOver	50yr30min	0.00	0.00	0.00	0.00
EFOver	50yr1hr	3.97	3.97	0.00	0.00
EFOver	50yr2hr	13.56	12.80	0.34	0.00
EFOver	50yr3hr	11.65	10.64	0.04	0.00
EFOver	50yr6hr	5.61	5.61	0.00	0.00
EFOver	50yr12hr	1.66	1.66	0.00	0.00
EFOver	50yr18hr	0.00	0.00	0.00	0.00
EFOver	50yr24hr	0.00	0.00	0.00	0.00
EFOver	50yr48hr	0.00	0.00	0.00	0.00
EFOver	50yr72hr	0.00	0.00	0.00	0.00
EFOver	50yr120hr	0.00	0.00	0.00	0.00
EFOver	50yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
EFOver	100yr5min	0.00	0.00	0.00	0.00
EFOver	100yr10min	0.00	0.00	0.00	0.00
EFOver	100yr15min	0.00	0.00	0.00	0.00
EFOver	100yr30min	0.00	0.00	0.00	0.00
EFOver	100yr1hr	18.18	18.17	1.40	0.00
EFOver	100yr2hr	26.90	26.40	7.42	5.12
EFOver	100yr3hr	25.85	25.24	6.50	4.31
EFOver	100yr6hr	20.28	19.74	2.62	0.99
EFOver	100yr12hr	0.00	0.00	0.00	0.00
EFOver	100yr18hr	0.00	0.00	0.00	0.00
EFOver	100yr24hr	0.00	0.00	0.00	0.00
EFOver	100yr48hr	0.00	0.00	0.00	0.00
EFOver	100yr72hr	0.00	0.00	0.00	0.00
EFOver	100yr120hr	0.00	0.00	0.00	0.00
EFOver	100yr240hr	0.00	0.00	0.00	0.00
EI	10yr5min	0.00	0.00	0.00	0.00
EI	10yr10min	0.00	0.00	0.00	0.00
EI	10yr15min	0.00	0.00	0.00	0.00
EI	10yr30min	15.76	0.00	0.00	0.00
EI	10yr1hr	15.79	15.79	15.78	0.00
EI	10yr2hr	15.81	15.81	15.80	0.00
EI	10yr3hr	15.81	15.81	15.80	0.00
EI	10yr6hr	15.80	15.80	15.79	0.00
EI	10yr12hr	0.00	0.00	0.00	0.00
EI	10yr18hr	0.00	0.00	0.00	0.00
EI	10yr24hr	0.00	0.00	0.00	0.00
EI	10yr48hr	0.00	0.00	0.00	0.00
EI	10yr72hr	0.00	0.00	0.00	0.00
EI	10yr120hr	0.00	0.00	0.00	0.00
EI	10yr240hr	0.00	0.00	0.00	0.00
EI	25yr5min	0.00	0.00	0.00	0.00
EI	25yr10min	0.00	0.00	0.00	0.00
EI	25yr15min	0.00	0.00	0.00	0.00
EI	25yr30min	0.00	0.00	0.00	0.00
EI	25yr1hr	15.83	15.83	15.81	0.00
EI	25yr2hr	15.85	15.85	15.83	0.00
EI	25yr3hr	15.85	15.85	15.82	0.00
EI	25yr6hr	15.85	15.85	15.82	0.00
EI	25yr12hr	0.00	0.00	0.00	0.00
EI	25yr18hr	0.00	0.00	0.00	0.00
EI	25yr24hr	0.00	0.00	0.00	0.00
EI	25yr48hr	0.00	0.00	0.00	0.00
EI	25yr72hr	0.00	0.00	0.00	0.00
EI	25yr120hr	0.00	0.00	0.00	0.00
EI	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
EI	50yr5min	5.10	5.10	0.00	0.00
EI	50yr10min	15.63	15.63	0.00	0.00
EI	50yr15min	15.77	15.77	0.00	0.00
EI	50yr30min	15.82	15.82	0.00	0.00
EI	50yr1hr	15.86	15.86	15.83	662.20
EI	50yr2hr	15.86	15.86	15.85	662.07
EI	50yr3hr	15.86	15.86	15.85	662.20
EI	50yr6hr	15.86	15.86	15.84	662.18
EI	50yr12hr	15.85	15.85	0.00	0.00
EI	50yr18hr	15.83	15.83	0.00	0.00
EI	50yr24hr	15.81	15.81	0.00	0.00
EI	50yr48hr	15.77	15.77	0.00	0.00
EI	50yr72hr	15.74	15.74	0.00	0.00
EI	50yr120hr	15.32	15.32	0.00	0.00
EI	50yr240hr	10.94	10.94	0.00	0.00
EI	100yr5min	0.00	0.00	0.00	0.00
EI	100yr10min	0.00	0.00	0.00	0.00
EI	100yr15min	0.00	15.74	0.00	0.00
EI	100yr30min	15.85	15.85	0.00	0.00
EI	100yr1hr	15.86	15.86	15.85	662.16
EI	100yr2hr	15.86	15.86	15.86	662.17
EI	100yr3hr	15.86	15.86	15.86	662.19
EI	100yr6hr	15.86	15.86	15.86	662.20
EI	100yr12hr	0.00	0.00	0.00	0.00
EI	100yr18hr	0.00	0.00	0.00	0.00
EI	100yr24hr	0.00	0.00	0.00	0.00
EI	100yr48hr	0.00	0.00	0.00	0.00
EI	100yr72hr	0.00	0.00	0.00	0.00
EI	100yr120hr	0.00	0.00	0.00	0.00
EI	100yr240hr	0.00	0.00	0.00	0.00
EIOver	10yr5min	0.00	0.00	0.00	0.00
EIOver	10yr10min	0.00	0.00	0.00	0.00
EIOver	10yr15min	0.00	0.00	0.00	0.00
EIOver	10yr30min	0.00	0.00	0.00	0.00
EIOver	10yr1hr	0.00	0.00	0.00	0.00
EIOver	10yr2hr	0.00	0.00	0.00	0.00
EIOver	10yr3hr	0.00	0.00	0.00	0.00
EIOver	10yr6hr	0.00	0.00	0.00	0.00
EIOver	10yr12hr	0.00	0.00	0.00	0.00
EIOver	10yr18hr	0.00	0.00	0.00	0.00
EIOver	10yr24hr	0.00	0.00	0.00	0.00
EIOver	10yr48hr	0.00	0.00	0.00	0.00
EIOver	10yr72hr	0.00	0.00	0.00	0.00
EIOver	10yr120hr	0.00	0.00	0.00	0.00
EIOver	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
ElOver	25yr5min	0.00	0.00	0.00	0.00
ElOver	25yr10min	0.00	0.00	0.00	0.00
ElOver	25yr15min	0.00	0.00	0.00	0.00
ElOver	25yr30min	0.00	0.00	0.00	0.00
ElOver	25yr1hr	0.00	0.00	0.00	0.00
ElOver	25yr2hr	393.55	393.55	0.00	0.00
ElOver	25yr3hr	362.59	362.59	0.00	0.00
ElOver	25yr6hr	0.00	0.00	0.00	0.00
ElOver	25yr12hr	0.00	0.00	0.00	0.00
ElOver	25yr18hr	0.00	0.00	0.00	0.00
ElOver	25yr24hr	0.00	0.00	0.00	0.00
ElOver	25yr48hr	0.00	0.00	0.00	0.00
ElOver	25yr72hr	0.00	0.00	0.00	0.00
ElOver	25yr120hr	0.00	0.00	0.00	0.00
ElOver	25yr240hr	0.00	0.00	0.00	0.00
ElOver	50yr5min	0.00	0.00	0.00	0.00
ElOver	50yr10min	0.00	0.00	0.00	0.00
ElOver	50yr15min	0.00	0.00	0.00	0.00
ElOver	50yr30min	0.00	0.00	0.00	0.00
ElOver	50yr1hr	547.13	547.13	0.00	0.00
ElOver	50yr2hr	901.25	888.12	154.24	0.00
ElOver	50yr3hr	867.77	848.94	46.17	0.00
ElOver	50yr6hr	652.22	652.22	0.00	0.00
ElOver	50yr12hr	350.19	350.17	0.00	0.00
ElOver	50yr18hr	0.00	0.00	0.00	0.00
ElOver	50yr24hr	0.00	0.00	0.00	0.00
ElOver	50yr48hr	0.00	0.00	0.00	0.00
ElOver	50yr72hr	0.00	0.00	0.00	0.00
ElOver	50yr120hr	0.00	0.00	0.00	0.00
ElOver	50yr240hr	0.00	0.00	0.00	0.00
ElOver	100yr5min	0.00	0.00	0.00	0.00
ElOver	100yr10min	0.00	0.00	0.00	0.00
ElOver	100yr15min	0.00	0.00	0.00	0.00
ElOver	100yr30min	0.00	0.00	0.00	0.00
ElOver	100yr1hr	984.62	984.22	320.73	0.00
ElOver	100yr2hr	1337.63	1319.44	751.46	622.26
ElOver	100yr3hr	1299.15	1275.89	702.49	570.43
ElOver	100yr6hr	1076.90	1053.54	441.99	268.05
ElOver	100yr12hr	0.00	0.00	0.00	0.00
ElOver	100yr18hr	0.00	0.00	0.00	0.00
ElOver	100yr24hr	0.00	0.00	0.00	0.00
ElOver	100yr48hr	0.00	0.00	0.00	0.00
ElOver	100yr72hr	0.00	0.00	0.00	0.00
ElOver	100yr120hr	0.00	0.00	0.00	0.00
ElOver	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
Link7	10yr5min	0.00	0.00	0.00	0.00
Link7	10yr10min	0.00	0.00	0.00	0.00
Link7	10yr15min	0.00	0.00	0.00	0.00
Link7	10yr30min	0.00	0.00	0.00	0.00
Link7	10yr1hr	50.14	18.50	19.71	0.00
Link7	10yr2hr	67.55	47.19	48.88	0.00
Link7	10yr3hr	66.18	54.39	55.35	0.00
Link7	10yr6hr	57.92	48.89	49.90	0.00
Link7	10yr12hr	0.00	0.00	0.00	0.00
Link7	10yr18hr	0.00	0.00	0.00	0.00
Link7	10yr24hr	0.00	0.00	0.00	0.00
Link7	10yr48hr	0.00	0.00	0.00	0.00
Link7	10yr72hr	0.00	0.00	0.00	0.00
Link7	10yr120hr	0.00	0.00	0.00	0.00
Link7	10yr240hr	0.00	0.00	0.00	0.00
Link7	25yr5min	0.00	0.00	0.00	0.00
Link7	25yr10min	0.00	0.00	0.00	0.00
Link7	25yr15min	0.00	0.00	0.00	0.00
Link7	25yr30min	0.00	0.00	0.00	0.00
Link7	25yr1hr	82.56	55.44	60.67	0.00
Link7	25yr2hr	136.02	91.18	110.12	0.00
Link7	25yr3hr	141.72	102.73	125.26	0.00
Link7	25yr6hr	117.00	93.57	105.01	0.00
Link7	25yr12hr	0.00	0.00	0.00	0.00
Link7	25yr18hr	0.00	0.00	0.00	0.00
Link7	25yr24hr	0.00	0.00	0.00	0.00
Link7	25yr48hr	0.00	0.00	0.00	0.00
Link7	25yr72hr	0.00	0.00	0.00	0.00
Link7	25yr120hr	0.00	0.00	0.00	0.00
Link7	25yr240hr	0.00	0.00	0.00	0.00
Link7	50yr5min	0.00	0.00	0.00	0.00
Link7	50yr10min	0.00	0.00	0.00	0.00
Link7	50yr15min	0.00	0.00	0.00	0.00
Link7	50yr30min	34.57	1.60	0.00	0.00
Link7	50yr1hr	133.00	82.20	101.54	88.40
Link7	50yr2hr	193.48	130.10	194.49	175.55
Link7	50yr3hr	194.81	144.24	200.75	195.63
Link7	50yr6hr	185.53	138.39	194.63	171.26
Link7	50yr12hr	37.04	36.93	0.00	0.00
Link7	50yr18hr	35.53	35.51	0.00	0.00
Link7	50yr24hr	33.74	33.73	0.00	0.00
Link7	50yr48hr	20.72	15.41	0.00	0.00
Link7	50yr72hr	0.00	0.00	0.00	0.00
Link7	50yr120hr	0.00	0.00	0.00	0.00
Link7	50yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
Link7	100yr5min	0.00	0.00	0.00	0.00
Link7	100yr10min	0.00	0.00	0.00	0.00
Link7	100yr15min	0.00	35.58	0.00	0.00
Link7	100yr30min	100.95	63.38	0.00	0.00
Link7	100yr1hr	187.86	111.87	163.08	147.84
Link7	100yr2hr	202.28	171.89	204.73	203.71
Link7	100yr3hr	201.67	189.28	205.94	205.34
Link7	100yr6hr	199.08	182.21	205.01	204.37
Link7	100yr12hr	0.00	0.00	0.00	0.00
Link7	100yr18hr	0.00	0.00	0.00	0.00
Link7	100yr24hr	0.00	0.00	0.00	0.00
Link7	100yr48hr	0.00	0.00	0.00	0.00
Link7	100yr72hr	0.00	0.00	0.00	0.00
Link7	100yr120hr	0.00	0.00	0.00	0.00
Link7	100yr240hr	0.00	0.00	0.00	0.00
F	10yr5min	0.00	0.00	0.00	0.00
F	10yr10min	0.00	0.00	0.00	0.00
F	10yr15min	0.00	0.00	0.00	0.00
F	10yr30min	160.54	0.00	0.00	0.00
F	10yr1hr	160.82	160.86	160.86	0.00
F	10yr2hr	160.83	160.86	160.86	0.00
F	10yr3hr	160.38	160.86	160.86	0.00
F	10yr6hr	160.84	160.85	160.86	0.00
F	10yr12hr	0.00	0.00	0.00	0.00
F	10yr18hr	0.00	0.00	0.00	0.00
F	10yr24hr	0.00	0.00	0.00	0.00
F	10yr48hr	0.00	0.00	0.00	0.00
F	10yr72hr	0.00	0.00	0.00	0.00
F	10yr120hr	0.00	0.00	0.00	0.00
F	10yr240hr	0.00	0.00	0.00	0.00
F	25yr5min	0.00	0.00	0.00	0.00
F	25yr10min	0.00	0.00	0.00	0.00
F	25yr15min	0.00	0.00	0.00	0.00
F	25yr30min	0.00	0.00	0.00	0.00
F	25yr1hr	160.84	160.86	160.86	0.00
F	25yr2hr	160.85	160.86	160.86	0.00
F	25yr3hr	160.50	160.85	160.86	0.00
F	25yr6hr	160.68	160.85	160.86	0.00
F	25yr12hr	0.00	0.00	0.00	0.00
F	25yr18hr	0.00	0.00	0.00	0.00
F	25yr24hr	0.00	0.00	0.00	0.00
F	25yr48hr	0.00	0.00	0.00	0.00
F	25yr72hr	0.00	0.00	0.00	0.00
F	25yr120hr	0.00	0.00	0.00	0.00
F	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
F	50yr5min	75.46	50.83	0.00	0.00
F	50yr10min	160.64	160.86	0.00	0.00
F	50yr15min	160.71	160.86	0.00	0.00
F	50yr30min	159.34	160.86	0.00	0.00
F	50yr1hr	160.85	160.86	160.85	160.86
F	50yr2hr	160.38	160.86	160.86	160.86
F	50yr3hr	160.86	160.86	160.86	160.86
F	50yr6hr	160.84	160.86	160.86	160.86
F	50yr12hr	160.86	160.85	0.00	0.00
F	50yr18hr	160.86	160.86	0.00	0.00
F	50yr24hr	160.86	160.86	0.00	0.00
F	50yr48hr	160.86	160.86	0.00	0.00
F	50yr72hr	160.86	160.86	0.00	0.00
F	50yr120hr	160.86	160.86	0.00	0.00
F	50yr240hr	113.05	113.00	0.00	0.00
F	100yr5min	0.00	0.00	0.00	0.00
F	100yr10min	0.00	0.00	0.00	0.00
F	100yr15min	0.00	160.50	0.00	0.00
F	100yr30min	160.71	160.86	0.00	0.00
F	100yr1hr	160.82	160.85	160.86	160.85
F	100yr2hr	160.54	160.86	160.86	160.86
F	100yr3hr	160.56	160.85	160.86	160.85
F	100yr6hr	160.84	160.86	160.86	160.85
F	100yr12hr	0.00	0.00	0.00	0.00
F	100yr18hr	0.00	0.00	0.00	0.00
F	100yr24hr	0.00	0.00	0.00	0.00
F	100yr48hr	0.00	0.00	0.00	0.00
F	100yr72hr	0.00	0.00	0.00	0.00
F	100yr120hr	0.00	0.00	0.00	0.00
F	100yr240hr	0.00	0.00	0.00	0.00
FOver	10yr5min	0.00	0.00	0.00	0.00
FOver	10yr10min	0.00	0.00	0.00	0.00
FOver	10yr15min	0.00	0.00	0.00	0.00
FOver	10yr30min	0.00	0.00	0.00	0.00
FOver	10yr1hr	0.00	0.00	0.00	0.00
FOver	10yr2hr	0.00	0.00	0.00	0.00
FOver	10yr3hr	0.00	0.00	0.00	0.00
FOver	10yr6hr	0.00	0.00	0.00	0.00
FOver	10yr12hr	0.00	0.00	0.00	0.00
FOver	10yr18hr	0.00	0.00	0.00	0.00
FOver	10yr24hr	0.00	0.00	0.00	0.00
FOver	10yr48hr	0.00	0.00	0.00	0.00
FOver	10yr72hr	0.00	0.00	0.00	0.00
FOver	10yr120hr	0.00	0.00	0.00	0.00
FOver	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
FOver	25yr5min	0.00	0.00	0.00	0.00
FOver	25yr10min	0.00	0.00	0.00	0.00
FOver	25yr15min	0.00	0.00	0.00	0.00
FOver	25yr30min	0.00	0.00	0.00	0.00
FOver	25yr1hr	0.00	0.00	0.00	0.00
FOver	25yr2hr	0.00	0.00	0.00	0.00
FOver	25yr3hr	0.00	0.00	0.00	0.00
FOver	25yr6hr	0.00	0.00	0.00	0.00
FOver	25yr12hr	0.00	0.00	0.00	0.00
FOver	25yr18hr	0.00	0.00	0.00	0.00
FOver	25yr24hr	0.00	0.00	0.00	0.00
FOver	25yr48hr	0.00	0.00	0.00	0.00
FOver	25yr72hr	0.00	0.00	0.00	0.00
FOver	25yr120hr	0.00	0.00	0.00	0.00
FOver	25yr240hr	0.00	0.00	0.00	0.00
FOver	50yr5min	0.00	0.00	0.00	0.00
FOver	50yr10min	0.00	0.00	0.00	0.00
FOver	50yr15min	0.00	0.00	0.00	0.00
FOver	50yr30min	608.94	0.00	0.00	0.00
FOver	50yr1hr	0.00	0.00	0.00	0.00
FOver	50yr2hr	204.67	0.00	253.59	0.00
FOver	50yr3hr	268.48	0.00	608.08	310.87
FOver	50yr6hr	0.00	0.00	259.55	0.00
FOver	50yr12hr	1001.71	983.68	0.00	0.00
FOver	50yr18hr	755.77	754.08	0.00	0.00
FOver	50yr24hr	486.89	486.17	0.00	0.00
FOver	50yr48hr	0.00	0.00	0.00	0.00
FOver	50yr72hr	0.00	0.00	0.00	0.00
FOver	50yr120hr	0.00	0.00	0.00	0.00
FOver	50yr240hr	0.00	0.00	0.00	0.00
FOver	100yr5min	0.00	0.00	0.00	0.00
FOver	100yr10min	0.00	0.00	0.00	0.00
FOver	100yr15min	0.00	0.00	0.00	0.00
FOver	100yr30min	0.00	0.00	0.00	0.00
FOver	100yr1hr	0.00	0.00	0.00	0.00
FOver	100yr2hr	705.18	0.00	873.52	803.95
FOver	100yr3hr	665.51	35.43	956.44	915.08
FOver	100yr6hr	503.92	0.00	890.89	846.47
FOver	100yr12hr	0.00	0.00	0.00	0.00
FOver	100yr18hr	0.00	0.00	0.00	0.00
FOver	100yr24hr	0.00	0.00	0.00	0.00
FOver	100yr48hr	0.00	0.00	0.00	0.00
FOver	100yr72hr	0.00	0.00	0.00	0.00
FOver	100yr120hr	0.00	0.00	0.00	0.00
FOver	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
Link8	10yr5min	0.00	0.00	0.00	0.00
Link8	10yr10min	0.00	0.00	0.00	0.00
Link8	10yr15min	0.00	0.00	0.00	0.00
Link8	10yr30min	73.20	0.00	0.00	0.00
Link8	10yr1hr	258.21	96.89	103.42	0.00
Link8	10yr2hr	369.95	242.36	251.59	0.00
Link8	10yr3hr	367.85	284.03	289.77	0.00
Link8	10yr6hr	308.72	256.74	262.13	0.00
Link8	10yr12hr	0.00	0.00	0.00	0.00
Link8	10yr18hr	0.00	0.00	0.00	0.00
Link8	10yr24hr	0.00	0.00	0.00	0.00
Link8	10yr48hr	0.00	0.00	0.00	0.00
Link8	10yr72hr	0.00	0.00	0.00	0.00
Link8	10yr120hr	0.00	0.00	0.00	0.00
Link8	10yr240hr	0.00	0.00	0.00	0.00
Link8	25yr5min	0.00	0.00	0.00	0.00
Link8	25yr10min	0.00	0.00	0.00	0.00
Link8	25yr15min	0.00	0.00	0.00	0.00
Link8	25yr30min	0.00	0.00	0.00	0.00
Link8	25yr1hr	387.29	285.77	318.23	0.00
Link8	25yr2hr	387.25	387.23	387.30	0.00
Link8	25yr3hr	387.18	387.25	387.17	0.00
Link8	25yr6hr	387.24	387.28	387.26	0.00
Link8	25yr12hr	0.00	0.00	0.00	0.00
Link8	25yr18hr	0.00	0.00	0.00	0.00
Link8	25yr24hr	0.00	0.00	0.00	0.00
Link8	25yr48hr	0.00	0.00	0.00	0.00
Link8	25yr72hr	0.00	0.00	0.00	0.00
Link8	25yr120hr	0.00	0.00	0.00	0.00
Link8	25yr240hr	0.00	0.00	0.00	0.00
Link8	50yr5min	19.78	19.77	0.00	0.00
Link8	50yr10min	98.90	98.89	0.00	0.00
Link8	50yr15min	115.29	115.29	0.00	0.00
Link8	50yr30min	177.36	135.55	0.00	0.00
Link8	50yr1hr	387.27	387.26	387.21	387.31
Link8	50yr2hr	387.31	387.25	387.22	387.24
Link8	50yr3hr	387.27	387.18	387.35	387.23
Link8	50yr6hr	387.26	387.21	387.30	387.27
Link8	50yr12hr	209.39	208.36	0.00	0.00
Link8	50yr18hr	196.92	196.83	0.00	0.00
Link8	50yr24hr	185.11	184.58	0.00	0.00
Link8	50yr48hr	117.89	86.95	0.00	0.00
Link8	50yr72hr	7.21	7.21	0.00	0.00
Link8	50yr120hr	4.43	4.43	0.00	0.00
Link8	50yr240hr	2.32	2.32	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
Link8	100yr5min	0.00	0.00	0.00	0.00
Link8	100yr10min	0.00	0.00	0.00	0.00
Link8	100yr15min	0.00	143.29	0.00	0.00
Link8	100yr30min	387.26	335.87	0.00	0.00
Link8	100yr1hr	387.28	387.32	387.32	387.26
Link8	100yr2hr	387.17	387.21	387.14	387.29
Link8	100yr3hr	387.31	387.26	387.07	387.26
Link8	100yr6hr	387.19	387.32	387.27	387.31
Link8	100yr12hr	0.00	0.00	0.00	0.00
Link8	100yr18hr	0.00	0.00	0.00	0.00
Link8	100yr24hr	0.00	0.00	0.00	0.00
Link8	100yr48hr	0.00	0.00	0.00	0.00
Link8	100yr72hr	0.00	0.00	0.00	0.00
Link8	100yr120hr	0.00	0.00	0.00	0.00
Link8	100yr240hr	0.00	0.00	0.00	0.00
H	10yr5min	0.00	0.00	0.00	0.00
H	10yr10min	0.00	0.00	0.00	0.00
H	10yr15min	0.00	0.00	0.00	0.00
H	10yr30min	211.37	0.00	0.00	0.00
H	10yr1hr	205.51	205.51	205.51	0.00
H	10yr2hr	205.53	205.53	205.53	0.00
H	10yr3hr	205.47	205.47	205.47	0.00
H	10yr6hr	205.29	205.29	205.29	0.00
H	10yr12hr	0.00	0.00	0.00	0.00
H	10yr18hr	0.00	0.00	0.00	0.00
H	10yr24hr	0.00	0.00	0.00	0.00
H	10yr48hr	0.00	0.00	0.00	0.00
H	10yr72hr	0.00	0.00	0.00	0.00
H	10yr120hr	0.00	0.00	0.00	0.00
H	10yr240hr	0.00	0.00	0.00	0.00
H	25yr5min	0.00	0.00	0.00	0.00
H	25yr10min	0.00	0.00	0.00	0.00
H	25yr15min	0.00	0.00	0.00	0.00
H	25yr30min	0.00	0.00	0.00	0.00
H	25yr1hr	205.70	205.70	205.70	0.00
H	25yr2hr	205.71	205.71	205.71	0.00
H	25yr3hr	205.70	205.70	205.70	0.00
H	25yr6hr	205.58	205.58	205.58	0.00
H	25yr12hr	0.00	0.00	0.00	0.00
H	25yr18hr	0.00	0.00	0.00	0.00
H	25yr24hr	0.00	0.00	0.00	0.00
H	25yr48hr	0.00	0.00	0.00	0.00
H	25yr72hr	0.00	0.00	0.00	0.00
H	25yr120hr	0.00	0.00	0.00	0.00
H	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
H	50yr5min	100.65	100.65	0.00	0.00
H	50yr10min	205.22	205.22	0.00	0.00
H	50yr15min	205.47	205.47	0.00	0.00
H	50yr30min	205.71	205.71	0.00	0.00
H	50yr1hr	205.72	205.72	205.72	205.72
H	50yr2hr	205.72	205.72	205.72	205.72
H	50yr3hr	205.71	205.71	205.71	205.71
H	50yr6hr	205.70	205.70	205.70	205.70
H	50yr12hr	205.34	205.34	0.00	0.00
H	50yr18hr	202.55	202.55	0.00	0.00
H	50yr24hr	193.98	193.98	0.00	0.00
H	50yr48hr	140.93	140.93	0.00	0.00
H	50yr72hr	108.49	108.49	0.00	0.00
H	50yr120hr	79.13	79.13	0.00	0.00
H	50yr240hr	54.46	54.46	0.00	0.00
H	100yr5min	0.00	0.00	0.00	0.00
H	100yr10min	0.00	0.00	0.00	0.00
H	100yr15min	0.00	286.03	0.00	0.00
H	100yr30min	205.72	205.72	0.00	0.00
H	100yr1hr	205.73	205.73	205.73	205.73
H	100yr2hr	205.73	205.73	205.73	205.73
H	100yr3hr	205.72	205.72	205.72	205.72
H	100yr6hr	205.71	205.71	205.71	205.71
H	100yr12hr	0.00	0.00	0.00	0.00
H	100yr18hr	0.00	0.00	0.00	0.00
H	100yr24hr	0.00	0.00	0.00	0.00
H	100yr48hr	0.00	0.00	0.00	0.00
H	100yr72hr	0.00	0.00	0.00	0.00
H	100yr120hr	0.00	0.00	0.00	0.00
H	100yr240hr	0.00	0.00	0.00	0.00
HOver	10yr5min	0.00	0.00	0.00	0.00
HOver	10yr10min	0.00	0.00	0.00	0.00
HOver	10yr15min	0.00	0.00	0.00	0.00
HOver	10yr30min	0.00	0.00	0.00	0.00
HOver	10yr1hr	0.00	0.00	0.00	0.00
HOver	10yr2hr	0.00	0.00	0.00	0.00
HOver	10yr3hr	0.00	0.00	0.00	0.00
HOver	10yr6hr	0.00	0.00	0.00	0.00
HOver	10yr12hr	0.00	0.00	0.00	0.00
HOver	10yr18hr	0.00	0.00	0.00	0.00
HOver	10yr24hr	0.00	0.00	0.00	0.00
HOver	10yr48hr	0.00	0.00	0.00	0.00
HOver	10yr72hr	0.00	0.00	0.00	0.00
HOver	10yr120hr	0.00	0.00	0.00	0.00
HOver	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Volume ft^3			
		Base	Pr1	Pr2	Pr3
HOver	25yr5min	0.00	0.00	0.00	0.00
HOver	25yr10min	0.00	0.00	0.00	0.00
HOver	25yr15min	0.00	0.00	0.00	0.00
HOver	25yr30min	0.00	0.00	0.00	0.00
HOver	25yr1hr	560.94	560.94	560.94	0.00
HOver	25yr2hr	563.36	563.36	563.36	0.00
HOver	25yr3hr	468.42	468.43	468.43	0.00
HOver	25yr6hr	0.00	0.00	0.00	0.00
HOver	25yr12hr	0.00	0.00	0.00	0.00
HOver	25yr18hr	0.00	0.00	0.00	0.00
HOver	25yr24hr	0.00	0.00	0.00	0.00
HOver	25yr48hr	0.00	0.00	0.00	0.00
HOver	25yr72hr	0.00	0.00	0.00	0.00
HOver	25yr120hr	0.00	0.00	0.00	0.00
HOver	25yr240hr	0.00	0.00	0.00	0.00
HOver	50yr5min	0.00	0.00	0.00	0.00
HOver	50yr10min	0.00	0.00	0.00	0.00
HOver	50yr15min	0.00	0.00	0.00	0.00
HOver	50yr30min	662.17	662.17	0.00	0.00
HOver	50yr1hr	860.45	860.45	860.45	860.45
HOver	50yr2hr	843.64	843.64	843.64	843.64
HOver	50yr3hr	753.23	753.23	753.23	753.23
HOver	50yr6hr	424.17	424.17	424.17	424.17
HOver	50yr12hr	0.00	0.00	0.00	0.00
HOver	50yr18hr	0.00	0.00	0.00	0.00
HOver	50yr24hr	0.00	0.00	0.00	0.00
HOver	50yr48hr	0.00	0.00	0.00	0.00
HOver	50yr72hr	0.00	0.00	0.00	0.00
HOver	50yr120hr	0.00	0.00	0.00	0.00
HOver	50yr240hr	0.00	0.00	0.00	0.00
HOver	100yr5min	0.00	0.00	0.00	0.00
HOver	100yr10min	0.00	0.00	0.00	0.00
HOver	100yr15min	0.00	0.00	0.00	0.00
HOver	100yr30min	930.76	930.76	0.00	0.00
HOver	100yr1hr	1082.55	1082.55	1082.55	1082.55
HOver	100yr2hr	1062.32	1062.32	1062.32	1062.33
HOver	100yr3hr	974.13	974.13	974.13	974.13
HOver	100yr6hr	644.56	644.56	644.56	644.56
HOver	100yr12hr	0.00	0.00	0.00	0.00
HOver	100yr18hr	0.00	0.00	0.00	0.00
HOver	100yr24hr	0.00	0.00	0.00	0.00
HOver	100yr48hr	0.00	0.00	0.00	0.00
HOver	100yr72hr	0.00	0.00	0.00	0.00
HOver	100yr120hr	0.00	0.00	0.00	0.00
HOver	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node1	10yr5min	0.00	0.00	0.00	0.00
Node1	10yr10min	0.00	0.00	0.00	0.00
Node1	10yr15min	0.00	0.00	0.00	0.00
Node1	10yr30min	655.57	0.00	0.00	0.00
Node1	10yr1hr	655.60	655.60	655.60	0.00
Node1	10yr2hr	655.60	655.60	655.60	0.00
Node1	10yr3hr	655.57	655.57	655.57	0.00
Node1	10yr6hr	655.48	655.48	655.48	0.00
Node1	10yr12hr	0.00	0.00	0.00	0.00
Node1	10yr18hr	0.00	0.00	0.00	0.00
Node1	10yr24hr	0.00	0.00	0.00	0.00
Node1	10yr48hr	0.00	0.00	0.00	0.00
Node1	10yr72hr	0.00	0.00	0.00	0.00
Node1	10yr120hr	0.00	0.00	0.00	0.00
Node1	10yr240hr	0.00	0.00	0.00	0.00
Node1	25yr5min	0.00	0.00	0.00	0.00
Node1	25yr10min	0.00	0.00	0.00	0.00
Node1	25yr15min	0.00	0.00	0.00	0.00
Node1	25yr30min	0.00	0.00	0.00	0.00
Node1	25yr1hr	655.73	655.73	655.73	0.00
Node1	25yr2hr	655.72	655.72	655.72	0.00
Node1	25yr3hr	655.68	655.68	655.68	0.00
Node1	25yr6hr	655.57	655.57	655.57	0.00
Node1	25yr12hr	0.00	0.00	0.00	0.00
Node1	25yr18hr	0.00	0.00	0.00	0.00
Node1	25yr24hr	0.00	0.00	0.00	0.00
Node1	25yr48hr	0.00	0.00	0.00	0.00
Node1	25yr72hr	0.00	0.00	0.00	0.00
Node1	25yr120hr	0.00	0.00	0.00	0.00
Node1	25yr240hr	0.00	0.00	0.00	0.00
Node1	50yr5min	654.62	654.62	0.00	0.00
Node1	50yr10min	655.53	655.53	0.00	0.00
Node1	50yr15min	655.66	655.66	0.00	0.00
Node1	50yr30min	655.80	655.80	0.00	0.00
Node1	50yr1hr	655.83	655.83	655.83	655.83
Node1	50yr2hr	655.81	655.81	655.81	655.81
Node1	50yr3hr	655.76	655.76	655.76	655.76
Node1	50yr6hr	655.64	655.64	655.64	655.64
Node1	50yr12hr	655.49	655.49	0.00	0.00
Node1	50yr18hr	655.41	655.41	0.00	0.00
Node1	50yr24hr	655.35	655.35	0.00	0.00
Node1	50yr48hr	655.25	655.25	0.00	0.00
Node1	50yr72hr	655.15	655.15	0.00	0.00
Node1	50yr120hr	654.67	654.67	0.00	0.00
Node1	50yr240hr	653.84	653.84	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node1	100yr5min	0.00	0.00	0.00	0.00
Node1	100yr10min	0.00	0.00	0.00	0.00
Node1	100yr15min	0.00	655.74	0.00	0.00
Node1	100yr30min	655.88	655.88	0.00	0.00
Node1	100yr1hr	655.91	655.91	655.91	655.91
Node1	100yr2hr	655.89	655.89	655.89	655.89
Node1	100yr3hr	655.84	655.84	655.84	655.84
Node1	100yr6hr	655.70	655.70	655.70	655.70
Node1	100yr12hr	0.00	0.00	0.00	0.00
Node1	100yr18hr	0.00	0.00	0.00	0.00
Node1	100yr24hr	0.00	0.00	0.00	0.00
Node1	100yr48hr	0.00	0.00	0.00	0.00
Node1	100yr72hr	0.00	0.00	0.00	0.00
Node1	100yr120hr	0.00	0.00	0.00	0.00
Node1	100yr240hr	0.00	0.00	0.00	0.00
Node2	10yr5min	0.00	0.00	0.00	0.00
Node2	10yr10min	0.00	0.00	0.00	0.00
Node2	10yr15min	0.00	0.00	0.00	0.00
Node2	10yr30min	653.75	0.00	0.00	0.00
Node2	10yr1hr	653.75	653.75	653.75	0.00
Node2	10yr2hr	653.75	653.75	653.75	0.00
Node2	10yr3hr	653.75	653.75	653.75	0.00
Node2	10yr6hr	653.75	653.75	653.75	0.00
Node2	10yr12hr	0.00	0.00	0.00	0.00
Node2	10yr18hr	0.00	0.00	0.00	0.00
Node2	10yr24hr	0.00	0.00	0.00	0.00
Node2	10yr48hr	0.00	0.00	0.00	0.00
Node2	10yr72hr	0.00	0.00	0.00	0.00
Node2	10yr120hr	0.00	0.00	0.00	0.00
Node2	10yr240hr	0.00	0.00	0.00	0.00
Node2	25yr5min	0.00	0.00	0.00	0.00
Node2	25yr10min	0.00	0.00	0.00	0.00
Node2	25yr15min	0.00	0.00	0.00	0.00
Node2	25yr30min	0.00	0.00	0.00	0.00
Node2	25yr1hr	653.75	653.75	653.75	0.00
Node2	25yr2hr	653.75	653.75	653.75	0.00
Node2	25yr3hr	653.75	653.75	653.75	0.00
Node2	25yr6hr	653.75	653.75	653.75	0.00
Node2	25yr12hr	0.00	0.00	0.00	0.00
Node2	25yr18hr	0.00	0.00	0.00	0.00
Node2	25yr24hr	0.00	0.00	0.00	0.00
Node2	25yr48hr	0.00	0.00	0.00	0.00
Node2	25yr72hr	0.00	0.00	0.00	0.00
Node2	25yr120hr	0.00	0.00	0.00	0.00
Node2	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node2	50yr5min	653.75	653.75	0.00	0.00
Node2	50yr10min	653.75	653.75	0.00	0.00
Node2	50yr15min	653.75	653.75	0.00	0.00
Node2	50yr30min	653.75	653.75	0.00	0.00
Node2	50yr1hr	653.75	653.75	653.75	653.75
Node2	50yr2hr	653.75	653.75	653.75	653.75
Node2	50yr3hr	653.75	653.75	653.75	653.75
Node2	50yr6hr	653.75	653.75	653.75	653.75
Node2	50yr12hr	653.75	653.75	0.00	0.00
Node2	50yr18hr	653.75	653.75	0.00	0.00
Node2	50yr24hr	653.75	653.75	0.00	0.00
Node2	50yr48hr	653.75	653.75	0.00	0.00
Node2	50yr72hr	653.75	653.75	0.00	0.00
Node2	50yr120hr	653.75	653.75	0.00	0.00
Node2	50yr240hr	653.52	653.52	0.00	0.00
Node2	100yr5min	0.00	0.00	0.00	0.00
Node2	100yr10min	0.00	0.00	0.00	0.00
Node2	100yr15min	0.00	653.75	0.00	0.00
Node2	100yr30min	653.75	653.75	0.00	0.00
Node2	100yr1hr	653.75	653.75	653.75	653.75
Node2	100yr2hr	653.75	653.75	653.75	653.75
Node2	100yr3hr	653.75	653.75	653.75	653.75
Node2	100yr6hr	653.75	653.75	653.75	653.75
Node2	100yr12hr	0.00	0.00	0.00	0.00
Node2	100yr18hr	0.00	0.00	0.00	0.00
Node2	100yr24hr	0.00	0.00	0.00	0.00
Node2	100yr48hr	0.00	0.00	0.00	0.00
Node2	100yr72hr	0.00	0.00	0.00	0.00
Node2	100yr120hr	0.00	0.00	0.00	0.00
Node2	100yr240hr	0.00	0.00	0.00	0.00
Node3	10yr5min	0.00	0.00	0.00	0.00
Node3	10yr10min	0.00	0.00	0.00	0.00
Node3	10yr15min	0.00	0.00	0.00	0.00
Node3	10yr30min	685.18	0.00	0.00	0.00
Node3	10yr1hr	685.80	685.80	685.58	0.00
Node3	10yr2hr	686.23	686.23	685.96	0.00
Node3	10yr3hr	686.21	686.21	685.95	0.00
Node3	10yr6hr	686.02	686.02	685.75	0.00
Node3	10yr12hr	0.00	0.00	0.00	0.00
Node3	10yr18hr	0.00	0.00	0.00	0.00
Node3	10yr24hr	0.00	0.00	0.00	0.00
Node3	10yr48hr	0.00	0.00	0.00	0.00
Node3	10yr72hr	0.00	0.00	0.00	0.00
Node3	10yr120hr	0.00	0.00	0.00	0.00
Node3	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node3	25yr5min	0.00	0.00	0.00	0.00
Node3	25yr10min	0.00	0.00	0.00	0.00
Node3	25yr15min	0.00	0.00	0.00	0.00
Node3	25yr30min	0.00	0.00	0.00	0.00
Node3	25yr1hr	686.66	686.66	686.16	0.00
Node3	25yr2hr	687.07	687.07	686.50	0.00
Node3	25yr3hr	687.07	687.07	686.47	0.00
Node3	25yr6hr	686.94	686.94	686.28	0.00
Node3	25yr12hr	0.00	0.00	0.00	0.00
Node3	25yr18hr	0.00	0.00	0.00	0.00
Node3	25yr24hr	0.00	0.00	0.00	0.00
Node3	25yr48hr	0.00	0.00	0.00	0.00
Node3	25yr72hr	0.00	0.00	0.00	0.00
Node3	25yr120hr	0.00	0.00	0.00	0.00
Node3	25yr240hr	0.00	0.00	0.00	0.00
Node3	50yr5min	683.53	683.53	0.00	0.00
Node3	50yr10min	684.66	684.66	0.00	0.00
Node3	50yr15min	685.43	685.43	0.00	0.00
Node3	50yr30min	686.46	686.40	0.00	0.00
Node3	50yr1hr	687.09	687.09	686.64	686.47
Node3	50yr2hr	687.13	687.13	687.03	686.89
Node3	50yr3hr	687.13	687.12	687.01	686.85
Node3	50yr6hr	687.10	687.10	686.77	686.61
Node3	50yr12hr	687.06	687.06	0.00	0.00
Node3	50yr18hr	686.66	686.66	0.00	0.00
Node3	50yr24hr	686.13	686.13	0.00	0.00
Node3	50yr48hr	685.44	685.44	0.00	0.00
Node3	50yr72hr	684.82	684.82	0.00	0.00
Node3	50yr120hr	684.23	684.23	0.00	0.00
Node3	50yr240hr	683.85	683.85	0.00	0.00
Node3	100yr5min	0.00	0.00	0.00	0.00
Node3	100yr10min	0.00	0.00	0.00	0.00
Node3	100yr15min	0.00	684.85	0.00	0.00
Node3	100yr30min	686.99	686.99	0.00	0.00
Node3	100yr1hr	687.14	687.14	687.06	686.98
Node3	100yr2hr	687.18	687.17	687.11	687.10
Node3	100yr3hr	687.17	687.17	687.11	687.09
Node3	100yr6hr	687.15	687.15	687.08	687.05
Node3	100yr12hr	0.00	0.00	0.00	0.00
Node3	100yr18hr	0.00	0.00	0.00	0.00
Node3	100yr24hr	0.00	0.00	0.00	0.00
Node3	100yr48hr	0.00	0.00	0.00	0.00
Node3	100yr72hr	0.00	0.00	0.00	0.00
Node3	100yr120hr	0.00	0.00	0.00	0.00
Node3	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node4	10yr5min	0.00	0.00	0.00	0.00
Node4	10yr10min	0.00	0.00	0.00	0.00
Node4	10yr15min	0.00	0.00	0.00	0.00
Node4	10yr30min	683.25	0.00	0.00	0.00
Node4	10yr1hr	683.40	682.74	682.77	0.00
Node4	10yr2hr	683.68	683.35	683.38	0.00
Node4	10yr3hr	683.66	683.48	683.49	0.00
Node4	10yr6hr	683.53	683.38	683.40	0.00
Node4	10yr12hr	0.00	0.00	0.00	0.00
Node4	10yr18hr	0.00	0.00	0.00	0.00
Node4	10yr24hr	0.00	0.00	0.00	0.00
Node4	10yr48hr	0.00	0.00	0.00	0.00
Node4	10yr72hr	0.00	0.00	0.00	0.00
Node4	10yr120hr	0.00	0.00	0.00	0.00
Node4	10yr240hr	0.00	0.00	0.00	0.00
Node4	25yr5min	0.00	0.00	0.00	0.00
Node4	25yr10min	0.00	0.00	0.00	0.00
Node4	25yr15min	0.00	0.00	0.00	0.00
Node4	25yr30min	0.00	0.00	0.00	0.00
Node4	25yr1hr	683.89	683.49	683.58	0.00
Node4	25yr2hr	684.50	683.99	684.22	0.00
Node4	25yr3hr	684.56	684.13	684.38	0.00
Node4	25yr6hr	684.29	684.02	684.16	0.00
Node4	25yr12hr	0.00	0.00	0.00	0.00
Node4	25yr18hr	0.00	0.00	0.00	0.00
Node4	25yr24hr	0.00	0.00	0.00	0.00
Node4	25yr48hr	0.00	0.00	0.00	0.00
Node4	25yr72hr	0.00	0.00	0.00	0.00
Node4	25yr120hr	0.00	0.00	0.00	0.00
Node4	25yr240hr	0.00	0.00	0.00	0.00
Node4	50yr5min	679.45	679.29	0.00	0.00
Node4	50yr10min	682.43	680.80	0.00	0.00
Node4	50yr15min	683.80	681.90	0.00	0.00
Node4	50yr30min	685.11	684.13	0.00	0.00
Node4	50yr1hr	684.47	683.89	684.12	683.96
Node4	50yr2hr	685.05	684.44	685.06	684.89
Node4	50yr3hr	685.06	684.58	685.11	685.07
Node4	50yr6hr	684.98	684.52	685.06	684.85
Node4	50yr12hr	685.16	685.16	0.00	0.00
Node4	50yr18hr	685.13	685.13	0.00	0.00
Node4	50yr24hr	685.10	685.10	0.00	0.00
Node4	50yr48hr	684.80	684.65	0.00	0.00
Node4	50yr72hr	683.39	682.96	0.00	0.00
Node4	50yr120hr	681.22	681.12	0.00	0.00
Node4	50yr240hr	679.77	679.77	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node4	100yr5min	0.00	0.00	0.00	0.00
Node4	100yr10min	0.00	0.00	0.00	0.00
Node4	100yr15min	0.00	684.52	0.00	0.00
Node4	100yr30min	684.11	683.62	0.00	0.00
Node4	100yr1hr	685.00	684.24	684.77	684.62
Node4	100yr2hr	685.13	684.85	685.15	685.14
Node4	100yr3hr	685.12	685.01	685.16	685.15
Node4	100yr6hr	685.10	684.95	685.15	685.14
Node4	100yr12hr	0.00	0.00	0.00	0.00
Node4	100yr18hr	0.00	0.00	0.00	0.00
Node4	100yr24hr	0.00	0.00	0.00	0.00
Node4	100yr48hr	0.00	0.00	0.00	0.00
Node4	100yr72hr	0.00	0.00	0.00	0.00
Node4	100yr120hr	0.00	0.00	0.00	0.00
Node4	100yr240hr	0.00	0.00	0.00	0.00
Node5	10yr5min	0.00	0.00	0.00	0.00
Node5	10yr10min	0.00	0.00	0.00	0.00
Node5	10yr15min	0.00	0.00	0.00	0.00
Node5	10yr30min	681.15	0.00	0.00	0.00
Node5	10yr1hr	682.21	681.24	681.28	0.00
Node5	10yr2hr	683.09	682.11	682.17	0.00
Node5	10yr3hr	683.05	682.37	682.41	0.00
Node5	10yr6hr	682.54	682.20	682.23	0.00
Node5	10yr12hr	0.00	0.00	0.00	0.00
Node5	10yr18hr	0.00	0.00	0.00	0.00
Node5	10yr24hr	0.00	0.00	0.00	0.00
Node5	10yr48hr	0.00	0.00	0.00	0.00
Node5	10yr72hr	0.00	0.00	0.00	0.00
Node5	10yr120hr	0.00	0.00	0.00	0.00
Node5	10yr240hr	0.00	0.00	0.00	0.00
Node5	25yr5min	0.00	0.00	0.00	0.00
Node5	25yr10min	0.00	0.00	0.00	0.00
Node5	25yr15min	0.00	0.00	0.00	0.00
Node5	25yr30min	0.00	0.00	0.00	0.00
Node5	25yr1hr	683.80	682.38	682.60	0.00
Node5	25yr2hr	684.47	683.93	684.17	0.00
Node5	25yr3hr	684.53	684.08	684.35	0.00
Node5	25yr6hr	684.26	683.96	684.11	0.00
Node5	25yr12hr	0.00	0.00	0.00	0.00
Node5	25yr18hr	0.00	0.00	0.00	0.00
Node5	25yr24hr	0.00	0.00	0.00	0.00
Node5	25yr48hr	0.00	0.00	0.00	0.00
Node5	25yr72hr	0.00	0.00	0.00	0.00
Node5	25yr120hr	0.00	0.00	0.00	0.00
Node5	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node5	50yr5min	680.82	680.82	0.00	0.00
Node5	50yr10min	681.25	681.25	0.00	0.00
Node5	50yr15min	681.36	681.36	0.00	0.00
Node5	50yr30min	681.73	681.48	0.00	0.00
Node5	50yr1hr	684.44	683.80	684.07	683.89
Node5	50yr2hr	685.04	684.41	685.05	684.87
Node5	50yr3hr	685.05	684.56	685.10	685.06
Node5	50yr6hr	684.97	684.50	685.05	684.83
Node5	50yr12hr	681.92	681.91	0.00	0.00
Node5	50yr18hr	681.84	681.84	0.00	0.00
Node5	50yr24hr	681.77	681.77	0.00	0.00
Node5	50yr48hr	681.37	681.18	0.00	0.00
Node5	50yr72hr	680.67	680.67	0.00	0.00
Node5	50yr120hr	680.62	680.62	0.00	0.00
Node5	50yr240hr	680.57	680.57	0.00	0.00
Node5	100yr5min	0.00	0.00	0.00	0.00
Node5	100yr10min	0.00	0.00	0.00	0.00
Node5	100yr15min	0.00	681.60	0.00	0.00
Node5	100yr30min	684.06	682.73	0.00	0.00
Node5	100yr1hr	684.99	684.19	684.75	684.60
Node5	100yr2hr	685.12	684.84	685.14	685.13
Node5	100yr3hr	685.11	685.00	685.15	685.14
Node5	100yr6hr	685.09	684.93	685.14	685.13
Node5	100yr12hr	0.00	0.00	0.00	0.00
Node5	100yr18hr	0.00	0.00	0.00	0.00
Node5	100yr24hr	0.00	0.00	0.00	0.00
Node5	100yr48hr	0.00	0.00	0.00	0.00
Node5	100yr72hr	0.00	0.00	0.00	0.00
Node5	100yr120hr	0.00	0.00	0.00	0.00
Node5	100yr240hr	0.00	0.00	0.00	0.00
Node6	10yr5min	0.00	0.00	0.00	0.00
Node6	10yr10min	0.00	0.00	0.00	0.00
Node6	10yr15min	0.00	0.00	0.00	0.00
Node6	10yr30min	691.26	0.00	0.00	0.00
Node6	10yr1hr	692.54	692.54	692.54	0.00
Node6	10yr2hr	692.59	692.59	692.59	0.00
Node6	10yr3hr	692.44	692.44	692.44	0.00
Node6	10yr6hr	691.92	691.92	691.92	0.00
Node6	10yr12hr	0.00	0.00	0.00	0.00
Node6	10yr18hr	0.00	0.00	0.00	0.00
Node6	10yr24hr	0.00	0.00	0.00	0.00
Node6	10yr48hr	0.00	0.00	0.00	0.00
Node6	10yr72hr	0.00	0.00	0.00	0.00
Node6	10yr120hr	0.00	0.00	0.00	0.00
Node6	10yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node6	25yr5min	0.00	0.00	0.00	0.00
Node6	25yr10min	0.00	0.00	0.00	0.00
Node6	25yr15min	0.00	0.00	0.00	0.00
Node6	25yr30min	0.00	0.00	0.00	0.00
Node6	25yr1hr	693.09	693.09	693.09	0.00
Node6	25yr2hr	693.09	693.09	693.09	0.00
Node6	25yr3hr	693.08	693.08	693.08	0.00
Node6	25yr6hr	692.75	692.75	692.75	0.00
Node6	25yr12hr	0.00	0.00	0.00	0.00
Node6	25yr18hr	0.00	0.00	0.00	0.00
Node6	25yr24hr	0.00	0.00	0.00	0.00
Node6	25yr48hr	0.00	0.00	0.00	0.00
Node6	25yr72hr	0.00	0.00	0.00	0.00
Node6	25yr120hr	0.00	0.00	0.00	0.00
Node6	25yr240hr	0.00	0.00	0.00	0.00
Node6	50yr5min	690.17	690.17	0.00	0.00
Node6	50yr10min	691.71	691.71	0.00	0.00
Node6	50yr15min	692.44	692.44	0.00	0.00
Node6	50yr30min	693.11	693.11	0.00	0.00
Node6	50yr1hr	693.13	693.13	693.13	693.13
Node6	50yr2hr	693.13	693.13	693.13	693.13
Node6	50yr3hr	693.12	693.12	693.12	693.12
Node6	50yr6hr	693.07	693.07	693.07	693.07
Node6	50yr12hr	692.07	692.07	0.00	0.00
Node6	50yr18hr	691.40	691.40	0.00	0.00
Node6	50yr24hr	690.93	690.93	0.00	0.00
Node6	50yr48hr	690.43	690.43	0.00	0.00
Node6	50yr72hr	690.23	690.23	0.00	0.00
Node6	50yr120hr	690.04	690.04	0.00	0.00
Node6	50yr240hr	689.88	689.88	0.00	0.00
Node6	100yr5min	0.00	0.00	0.00	0.00
Node6	100yr10min	0.00	0.00	0.00	0.00
Node6	100yr15min	0.00	691.79	0.00	0.00
Node6	100yr30min	693.14	693.14	0.00	0.00
Node6	100yr1hr	693.16	693.16	693.16	693.16
Node6	100yr2hr	693.16	693.16	693.16	693.16
Node6	100yr3hr	693.15	693.15	693.15	693.15
Node6	100yr6hr	693.11	693.11	693.11	693.11
Node6	100yr12hr	0.00	0.00	0.00	0.00
Node6	100yr18hr	0.00	0.00	0.00	0.00
Node6	100yr24hr	0.00	0.00	0.00	0.00
Node6	100yr48hr	0.00	0.00	0.00	0.00
Node6	100yr72hr	0.00	0.00	0.00	0.00
Node6	100yr120hr	0.00	0.00	0.00	0.00
Node6	100yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node7	10yr5min	0.00	0.00	0.00	0.00
Node7	10yr10min	0.00	0.00	0.00	0.00
Node7	10yr15min	0.00	0.00	0.00	0.00
Node7	10yr30min	679.31	0.00	0.00	0.00
Node7	10yr1hr	679.31	679.31	679.31	0.00
Node7	10yr2hr	679.31	679.31	679.31	0.00
Node7	10yr3hr	679.31	679.31	679.31	0.00
Node7	10yr6hr	679.31	679.31	679.31	0.00
Node7	10yr12hr	0.00	0.00	0.00	0.00
Node7	10yr18hr	0.00	0.00	0.00	0.00
Node7	10yr24hr	0.00	0.00	0.00	0.00
Node7	10yr48hr	0.00	0.00	0.00	0.00
Node7	10yr72hr	0.00	0.00	0.00	0.00
Node7	10yr120hr	0.00	0.00	0.00	0.00
Node7	10yr240hr	0.00	0.00	0.00	0.00
Node7	25yr5min	0.00	0.00	0.00	0.00
Node7	25yr10min	0.00	0.00	0.00	0.00
Node7	25yr15min	0.00	0.00	0.00	0.00
Node7	25yr30min	0.00	0.00	0.00	0.00
Node7	25yr1hr	679.31	679.31	679.31	0.00
Node7	25yr2hr	679.31	679.31	679.31	0.00
Node7	25yr3hr	679.31	679.31	679.31	0.00
Node7	25yr6hr	679.31	679.31	679.31	0.00
Node7	25yr12hr	0.00	0.00	0.00	0.00
Node7	25yr18hr	0.00	0.00	0.00	0.00
Node7	25yr24hr	0.00	0.00	0.00	0.00
Node7	25yr48hr	0.00	0.00	0.00	0.00
Node7	25yr72hr	0.00	0.00	0.00	0.00
Node7	25yr120hr	0.00	0.00	0.00	0.00
Node7	25yr240hr	0.00	0.00	0.00	0.00
Node7	50yr5min	678.34	678.18	0.00	0.00
Node7	50yr10min	679.31	679.31	0.00	0.00
Node7	50yr15min	679.31	679.31	0.00	0.00
Node7	50yr30min	679.31	679.31	0.00	0.00
Node7	50yr1hr	679.31	679.31	679.31	679.31
Node7	50yr2hr	679.31	679.31	679.31	679.31
Node7	50yr3hr	679.31	679.31	679.31	679.31
Node7	50yr6hr	679.31	679.31	679.31	679.31
Node7	50yr12hr	679.31	679.31	0.00	0.00
Node7	50yr18hr	679.31	679.31	0.00	0.00
Node7	50yr24hr	679.31	679.31	0.00	0.00
Node7	50yr48hr	679.31	679.31	0.00	0.00
Node7	50yr72hr	679.31	679.31	0.00	0.00
Node7	50yr120hr	679.31	679.31	0.00	0.00
Node7	50yr240hr	678.66	678.66	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node7	100yr5min	0.00	0.00	0.00	0.00
Node7	100yr10min	0.00	0.00	0.00	0.00
Node7	100yr15min	0.00	679.31	0.00	0.00
Node7	100yr30min	679.31	679.31	0.00	0.00
Node7	100yr1hr	679.31	679.31	679.31	679.31
Node7	100yr2hr	679.31	679.31	679.31	679.31
Node7	100yr3hr	679.31	679.31	679.31	679.31
Node7	100yr6hr	679.31	679.31	679.31	679.31
Node7	100yr12hr	0.00	0.00	0.00	0.00
Node7	100yr18hr	0.00	0.00	0.00	0.00
Node7	100yr24hr	0.00	0.00	0.00	0.00
Node7	100yr48hr	0.00	0.00	0.00	0.00
Node7	100yr72hr	0.00	0.00	0.00	0.00
Node7	100yr120hr	0.00	0.00	0.00	0.00
Node7	100yr240hr	0.00	0.00	0.00	0.00
Node8	10yr5min	0.00	0.00	0.00	0.00
Node8	10yr10min	0.00	0.00	0.00	0.00
Node8	10yr15min	0.00	0.00	0.00	0.00
Node8	10yr30min	680.34	0.00	0.00	0.00
Node8	10yr1hr	681.41	680.44	680.48	0.00
Node8	10yr2hr	682.23	681.31	681.37	0.00
Node8	10yr3hr	682.22	681.57	681.61	0.00
Node8	10yr6hr	681.74	681.40	681.43	0.00
Node8	10yr12hr	0.00	0.00	0.00	0.00
Node8	10yr18hr	0.00	0.00	0.00	0.00
Node8	10yr24hr	0.00	0.00	0.00	0.00
Node8	10yr48hr	0.00	0.00	0.00	0.00
Node8	10yr72hr	0.00	0.00	0.00	0.00
Node8	10yr120hr	0.00	0.00	0.00	0.00
Node8	10yr240hr	0.00	0.00	0.00	0.00
Node8	25yr5min	0.00	0.00	0.00	0.00
Node8	25yr10min	0.00	0.00	0.00	0.00
Node8	25yr15min	0.00	0.00	0.00	0.00
Node8	25yr30min	0.00	0.00	0.00	0.00
Node8	25yr1hr	682.41	681.58	681.80	0.00
Node8	25yr2hr	682.41	682.41	682.41	0.00
Node8	25yr3hr	682.41	682.41	682.41	0.00
Node8	25yr6hr	682.41	682.41	682.41	0.00
Node8	25yr12hr	0.00	0.00	0.00	0.00
Node8	25yr18hr	0.00	0.00	0.00	0.00
Node8	25yr24hr	0.00	0.00	0.00	0.00
Node8	25yr48hr	0.00	0.00	0.00	0.00
Node8	25yr72hr	0.00	0.00	0.00	0.00
Node8	25yr120hr	0.00	0.00	0.00	0.00
Node8	25yr240hr	0.00	0.00	0.00	0.00

Link Name	Storm	Max Water Elevation (ft)			
		Base	Pr1	Pr2	Pr3
Node8	50yr5min	680.01	680.01	0.00	0.00
Node8	50yr10min	680.45	680.45	0.00	0.00
Node8	50yr15min	680.55	680.55	0.00	0.00
Node8	50yr30min	680.93	680.68	0.00	0.00
Node8	50yr1hr	682.41	682.41	682.41	682.41
Node8	50yr2hr	682.41	682.41	682.41	682.41
Node8	50yr3hr	682.41	682.41	682.41	682.41
Node8	50yr6hr	682.41	682.41	682.41	682.41
Node8	50yr12hr	681.12	681.11	0.00	0.00
Node8	50yr18hr	681.04	681.04	0.00	0.00
Node8	50yr24hr	680.97	680.97	0.00	0.00
Node8	50yr48hr	680.57	680.38	0.00	0.00
Node8	50yr72hr	679.86	679.86	0.00	0.00
Node8	50yr120hr	679.82	679.82	0.00	0.00
Node8	50yr240hr	679.76	679.76	0.00	0.00
Node8	100yr5min	0.00	0.00	0.00	0.00
Node8	100yr10min	0.00	0.00	0.00	0.00
Node8	100yr15min	0.00	680.80	0.00	0.00
Node8	100yr30min	682.41	681.93	0.00	0.00
Node8	100yr1hr	682.41	682.41	682.41	682.41
Node8	100yr2hr	682.41	682.41	682.41	682.41
Node8	100yr3hr	682.41	682.41	682.41	682.41
Node8	100yr6hr	682.41	682.41	682.41	682.41
Node8	100yr12hr	0.00	0.00	0.00	0.00
Node8	100yr18hr	0.00	0.00	0.00	0.00
Node8	100yr24hr	0.00	0.00	0.00	0.00
Node8	100yr48hr	0.00	0.00	0.00	0.00
Node8	100yr72hr	0.00	0.00	0.00	0.00
Node8	100yr120hr	0.00	0.00	0.00	0.00
Node8	100yr240hr	0.00	0.00	0.00	0.00

Village of Mettawa
Stormwater Management Plan
Preliminary Cost Opinion

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
15390 W Little Saint Marys Road					
	MOBILIZATION	L SUM	1	$ 2,500.00	$ 2,500.00
	CLEARING AND GRUBBING	AC	1	$ 15,000.00	$ 15,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 7,500.00	$ 7,500.00
	ADDITIONAL CULVERT	L SUM	1	$ 5,000.00	$ 5,000.00
	DRIVEWAY CULVERT MODIFICATION	L SUM	1	$ 2,500.00	$ 2,500.00
	CHANNEL STABILIZATION AND RESTORATION	LF	1500	$ 25.00	$ 37,500.00
	DESIGN AND PERMITTING CONTINGENCY	PERC	1	15%	$ 10,500.00
	CONSTRUCTION CONTINGENCY	PERC	1	20%	$ 14,000.00
				TOTAL	**$ 94,500.00**

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
27115 Meadowoods Drive					
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 500.00	$ 500.00
	STABILIZATION AND RESTORATION	L SUM	1	$ 1,000.00	$ 1,000.00
	FLARED END SECTION REPLACEMENT	L SUM	1	$ 1,250.00	$ 1,250.00
				TOTAL	**$ 2,750.00**

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
15141 W Little Saint Marys					
	MOBILIZATION	L SUM	1	$ 1,000.00	$ 1,000.00
	CLEARING AND GRUBBING	L SUM	1	$ 1,500.00	$ 1,500.00
	MINOR GRADING	L SUM	1	$ 2,000.00	$ 2,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 1,000.00	$ 1,000.00
	ROADWAY CULVERT REPLACEMENT	L SUM	1	$ 5,000.00	$ 5,000.00
	PAVEMENT PATCH	L SUM	1	$ 500.00	$ 500.00
				TOTAL	**$ 11,000.00**

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
Mettawa Woods Drive cul de sac					
	MOBILIZATION	L SUM	1	$ 2,500.00	$ 2,500.00
	CLEARING AND GRUBBING	AC	0.5	$ 8,000.00	$ 4,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 2,500.00	$ 2,500.00
	STABILIZATION AND RESTORATION	L SUM	1	$ 5,000.00	$ 5,000.00
	CHANNEL GRADING	L SUM	1	$ 10,000.00	$ 10,000.00
	DESIGN AND PERMITTING CONTINGENCY	PERC	1	20%	$ 4,800.00
	CONSTRUCTION CONTINGENCY	PERC	1	20%	$ 4,800.00
				TOTAL	**$ 33,600.00**

Village of Mettawa
Stormwater Management Plan
Preliminary Cost Opinion

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
Old School Road and Bradley Road					
	MOBILIZATION	L SUM	1	$ 1,000.00	$ 1,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 500.00	$ 500.00
	STABILIZATION AND RESTORATION	L SUM	1	$ 1,000.00	$ 1,000.00
	PIPE MODIFICATION	L SUM	1	$ 1,000.00	$ 1,000.00
	DITCH GRADING	L SUM	1	$ 3,000.00	$ 3,000.00
				TOTAL	**$ 6,500.00**

ITEM	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	PRICE
Oasis Park, Mettawa Lane, Oasis Park Drainage					
A. Oasis Park					
	FINAL DESIGN AND PERMITTING	L SUM	1	$ 35,000.00	$ 35,000.00
	MOBILIZATION	L SUM	1	$ 5,000.00	$ 5,000.00
	CLEARING AND GRUBBING	AC	4	$ 7,500.00	$ 30,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 5,000.00	$ 5,000.00
	EARTHWORK	L SUM	1	$ 250,000.00	$ 250,000.00
	OUTLET STRUCTURE MODIFICATION	EACH	1	$ 5,000.00	$ 5,000.00
	STABILIZATION AND RESTORATION	L SUM	1	$ 50,000.00	$ 50,000.00
	CONSTRUCTION CONTINGENCY	PERC	1	20%	$ 76,000.00
				SUBTOTAL	**$ 456,000.00**
B. Mettawa Lane and Oasis Park Drainage					
	FINAL DESIGN AND PERMITTING	L SUM	1	$ 15,000.00	$ 15,000.00
	MOBILIZATION	L SUM	1	$ 5,000.00	$ 5,000.00
	CLEARING AND GRUBBING	AC	1	$ 15,000.00	$ 15,000.00
	SOIL EROSION AND SEDIMENT CONTROL	L SUM	1	$ 10,000.00	$ 10,000.00
	SCOUR AND EROSION PROTECTION	L SUM	1	$ 7,500.00	$ 7,500.00
	GRADE CONTROL AND BANK STABILIZATION	L SUM	1	$ 15,000.00	$ 15,000.00
	CULVERT REPLACEMENT	L SUM	1	$ 15,000.00	$ 15,000.00
	METTAWA LANE STORM SEWER	L SUM	1	$ 20,000.00	$ 20,000.00
	METTAWA LANE ROADWAY IMPROVEMENTS	L SUM	1	$ 50,000.00	$ 50,000.00
	STABILIZATION AND RESTORATION	L SUM	1	$ 30,000.00	$ 30,000.00
	CONSTRUCTION CONTINGENCY	PERC	1	20%	$ 36,500.00
				SUBTOTAL	**$ 219,000.00**
				TOTAL	**$ 675,000.00**

Hydrologic and Hydraulic Model Files (Digital)

Hey and Associates, Inc.